

THE FLOWERING PLANTS
OF THE
ANGLO-EGYPTIAN SUDAN

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VOLUME II
(STERCULIACEAE—DIPSACACEAE)

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PREFACE

THE second volume completes the families up to and including the *Dipsacaceae*. The arrangement of the families, genera and species is on similar lines to that of Vol. I.

I have continued to make use of the works and illustrations mentioned in the first volume, and my renewed thanks are due to the authors and publishers. A number of the illustrations have been drawn by Mrs. W. Andrew from living specimens in the Sudan.

Again I must record my great indebtedness to Mr. J. E. Dandy of the British Museum (Natural History) for his assistance in the preparation of the final manuscript of this volume and for his help in the correction of the proofs, and also to Mr. E. Milne-Redhead of the Herbarium, Royal Botanic Gardens, Kew, for his continued co-operation in the naming of Sudan plants. My thanks are also due to Babikr Eff. Bashir for efficiently carrying out the typing of an almost indecipherable manuscript.

It should be noted that *Equatoria* as used in this flora includes the recently re-created Bahr-el-Ghazal Province.

F. W. ANDREWS.

SEQUENCE OF FAMILIES CONTAINED IN VOLUME II

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DESCRIPTIVE SYSTEMATIC LIST

ANGIOSPERMAE

DICOTYLEDONES

71. STERCULIACEAE

Trees or shrubs usually with soft wood, or very rarely herbs with often stellate indumentum. Leaves alternate or very rarely subopposite, simple or digitately compound; stipules usually present. Flowers variously arranged, hermaphrodite or unisexual, normally actinomorphic. Sepals 3-5, valvate, more or less partially connate or rarely spathaceous. Petals 5 or absent, hypogynous, contorted-imbricate, sometimes hooded. Stamens free or connate into a tube, sometimes with staminodes. Ovary superior, of 2-12 more or less united carpels or of one carpel; style simple or divided into lobes or rarely the styles free to the base; ovules 2 or more in each loculus or rarely 1, on axile placentas. Fruit various.

- A. Petals present; flowers hermaphrodite:
- B. Staminodes present between the fertile stamens; usually trees or shrubs:
- (a) Petals not hooded:
- (b) Bracteoles neither persistent nor enlarging in fruit; petals persistent, becoming dry and scarious
DOMBEYA. 3.
- (bb) Bracteoles persistent and often enlarging in fruit, suborbicular MELHANIA. 6.
- (aa) Petals hooded:
- (c) Anthers solitary between the staminodes; fruit a prickly 5-valved capsule, the valves separating
BYTTNERIA. 1.
- (cc) Anthers several among the staminodes; fruit a non-prickly 3-valved capsule LEPTONYCHIA. 5.
- BB. Staminodes absent; usually herbs or undershrubs:
- (d) Ovules numerous in each loculus; capsule loculicidally 5-valved, often with horny appendages at the apex
HERMANNIA. 4.
- (dd) Ovules 2 in each loculus:
- (e) Ovary 5-locular; capsule loculicidally 5-valved; loculi 1-seeded MELOCHIA. 7.
- (ee) Ovary 1-locular; capsule 2-valved, 1-seeded
WALTHERIA. 9.

- AA Petals absent; flowers unisexual or polygamous; trees or shrubs:
 (f) Anthers arranged in irregular masses; fruiting carpels grey to brownish outside, velvety with pungent bristles inside STERCULIA. 8.
 (ff) Anthers whorled; fruiting carpels at first scarlet outside, smooth inside COLA. 2.

1. **BYTTNERIA** Loeffl.**Byttneria africana** Mast.

Woody climber; branchlets slender, stellate-puberulous. Leaves thin, long-petiolate, entire, broadly ovate, acutely acuminate at the apex, widely truncate-cordate at the base, about 6 in. long and broad, glabrous or nearly so. Flowers small, in slender leaf-opposed cymes sometimes with an additional subaxillary smaller cyme; cymes about as long as the petiole. Sepals lanceolate, $\frac{1}{2}$ in. long. Petals a little longer than the sepals, linear-lanceolate, glabrous. Fruit spinose, about $1\frac{1}{2}$ in. long.

Equatoria.

2. **COLA** Schott & Endl.**Cola cordifolia** (Cav.) R. Br.

Deciduous forest tree up to 100 ft. high with spreading crown and shortly buttressed trunk, the ash-grey bark stripping like that of a plane tree; slash mottled-yellow-white, exuding gum. Leaves simple, ovate to broadly ovate, obtuse at the apex, cordate to truncate at the base, usually 5-7 in. long and 4-5 in. broad on flowering shoots (sometimes as much as 24 in. long and 20 in. broad), glabrous above, stellate-pubescent to tomentose beneath; petiole $1\frac{1}{2}$ -6 in. long. Flowers white becoming pink, small, subsessile, thickly clustered on the branches of the axillary pale-yellow-tomentose inflorescences. Fruit a stellate cluster of 4-5 oblong, shortly beaked follicles each 5 in. long and 3 in. broad, smooth and pinkish-white inside, at first felty-tomentose and scarlet outside, but drying to brown and opening almost flat.

Equatoria.

3. **DOMBEYA** Cav.**Dombeya quinqueseta** (Del.) Exell.

Fig. 1.

D. reticulata Mast.; *D. multiflora* var. *vestita* K. Schum.

Shrub or tree 6-15 ft. high, occasionally up to 20 ft.; branchlets glabrous or nearly so. Leaves ovate, acutely or obscurely lobed, cordate at the base, $2\frac{1}{2}$ -8 $\frac{1}{2}$ in. long, 2-7 in. broad, stellate-tomentose (often densely so) on both surfaces; lateral nerves very prominent beneath; petiole 1-4 in. long. Flowers white or pinkish-white appearing before the leaves, woolly tomentose in bud, on more or less tomentose peduncles up to 4 in. long; pedicels $\frac{1}{2}$ in. long. Sepals up to $\frac{1}{2}$ in. long. Petals oblique, up to $\frac{3}{4}$ in. long.

Central and Southern Sudan.



Fig. 1—DOMBEYA QUINQUESETA (Del.) Exell.

A, leaf. B, flower and bud. C, longitudinal section of flower. D, stamens and staminodes. E, ovary and transverse section of ovary. F, stellate hair from ovary.

D. mukole Sprague.

Tree up to 60 ft. high. Leaves broadly ovate, acuminate at the apex, cordate at the base, crenate-serrate, 2-5 in. long, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. broad, stellate-puberulous on both surfaces; petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Flowers white, usually appearing before the leaves, in axillary cymes 2-4 in. long; pedicels $\frac{1}{2}$ in. long. Sepals $\frac{1}{2}$ in. long. Petals oblique, slightly more than $\frac{1}{2}$ in. long. Ovary 3-locular.

Equatoria: Imatong Mountains, Talanga Forest; near Opari.

D. ellottii Schum. & Engler.

Tree; branches at first villous-tomentose, at length becoming glabrous. Leaves broadly ovate, cordate at the base, acuminate at the apex, 7-nerved, $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long, pilose above with simple hairs, densely stellate-tomentose beneath. Flowers long-pedicellate in subumbellate inflorescences; peduncles tomentose; pedicels villous. Sepals lanceolate, shortly acuminate at the apex, villous-tomentose. Ovary tomentose.

Equatoria: Imatong Mountains.

D. multiflora (Endl.) Planch.

Shrub with glabrous or downy branches. Leaves orbicular or oblong, cordate at the base, irregularly toothed, palmately 5-7-nerved, 1-2 in. long, stellate-pilose on both surfaces, downy when young, nearly glabrous when old. Inflorescences appearing before the leaves from the axils of the fallen leaves; pedicels numerous, as long as the petioles. Sepals lanceolate, downy or sometimes glabrous. Petals exceeding the sepals, oblique-cuneate. Style 5-partite.

Central Sudan.

D. mastersii Hook. f.

Small tree, the herbaceous parts tomentose with weak spreading hairs. Leaves ovate, acute or acuminate at the apex, cordate at the base, sometimes obscurely lobed, palmately 5-9-nerved, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, downy and villous; petioles 1-4 in. long. Peduncles axillary and terminal, about the length of the petioles, supporting many-flowered umbels; pedicels slender, shorter than the peduncles. Sepals lanceolate, $\frac{1}{2}$ in. long. Petals whitish, oblique, obovate, cuneate at the base, longer than the sepals. Stamens united at the base for rather less than half their length. Style pilose at the base, longer than the stamens.

Equatoria: Kagelu; Mount Loka.

D. bagshawei Bak. f.

Shrub or tree up to 20 ft. high; stems woody; branchlets at first densely rusty-pubescent, later nearly glabrous. Leaves with 3-5 irregularly denticulate lobes, sometimes emarginate at the apex, cordate at the base, up to $3\frac{1}{2}$ in. long, $4\frac{1}{2}$ in. broad, pubescent above, paler and more densely pubescent and prominently 7-9-nerved beneath; petiole rusty-tomentose. Flowers white, numerous, in corymbose cymes on rusty-tomentose peduncles up to 6 in. long.

Equatoria: Imatong Mountains.

D. goetzenii K. Schum.

Forest shrub or tree up to 50 ft. high with the bole up to 4 ft. in girth; bark grey, smooth; slash yellow-brown; branchlets pubescent when young, becoming glabrous. Leaves dark-green, usually with red nerves, suborbicular to broadly ovate, rarely trilobed, denticulate, long-acuminate at the apex, deeply cordate and often with overlapping lobes at the base, 5-14 in. long, 3½-10 in. broad, softly pubescent on both surfaces. Flowers pale-pink (deep-red at base of staminal tubes) in 10-18-flowered pseudo-umbels; inflorescences up to 12 in. long. Sepals up to ½ in. long. Petals ½-¾ in. long. Capsule densely pubescent to tomentose, 5-locular, 10-seeded.

Equatoria: Didinga Mountains, Nagichot.

4. **HERMANNIA** L.**Hermannia modesta** (Ehrenb.) Mast.

Low-growing slender annual herb covered with glandular hairs. Leaves subsessile, linear-oblong, obtuse to subacute at the apex, entire or the lower somewhat dentate, 1-1½ in. long, covered with a few stellate hairs. Flowers nodding, about ¼ in. long; peduncles solitary, axillary, thread-like, scarcely as long as the leaves. Filaments dilated above. Styles 5, shorter than the stamens.

Northern Sudan. Kordofan.

H. tigreensis Hochst. ex A. Rich.

Erect stellate-hairy annual herb up to 1 ft. high. Leaves subsessile, elliptic-oblong, acute at the apex, serrate, 1-1½ in. long, with simple hairs above, stellate hairs beneath; stipules persistent, lanceolate, pilose, often leafy. Flowers deep-red, small; peduncles generally longer than the leaves, axillary, solitary, 1-flowered, spreading, slender, pilose near the apex. Filaments petaloid, obovate. Fruit broadly turbinate, truncate with several horns at the apex, loosely stellate-pubescent.

Central Sudan.

5. **LEPTONYCHIA** Turcz.**Leptonychia chrysocarpa** K. Schum.

Small tree. Leaves oblong-elliptic to orbicular, obtusely long-acuminate at the apex, 3-nerved at the base, entire, the margin often undulate, about 6 in. long and 2½ in. broad, glabrous. Fruit globose, axillary, about 3-4 together, depressed, about ¾ in. in diameter, golden stellate-tomentellous.

Equatoria.

6. **MELHANIA** Forsk.**Melhania ferruginea** A. Rich.

Erect much-branched undershrub 2-3 ft. high, more or less densely covered with grey down and stellate hairs, and with yellow or

bright-red hairs at the apex. Leaves elliptic-oblong, subcordate at the base, serrate, $\frac{3}{4}$ - $4\frac{1}{2}$ in. long, velvety on both surfaces; nerves covered with rusty tomentum beneath; stipules persistent, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Peduncles solitary, axillary, clustered at the ends of branches, bearing often one but sometimes up to four flowers. Epicalyx one-sided, consisting of 3 broadly ovate segments. Fruit ovoid, acute at the apex, about $\frac{3}{4}$ in. long, villous, 5-locular, with more than 2 seeds in each loculus.

Equatoria.

M. denhamii R. Br.

Undershrub; branches and leaves softly grey-stellate-tomentose. Leaves ovate-elliptic, rounded or truncate at the apex, subcordate at the base, crenate-serrate, about $1\frac{1}{2}$ in. long and $\frac{3}{4}$ in. broad; petioles up to 1 in. long; stipules subulate-thread-like, becoming glabrous. Flowers yellow, axillary, solitary or peduncles sometimes forked, enclosed in the large red bracteoles, the latter enlarging, cordate at the base, membranous and wing-like in fruit. Fruit a small loculicidal capsule, 1-2-seeded.

Northern Sudan. Darfur. Kordofan.

M. steudneri Schweinf.

Undershrub. Leaves oblong or ovate-oblong, truncate or shortly apiculate at the apex, rounded at the base, serrate, $\frac{3}{4}$ -2 in. long, subtomentose above and beneath; stipules thread-like, falling. Flowers yellow, in pairs or rarely solitary, axillary; peduncles and pedicels covered with short yellow-grey hairs; bracteoles shortly ovate with long narrow points, subcordate at the base, grey-tomentose, scarcely enlarging in fruit. Fruit about $\frac{1}{4}$ in. long, tomentose.

Red Sea Hills: near Erkowit; Karora Hills.

7. MELOCHIA L.

Melochia corchorifolia L.

Erect or sometimes prostrate herb or undershrub $1\frac{1}{2}$ -2 or more ft. high, with hollow stems having lines of stellate hairs on the young parts. Leaves ovate, acute at the apex, rounded or very slightly cuneate at the base, serrate, 5-nerved at the base, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, up to $1\frac{1}{2}$ in. broad, nearly glabrous; petioles $\frac{1}{2}$ - $\frac{3}{4}$ as long as the lamina. Flowers white, yellowish or pinkish, small, in terminal clusters; bracts linear, ciliate.

Central and Southern Sudan.

M. mollis (K. Schum.) Hutch. & Dalziel.

Herb; stems and young parts densely covered with long silky hairs. Leaves ovate-lanceolate, acute at the apex, rounded to truncate at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 in. broad, pilose; petiole about $\frac{1}{2}$ as long as the lamina. Flowers white or yellowish, small, in axillary clusters; bracts very long-linear, densely plumose-pilose.

Equatoria.



Fig. 2—STERCULIA SETIGERA Del.

A, staminal column with head of anthers. B, seeds.

8. STERCULIA L.

Sterculia setigera Del.

Fig. 2.

S. tomentosa Guillem. & Perrott., non Thunb.; *S. cinerea* A. Rich.

Deciduous savannah tree up to 40 ft. high; bole buttressed at the base; bark grey-purple, flaking in oblong scales which leave pale-grey or greenish-yellow patches on falling; slash meat-red with paler streaks, exuding a white gum and a watery sap. Leaves suborbicular, digitately nerved and lobed, cordate at the

71. STERCULIACEAE

base with broadly overlapping auricles, 3½-7 in. in diameter, stellate-pilose above, grey-tomentose beneath. Flowers appearing before the leaves in erect cymes 2-4 in. long, chiefly from the ends of branches. Calyx green outside, purple-red with green lines inside, ½ in. long, downy. Fruiting carpels grey-green or brown, usually 4 together, sessile, oblong, beaked, 2-3 in. long, downy outside, velvety inside with numerous stiff, pungent, red-brown bristles along the inner side; seeds purple-black, with a small fleshy yellow-brown aril at the base, oblong, numerous.

Central and Southern Sudan.

S. africana (Lour.) Fiori.

Large tree with thick greyish branches. Leaves cordate at the base, orbicular or 3-lobed, 4-5 in. long; lobes entire, acuminate at the apex, the central one longest, nearly glabrous on both surfaces; petioles 4-5 in. long. Flowers numerous in much-branched axillary panicles; peduncles 2-3 in. long, downy. Calyx less than ½ in. long, downy outside, smooth and pink within, divided into 5 ovate-lanceolate segments. Fruiting carpels 3-5, spreading, subsessile, ovate, acuminate at the apex, downy on the outer surface.

Red Sea Hills: Erkowit; Jebel Elba.

9. WALTHERIA L.

Waltheria indica L.

W. americana L.

Erect grey-tomentose herb, woody at the base. Leaves more or less ovate, obtuse or subacute at the apex, rounded or subcordate at the base, rather closely serrulate-crenate, 2-4 in. long, ¾-2½ in. broad, stellate-tomentose beneath. Flowers yellow, small, in dense almost sessile heads in leaf-axils or the upper ones clustered into a short spike or irregularly collected into dense cymes or corymbs; bracts linear-lanceolate, about ½ in. long, villous. Calyx campanulate, 5-cleft.

Central and Southern Sudan.

72. BOMBACACEAE

Trees sometimes with bulging stems through excess of water storage. Leaves alternate, simple or digitate, often lepidote; stipules present and deciduous. Flowers hermaphrodite, large and showy. Calyx closed and valvate in bud or rarely deeply 5-lobed with slightly imbricate lobes, often with an epicalyx. Petals often elongated, sometimes absent. Stamens free or united into a tube; anthers reniform to linear, 1-locular; pollen smooth. Ovary superior, 2-5-locular; style simple, capitate or lobed; ovules 2 or more on the inner angle of each loculus. Fruit indehiscent or loculicidally dehiscent, the valves rarely falling away; seeds often embedded in hairs from the wall of the fruit.

A. Stamens numerous; flowers large, solitary ADANSONIA. 1.

AA. Stamens 15, united in 3's in bundles; flowers small, in clusters; fruit filled with soft woolly floss inside CEIBA. 2.



Fig. 3—ADANSONIA DIGITATA L.

1. **ADANSONIA** L.**Adansonia digitata** L.

Baobab. Fig. 3.

Large tree often of great girth; bark whitish, sometimes purplish, shining. Leaves digitately 5-foliolate, long-petiolate; leaflets subsessile, oblanceolate to obovate, acutely acuminate at the apex, entire or denticulate, up to $4\frac{1}{2}$ in. long and 2 in. broad, stellate-pubescent or nearly glabrous beneath. Flowers white, large, pendulous on long stalks. Calyx deeply 5-lobed, very hirsute-tomentose on both surfaces. Petals setose outside. Fruit yellowish-felted outside, oblong-ellipsoid to globose, 6-9 in. long, pendulous on long stalks; seeds embedded in a dry acid pulp.

Widespread except in Equatoria.

2. **CEIBA** Mill.**Ceiba pentandra** (L.) Gaertn.

Silk-cotton Tree.

Large forest tree up to 150 or more ft. high; trunk with large plank buttresses extending 20 or more ft. up; branches horizontal or ascending, without prickles or with obtuse or acutely-pointed stout prickles, generally prickly in the young state. Leaves digitately 8-15-foliolate, long-petiolate; leaflets sessile, lanceolate to oblanceolate, acutely acuminate at the apex, acute at the base, 4-8 in. long, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. broad, glabrous. Flowers white, clustered, appearing either when the whole tree is bare, or on leafless branches. Fruit pale-brownish, ellipsoid, or elongate-fusiform, narrowed at both ends, 4-12 in. long, containing a white or grey floss, either bursting on the tree or after falling.

Equatoria.

73. **MALVACEAE**

Herbs often with fibrous stems or rarely shrubs; indumentum usually stellate or lepidote. Leaves alternate, with stipules, entire or variously lobed, often palmately nerved. Flowers actinomorphic, hermaphrodite or rarely unisexual. Sepals 3-5, valvate, more or less united, with or without an epicalyx of bracteoles. Petals 5, free from each other but often adnate at the base to the staminal-column, contorted or imbricate. Stamens numerous, monadelphous, the staminal-column divided at the apex; anthers 1-locular. Ovary hypogynous, syncarpous, 2- or more-locular, often 5-locular or rarely of 1 carpel, or rarely the carpels in vertical rows; style branched above or rarely club-shaped; ovules 1 or more on axile placentas. Fruit breaking into cocci or capsular or rarely baccate.

A. Epicalyx absent:

B. Carpels transversely divided, contracted in the middle (the upper half spreading stellately in fruit), 2-seeded, the lower seed tomentose WISSADULA. 14.

BB. Carpels not transversely divided:

(a) Staminal column divided at the apex into several filaments and provided with anthers up to the apex:

- (b) Ovules usually more than 1 in each loculus; carpels 10 or more or very rarely less; leaves always cordate at the base ABUTILON. 1.
- (bb) Ovule 1 in each loculus; carpels up to 10 or very rarely more; leaves not always cordate at the base SIDA. 11.
- (aa) Staminal column truncate or 5-toothed at the apex, sometimes without anthers at the apex HIBISCUS. 4.
- AA. Epicalyx present:
- (c) Styles twice as many as the carpels; staminal column often without anthers at the apex:
- (d) Flowers not in heads, or not surrounded by an involucre:
- (e) Bracteoles of epicalyx connate at the base and adnate to the calyx; carpels covered with hooked bristles URENA. 13.
- (ee) Bracteoles of epicalyx free to the base or very nearly so; carpels sometimes with bearded but not hooked bristles PAVONIA. 9.
- (dd) Flowers in heads surrounded by an involucre of bracts MALACHRA. 6.
- (cc) Styles as many as the carpels, or style more or less undivided:
- (f) Style undivided or nearly so:
- (g) Calyx truncate; seeds pubescent; tall shrubs or trees with leaves lepidote when young THESPESIA. 12.
- (gg) Calyx 5-lobed; seeds cottony-downy; shrubby herbs with glandular leaves CIENFUEGOSIA. 2.
- (ff) Style divided into separate stigmas:
- (h) Epicalyx of 1-3 bracteoles:
- (i) Bracteoles foliaceous or ovate, more or less cordate:
- (j) Seeds solitary by abortion in each loculus, pilose; corolla violet below, yellow above, or all violet SERRA. 10.
- (jj) Seeds 2 or more in each loculus, fuzzy; corolla not as above GOSSYPIUM. 3.
- (ii) Bracteoles linear:
- (k) Flowers purple, in axillary clusters MALVA. 7.
- (kk) Flowers yellow:
- (l) Ovule 1 in each loculus MALVASTRUM. 8.
- (ll) Ovules more than 1 in each loculus GOSSYPIUM. 3.
- (hh) Epicalyx of more than 3 usually narrow bracteoles, or rudimentary:
- (m) Ovule 1 in each loculus KOSTELETZKYA. 5.
- (mm) Ovules more than 1 in each loculus HIBISCUS. 4.

1. **ABUTILON** Mill.

- A. Ripe carpels rounded or obtuse at the apex :
- B. Branches (especially the upper ones) angular ... *A. angulatum*.
- BB. Branches usually terete:
- (a) Flowers purple in large loose terminal much-branched panicles *A. longicuspe*.
- (aa) Flowers yellow, with or without a dark purple centre:
- (b) Indumentum of stems, calyces, &c., densely downy with dense longer non-glandular hairs concealing in the younger parts the underlying down; flowers large usually with a dark purple centre *A. pannosum*.
- (bb) Indumentum of stems, calyces, &c., downy and with scattered larger spreading hairs:
- (c) Indumentum with scattered long glandular hairs; flowers large, usually with a dark purple centre ... *A. hirtum*.
- (cc) Indumentum with scattered long non-glandular hairs; flowers small, usually without a purple centre
A. figarianum.
- AA. Ripe carpels acutely acuminate at the apex :
- C. Ripe carpels 20 or more, each with 2 long densely hairy awns ...
A. mauritianum.
- CC. Ripe carpels less than 20:
- (d) Flowers solitary or paired, axillary; leaves subentire to denticulate; carpels not prolonged into long awns
A. fruticosum.
- (dd) Flowers in panicles or cymes:
- (e) Carpels more than 10, acuminate but not prolonged into long awns, densely pubescent *A. bidentatum*.
- (ee) Carpels 10 or less, prolonged into 2 fine long awns, glandular-pubescent *A. ramosum*.

Abutilon angulatum (Guillem. & Perrott.) Mast.

Whitish-downy perennial herb 3-8 ft. high. Leaves long-petiolate, broadly ovate, acuminate at the apex, widely cordate at the base, crenulate to crenate-serrate, 2-5½ in. long, up to 5 in. broad, minutely tomentellous, paler on the undersurface. Flowers yellow or orange in leafy panicles. Carpels about 20, 1-seeded. Fruit twice as long as the persistent calyx.

Central and Southern Sudan.

A. longicuspe Hochst. ex A. Rich.

Shrubby much-branched herb up to 15 ft. high, thickly covered with fine down. Leaves broadly ovate, acuminate to long-acuminate at the apex, cordate at the base, serrate, paler beneath. Fruit downy, longer than the persistent calyx; carpels 1-seeded.

Red Sea Hills: Erkowit. Equatoria: Imatong Mountains, Ibadin.



Fig. 4—*ABUTILON PANNOSUM* (Forst. f.) Schlecht.

A. pannosum (Forst. f.) Schlecht.

Fig. 4.

A. glaucum (non Sweet) Broun & Massey.

Tall perennial herb or undershrub, with downy branches, 3-6 ft. high. Leaves broadly ovate to suborbicular, triangular-acute at the apex, cordate at the base, irregularly dentate, $1\frac{1}{2}$ -4 in. in diameter, softly tomentellous on both surfaces. Flowers yellow with a dark centre, usually paired. Fruit up to $\frac{1}{4}$ in. in diameter; carpels 2-3-seeded.

Widespread.Fig. 5—*ABUTILON FIGARIANUM* Webb.

A, longitudinal section of flower. B, flower from side. C, staminal column. D, anther. E, ovary and staminal column. F, transverse section of fruit. G, ripe carpels. H, carpel showing seeds. I, seeds.

A. hirtum (Lam.) Sweet.

Tall erect downy perennial herb. Leaves long-petiolate, ovate, acute at the apex, cordate at the base, coarsely serrate, downy on both surfaces; stipules persistent, subulate. Flowers solitary or in pairs on axillary or terminal peduncles articulate near the top. Fruit about $\frac{1}{2}$ in. in diameter; carpels 3-seeded.

Central Sudan.

A. figarianum Webb.

Fig. 5.

A. graveolens (non Wight & Arn.) Broun & Massey.

Tall perennial herb 3-6 ft. high, with more or less zigzag branches. Leaves broadly ovate, acute to acuminate at the apex, cordate at the base, crenate, up to 4 in. long and $3\frac{1}{2}$ in. broad, stellate-pubescent above, more densely so beneath; petiole as long as the lamina. Flowers yellow, usually without a purple centre, solitary or paired on each peduncle. Fruit up to $\frac{3}{8}$ in. in diameter; carpels 3-seeded.

Northern and Central Sudan.

A. mauritanium (Jacq.) Medic.

Whitish-downy perennial herb or undershrub 3-5 ft. high. Leaves broadly ovate, acuminate to long-acuminate at the apex, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, downy on both surfaces. Flowers yellow or orange, axillary, solitary. Carpels at length spreading stellately in fruit, at first densely pilose, at length nearly glabrous and blackish.

Equatoria.

A. fruticosum Guillem. & Perrott.

Fig. 6.

Densely white-downy, often much-branched, rigid perennial herb or undershrub. Leaves ovate, subentire or denticulate, cordate at the base, $\frac{3}{4}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 in. broad; stipules linear, falling early. Flowers yellow, axillary, solitary or paired. Carpels densely tomentose, 2-3-seeded.

Northern and Central Sudan.

A. bidentatum A. Rich.

Erect undershrub with slender downy branches. Leaves ovate, acute at the apex, cordate at the base, denticulate, slightly pilose on both surfaces. Flowers in small axillary panicles. Carpels 3-seeded.

Northern and Central Sudan.

A. ramosum (Cav.) Guillem. & Perrott.

Erect branching perennial herb or undershrub, somewhat glandular-tomentose and with spreading hairs. Leaves broadly ovate, entire or slightly trilobed, coarsely crenate, up to $4\frac{3}{4}$ in. broad, stellate-pubescent beneath, less so above; stipules thread-like, $\frac{3}{4}$ in. long, ciliate. Flowers yellow or whitish, in axillary and terminal cymes. Carpels 2-3-seeded.

Central Sudan.



Fig. 6—*ABUTILON FRUTICOSUM* Guillem. & Perrott.

2. CIENFUEGOSIA Cav.

Cienfuegosia digitata Cav.

Shrubby herb 1 or more ft. high with angular branches. Leaves digitately divided; lobes 5-7, linear or oblanceolate, up to 1½ in. long, glabrous; stipules linear, slightly pubescent; petiole about ½ as long as the lamina. Flowers yellow with a red-purple centre, 1-2 in. in diameter, axillary, solitary, appearing on the young shoots. Capsule shorter than the calyx, loculicidally 3-4-valved; seed covered with reddish-cottony down.

Central Sudan.

3. GOSSYPIUM L.¹*Gossypium anomalum* Wawra.

Fig. 7.

Upright perennial shrub 3-7 ft. high; stems thin, weak, thickly covered with long soft hairs. Leaves deeply 3-5-lobed, up to 2 in. long, pubescent on both surfaces. Flowers funnel-shaped; bracteoles linear, usually divided into 3 or 4 teeth at the apex, rarely entire. Capsule usually 3-locular, about twice as long as broad, beaked, dotted with prominent black glandular pustules, the sutures developing a partial false septum at the base of the capsule, and bearing a fringe of hairs above; seeds thin, with a single coat of fine brown hairs up to ¾ in. long.

Central Sudan.

G. somalense (Gürke) J. B. Hutch.

Fig. 8.

Spindly shrub up to 5 ft. high; stems thin and weak, canescent or pubescent. Leaves shallowly 3-lobed, sometimes entire, subcordate at the base, up to 2½ in. long, canescent or pubescent. Bracteoles ovate, cordate at the base, shallowly serrate along the upper margin, rarely entire. Fruiting branches 2-4-jointed, with the leaves at the nodes reduced to small appendages no larger than the stipules, usually bearing only a single yellow flower. Capsule globose, mucronate or prominently pointed at the apex, about ¾ in. long, gland-dotted, usually 3-4-locular, sutures bearing a line of hairs below; seeds narrow, bearing a copious coat of short rusty-brown hairs.

Central Sudan.

¹Only *G. anomalum* and *G. somalense* can be considered as truly indigenous to the Sudan. Other species and varieties now present in the Sudan were at some time introduced to this country. These comprise *G. arboreum* L. (*G. nanking* Meyen), *G. herbaceum* var. *africanum* (Watt) Hutch. & Ghose (*G. obtusifolium* var. *africanum* Watt), *G. herbaceum* var. *acertifolium* (Guillém. & Perrott.) A. Chev. (*G. obtusifolium* var. *wightianum* (Todaro) Watt), *G. hirsutum* L. (cultivated American cotton), *G. hirsutum* var. *punctatum* (Schumach.) J. B. Hutch. (*G. purpurascens* Poir.), *G. barbadense* L. (*G. peruvianum* Cav.) (cultivated Egyptian cotton) and *G. barbadense* var. *brasilense* (Macfad.) J. B. Hutch. (*G. brasilense* Macfad.). See *The Evolution of Gossypium* by J. B. Hutchinson, R. A. Sillow and S. G. Stephens. Oxford Univ. Press, 1947.



Fig. 7—*GOSSYPIUM ANOMALUM* Wawra.

A, longitudinal section of flower. B, punctate fruit with 3 bracteoles. C, fruit dehiscing. D, transverse section of fruit. E, seeds with appressed hairs (lint). F, seed with some lint teased out. G, stellate hairs.



Fig. 8—*GOSSYPIUM SOMALENSE* (Gürke) J. B. Hutch.

A, specimen with less divided leaves. B, fruit and seed of same. C, flower.
 D, longitudinal section of flower. E, fruit. F, transverse section of fruit.
 G, seeds, one with lint teased out. H, stellate hairs.

4. HIBISCUS L.

- A. Calyx more or less deeply lobed, not splitting down one side, persistent in fruit:
- B. Bracteoles present:
- C. Seeds glabrous, pubescent, pilose or downy, but not with long hairs like cotton; bracteoles conspicuous:
- D. Bracteoles free, or inconspicuously united at their extreme base:
- E. Bracteoles entire:
- F. Calyx inflated *H. trionum*.
- FF. Calyx not inflated:
- (a) Capsule obtuse or depressed at the apex, winged:
- (b) Bracteoles oblong, spatulate, as long as the calyx *H. dictyocarpus*.
- (bb) Bracteoles linear, thread-like, pilose, shorter than the calyx *H. vitifolius*.
- (aa) Capsule acute at the apex:
- (c) Annual:
- (d) Calyx-segments 1-nerved *H. obtusilobus*.
- (dd) Calyx-segments 3-nerved *H. aristivalvis*.
- (cc) Perennial:
- (e) Stem prickly *H. diversifolius*.
- (ee) Stem smooth:
- (f) Flowers numerous:
- (g) Flowers in terminal ultimately leafless simple racemes, or axillary and solitary, or crowded into a corymb:
- (h) Flowers crowded, corymbose *H. corymbosus*.
- (hh) Flowers not crowded, in terminal ultimately leafless racemes or axillary and solitary *H. physaloides*.
- (gg) Flowers in leafy much-branched panicles or cymes *H. rhabdotospermus*.
- (ff) Flowers few, solitary, axillary *H. articulatus*.
- EE. Bracteoles forked or provided with a foliaceous appendage; seeds pilose or downy:
- G. Stipules foliaceous, reniform-orbicular; plant trailing; stem with spreading hairs and recurved prickles ... *H. surattensis*.
- GG. Stipules linear; plant erect or half-climbing; stems more or less prickly and hispid:
- H. Branches laxly prickly but not or scarcely hispid; bracteoles forked *H. furcatus*.
- HH. Branches densely prickly and also densely hispid:
- (i) Leaves dentate, not lobed, triangular; bracteoles forked, tomentose *H. sudanensis*.

- (ii) Leaves palmately 3-5-lobed; bracteoles with a spoon-shaped appendage or 3-partite
H. rostellatus.
- DD. Bracteoles clearly united at the base or confluent with the base of the calyx:
- I. Epicalyx of 5 bracteoles:
- J. Flowers in terminal sometimes leafless pseudo-racemes ...
H. dongolensis.
- JJ. Flowers axillary:
- (j) Stems sparsely pubescent to almost glabrous:
- (k) Flowers large *H. calyphyllus.*
- (kk) Flowers very small *H. mongallaensis.*
- (jj) Stems velvety or downy pubescent:
- (l) Leaves more or less palmately 3-5-lobed; pedicels $\frac{3}{8}$ or less in. long; plant covered with dense yellow-brown tomentum; flowers 3-4 in. long ...
H. ludwigii.
- (ll) Leaves not or only obscurely lobed; pedicels longer than above:
- (m) Petioles 1- $\frac{3}{4}$ in. long *H. owariensis.*
- (mm) Petioles up to 1 in. long *H. schweinfurthii.*
- II. Epicalyx of more than 5 bracteoles:
- K. Bracteoles spatulate, widened above the middle
H. panduriformis.
- KK. Bracteoles narrowed to the apex:
- (n) Stems and calyx prickly; calyx very setose but not woolly *H. asper.*
- (nn) Stems not prickly or only slightly so:
- (o) Calyx woolly as well as setose; leaves long-petioled, sometimes deeply 5-7-lobed, rather sharply serrate, nearly glabrous ... *H. cannabinus.*
- (oo) Calyx not woolly, at most puberulous, rough especially on the margins; leaves ovate, often 3- (rarely 5)-lobed, glabrous or nearly so
H. sabdariffa.
- CC. Seeds with long cottony hairs; bracteoles small or inconspicuous:
- L. Bracteoles small and inconspicuous, shorter than the calyx *H. micranthus.*
- LL. Bracteoles linear or linear-subulate as long as or longer than the calyx:
- (p) Surface of plant covered with dense stellate rust-coloured rigid pubescence *H. crassinervius.*
- (pp) Surface of plant not as above *H. aponeurus.*
- BB. Bracteoles absent; seeds glabrous or pilose but not cottony:

- (q) Calyx longer than the fruit *H. ternifolius*.
 (qq) Calyx shorter than the fruit *H. lobatus*.
 AA. Calyx at most toothed, eventually splitting down one side, falling
 away in fruit:
 (r) Epicalyx present; fruit ribbed, becoming fibrous
H. esculentus.
 (rr) Epicalyx absent; fruit not ribbed, becoming dry and crusta-
 ceous *H. ficulneus*.

Hibiscus trionum L.

Much-branched hispid annual herb 1-2 ft. high. Leaves long-petiolate, orbicular, usually deeply palmately 3-5-lobed, but lower leaves sometimes undivided, 2-3 in. long; lobes coarsely and irregularly toothed, hispid. Flowers yellow with a purple centre, solitary, on peduncles jointed near the apex. Capsule blackish, oblong, obtuse, ciliated.

Northern and Central Sudan.

H. diotyocarpus Webb.

Much-branched hairy woody herb. Leaves orbicular or angular, 3-5-lobed, cordate at the base; lobes oblong-lanceolate, toothed, the central lobe the longest, tomentose on both surfaces; petiole 2-4 in. long, villous, longer than the lamina. Flowers yellow with a purple centre, solitary, axillary, on peduncles 1-2 in. long. Capsule globose of 5 membranous carpels with membranous wings.

Blue Nile: Jebel Arashkol; Abu Hubeira, near Kosti.

H. vitifolius L.

Fig. 9.

Tall downy undershrub, sometimes with almost pungent hairs, 3-6 ft. high. Leaves long-petiolate, orbicular, often deeply palmately 3-5-lobed, cordate at the base, coarsely dentate, usually softly pubescent; lobes oblong or lanceolate or deltoid. Flowers bright-yellow with a purple centre, 1-2 in. long, solitary, axillary. Capsule 5-winged; seeds tuberculate.

Northern and Central Sudan.

H. obtusilobus Garcke.

Herb up to 8 ft. high, often woody at the base, glabrous or covered with stellate hairs. Leaves ovate-oblong or more or less deeply 3-5-lobed, more or less cordate at the base; lobes oblong, undulate-crenate, with a few stellate hairs, the central lobe the longest; petiole 1-4 in. long, usually shorter than the lamina. Flowers white inside, pink outside, later all pink, solitary, axillary. Capsule oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, woody, covered with forked bristles; seeds black, tuberculate.

Blue Nile: Jebel Arashkol; Gezira.

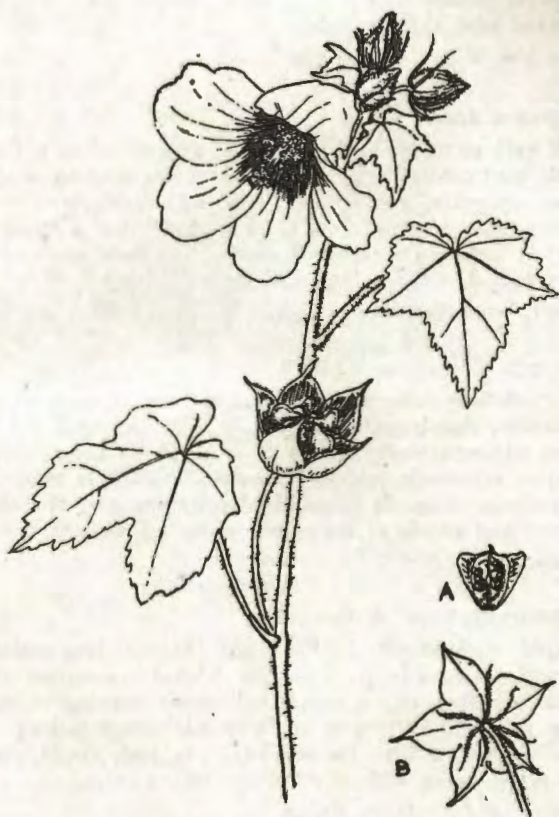


Fig. 9—HIBISCUS VITIFOLIUS L.
A, winged valves of fruit. B, epicalyx and calyx.

H. aristivalvis Garcke.

H. intermedius A. Rich., non Bélanger.

Weak erect or half-climbing much-branched annual herb 1-2 ft. high, with scattered reflexed prickly hairs, and a line of hairs along one side of the stem which shifts in position at every node. Leaves long-petiolate, very variable, usually deeply palmate. Flowers pale-yellow with a purplish centre, solitary, axillary. Capsule globose with a long beak, shorter than the calyx; seeds covered with shining hairs.

Red Sea Hills. Equatoria.

H. diversifolius Jacq.

Fig. 10.

Tall herb or undershrub; branches, as well as the petioles, armed with hard conical prickles. Leaves long-petiolate, cordate at the base, orbicular, angular or 3-5-lobed, irregularly toothed; upper leaves elliptic or lanceolate. Flowers yellow with a red-purple centre, large, in a terminal cluster. Capsule acute at the apex, very hispid, ultimately smooth; seeds smooth.

Central and Southern Sudan.

H. corymbosus Hochst. ex A. Rich.

Erect stellate-pubescent perennial herb 2-3 ft. high. Lower leaves petiolate, deeply palmately 3-lobed, 3-5 in. long, 2-4 in. broad; lobes oblong-lanceolate, rough on both surfaces; upper leaves simple, sub-sessile, oblong-lanceolate. Flowers yellow, crowded, corymbose. Capsule ellipsoid, slightly acute at the apex, valves downy and ciliate at the edges; seeds tuberculate.

Equatoria.

H. physaloides Guillem. & Perrott.

Hispid undershrub 3-6 ft. high. Leaves long-petiolate, very variable, generally more or less 5-lobed, tomentose and hispid. Flowers yellow with a purple-red centre, turning violet, 1½-1¾ in. long, solitary, axillary or in a terminal pseudo-raceme from which the leaves soon fall. Capsule ovoid, beaked, hispid, shorter than the calyx; seeds with a few short stellate hairs.

Central and Southern Sudan.

H. rhabdotospermus Garcke.

Erect suffruticose herb; stems downy, somewhat villous. Leaves ovate or ovate-lanceolate, acute at the apex, cordate at the base, coarsely dentate, slightly downy above, more so beneath; petioles 2-4 in. long, as long as or longer than the lamina. Flowers yellow, 1 in. or more in diameter, on 1-3 in. peduncles. Capsule ovoid, acuminate at the apex, woody; seeds brownish, with a few stellate hairs.

Blue Nile: Jebel Arashkol.



Fig. 10—*HIBISCUS DIVERSIFOLIUS* Jacq.
A, fruits.

H. articulatus Hochst. ex A. Rich.

Undershrub 5-6 ft. high, or branches 1-1½ ft. from a perennial rhizome; stems more or less hispid with yellowish spreading hairs. Leaves short-petiolate, often very deeply 3-lobed or scarcely lobed, 2-3½ in. long, grey beneath. Flowers white, cream or yellow turning reddish, up to 2 in. in diameter, solitary, axillary. Capsule oblong-ovoid, ¾ in. long, sparingly setose; seeds nearly smooth.

Central and Southern Sudan.

H. surattensis L.

Trailing or climbing herb. Leaves digitately 3-5-lobed, up to 2½ in. long, prickly on the nerves beneath as well as on the petioles. Flowers yellow with a red centre, 1-2 or more in. in diameter, solitary. Capsule ovoid, beaked; seeds reniform, rather downy.

Equatoria.

H. furcatus Willd.

Erect or half-climbing herb. Leaves long-petiolate, ovate or angular, entire or at most 3-lobed, 2-4 in. long. Flowers yellow with a red centre, about 2 in. long, solitary, on very short peduncles. Capsule ovoid, acute at the apex.

Equatoria.

H. sudanensis Hochr.

Woody herb. Leaves triangular, truncate at the base, dentate, up to 6½ in. long, glabrous above, pubescent or nearly glabrous beneath. Flowers axillary, solitary or 2-3 together. Capsule globose, apiculate, setose, ¼ in. in diameter.

Equatoria.

H. rostellatus Guillem. & Perrott.

Undershrub 6-10 ft. high, erect or half-climbing. Leaves angular, palmately 3-5-lobed, cordate at the base, 2-5 in. long; lobes deltoid, crenate-dentate, hispid. Flowers yellow with a dark-purple centre, 2-3 or more in. long, axillary, solitary. Capsule ovoid, acute at the apex, densely villous.

Equatoria.

H. dongolensis Del.

H. lunarifolius (non Willd.) Broun & Massey.

Tall undershrub, coarsely stellate-pubescent becoming glabrous. Leaves long-petiolate, coarsely crenate-serrate, rarely slightly lobed, orbicular to ovate-lanceolate, acuminate at the apex, subcordate or truncate at the base, glabrous above and with a few scattered stellate hairs beneath. Flowers yellow with a purple centre, large, shortly pedicellate, axillary and crowded at the apex of the stem. Capsule broadly ovoid, ¾ in. long, at first stellate-setose; seeds reniform, pilose.

Central and Southern Sudan.

H. calyphyllus Cav.*H. calycinus* Willd.

Tall herb or undershrub. Leaves long-petiolate, orbicular or ovate, often obtusely 3-5-angled, acute to acuminate at the apex, cordate to subcordate at the base, coarsely crenate-serrate, 1-7 in. long, downy or sometimes nearly glabrous. Flowers yellow with a purple centre, 2 in. in diameter, axillary, solitary. Capsule ovoid, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, shorter than the calyx.

*Central and Southern Sudan.***H. mongallaensis** Bak. f.

Erect tall herb. Leaves long-petiolate, ovate or suborbicular, cordate at the base, serrate, $1\frac{1}{2}$ -2 in. long, $1\frac{1}{2}$ -2 in. broad. Capsule mucronate at the apex, $\frac{1}{2}$ in. long; seeds sparsely pubescent.

*Equatoria: Naramum.***H. ludwigii** Eckl. & Zeyh.

Slender erect bush or woody climber, densely covered with yellowish-brown tomentum. Leaves orbicular, palmately 3-5-lobed, acuminate at the apex, cordate at the base, up to $2\frac{1}{2}$ in. long; petiole shorter than the lamina. Flowers yellow with deep-crimson centre, 3-4 in. long, solitary, axillary. Capsule exceeding the calyx, densely rusty-villous.

*Equatoria: Didinga Mountains, Nagichot.***H. owariensis** Beauv.

Downy undershrub up to 6 ft. high. Leaves long-petiolate, broadly ovate to more or less pentagonal, rounded to sub-cordate at the base. Flowers yellow with red-purple centre, large, on pedicels up to 1 in. long; bracteoles up to 1 in. long, softly pubescent. Capsule acute at the apex, 1 in. long, pubescent.

*Equatoria.***H. schweinfurthii** Gürke.

Shrub up to 7 ft. high; stems velvety-pubescent. Leaves irregularly crenate-serrate, suborbicular or broadly ovate, sometimes obscurely 3-lobed at the apex, rounded to obscurely sub-cordate at the base, 4-5 $\frac{1}{2}$ in. long, 3 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. broad, prominently 5-7-nerved and very shortly and somewhat harshly pilose beneath. Flowers yellow, purple at the centre, solitary, long-pedunculate, in the axils of the upper leaves; bracteoles lanceolate, acute at the apex, pubescent outside.

Equatoria: Tonj.

H. panduriformis Burm. f.

Erect branched undershrub 4-8 ft. high, covered with fine down mixed with bristles. Leaves ovate to orbicular, often somewhat pentagonal, doubly crenate, 2-6 in. in diameter, densely and softly tomentose beneath. Flowers yellow turning orange, or purple-streaked, with a red or purple centre, large, usually solitary, shortly pedicellate. Capsule very villous; seeds downy.

Central and Southern Sudan.

H. asper Hook. f.

Erect undershrub 6-8 ft. high, often red-tinged in parts and armed with small spine-tipped tubercles. Leaves varying from ovate to deeply 5-lobed. Flowers yellow with a purple centre, fairly large, very shortly pedicellate.

Eastern Sudan.

H. cannabinus L.

Fig. 11.

Erect more or less hairy annual herb 6-12 ft. high. Flowers yellow with a red-purple centre, large, shortly pedicellate. Capsule ovoid, acute at the apex, villous; seeds slightly pilose.

Central and Southern Sudan. Wild and cultivated.

H. sabdariffa L.

Fig. 12.

Erect slightly-branched annual or perennial herb; stems smooth or slightly hispid, often coloured. Flowers yellow with a purple centre, 1 or more in. in diameter, very shortly pedicellate; epicalyx and calyx becoming succulent, deep-red in the cultivated variety. Capsule ovoid, densely villous; seeds reniform, pilose.

Southern Sudan. Also generally cultivated.

H. micranthus L. f.

Herb or undershrub 5-6 ft. high with long rod-like spreading branches thinly covered with appressed stellate bristle-like hairs. Leaves distinctly but shortly petiolate, lanceolate or ovate to sub-orbicular, serrate-dentate, $\frac{1}{2}$ -2 in. long, $\frac{1}{4}$ -1 $\frac{1}{4}$ in. broad, scabrous; stipules almost spiny. Flowers white turning pink, about $\frac{1}{2}$ in. long, axillary, solitary on slender pedicels.

Widespread.

H. crassinervius Hochst. ex A. Rich.

Undershrub; stems covered with dense rust-coloured stellate rigid pubescence. Leaves coarsely and irregularly serrated, oblong-ovate, subcordate at the base, about 1 in. long, densely rusty-pubescent beneath; stipules setaceous, deciduous. Flowers pink, about $\frac{1}{2}$ in. long, on solitary axillary peduncles. Capsule about twice the length of the calyx.

Equatoria: Didinga Mountains, Mount Lofuke, Char, 6000 ft.



Fig. 11—HIBISCUS CANNABINUS L.



Fig. 12—HIBISCUS SABDARIFFA L.

H. aponeurus Sprague & Hutch.

Shrubby plant up to 3½ ft. high; branches densely stellate-pubescent or tomentose. Leaves ovate or elliptic, rounded or obtuse at the apex, rounded at the base, serrulate, ½-2 in. long, ½-1½ in. broad, rough, stellate-pubescent above and beneath; stipules almost spiny. Flowers up to ¾ in. long, solitary or in pairs, axillary. Capsule ¾-1 in. long, appressed-puberulous.

Red Sea Hills: Erkowit.

H. ternifoliolus F. W. Andr., nom. nov.

Solandra ternata Cav.; *H. ternatus* (Cav.) Mast., non Cav.

Erect branching pubescent annual herb, woody at the base. Leaves long-petiolate, very variable, simple to 3-foliolate on the same plant, ovate to linear-lanceolate, up to 3½ in. long, slightly pubescent. Flowers pale-yellow, less than 1 in. long, solitary, axillary. Capsule hairy; seeds strongly tuberculate.

Central and Southern Sudan.

H. lobatus (Murr.) Kuntze.

H. solandra L'Hérit.

Erect slightly villous branching annual herb. Leaves long-petiolate, ovate, acuminate at the apex, often deeply palmately 3-lobed. Flowers pink, ½ in. in diameter, arranged towards the ends of the branches, forming an elongated ultimately leafless pseudo-raceme. Calyx campanulate, deeply divided into 5 lanceolate 3-nerved segments. Capsule ovoid, beaked; seeds blackish, tuberculate.

Blue Nile.

H. esculentus L.

Fig. 13.

Tall erect woody herb; stems scabrous or smooth. Leaves long-petiolate, cordate, usually 5-lobed. Flowers yellow with a purple centre, large. Capsule up to 6 in. long on a short stout pedicel, smooth or bristly.

Widespread. Wild and cultivated.

H. ficulneus L.

Annual herb; stems sometimes covered with small sharp tubercles, tomentose when young, nearly glabrous later. Leaves palmately 3-5-lobed, hispid; lobes narrowed at the base, unequally toothed; petiole 2½-4 in. long, usually as long as the lamina. Flowers white with a rosy centre, turning wholly pink later, about 1 in. in diameter, on peduncles forming leafless racemes in the upper part. Capsule ovoid, tomentose, covered with viscid points when green; seeds globose, sulcate, slightly pilose.

Central Sudan.



Fig. 13—HIBISCUS ESCULENTUS L.

A, longitudinal section of flower. B, young fruit. C, transverse section of ovary.

5. KOSTELETZKYA C. Presl

Kosteletzkya adoensis (Hochst.) Mast.

Large herb or undershrub with erect rod-like branches traversed by a line of hairs along one side, which shifts at every node to the other side. Leaves long-petiolate, orbicular, acuminate or sometimes 3-cuspidate at the apex, cordate at the base, 1-2½ in. long, coarsely serrate, slightly hairy. Flowers yellow with a purple centre; peduncles very slender, branched. Capsule 5-locular, hispid, depressed, deeply furrowed; seeds flat.

Central Sudan.

K. buettneri Gürke.*K. flava* Bak. f.

Erect scabrous fibrous perennial herb 2-3 ft. high. Leaves very short-petiolate, linear to linear-lanceolate, narrowed to the base, the lower leaves often hastate, serrulate, up to 5½ in. long and ¾ in. broad, scabrous on both surfaces. Flowers white with pink veins, turning yellow, over 1 in. in diameter, solitary, axillary. Capsule 5-locular, depressed, pentagonal, about ¼ in. broad, bristly-pilose all over; seeds densely papillose all over.

*Equatoria.***K. grantii** (Mast.) Garcke.*Hibiscus grantii* Mast.; *K. chevalieri* Hochr.

Erect herb with rod-like stems about 4 ft. high, densely strigose-hispid. Leaves suborbicular, widely cordate at the base, slightly 3-lobed, doubly dentate, 2-2½ in. in diameter, softly stellate-pilose. Flowers pinkish, densely clustered at the ends of the shoots and forming spike-like panicles. Capsule depressed, 5-angled, bristly-pilose all over; seeds faintly lined.

*Equatoria.*6. **MALACHRA** L.**Malachra radiata** (L.) L.

Erect coarsely hairy perennial herb about 4 ft. high, often occurring in wet places; stems coarsely strigose. Leaves deeply 3-7-lobed; lobes oblanceolate, toothed, pilose, coarsely strigose beneath, about 2½ in. long. Flowers light-red, in dense subglobose heads 1-2 in. in diameter, subtended by leafy suborbicular bracts with an obtuse or long tail-like point. Epicalyx of several thread-like plumose bracteoles. Calyx long-pilose.

*Southern Sudan.*7. **MALVA** L.**Malva parviflora** L.

Trailing plant; stems slightly hairy or nearly glabrous. Leaves orbicular, slightly 3-5-lobed, cordate at the base, crenate-dentate; petiole 3-4 in. long with a few simple hairs near the apex. Flowers purplish, in axillary few-flowered clusters. Carpels rugose, hairy or smooth.

Northern Sudan. Cultivated in most parts.**M. verticillata** L.

Annual or perennial herb with an erect furrowed branched stem, 2-4 ft. high. Leaves long-petiolate, orbicular, cordate at the base, 5-6-lobed, more or less densely covered with stellate hairs on both surfaces. Flowers purplish, in dense axillary or terminal clusters, sessile or shortly pedicellate. Carpels 10-12 in a whorl, enclosed within the accrescent calyx, each reniform and 3-sided.

Central Sudan.

8. MALVASTRUM A. Gray

Malvastrum americanum (L.) Torr.*M. spicatum* (L.) A. Gray.

Erect branching herb 1-2 ft. high, stellate-tomentose. Leaves ovate, obtuse or acute at the apex, crenate-serrate, sometimes 3-lobed, 1-2 in. long. Flowers yellow, small, in a dense terminal leafy spike. Carpels 8-12, angular, pubescent.

*Central Sudan.***M. coromandelianum** (L.) Garcke.*M. tricuspidatum* A. Gray.

Erect branching herb 2-3 ft. high, covered with appressed simple hairs. Leaves ovate-lanceolate, irregularly toothed, 1-2 in. long, hairy. Flowers yellow, nearly sessile, in axillary and terminal clusters. Carpels 8-12, closely packed, each reniform with 3 small points at the upper edge.

Central Sudan.

9. PAVONIA Cav.

A. Carpels muricate *P. patens*.

AA. Carpels not muricate:

B. Carpels prickly or awned:

(a) Carpels with rather soft reflexed prickles *P. hirsuta*.(aa) Carpels with 3 long awns covered with reflexed prickles
P. urens.

BB. Carpels neither prickly nor awned:

C. Carpels broadly winged *P. kotschyi*.

CC. Carpels not obviously winged:

D. Carpels reticulate, glabrous or nearly so *P. burchellii*.

DD. Carpels not reticulate, more or less pubescent:

(b) Leaves all entire, rounded or subcordate at the base, up to 1 in. long *P. arabica*.

(bb) Leaves (at least some of them) 3-5-lobed:

(c) Leaves deeply 3-lobed, the lateral lobes deeply bilobed; flowers yellow *P. zeylanica*.(cc) Leaves 3-lobed, the middle lobe the largest, with or without ovate leaves deeply dentate at the apex; flowers rose or orange *P. triloba*.**Pavonia patens** (Andr.) Chiov.*P. glechomifolia* (A. Rich.) Garcke.

Rigid herb or undershrub with slender hirsute branches. Leaves long-petiolate, ovate, cordate at the base, somewhat 3-lobed, crenate-serrate, hairy on both surfaces. Flowers yellow, often with a red centre, about 1 in. in diameter, solitary, axillary, on slender pedicels. Carpels oblong, obtuse at the apex, somewhat woody, muricate, sometimes having a dorsal serrulated crest.

Northern and Central Sudan.



W.ET.

Fig. 14—*PAVONIA HIRSUTA* Guillem. & Perrott.
 A, lobe of epicalyx. B, flower-bud. C, portion of flower. D, anther. E, pistil. F, ovary with calyx and epicalyx.
 G, cross-section of fruit. H, mature fruit.

P. hirsuta Guillem. & Perrott.

Fig. 14.

Erect or sometimes prostrate undershrub; branches up to 6 ft. long, softly yellowish-tomentose all over. Leaves slightly lobed, cordate at the base, densely tomentose beneath; lobes triangular, doubly dentate. Flowers yellow with a red-purple centre, $1\frac{1}{2}$ or more in. in diameter, solitary or crowded above. Calyx persistent. Carpels covered with short reflex prickles.

Central Sudan.

P. urens var. **glabrescens** (Ulbr.) Brenan, comb. nov.

P. schimperiana var. *glabrescens* Ulbr.

Undershrub 4-12 ft. high; stems variously smooth or tomentose. Leaves distinctly digitately lobed, cordate at the base, usually coarsely toothed, up to 4 in. long, slightly pubescent beneath. Flowers white or rarely reddish, about 2 in. in diameter, clustered in leaf-axils on short pedicels. Calyx persistent, with 3-5 green nerves. Carpels covered with short reflexed bristles.

Equatoria: Laboni Forest; Kagelu.

Var. *hirsuta* (Hochst.) Brenan, comb. nov.

P. schimperiana var. *hirsuta* Hochst. ex Ulbr.

Leaves villous-pilose beneath.

Equatoria: Imatong Mountains, Lomuleng, 8000 ft.

P. kotschyi Hochst. ex Webb.

Low woody perennial herb with short densely pubescent branchlets, occurring in semi-desert regions. Leaves elliptic-suborbicular, coarsely toothed towards the apex, rounded at the base, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, pubescent beneath with long and short stellate hairs. Flowers yellow, less than 1 in. in diameter, axillary, solitary on slender pedicels jointed towards the apex. Epicalyx persistent, forming a little basket containing the membranous winged unawned softly pubescent carpels.

Northern and Central Sudan.

P. burchellii (DC.) R. A. Dyer.

P. macrophylla E. Mey. ex Harv.

Erect herb to rambling shrub. Leaves long-petiolate, cordate at the base, deeply crenate, usually 3-lobed, up to $2\frac{1}{2}$ in. long, both surfaces but especially the lower more or less covered with very short stellate hairs. Flowers yellow, 1 in. in diameter, axillary, solitary. Epicalyx of 5 rhomboid-ovate pubescent segments. Carpels subglobose, reticulate, glabrous when ripe.

Widespread.

P. arabica Steud. & Hochst. ex Boiss.

Erect tufted tomentose perennial herb or undershrub with few spreading branches. Leaves oblong, obtuse or subtruncate at the apex, subcordate at the base, entire or with small dentations

at the apex, up to $1\frac{1}{2}$ in. long, densely stellate-pubescent on both surfaces. Flowers pink, about $\frac{1}{2}$ in. long, solitary, axillary. Fruit subglobose, about the size of a pea, somewhat woody, villous, arched over by the linear villous bracteoles of the epicalyx.

Northern Sudan. Darfur.

***P. zeylanica* Cav.**

Hispid herb about $1\frac{1}{2}$ ft. high. Leaves deeply divided, up to $1\frac{1}{2}$ in. long, pubescent with stellate and simple hairs on both surfaces. Flowers yellow, $\frac{1}{8}$ in. long, solitary, axillary, on long pedicels. Fruit subglobose.

Red Sea Hills: Karora.



Fig. 15 —PAVONIA TRILOBA Guillem. & Perrott.

A, calyx and epicalyx.



Fig. 16—*SERRA INCANA* Cav.
A, epicalyx and calyx with capsule.

P. triloba Guillem. & Perrott.

Fig. 15.

Perennial herb with hispid branches 1-1½ ft. high from a thick woody base. Lobes of the leaves up to 1 in. long, densely tomentose beneath with long and short stellate hairs. Flowers rose or orange, solitary on long pedicels, exceeding the persistent epicalyx. Fruit subglobose.

Northern and Central Sudan.

10. **SERRA** Cav.**Serra incana** Cav.

Fig. 16.

Much-branched softly downy undershrub. Leaves orbicular, cordate at the base, palmately 3-5-lobed, denticulate. Flowers violet below, yellow above, or all violet, solitary, axillary, or sometimes crowded into long terminal or axillary erect leafy racemes. Bracteoles of the epicalyx foliaceous, ovate to orbicular, membranous, cordate at the base. Capsule ovoid-orbicular; seeds solitary by abortion, pilose and spotted with black dots.

Central Sudan.

11. **SIDA** L.

- A. Prostrate herbs with long slender branches often rooting at the lower nodes; stems weakly pilose *S. veronicifolia*.
- AA. More or less erect herbs or small shrubs, not rooting at the nodes:
- B. Leaves cordate at the base, broadly ovate; flowers clustered or rarely solitary:
- (a) Indumentum of long pilose loose hairs; flowers usually clustered at the ends of the branches or rarely solitary; carpels 5, scarcely beaked *S. urens*.
- (aa) Indumentum of short dense stellate hairs; flowers solitary in the lower axils, more crowded above; carpels 10, with long sharp awns covered with reflexed hairs
S. cordifolia.
- BB. Leaves rounded to acute at the base; flowers usually solitary or paired:
- (b) Leaves covered with a close short stellate indumentum beneath:
- (c) Carpels 5, dehiscent, awned; leaves oblong-lanceolate to orbicular, crenate *S. alba*.
- (cc) Carpels more than 5:
- (d) Carpels 7-8, indehiscent, rugose, the beaks more or less connivent or rarely beakless; leaves ovate-elliptic, rounded at the apex, crenate *S. ovata*.
- (dd) Carpels 9-10 or rarely more, dehiscent, glabrous, the beaks connivent; leaves rhomboid-ovate or lanceolate, acute at the apex, often doubly serrate, paler beneath *S. rhombifolia*.
- (bb) Leaves nearly glabrous or thinly pilose or pubescent:
- (e) Flowers solitary *S. acuta*.
- (ee) Flowers in large lax panicles *S. paniculata*.

Fig. 17—*SIDA ALBA* L.

A, bud. B, flower. C, longitudinal section of flower. D, fruit dehiscent. E, ripe carpels. F, transverse section of fruit. G, seeds.

Sida veronicifolia Lam.*S. humilis* Cav.

Straggling wayside herb. Leaves broadly ovate, acuminate at the apex, widely cordate at the base, doubly crenate, $\frac{3}{4}$ -2 in. long, up to $1\frac{1}{2}$ in. broad, sparingly pubescent. Flowers pale-yellow, under $\frac{1}{2}$ in. in diameter, solitary or paired on thread-like pedicels. Carpels 5, shortly bicuspidate.

*Equatoria.***S. urens** L.

Hirsute perennial herb; branches sometimes lax and trailing. Leaves crenate-serrate, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, pilose. Flowers whitish or pale-yellow.

*Central and Southern Sudan.***S. cordifolia** L.

Erect softly downy perennial herb up to 5 ft. high. Leaves dentate, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $1\frac{1}{2}$ -2 in. broad, softly tomentose; petioles stout, nearly as long as the lamina. Flowers small, bright-yellow.

*Widespread.***S. alba** L.

Fig. 17.

S. spinosa L. p.p.

Woody herb; branches sometimes lax and trailing. Leaves $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, softly tomentellous beneath; petiole sometimes with a small spine at the base. Flowers white to yellow, small, solitary to clustered.

*Widespread.***S. ovata** Forsk.*S. grewoides* Guillem. & Perrott.

Rather hoary woody herb, 2 or more ft. high. Leaves up to $1\frac{1}{2}$ in. long, and $1\frac{1}{2}$ in. broad; petiole about $\frac{1}{3}$ as long as the lamina. Flowers yellow, small.

*Widespread.***S. rhombifolia** L.

Very variable perennial wayside herb 1-several ft. high. Leaves $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, very softly tomentellous beneath; petiole short. Flowers pale-yellow deepening to orange, solitary or clustered at the ends of branches.

*Central and Southern Sudan.***S. acuta** Burm. f.

Perennial erect herb, sometimes shrubby, up to 10 ft. high. Leaves lanceolate or lanceolate-rhomboid, serrate, 1-3 $\frac{1}{2}$ in. long, up to $1\frac{1}{2}$ in. broad; petiole short. Flowers pale-yellow; pedicels usually short, if long then sometimes jointed. Carpels 7-8, rugose, sharply 2-awned.

Equatoria.

S. paniculata L.*S. schweinfurthii* Bak. f.

Erect herb; stems 3 or more ft. high. Leaves ovate to orbicular, unequally serrate, rounded at the base, 2-4½ in. long, 2-3 in. broad. Carpels 5, shortly bicuspidate at the apex, dehiscent.

*Equatoria.***12. THESPESIA Soland. ex Correa*****Thespesia garckeana* F. Hoffm.**

Fig. 18.

Shrub or tree 6-60 ft. high, suckering freely when felled. Leaves usually 3-lobed but sometimes up to 7-lobed or rarely entire, cordate at the base, rough, usually densely sometimes sparsely stellate-hairy beneath. Flowers solitary in the axils of the uppermost leaves; bracteoles of epicalyx usually deciduous and leaving scars forming a continuous ring round the base of the calyx, but sometimes more or less persistent. Capsule obovoid, ovoid or flattened, woody, hairy on the outside; seeds obovoid, compressed, covered with a dense short rusty-brown fuzz.

Central Sudan.Fig. 18—*THESPESIA GARCKEANA* F. Hoffm.

A, leaf and fruit. B, flower. C, longitudinal section of flower. D, staminal column and pistil with stigma-lobes open. E, anthers. F, fruit and transverse section of fruit. G, portion of outside of petal.

13. URENA L.

Urena lobata L.

Woody fibrous undershrub, or shrub 8-10 ft. high, covered with stellate hairs. Leaves very variable, usually more or less 3-5-lobed, sometimes deeply so, whitish beneath, midrib often with a large pitted gland near the base. Flowers rose-pink, 1 or less in. long, axillary, usually solitary. Fruit depressed-globose, covered with rigid hooked bristles.

Central and Southern Sudan.

14. WISSADULA Medic.

Wissadula amplissima var. *rostrata* (Schumach.) R. E. Fr.

W. rostrata (Schumach.) Hook. f.

Undershrub, erect, 3-6 ft. high; branches slender, puberulous with very short hairs and often also pubescent with stellate hairs. Leaves ovate, entire, acutely acuminate at the apex, cordate at the base, 2-4 in. long, 1½-3½ in. broad, minutely puberulous above, densely stellate-tomentellous beneath. Flowers yellow or orange to reddish, small, in terminal panicles. Fruiting carpels about ½ in. long with rather long sharp beaks.

Central and Southern Sudan.

74. MALPIGHIACEAE

Trees, shrubs or climbers, usually clothed with appressed medifixed hairs. Leaves opposite or rarely alternate, simple, a pair of glands often present on the petiole or at the base of the lamina; stipules present or absent, sometimes large and connate. Flowers mostly hermaphrodite, rarely polygamous, usually actinomorphic. Sepals 5, imbricate or rarely valvate, often biglandular outside. Petals 5, convolute, clawed. Disk present, small. Stamens usually 10, hypogynous or nearly so, sometimes some without anthers; filaments free or connate at the base; anthers short, 2-locular, sometimes winged, opening lengthwise. Carpels 3 or rarely 2 or 4, free or more or less connate into a 2-4-locular ovary; loculi 1-ovuled; styles usually separate and spreading. Fruiting carpels usually winged or carpels connate into a fleshy or woody drupe.

- A. Leaves alternate ACRIDOCARPUS. 1.
 AA. Leaves opposite FLABELLARIA. 2.

1. ACRIDOCARPUS Guillem. & Perrott.

Acridocarpus ugandensis Sprague.

Erect shrub 6-10 ft. high; young branchlets rusty-pubescent, the upper internodes shortened. Leaves coriaceous, elliptic-oblong, rounded and more or less recurved at the apex, rounded or broadly cuneate at the base, 4-9 in. long, 1½-4 in. broad, glabrous, brownish-green above, paler with prominent nerves beneath; petiole ½-¾ in. long. Flowers in terminal and lateral racemes up to 5 in. long; bracts very small; bracteoles minute. Fruiting carpels 2,

about $\frac{3}{8}$ in. long, connate, each with a broad glabrous wing up to $1\frac{1}{2}$ in. long.

Equatoria: near *Torit*.

2. FLABELLARIA Cav.

Flabellaria paniculata Cav.

Climbing shrub; branchlets grey-silky-appressed-pubescent. Leaves ovate or ovate-orbicular, obtuse or subacute at the apex, 3-5 $\frac{1}{2}$ in. long, up to 4 in. broad, glabrous above, appressed-silky-tomentose beneath; lateral nerves about 4-5 pairs. Flowers white or light-pink in terminal, lax, many-flowered panicles; bracts oblanceolate. Wings of fruit together suborbicular, about $1\frac{1}{2}$ -2 $\frac{1}{4}$ in. in diameter.

Equatoria: *Kagehu*.

75. ERYTHROXYLACEAE

Trees, shrubs or undershrubs. Leaves alternate or rarely opposite, simple, entire; stipules intrapetiolar, rarely extrapetiolar, often shed early. Flowers in clusters, hermaphrodite, rarely subdioecious, hypogynous, actinomorphic. Calyx-lobes 5, persistent, campanulate, imbricate. Petals 5, free, deciduous, imbricate, mostly with a scale on the inside. Stamens 10, in 2 series, more or less connate at the base; anthers ellipsoid, 2-locular, opening lengthwise. Ovary of 3 carpels, 3-locular, usually two of the loculi sterile, fertile loculi 1-2-ovuled; styles 3, free or more or less connate; stigmas oblique, depressed-capitate or club-shaped. Fruit drupaceous.

1. ERYTHROXYLUM Browne

Erythroxylum fischeri Engler.

Amamoa schweinfurthii Bak. & Hutch.

Shrub or tree up to 60 ft. high; branches grey-brown, densely warted. Leaves subcoriaceous, oblong-elliptic, very shortly acuminate at the apex, somewhat acute at the base, 3 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. broad, grey-green above, more or less rust-coloured and shiny with a prominent midrib and nerves beneath; petiole about $\frac{1}{2}$ in. long. Flowers 1-3 in the axils of the branches, often clustered; pedicels up to $\frac{1}{2}$ in. long; short-styled flowers with stamens $\frac{3}{8}$ in. long and style $\frac{1}{8}$ in. long; long-styled flowers with stamens of unequal size and style $\frac{1}{10}$ in. long.

Equatoria: *Azza Forest*; *Wandi*.

76. EUPHORBIACEAE

Trees, shrubs or herbs, occasionally with milky juice. Leaves alternate or rarely opposite, usually with stipules, simple or digitately compound, sometimes reduced. Flowers unisexual, mostly monoecious. Sepals imbricate or valvate, or in very specialised inflorescences much reduced or absent. Petals absent or rarely present and sometimes united. Stamens 1-numerous, free or variously connate; anthers 2-(3-4)-locular, erect or inflexed in bud, opening lengthwise, or rarely by pores.

Rudimentary ovary often present in the male flowers. Ovary usually 3-locular; styles free or united at the base; ovules solitary or paired, pendulous from the inner angle of the loculi. Fruit a capsule or drupe; seeds often with a conspicuous caruncle.

Jatropha curcas L., Physic Nut, native of America, is widely grown as a hedge plant in the Sudan.

A. Male and female flowers not enclosed in a common involucre; stamens usually more than one:

B. Ovary-loculi 2-ovuled:

C. Sepals of the male flowers valvate in bud; petals 5, small, scale-like; flowers monoecious or rarely dioecious; fruit drupaceous BRIDELIA. 6.

CC. Sepals of the male flowers imbricate in bud:

D. Petals present in the male flowers:

(a) Diffuse herbs; flowers monoecious ... ANDRACHNE. 3.

(aa) Trees; flowers dioecious SPONDIANTHUS. 30.

DD. Petals absent from the male flowers:

E. Male flowers not in a globose head:

F. Male flowers in spikes or racemes:

(b) Fruit not winged, drupaceous; ovary 1-locular; flowers dioecious, small, in slender catkin-like inflorescences; leaves not glandular beneath ANTIDESMA. 4.

(bb) Fruit broadly winged, flat; ovary 2-3-locular; flowers dioecious; male inflorescence a catkin-like spike, female shortly racemose; leaves golden-glandular beneath HYMENOCARDIA. 16.

FF. Male flowers in axillary clusters or rarely in racemes of clusters or solitary in the leaf axils:

(c) Disk in the male flowers central; fruit indehiscent; flowers dioecious, often produced on the old wood DRYPETES. 13.

(cc) Disk in the male flowers not central; fruit usually dehiscent:

(d) Rudimentary ovary absent from the male flowers; flowers usually monoecious PHYLLANTHUS. 24.

(dd) Rudimentary ovary present in the male flowers, deeply 2-3-partite; flowers dioecious SECURINEGA. 29.

EE. Male flowers in a globose head surrounded by calycine bracts; female flowers solitary in an involucre of bracts; flowers dioecious; fruit indehiscent, containing 3-4 pyrenes UAPACA. 34.

BB. Ovary-loculi 1-ovuled:

G. Leaves digitately compound with separate leaflets; flowers dioecious; petals present and connate in the male flowers; stipules broad, reniform, toothed; fruit indehiscent RICINODENDRON. 26.

- GG. Leaves simple, sometimes deeply lobed, but not into separate leaflets:
- H. Petals present in the male flowers:
- I. Anthers inflexed in bud; male petals free; leaves often lepidote or stellate-pubescent beneath; flowers spicate or racemose, monoecious or more rarely dioecious CROTON. 11.
- II. Anthers erect in bud:
- J. Male calyx-lobes imbricate:
- (e) Flowers dioecious in axillary clusters, or the female ones solitary; leaves narrow CLUTIA. 10.
- (ee) Flowers monoecious, rarely dioecious, cymose or paniculate; male petals free or united into a tube; leaves entire or digitately lobed JATROPHA. 17.
- JJ. Male calyx-lobes valvate:
- K. Inflorescence racemose or spicate:
- (f) Rudimentary ovary present in the male flowers; style lacerate; flowers monoecious or rarely dioecious in lax axillary racemes; capsule covered with processes CAPERONIA. 7.
- (ff) Rudimentary ovary absent in the male flowers; style 2-fid; flowers monoecious in rather dense racemes from the axils of the upper leaves; capsule covered with stellate hairs or scales CHROZOPHORA. 9.
- KK. Inflorescence paniculate or cymose; flowers dioecious; leaves and calyx stellate-pubescent; male petals united; leaves 2-glandular at the base MANNIOPHYTON. 21.
- HH. Petals absent from the male flowers:
- L. Male calyx closed in bud and enveloping the stamens:
- M. Styles free, or if connate into a column then continuous with the central axis:
- N. Racemes, panicles, or flower clusters all terminal or nearly so:
- (g) Flowers monoecious:
- (h) Flowers large; calyx often coloured, lobes imbricate or contorted; leaves large, digitately lobed; glabrous shrubs MANIHOT. 20.
- (hh) Flowers small:
- (i) Flowers in globose heads; leaves not lobed; stellate-pubescent shrubs CEPHALOCROTON. 8.
- (ii) Flowers in erect panicles; leaves deeply lobed; filaments repeatedly branched; glabrous herbs or shrubs RICINUS. 27.
- (gg) Flowers dioecious in copious panicles; leaves large, entire or somewhat undulate or crenate; trees NEOBOUTONIA. 23.

- NN. Racemes, spikes, or flower clusters (some at least), axillary or lateral :
- O. Filaments unbranched, usually free :
- P. Anther-loculi separate, except at the point of attachment to the filament, globose or ovoid :
- (j) Anther-loculi sessile, erect :
- (k) Buds covered with scales; capsule usually 2-lobed; flowers dioecious; shrubs or small trees ERYTHROCOCCA. 14.
- (kk) Buds not covered with scales; capsule 3-or rarely 2-lobed; flowers monoecious; annual herbs MICROCOCCA. 22.
- (jj) Anther-loculi stipitate, at length flexuous; stamens 8 or fewer; flowers monoecious or rarely dioecious; female flowers within a variously toothed or lobed, sometimes foliaceous bract ACALYPHA. 1.
- PP. Anther-loculi adnate to the connective from the middle upwards or throughout, usually oblong :
- Q. Anthers 2-locular :
- (l) Stamens free, 8 or fewer; flowers usually dioecious, rarely monoecious; male flowers small, clustered on a slender rachis; small trees or shrubs ALCHORNEA. 2.
- (ll) Stamens free, 15-30 :
- (m) Stamens mixed with receptacular glands; leaves pubescent beneath; flowers monoecious; shrubs ARGOMUELLERA. 5.
- (mm) Stamens without receptacular glands; leaves golden-gland-dotted beneath; flowers dioecious or rarely monoecious; shrubs MALLOTUS. 19.
- QQ. Anthers 4-locular or rarely 3-locular; stamens usually numerous, free or united; flowers dioecious or rarely monoecious; trees MACARANGA. 18.
- OO. Filaments repeatedly branched, columnar below RICINUS. 27.
- MM. Styles connate (at least below) into a column and continuous with the body of the carpels :
- (n) Flowers racemose or spicate :
- (o) Stamens numerous, free; flowers monoecious; female flower usually at the apex of the inflorescence PYCNOCOMA. 25.

- (oo) Stamens usually 3, casually 1-2 or 4-5, free; flowers monoecious or rarely dioecious, or polygamous; female flowers at the base of the inflorescence; stems often twining, often clothed with stinging bristles:
- (p) Styles free above TRAGIA. 32.
- (pp) Styles united throughout into a hollow column ... TRAGIELLA. 33.
- (nn) Flowers in dense involucrate heads; flowers monoecious; stamens 20-30, filaments connate below; climbers DALECHAMPIA. 12.
- LL. Male calyx open in bud, not covering the stamens; flowers monoecious or rarely dioecious, spicate; stamens 2-3; fruit dehiscent; trees SAPIUM. 28.
- AA. Male and female flowers much reduced and enclosed in a common involucre:
- (q) Involucre entirely surrounded by a continuous or notched rim-like gland SYNADENIUM. 31.
- (qq) Involucre with 1-8 distinct and very conspicuous glands on the margin EUPHORBIA. 15.

1. ACALYPHA L.

- A. Male and female flowers on separate inflorescences, very rarely a few male ones present at the apex of the female axis:
- B. Flowers dioecious or at least each shoot or stem unisexual; leaves acuminate at the apex, coarsely serrate; female inflorescences terminal *A. grantii*.
- BB. Flowers monoecious:
- (a) Female inflorescences paniculate *A. racemosa*.
- (aa) Female inflorescences spicate:
- (b) Ovary with gland-tipped hairs; shrub or undershrub *A. senensis*.
- (bb) Ovary without gland-tipped hairs:
- (c) Bracts of the female flowers with numerous gland-tipped hairs on the teeth or within; leaves ovate, long-acuminate at the apex, coarsely serrate ... *A. ornata*.
- (cc) Bracts of the female flowers without or rarely with a few gland-tipped hairs; leaves lanceolate or ovate, acute to acuminate at the apex, rather coarsely crenate-serrate *A. villicaulis*.
- AA. Male and female flowers on the same inflorescence or in the same leaf axil:
- C. Leaves with usually numerous gold-coloured glands beneath *A. fruticosa*.
- CC. Leaves without surface glands beneath:
- D. Female bracts digitately 3-5-(rarely 7-) partite:
- (d) Female bracts 3-partite; usually a small slender annual herb *A. brachystachya*.
- (dd) Female bracts 5-(rarely 7-) partite; more or less woody herb *A. psilostachya*.

- DD. Female bracts dentate with a fringed margin, or lacinate with numerous teeth:
- E. Annual herbs, usually sparingly branched:
- (e) Female flower sessile in each leaf-axil, at the base of but not on the axis bearing the male flowers
A. hochstetteriana.
- (ee) Female flowers arranged on the same axis as the males:
- (f) Female bracts with a ciliate fringed margin
A. ciliata.
- (ff) Female bracts crenate or dentate:
- (g) Female bracts rather small, usually crowded and overlapping in the leaf axils:
- (h) Inflorescences collected towards the ends of the shoots; female bracts crowded, foliaceous, with numerous long gland-tipped hairs
A. glomerata.
- (hh) Inflorescences not collected towards the ends of the shoots; female bracts ciliate, without or with very few gland-tipped hairs *A. crenata.*
- (gg) Female bracts large and foliaceous, very laxly arranged, dentate, more or less reniform when spread out *A. indica.*
- EE. Perennial shrubs with woody branches:
- (j) Ovary densely covered with coarse bristle-tipped tubercles; erect shrubs *A. neptunica.*
- (jj) Ovary not tubercular:
- (k) Climbing shrubs; female bracts inserted about the middle of the axis supporting the male flowers
A. bipartita.
- (kk) Shrubs, not climbing; female bracts inserted at the base of the axis supporting the male flowers
A. volkensii.

***Acalypha grantii* Bak. & Hutch.**

Shrub about 6 ft. high. Leaves ovate, rounded or subcordate at the base, 2-2½ in. long, ¾-1¼ in. broad, glabrous on both surfaces, nerves prominent beneath; petiole slender, ¾-1¼ in. long, with a line of hairs in the groove on the upper side, otherwise glabrous. Female spikes about ¾ in. long; bracts small, acuminate at the apex, minutely toothed, teeth gland-tipped, pubescent outside. Ovary pilose on the upper part; styles 3, purple, stout, deeply lacinate, glabrous.

Equatoria.

***A. racemosa* Wall. ex Baill.**

A. paniculata Miq.

Erect nettle-like herb 2-5 ft. high; stems pubescent. Leaves long-petiolate, ovate, acuminate at the apex, subcordate at the base, coarsely crenate-serrate, 1½-3½ in. long, 1-3 in. broad, spar-

ingly bristly on both surfaces. Male racemes axillary, very slender, $2\frac{1}{2}$ - $5\frac{1}{2}$ in. long; female flowers often deep-red in colour, small. Ovary slightly 3-lobed with wart-like knobs.

Equatoria.

A. senensis Klotzsch.

A. villicaulis (non Hochst.) Broun & Massey p.p.

Herb or undershrub or shrub 1-3 ft. high; stems angular or deeply furrowed when young, sometimes densely hirsute. Leaves linear-lanceolate or lanceolate, cordate at the base, $2\frac{1}{2}$ -3 in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad, villous on both surfaces. Male spikes axillary, pedunculate, $\frac{3}{4}$ - $2\frac{1}{2}$ in. long; female spikes terminal, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, nearly $\frac{1}{2}$ in. broad. Styles 3 or 4, purple, sparingly laciniate, about $\frac{1}{2}$ in. long.

Darfur: Jebel Marra, Sunni, 6000 ft. Equatoria.

A. ornata Hochst. ex A. Rich.

Undershrub up to 8 ft. high; stems usually softly pubescent and sometimes villous. Leaves ovate, rounded or subcordate at the base, rather coarsely serrate, 2- $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, spreadingly pilose on the nerves beneath. Male inflorescences axillary, very slender, 2 or more in. long; female inflorescences terminal, densely bracteate, 2- $3\frac{1}{2}$ in. long. Ovary trilobed, rather densely pilose on the upper half; styles 3, laciniate.

Central and Southern Sudan.

A. villicaulis Hochst. ex A. Rich.

Woody herb up to 2 ft. high; stems angular arising from a woody rhizome, hirsute with long reflexed hairs. Leaves lanceolate or ovate, acute to acuminate at the apex, sometimes cordate at the base, rather coarsely crenate-serrate, 1-5 in. long, $\frac{3}{4}$ - $2\frac{1}{2}$ in. broad, sparingly hirsute above, more densely so beneath, the nerves slightly prominent; petiole $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, hirsute, often provided with two fleshy glands at the apex. Male inflorescences axillary, solitary, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, the axis crisped-pubescent; female spikes solitary or 2 or 3 together, terminating each shoot. Styles 3, crimson, laciniate, about $\frac{1}{2}$ in. long, glabrous.

Central and Southern Sudan.

A. fruticosa Forsk.

Shrub, branches shortly crisped-pubescent when young, becoming glabrous and clothed with a light-brown bark. Leaves ovate, shortly acuminate to sharply mucronate at the apex, rather coarsely serrate, very variable in size but up to 4 in. long and 3 in. broad, shortly pilose on both surfaces, at length glabrous; petiole $\frac{1}{2}$ -2 in. long, pubescent. Inflorescences up to $\frac{1}{2}$ in. long, consisting of 2 or 3 foliaceous unilateral bracts each containing a solitary sessile female flower, and a very short terminal peduncu-

late male spike. Ovary slightly trilobed, with numerous golden glands in the depressions between the lobes; styles 3, free, terete at the base, much-branched above.

Red Sea Hills: Karora. Equatoria.

A. brachystachya Hornem.

Usually a small slender-branched annual herb 6-12 in. high. Leaves ovate, acute to acuminate at the apex, subcordate at the base, crenate, $\frac{1}{2}$ -2 in. long, $\frac{1}{3}$ -1 $\frac{1}{2}$ in. broad, sparingly pubescent; petiole as long as the lamina. Inflorescences very short, axillary, solitary or in pairs, with 6-9 female flowers in the lower part, and with the male flowers in a terminal short dense cluster; axis rather densely pubescent; female bracts digitately 3-partite, with gland-tipped hairs on the margins. Ovary setose; styles slender, lacinate, nearly glabrous.

Equatoria.

A. psilostachya Hochst. ex A. Rich.

Herb or undershrub; stems hirsute or hirsute-tomentose when young. Leaves ovate or rhomboid-ovate, acutely long-acuminate at the apex, rounded or cordate at the base, coarsely serrate, 2-5 in. long, 1 $\frac{1}{2}$ -2 in. broad, setose and the nerves prominent on both surfaces. Inflorescences axillary, solitary, 1-3 in. long, slender, with about 3-4 female flowers towards the base, and male flowers on the remaining portion. Ovary densely hirsute; styles 3, slender, lacinate.

Equatoria: Imatong Mountains, near Mount Garia, 6000-7000 ft.

A. hochstetteriana Muell. Arg.

Annual herb up to 2 ft. high; stems and branches shallowly sulcate, sparingly puberulous. Leaves lanceolate or elliptic, crenulate, $\frac{1}{2}$ -3 in. long, $\frac{1}{3}$ -1 $\frac{1}{2}$ in. broad, nearly glabrous on both surfaces, rather closely pellucid-dotted; petiole $\frac{1}{2}$ -1 in. long. Male spikes shortly pedunculate, solitary in each leaf-axil together with a solitary sessile female flower; male peduncle $\frac{1}{2}$ in. long, flowering part about $\frac{1}{4}$ in. long. Ovary warted; styles short, lacinate.

Central Sudan.

A. ciliata Forsk.

Erect slightly pubescent branched annual herb up to 2 $\frac{1}{2}$ ft. high; stems at length nearly glabrous. Leaves long-petiolate, ovate to rhomboid-ovate, crenate-serrate, 1 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 in. broad, thin, slightly scabrous. Inflorescences axillary, solitary or in pairs, $\frac{1}{2}$ -1 in. long, with about 10 female flowers in the lower part, the upper part male and spicate. Ovary trilobed, small, sparingly pubescent.

Central and Southern Sudan.

A. glomerata Hutch.

Erect slender branched herb; stems often woody towards the base, sulcate, crisped-pubescent with short hairs and often with numerous gland-tipped hairs intermixed. Leaves ovate-elliptic or rhomboid-elliptic, obtuse or subacute at the apex, crenate, 1-2½ in. long, ¼-1½ in. broad, setulose-pubescent, the nerves prominent on both surfaces. Ovary trilobed, setose-pubescent in the upper two-thirds with gland-tipped hairs intermixed.

Southern Sudan.

A. crenata Hochst. ex A. Rich.

Annual herb 1-1½ ft. high; stems crisped-pubescent, channelled or compressed. Leaves long-petiolate, ovate to elliptic, obtuse or subacute at the apex, more or less rounded at the base, crenate, ¾-2 in. long, ½-1½ in. broad, 5-nerved from the base, glabrous or nearly so; petiole pubescent. Inflorescences terminated by a cluster of abortive flowers. Ovary pilose with tubercle-based hairs.

Central Sudan.

A. indica L.

Fig. 19.

Annual herb up to 3 ft. high; stems sometimes woody at the base, shortly crisped-pubescent, sulcate or angular. Leaves rhomboid-ovate, ovate-oblong or ovate-lanceolate, acute or subacute at the apex, serrate, ¾-2½ in. long, ¼-1½ in. broad, usually glabrous on both surfaces, except on the midrib and lateral nerves; petiole ¾-3 in. long. Inflorescences axillary, solitary or in pairs, ¾-2½ in. long, with 1-7 rather distantly arranged female flowers in the lower part, the male flowers very few and terminal and remote from the female; axis terminated by an obovoid pubescent abortive female flower. Ovary deeply trilobed, pilose with tubercle-based hairs.

Central and Southern Sudan.

A. neptunica Muell. Arg.

Shrub about 3½ ft. high; branches woody, clothed with reddish-brown bark. Leaves oblanceolate-elliptic, obovate or subrhomboid, shortly tailed-acuminate at the apex, obtusely serrate, 2-6 in. long, 1-3½ in. broad, rather closely pellucid-dotted, scabrous above, glabrous beneath except for a few short hairs on the nerves; petiole up to 3 in. long. Inflorescences axillary, solitary, 1-1½ in. long, with 2 or 3 female flowers towards the base, the upper part spicate with male flowers; female bracts reniform, about ⅞ in. long and ½ in. broad when spread out.

Equatoria: Azza Forest.



Fig. 19—ACALYPHA INDICA L.

A, inflorescence; male flowers above, female flowers below in bracts. B, flowering branch showing bracts with male flowers at end of branch. C, bract opened out. E, dehiscent capsule. F, seed.

A. bipartita Muell. Arg.

Climbing shrub; branches subquadrangular, the young ones clothed with yellow hairs. Leaves ovate, gradually and sub-acutely acuminate at the apex, slightly rounded or subtriangular at the base, serrate, $1\frac{1}{2}$ -4 in. long, $\frac{3}{4}$ -2 $\frac{1}{4}$ in. broad, rather sparingly setulose above, densely pubescent with spreading hairs on the veins beneath, nerves raised on both surfaces; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long,

densely pubescent. Inflorescences axillary, solitary, pedunculate; peduncle about 4 in. long with a female 2-flowered foliaceous bract $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter placed slightly above the middle, the upper part (1-2 $\frac{1}{2}$ in. long) spicate with male flowers.

Equatoria.

A. volkensii Pax.

Undershrub or shrub up to 5 ft. high. Leaves ovate, more or less gradually acuminate at the apex, cordate to subcordate at the base, 1 $\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, crenate-serrate, sparsely pubescent above, pubescent on the nerves beneath; petiole 1-1 $\frac{1}{2}$ in. long. Inflorescences axillary; male racemes 2-3 $\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, Itobol, 6400 ft.

2. ALCHORNEA Sw.

Alchornea cordifolia (Schumach.) Muell. Arg.

A. cordata Benth.

Shrub or tree up to 25 ft. high often growing near water; stems frequently armed with blunt spines. Leaves long-petiolate, broadly ovate, acute to shortly acuminate at the apex, cordate at the base, repand-dentate or subentire, 4-10 in. long, 3-6 in. broad, with 4 basal glands in the angles of the nerves, finely stellate-puberulous, or nearly glabrous beneath; petiole up to 6 in. long, ascending, the lamina drooping over it. Flowers greenish-yellow; inflorescences axillary, the male paniculate, the female a long lax spike. Ovary 2-locular; styles 2, long. Fruit red, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter.

Equatoria.

A. floribunda Muell. Arg.

Shrub or tree up to 30 ft. high; branchlets glabrous. Leaves very short-petiolate, elongate-obovate-oblancoleate, long-attenuated to the base, repand-denticulate, 6-12 in. long, 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. broad, with 2 or more glands at the base of the lamina beneath, glabrous. Male spikes paniculate, lateral; female spikes terminal. Ovary 3-4-locular; styles 3.

Equatoria.

A. laxiflora (Benth.) Pax & Hoffm.

Lepidoturus laxiflorus Benth.

Shrub or small tree 15-20 ft. high, sometimes climbing. Leaves ovate-elliptic, tailed-acuminate at the apex, rounded at the base, palmately 3-5-nerved, crenate, 3-7 in. long, 1 $\frac{1}{2}$ -4 in. broad; petiole up to 3 $\frac{1}{2}$ in. long, with a pair of stipel-like processes at the apex. Male spikes slender, 1 $\frac{1}{2}$ -3 in. long, many-flowered, borne on the old wood and flowering in the absence of the leaves; female spikes few-flowered, borne on the young shoots.

Equatoria.

A. yambuyaensis De Wild.

Shrub 10 ft. high; branches pubescent. Leaves petiolate, oblong or elliptic-ovate, long-acuminate at the apex, coarsely crenate, cordate or rounded at the base, 3-6 in. long, $1\frac{1}{2}$ - $2\frac{3}{4}$ in. broad, sparingly hirsute on the nerves above, densely pubescent on the nerves beneath, almost glabrous when old, sometimes with a pair of glands at the base of the lamina beneath; petiole with two thread-like stipels at the apex. Spikes simple, terminal, axillary, the terminal one bi-sexual or female, the lateral ones male. Ovary 3-4-locular, pubescent and ridged; styles simple, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Capsule 3-4-cocccous, irregularly warted at the apex.

Equatoria.

3. ANDRACHNE L.**Andrachne aspera** Spreng.

Diffuse scabrous herb about 1 ft. high, from a perennial rhizome. Leaves orbicular or sub-reniform, often emarginate and mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous or scabrous-puberulous. Flowers axillary; male flowers clustered; female flower solitary. Ovary 3-locular; styles 3, 2-partite. Capsule globose, about $\frac{1}{4}$ in. in diameter.

Red Sea District: Suakin; Erkowit.

4. ANTIDESMA L.**Antidesma membranaceum** Muell. Arg.

Shrub or tree 20-30 ft. high. Leaves obovate to elliptic-lanceolate, usually long-acuminate at the apex, cuneate at the base, usually 2-5 in. long and 1-2 in. broad, sometimes up to 8 in. long and 3 in. broad, glabrous except on the midrib and the nerves beneath. Flowers yellow-green; male inflorescences pubescent, 2-5 in. long; female racemes usually 3-6 in. long (exceptionally up to 12 in. long). Fruit red, ellipsoid, slightly flattened, $\frac{1}{2}$ in. long.

Equatoria.

A. venosum E. Mey. ex Tul.

Shrub or tree up to 30 ft. high. Leaves elliptic, oblong-elliptic to obovate, usually rounded at the apex, rounded to cuneate at the base, usually $1\frac{1}{2}$ -5 in. long and $\frac{1}{2}$ -2 in. broad, sometimes up to 6 in. long and 3 in. broad, pale-green and sparsely hairy to densely tomentose beneath. Flowers greenish; male spikes tomentose, usually about 3 in. long, sometimes as much as 6 in. long; anthers red; female racemes 2-5 in. long. Fruit dark-red, ellipsoid, slightly flattened, edible, $\frac{1}{2}$ in. long.

Central and Southern Sudan: occurring in damp places.

5. ARGOMUELLERA Pax

Argomuellera macrophylla Pax.

Shrub 6-20 ft. high; branchlets softly tomentose. Leaves obovate to oblanceolate, acute at the apex, serrate, 8-12 in. long, 2-5½ in. broad, villous on the midrib and the nerves beneath. Flowers in clusters in axillary racemes up to 8 in. long, each cluster usually with several males and a single central female flower. Ovary densely pubescent; styles recurved, nearly free or shortly connate. Capsule subglobose, somewhat 3-sulcate, densely pubescent, breaking up into 3 2-valved cocci.

Equatoria: Azza, Lotti and Laboni Forests.

6. BRIDELIA Willd.

Bridelia scleroneuroides Pax.

Shrub or small tree up to 10 ft. high with drooping branches; branchlets yellowish-pubescent. Leaves oblong-elliptic to oblong-lanceolate, 1-5 in. long, ½-2½ in. broad, pubescent above when young, later glabrous, more or less softly pubescent beneath. Male flowers small, numerous, sub-sessile in leaf axils; female flowers fewer or solitary. Fruit purple-black, globose, 2-locular, ¼ in. in diameter.

Central and Southern Sudan.

B. aubrevillei Pellegr.

B. ferruginea var. *orientalis* Hutch. p.p.; *B. micrantha* (non Baill.) Broun & Massey.

Shrub or tree up to 60 ft. high; branchlets rusty-hairy; bark dark-grey, scaly; slash crimson. Leaves undulate, broadly elliptic, very shortly acuminate at the apex, 2-8 in. long, 1-3¼ in. broad, rusty-pubescent beneath; lateral nerves extending to the margin but sometimes branching. Flowers creamy-yellow, fragrant, in axillary clusters. Fruit black, ovoid, ¼-½ in. long, 1-locular.

Equatoria: often beside streams and in swampy forests.

B. micrantha (Höchst.) Baill.

Fig. 20.

Tree up to 40 ft. high with a dense wide spreading crown; branches frequently spiny. Leaves elliptic to obovate, acuminate at the apex, usually 3-5 in. long, 1-2 in. broad, shining and glabrous above, minutely puberulous beneath. Flowers creamy, in axillary clusters; male and female flowers very shortly pedicellate. Fruit blue-black, ellipsoid, ¼-½ in. long, 1-locular, edible, carrying the remains of two bifid styles.

Equatoria.

B. atro-viridis Muell. Arg.

Shrub or small tree. Leaves oblong-elliptic, acuminate at the apex, 3-6½ in. long, 1½-2½ in. broad, lateral nerves not continued to the margins to form a marginal nerve, becoming glabrous on both surfaces. Flowers in small axillary clusters, red in bud. Fruit black, oblong-ellipsoid, about ½ in. long, 1-locular.

Equatoria.



Fig. 20—BRIDELIA MICRANTHA (Hochst.) Baill.

A, male shoot. B, female shoot. C, flower-bud. D, male flower. E, anther. F, female flower. G, longitudinal section of female flower. H, transverse section of ovary. I, fruit.

B. bridellifolia (Pax) Fedde ex Pax.

Spreading tree 15-30 ft. high, sometimes attaining 70 ft.; branchlets sometimes spiny. Leaves elliptic to oblong-elliptic, shortly and obtusely acuminate at the apex, 2-5 in. long, 1½-3 in. broad, almost glabrous above, rusty-pubescent beneath. Flowers pale-yellow in terminal spikes. Fruit ovoid, acute, ½-¾ in. long, 1-locular.

Equatoria: Imatong Mountains, Kineti Forest, 6000-7000 ft.

7. CAPERONIA St.-Hil.

Caperonia palustris (L.) St.-Hil.

Erect fairly stout herb 2-3 ft. high; young stems very densely setose with stiff hairs. Leaves lanceolate to elliptic, closely serrate, up to 6 in. long and 1½ in. broad, usually hispid on the nerves beneath. Racemes up to 3 in. long; female sepals 6; male petals unequal. Ovary closely covered with narrow-subulate gland-tipped processes. Capsule muricate and setose, ½ in. broad, the accrescent sepals ⅙-⅓ in. long.

Central and Southern Sudan.

C. serrata (Turcz.) C. Presl.

Annual herb 1½-3 ft. high; branches hispid upwards. Leaves short-petiolate, lanceolate or narrow-lanceolate, closely serrate, 2-4 in. long, ¼-½ in. wide, pale-green, glabrous on both surfaces or with

a few hairs on the nerves beneath. Racemes 2-4 in. long; female sepals 8-10; male petals subequal. Ovary closely covered with flattened, not gland-tipped processes. Capsule slightly muricate, $\frac{1}{2}$ in. broad, the accrescent sepals $\frac{1}{16}$ - $\frac{1}{8}$ in. long.
Central and Southern Sudan.

8. CEPHALOCROTON Hochst.

Cephalocroton cordofanus Hochst.

Shrub up to 4 ft. high; branches finely stellate-pubescent, sometimes also glandular. Leaves ovate, acute or shortly acuminate at the apex, cordate at the base, crenate, $\frac{1}{2}$ -2 in. long, $\frac{1}{3}$ -1 $\frac{1}{2}$ in. broad, glandular or not, stellate-tomentose, at length almost glabrous on both surfaces. Flower-heads globose, terminal, $\frac{1}{2}$ in. in diameter; peduncle stellate-pubescent, up to 1 in. long. Capsule scabrously stellate-pubescent, deeply 3-sulcate, $\frac{3}{4}$ in. in diameter.

Widespread.

9. CHROZOPHORA Neck.

Chrozophora plicata (Vahl) A. Juss. ex Spreng.

Fig. 21.

Prostrate undershrub covered with soft white stellate hairs. Leaves long-petiolate, ovate or ovate-rhomboid, rounded or very obtuse at the apex, somewhat unequally truncate and biglandular at the base, margin undulate, $\frac{1}{2}$ -2 in. long, $\frac{2}{3}$ -1 $\frac{1}{4}$ in. broad, thinly stellate-tomentose above, more densely so beneath. Flowers pink, small, in short racemes, leafy at the base. Fruit red-purple, deeply 3-lobed, stellate-tomentose but not lepidote.

Widespread on river banks and in depressions.

C. oblongifolia (Del.) A. Juss. ex Spreng.

Much-branched undershrub; stems rather harshly white or tawny stellate-pubescent. Leaves usually more or less lobed or incised or rarely entire, ovate-rhomboid or oblong to lanceolate, obtuse to acute at the apex, serrate, 1-4 in. long, $\frac{1}{2}$ -2 in. wide, biglandular at the base, thinly and rather harshly stellate-pubescent above, more closely so beneath. Racemes short-peduncled, rather dense. Petals yellowish-white. Capsule blue-purple, 3-coccos, about $\frac{1}{2}$ in. wide, loosely clothed with floccose white scales with fringed denticulate margins.

Northern Sudan, hills and sea-coast.

C. brocchiana Vis.

C. brocchiana var. *hartmanni* Schweinf.

Low undershrub; stems stout, more or less erect, very woolly. Leaves sometimes slightly 3-lobed, ovate-rhomboid, 1-1 $\frac{1}{2}$ in. long, up to 1 $\frac{1}{4}$ in. broad, biglandular at the base, very woolly beneath. Racemes very dense, sessile. Capsule 3-coccos, about $\frac{1}{2}$ in. broad, covered with whitish or violet-tinged scales with sub-entire margins.

Northern and Central Sudan.

Var. *intermedia* Prain.

Leaves with two kinds of tomentum, sometimes velvety with long-rayed hairs or sometimes with short-rayed densely appressed hairs.

Central Sudan.



Fig. 21—CHROZOPHORA PLICATA (Vahl) A. Juss. ex Spreng.

A, back of leaf showing 2 glands at base. B, inflorescence showing female flowers below, male flowers above. C, female flower. D, male flower. E, longitudinal section of male flower. F, male flower with sepals removed showing silver peltate scales on back of petals. G, transverse section of fruit. H, seeds.

10. CLUTIA L.

Clutia abyssinica Jaub. & Spach.

Shrub about 10 ft. high. Leaves lanceolate or elliptic-lanceolate, entire, usually obtuse at the apex, gradually narrowed to the base, 1-4 in. long, $\frac{1}{2}$ -1 in. broad, very light-green or glaucous when dry, glabrous on both surfaces, except on midrib beneath. Male flowers several in each leaf axil; female flowers 1-3 together, axillary; pedicel $\frac{1}{2}$ in. long when in flower, attaining $\frac{1}{2}$ in. in fruit. Ovary subglobose; styles spreading and recurved, bilobed, soon falling off. Capsule about $\frac{1}{2}$ in. in diameter, reticulately wrinkled, glabrous; seeds black and shining, minutely pitted, with undulately lobed caruncles.

Equatoria: Imatong Mountains, Mount Baghanj, 6000-7000 ft.

11. CROTON L.

Croton lobatus L.

Erect annual herb 2-3 ft. high; young branchlets stellate-pubescent. Leaves digitately 3-5-partite, 1-4 in. long and broad; petiole up to 4 in. long. Inflorescences axillary and terminal, slender, up to 5 in. long, the lower half consisting of subsessile female flowers, the upper half of much smaller male flowers. Petals present in the male flower, but represented by a hair in the female flower. Ovary stellate-pubescent and setose; styles 3. free to the base, 6-7-lobed to about the middle. Capsule about $\frac{1}{2}$ in. long, setose and stellate-pubescent, at length becoming nearly glabrous.

Central Sudan.

C. polytrichus Pax.

Shrub; branches glabrous; young branchlets densely yellow- or rusty-tomentose. Leaves oblong-ovate or oblong-elliptic, rather abruptly and acutely acuminate at the apex, rounded and biglandular at the base, 1-2 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, softly rusty-tomentose when young, at length stellate-pubescent on both surfaces. Racemes terminal, the lower third entirely with female flowers, the upper two-thirds with male flowers. Petals absent from the female flowers. Ovary rusty-stellate-tomentose; styles 3, spreading, linear, bilobed to the middle.

Equatoria: Nyin Akok.

C. macrostachyus Hochst. ex Del.

Tree usually 20-40 ft. high sometimes attaining 80 ft.; bark grey. Leaves with a pair of stalked glands at the base of the lamina, crenulate, broadly ovate, acuminate at the apex, usually 3-6 in. long and 1 $\frac{1}{2}$ -4 in. broad, usually shortly stellate-puberulous at first on both surfaces, but becoming nearly glabrous, sometimes tomentose throughout life; petiole up to 3 $\frac{1}{2}$ in. long. Flowers yellow-white, sweet-scented, normally dioecious or at least on separate shoots, sometimes a few female flowers accompanying the

male flowers; male inflorescences up to 10 in. long; female inflorescences usually less. Capsule grey-white, trilobed, $\frac{1}{2}$ in. in diameter, tomentellous.

Equatoria.

C. zambesicus Muell. Arg.

C. gratissimus (non Burch.) Broun & Massey.

Shrub or small tree; branchlets sulcate or angular when young, scaly. Leaves elliptic-lanceolate, emarginate and obtuse or slightly acuminate at the apex, rounded to narrowly cordate at the base, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, 1 - $1\frac{1}{2}$ in. broad, glabrous and dull-brown to dark-green on the upper surface, silvery and scaly beneath with 2 conspicuous glands at the base. Flowers monoecious in racemes up to 4 in. long, with a few female flowers towards the base and the remainder males, the axis angular and densely covered with scales. Capsule trilobed, about $\frac{1}{2}$ in. in diameter, covered with yellow fringed scales.

Nuba Mountains: Jebel Daier. Equatoria: Mount Bitimu, Boma Plateau, 4100 ft.

C. leuconeurus Pax.

Tree up to 20 ft. high. Leaves ovate or elliptic-ovate, rounded at the base, shortly crenate-serrate with a shortly stipitate coriaceous gland in the sinus of each tooth, 2 - $5\frac{1}{2}$ in. long, 1 - 3 in. broad, thinly stellate-pubescent above when young, densely so beneath, at length becoming glabrous. Racemes terminal, interrupted, up to 7 in. long, a few female flowers scattered here and there among the male flowers. Petals of female flower rudimentary. Ovary globose, densely tomentose.

Equatoria: Mvolo.

12. **DALECHAMPIA** L.

Dalechampia scandens var. *cordofana* (Hochst.) Muell. Arg. Fig. 22.

Slender climber. Leaves deeply 3-5-partite, deeply cordate at the base; lobes rather broad-oblong, acute or occasionally obtuse at the apex. $1\frac{1}{2}$ - 5 in. long 2 - 5 in. broad; petiole 1 - 3 in. long. Flower-heads axillary, long-pedunculate; outer involucre bracts yellowish or yellow, membranous, $\frac{1}{2}$ - $\frac{3}{4}$ in. long and broad. Cocci brown, rather closely covered with more or less appressed hairs.

Central and Southern Sudan.

13. **DRYPETES** Vahl

Drypetes mildbraedii (Pax) Hutch.

Large shrub; bark light-grey. Leaves oblong or elliptic, abruptly acuminate at the apex, entire or minutely serrate, 4 - 8 in. long, $1\frac{1}{2}$ - 3 in. broad, glabrous except on the nerves. Flowers of both sexes produced on the 2-year old branchlets or towards the base of the young shoots. Petals absent. Ovary subglobose, slightly bilobed, densely tomentose; stigmas flat and spreading, bifid.

Equatoria.



Fig. 22—*DALECHAMPIA SCANDENS* var. *CORDOFANA* (Hochst.) Muell. Arg.
 A, back of leaf showing hairs. B, flower-head. C, the same, with outer bracts pulled open. C₁, plan showing arrangement of flowers. D, female flowers and their bracts. E, male flowers in cup. F, male flower and stamens. G, female flower. H, fruit whole and in cross-section. I, fruit dehiscent. J, seed. K, enlarged portion of male cup.

14. **ERYTHROCOCCA** Benth.**Erythrococca bongensis** Pax.*E. africana* (non Prain) Broun & Massey.

Shrub or small tree; branchlets grey-white, with small stipular prickles. Leaves obscurely crenate, elliptic to ovate, acute to rounded at the apex, cuneate at the base, $\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad. Flowers minute; male flowers in small compact clusters with a densely pubescent rhachis and pedicels up to $\frac{1}{3}$ in. long. Female flowers and fruit not seen.

*Equatoria.***E. atrovirens** (Pax) Prain.*E. flaccida* (Pax) Prain.

Shrub or small tree up to 15 ft. high. Leaves ovate, acuminate at the apex, widely cuneate at the base, very shortly denticulate, 2-4 in. long, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. wide, at first thinly membraneous, at length firmer, paler beneath, pubescent on the nerves. Flowers small, in pedunculate racemes; peduncles slender, pubescent; male peduncles up to $\frac{1}{2}$ in. long, the female up to 1 $\frac{1}{2}$ in. long, 12-16-flowered. Ovary glabrous, 2-locular. Capsule 2-coccos, cocci up to $\frac{1}{2}$ in. in diameter.

*Equatoria. Upper Nile: Jongol's Post.*15. **EUPHORBIA** L.

A. Trees or shrubs to 10 ft. high:

B. Trees:

C. Leaves absent or inconspicuous:

D. Branches thick, angled, succulent, spiny, ascending like a candelabra:

- (a) Wing-like angles of flowering branches much broader than the central solid part is thick

E. candelabrum.

- (aa) Wing-like angles of the 5-7-angled flowering branches not broader than the central solid part is thick

E. abyssinica.

DD. Branches terete, spineless, not arranged like a candelabra

E. tirucalli.

CC. Leaves elongate-obovate, 3-12 in. long

E. teke.

BB. Shrubs up to 10 ft. high:

- (b) Branches cylindric, 1-2 in. thick, armed with solitary simple spines ending abruptly at their dilated base, not forming a suborbicular shield; leaves 3-10
- $\frac{1}{4}$
- in. long

E. venetica.

- (bb) Branches not as above; leaves not more than 1 in. long:

- (c) Branchlets distinctly woody, spine-tipped, rigid

E. cuneata.

- (cc) Branchlets woody or succulent, terete, neither spine-tipped or armed with spines:

- (d) Mature involucre (including glands)
- $\frac{1}{2}$
- in. in diameter

E. nubica.

- (dd) Mature involucre (including glands) $\frac{1}{16}$ - $\frac{1}{8}$ in. in diameter *E. consobrina*.
- AA. Undershubs and herbs:
- E. Plants without spine-shields, prickles or spines:
- F. Involucre-glands red, pubescent on the inner or upper surface as well as on the back, ciliate, entire or without appendages or processes; low perennial herbs with thick stems; leaves elliptic, often attacked by a whitish mildew *E. acalyphoides*.
- FF. Involucre glands glabrous on the inner and upper surfaces, mostly entire, but sometimes with petal-like appendages, or 2-horned or with toothed processes:
- G. Annuals or perennials; stems prostrate or rarely erect, usually less than $\frac{1}{8}$ in. thick:
- H. Involucres several (more than 3) or many together in pedunculate heads, clusters or cymes:
- (e) Young parts of stem and branches conspicuously pilose with spreading yellow hairs; flowers in globose heads *E. hirta*.
- (ee) Young parts of stem and branches puberulous, never with conspicuous spreading hairs; flowers in small cymes or clusters *E. indica*.
- HH. Involucres 1-3 together:
- I. Leaves about 5-12 times as long as broad, linear or linear-oblong; branches glabrous all round:
- (f) Plant rather densely leafy; seeds rather deeply rugose or pitted-rugose *E. polycnemoides*.
- (ff) Plant laxly leafy; seeds faintly rugose or nearly smooth *E. arabica*.
- II. Leaves about 1-4 times as long as broad, linear-lanceolate, oblong, elliptic or orbicular:
- J. Branches, both surfaces of the leaves and capsule glabrous:
- (g) Leaves oblong or obliquely elliptic, often with a red spot; prostrate herbs ... *E. inaequilatera*.
- (gg) Leaves linear or linear-lanceolate, without a red spot; usually prostrate herbs *E. polycnemoides*.
- (ggg) Leaves obovate to orbicular without a red spot, entire; small erect herb *E. pepus*.
- JJ. Branches puberulous on the upper surface, at least along a central line, with minute, curved (rarely straight) hairs, glabrous on the under surface, prostrate *E. granulata* var. *glabrata*.
- JJJ. Branches with some kind of pubescence all round at least at the apices, prostrate or erect:
- K. Leaves minutely subtomentose to nearly glabrous on one or both surfaces; plant usually erect *E. convolvuloides*.

- KK. Leaves pubescent beneath or on both surfaces:
- (h) Branches always with a pubescence of spreading straight hairs, sometimes scanty; leaves entire *E. granulata*.
 - (hb) Branches tomentose or puberulous with minute curved appressed hairs, or if villous with spreading hairs, then with toothed leaves:
 - (i) Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, acute at the apex, entire or minutely toothed; plant usually erect ..
E. convolvuloides.
 - (ii) Leaves $\frac{1}{2}$ - $\frac{3}{4}$ in. long, usually distinctly and acutely toothed; plant erect or prostrate ...
E. scordifolia.
 - (iii) Leaves $\frac{1}{2}$ - $\frac{1}{2}$ in. long, entire or minutely or obscurely toothed; prostrate spreading annual *E. aegyptiaca*.
- GG. Annuals or perennials, erect or rarely somewhat scrambling (never prostrate) herbs, sometimes woody at the base, but always with herbaceous flowering branches usually $\frac{1}{2}$ in. or more thick:
- L. Stems and branches with narrow wing-angles decurrent from the flat petioles *E. crotonoides*.
 - LL. Stems and branches terete or slightly angular but without wing-like angles:
 - M. Ovary densely and conspicuously tuberculate, glabrous; involucre in 4-5-rayed terminal umbels
E. depauperata.
 - MM. Ovary not tuberculate:
 - N. Involucre solitary, terminal or in the forks of the branches or both:
 - (j) Leaves opposite or only those alternate that are on the lower parts of the stems and branches ...
E. dracunculoides.
 - (jj) Leaves all alternate, sometimes reflexed
E. bongensis.
 - NN. Involucres in terminal 3-10-rayed umbels of forked or umbellately divided (rarely simple) rays, or rarely reduced to a small terminal head-like cluster:
 - O. Leaves reflexed or recurved, or the upper spreading; involucre in a head-like cluster
E. cyparissioides.
 - OO. Leaves ascending or spreading:
 - P. Leaves sharply serrate, sessile; annual herbs
E. arguta.
 - PP. Leaves entire or finely toothed:
 - Q. Involucre glands 2-horned, or at least with a minute point at each end of the outer margin *E. schimperiana*.

- QQ. Involucre glands entire, sometimes 2-lipped when dried, but without teeth or points at the end:
- (k) Involucre gland 1, flesh-coloured
E. heterophylla.
- (kk) Involucre glands more than 1:
- (l) Leaves and bracts petiolate; leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long
E. agowensis.
- (ll) Leaves and bracts subsessile; leaves usually 2 $\frac{1}{2}$ -6 in. long
E. macrophylla.
- EE. Succulent plants always armed with prickles or spines or spine-shields of which the spines have become aborted:
- (m) Branches angular or cylindric, $\frac{1}{2}$ in. thick, leafless; main spines simple or forked, solitary, or with a pair of small spines or minute prickles at their base:
- (n) Spine-shields decurrent, $\frac{1}{2}$ - $\frac{1}{2}$ in. below the spines and narrowly linear
E. triaculeata.
- (nn) Spine-shields decurrent, $\frac{1}{2}$ - $\frac{1}{2}$ in. below the spines and oblong or linear-oblong
E. monacantha.
- (mm) Flowering branches 1-2 in. in diameter; spines in pairs, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, very unequal on the same stem
E. thi.
- (mmm) Flowering branches $\frac{1}{2}$ -1 in. in diameter; spines in pairs, subequal, $\frac{1}{2}$ - $\frac{1}{2}$ in. long
E. infausta.

***Euphorbia candelabrum* Trémaux ex Kotschy.**

E. murieli N.E.Br.; *E. calycina* N.E.Br.

Tree up to 30 ft. high with succulent dark-green 4-winged spiny leafless branches, slightly constricted at intervals, the central solid part $\frac{1}{2}$ - $\frac{1}{2}$ in. thick; spines about $\frac{1}{2}$ in. long, in pairs, more or less diverging, on oblong or orbicular cushions, which are not decurrent. Cymes pedunculate, composed of a central sessile male involucre and 2 lateral usually hermaphrodite cream-coloured involucre on short branches up to $\frac{1}{2}$ in. long.

Central and Southern Sudan.

***E. abyssinica* J. F. Gmel.**

E. erythraeae (Berger) N.E.Br.

Spiny leafless tree; branches 3-8 angled, straight, irregularly constricted with wing-like angles up to 1 in. broad. Spines in pairs up to $\frac{1}{2}$ in. long, on suborbicular shields close together but not connected. Cymes crowded at the tops of branchlets. Capsule at first green becoming deep-crimson streaked with white, with a distinct fleshy 3-lobed involucre at its base, and exerted on a stout pedicel, 3-angled, glabrous.

Red Sea Hills.

E. tirucalli L.*E. scoparia* N.E.Br.

Tree up to 15-25 ft. high, leafless except when young; branchlets abundant, green, cylindric, fleshy, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter, marked with leaf scars. Leaves about $\frac{1}{2}$ in. long, clustered at the ends of the branches. Involucres in dense sessile clusters at the tips of the branches, about $\frac{1}{2}$ in. in diameter. Ovary erect on a stout glabrous pedicel.

*Central Sudan.***E. teke** Schweinf. ex Pax.

Forest shrub or tree up to 20 or more ft. high; branchlets green, succulent, spiny, 4-angled; spines paired, up to $\frac{1}{2}$ in. long, not connected by a horny border. Leaves fleshy, obovate, obtuse to rounded at the apex, gradually tapered from above the middle to the base, 3-12 in. long, 1-3 in. broad; petiole up to $1\frac{1}{2}$ in. long. Cymes sessile, axillary, composed of 2-4 peduncle-like branches up to $1\frac{1}{2}$ in. long, each with two smaller branches terminating in solitary involucres about $\frac{1}{2}$ in. in diameter.

Equatoria.

Fig. 23—EUPHORBIA VENEFICA Trémaux ex Kotschy.

A, young leaf.

E. venefica Trémaux ex Kotschy.

Fig. 23.

Cactus-like perennial, branching at the base into few or several main cylindric stems 1-several inches thick, which are also branched irregularly; spines brown or greyish-brown, conical, stout, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Leaves deciduous, narrowly lanceolate to oblanceolate, tapering into a short stout petiole or subsessile, 3-10 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad. Cymes solitary in the axils of the tubercles, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Capsule deeply 3-lobed, $\frac{1}{2}$ in. in diameter, glabrous, finally

exserted on a pedicel up to $\frac{1}{4}$ in. long: seeds globose, about $\frac{1}{8}$ in. in diameter, covered with a minute lace-like fibrous reticulation.
Central and Southern Sudan.



Fig. 24—EUPHORBIA CUNEATA Vahl.

A, inflorescences.

E. cuneata Vahl.

Fig. 24.

Woody shrub; bark brown or greyish; branches horizontal, usually spine-tipped. Leaves scattered on primary branches and tufted on secondary branches, linear to spatulate, truncate or notched at the apex, cuneate at the base, usually $\frac{1}{2}$ -1 in. long. Cymes umbel-like, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, axillary or terminal. Capsule erect, $\frac{1}{4}$ in. in diameter, puberulous; seeds brown, ellipsoid, smooth.

Red Sea District: Suakin; Erkowit.

E. nubica N. E. Br.

Fig. 25.

Unarmed green early-leafless shrub, up to 6 ft. high; branches alternate, cylindric, with prominent leaf scars. Umbels terminal, of 2-7 simple rays, about $\frac{1}{2}$ in. long; bracts early-deciduous, oblong, acute at the apex, $\frac{1}{2}$ in. long, whorled at the base of the umbel, and also orbicular-obovate, $\frac{1}{2}$ in. long, paired below the involucre; involucre $\frac{1}{2}$ in. in diameter, shallowly campanulate. Capsule $\frac{1}{2}$ in. in diameter, much-exserted on a pedicel ultimately $\frac{1}{2}$ or more in. long; seeds whitish, ellipsoid, about $\frac{1}{8}$ in. long with a small caruncle.

Northern and Central Sudan.



Fig. 25—EUPHORBIA NUBICA N.E.Br.
A, inflorescences.

E. consobrina N. E. Br.

Much-branched woody shrub, leafless except on the very young branchlets. Leaves sessile, linear-lanceolate, acute at the apex, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, falling early. Umbel of up to 3 simple rays up to $\frac{1}{2}$ in. long, terminal, with a whorl of leaves at the base. Involucres about $\frac{1}{2}$ in. in diameter. Capsule slightly exserted, curved to one side.

Red Sea Hills: Erkowit.

E. acalyphoides Hochst. ex Boiss.

Fig. 26.

Annual or perennial herb 6-15 in. high. Leaves alternate, $\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ -1 in. broad, glabrous above, thinly pubescent beneath; petioles $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Peduncles axillary, borne all along the stems and branches, much shorter than the petioles, with a pair of small opposite bract-leaves and 1-3 sessile involucre. Capsule about $\frac{1}{2}$ in. in diameter, puberulous with minute curved hairs.

Central Sudan: common in Gezira cotton area.



Fig. 26—*EUPHORBIA ACALYPHOIDES* Hochst. ex Boiss.
 A, inflorescences. B, male flowers. C, involucre opened out showing hairy glands. D, longitudinal section of inflorescence. E, fruit. F, transverse section of fruit. G, seeds.

E. hirta L.

Annual herb 4-16 in. high; stems erect or decumbent; rather coarsely pilose with yellowish spreading hairs, and with an under pubescence of curved appressed hairs. Leaves opposite, obliquely lanceolate or ovate or rhomboid-oblong, finely serrate, $\frac{1}{2}$ -2 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, thinly appressed-pubescent on both surfaces. Involucres densely crowded, male or bisexual, minute. Capsule globose-trigonal, minute, thinly puberulous with minute appressed hairs; seeds light-reddish, oblong, minute.

Central and Southern Sudan.

E. indica Lam.

E. hypericifolia (non L.) Broun & Massey.

Glaucous annual herb, erect or sometimes prostrate, 3-18 in. high. Leaves opposite, oblong, linear-oblong, oblong-lanceolate, elliptic or ovate, usually denticulate, subacute to rounded at the apex, oblique at the base, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long including the very short petiole, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, puberulous to pubescent on one or both surfaces. Cymes axillary, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter; peduncle $\frac{1}{10}$ - $\frac{1}{2}$ in. long, often with a pair of leaves at the apex; involucre about $\frac{1}{4}$ in. long. Capsule $\frac{1}{4}$ in. in diameter, puberulous; seeds reddish-brown or glaucous to whitish-grey, ellipsoid.

Widespread.

E. polycnemoides Hochst. ex Boiss.

Annual herb; stems usually prostrate, sometimes erect from a woody base, 4-14 in. long, glabrous. Leaves often purple-tinged, opposite, linear-lanceolate or linear, more rarely oblong, minutely and acutely toothed at the apex, $\frac{1}{2}$ -1 in. long, glabrous. Involucres solitary, axillary, and usually spaced along the flowering branchlets, $\frac{1}{24}$ - $\frac{1}{18}$ in. long. Capsule nearly $\frac{1}{4}$ in. long, glabrous.

Central and Southern Sudan.

E. arabica Steud. & Hochst. ex Boiss.

Erect glabrous annual herb. Leaves opposite, linear, entire, acute at the apex, obtuse at the base, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, glabrous on both surfaces. Peduncles (or peduncle-like branchlets) axillary, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, slender, bearing a pair of small leaves and 2-3 minute involucres, with or without a solitary one in the fork between the peduncle and the stem. Capsule nearly $\frac{1}{4}$ in. in diameter, glabrous.

Northern and Central Sudan.

E. inaequilatera Sond.

E. sanguinea Steud. & Hochst. ex Boiss.

Prostrate glabrous annual herb. Leaves opposite, oblong or obliquely elliptic, very oblique at the base, toothed nearly to the base at least on one margin, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, up to $\frac{1}{2}$ in. broad, glabrous. Inflorescences in short, axillary, leafy, raceme-like branchlets, with 1 axillary involucre to each pair of reduced leaves, sometimes reduced to a cluster of 2-3 involucres on a short peduncle. Capsule up to $\frac{1}{4}$ in. in diameter, glabrous; seeds pale-reddish, 4-angled, minute.

Red Sea District: Suakin, 21° N.

E. pepus L.

Erect glabrous annual herb 3-10 in. high. Leaves thin, alternate or subopposite, obovate to orbicular, obtuse to rounded at the apex, often narrowed into the petiole at the base, about $\frac{1}{2}$ in. long, glabrous; petiole short, the upper leaves sometimes subsessile. Involucres in 3-rayed repeatedly forked umbels; bracts ovate, free to the base; involucre glands reniform or falcate with cuspidate tips. Capsule small; valves 2-keeled on the back.

Red Sea Hills: Erkowit.

E. convolvuloides Hochst. ex Benth.

Usually erect branched annual herb 6-20 in. high. Leaves opposite, oblong-lanceolate or rarely ovate, very unequal at the semi-cordate base, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad. Flowering branchlets short, with the involucres densely clustered along them among the small leaves and bracts; involucres densely covered with white or tawny tomentum. Capsule about $\frac{1}{4}$ in. in diameter, densely tomentose.

Central Sudan.

E. granulata Forsk.

Prostrate annual herb; stems spreading, 1-8 in. long, simple or with alternate branches, sometimes thickened or with ring-like marks at the nodes. Leaves opposite, oblong or obovate-oblong, very unequal at the base, under $\frac{1}{2}$ in. long. Inflorescences of very short, leafy, raceme-like branchlets in the axils of and sometimes not longer than the leaves of the primary branches, with one involucre to each pair of reduced leaves. Capsule up to $\frac{1}{4}$ in. in diameter, puberulous all over with minute appressed or spreading hairs.

Northern and Central Sudan.

Var. glabrata (Gay) Boiss.

Leaves entire, glabrous above, thinly pubescent beneath, sometimes becoming glabrous on both surfaces with age.

Northern and Central Sudan.

E. scordifolia Jacq.

Erect or prostrate annual herb, densely (rarely thinly) tomentose on all parts. Leaves opposite, oblong or elliptic-oblong, very unequal at the semicordate base, usually $\frac{1}{4}$ - $\frac{3}{4}$ in. long, very rarely larger. Involucres usually crowded along the short, densely leafy, axillary flowering branchlets, rarely solitary and axillary on the main branches. Capsule $\frac{1}{2}$ in. in diameter.

Widespread.

E. aegyptiaca Boiss.

Fig. 27.

Spreading annual herb; stems $1\frac{1}{2}$ -12 in. long with alternate branches. Leaves opposite, oblong, very unequal at the base, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, up to $\frac{1}{2}$ in. broad. Inflorescences as *E. inaequilatera*. Capsule up to $\frac{1}{2}$ in. in diameter, thinly appressed-puberulous or subtomentose; seeds whitish or glaucous on a pale-reddish ground.

Northern and Central Sudan.

E. crotonoides Boiss.

Erect annual herb 1-2 or more ft. high; branches with narrow wing-like angles. Leaves alternate on the stems and branches, opposite at the forkings of the flowering branches, lanceolate or on the flowering branches sometimes linear, irregularly serrate, $\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 in. broad, with a very prominent wing-like midrib beneath. Flowering-branches forked or raceme-like, $1\frac{1}{2}$ -8 in. long; involucres somewhat woolly-pubescent, solitary in the forks or at the nodes and apex of the branches; glands red or purple, distinctly stalked. Capsule shortly exserted, about $\frac{1}{2}$ in. in diameter at the base, covered with long soft spreading hairs; seeds greyish-brown, ovoid, acutely 4-angled, about $\frac{1}{2}$ in. long, tuberculate.

Central Sudan.

E. depauperata Hochst. ex A. Rich.

Woody perennial herb up to 3 ft. high; stems 2 to several, glabrous. Leaves alternate, with a whorl of 4-5 at the base of the umbel, linear-lanceolate or lanceolate to elliptic or suborbicular, $\frac{1}{2}$ -3 in. long, glabrous. Umbel $\frac{1}{2}$ -3 in. in diameter with 4-5 simple or once divided rays $\frac{1}{2}$ -3 in. long, often with 1 or more similar rays arising from the axils of the leaves below the umbel; involucres solitary or more rarely 2-3 on each ray, glabrous outside, woolly-pubescent inside. Capsule far-exserted, tuberculate, up to $\frac{1}{2}$ in. in diameter; seeds light-brown or grey, ellipsoid, glabrous, with a small caruncle, up to $\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains.



Fig. 27—EUPHORBIA AEGYPTIACA Boiss

A, branchlet enlarged. B, inflorescence. C, longitudinal section of inflorescence. D, young inflorescence before extrusion of female flower. E, dehiscent capsule. F, seed. G, transverse section of fruit. H, male flowers. I, habit of plant.

E. dracunculoides Lam.

Erect branching annual herb 3-12 in. high, glabrous. Leaves opposite on all flowering parts, alternate on some of the lower parts of the stems and branches, sessile, linear or linear-lanceolate, $\frac{1}{2}$ -2 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Involucres solitary at the forks or ends of the branches. Capsule exserted on a recurved pedicel twice as long as the involucre, glabrous; seeds ellipsoid or ovoid, white-rugose with a few smooth dark-brown or dull-green markings and with a peltate caruncle.

Red Sea District: Suakin; Soturba.

E. bongensis Kotschy & Peyr.

Perennial herb; stems brown or green, 2 $\frac{1}{2}$ -12 in. high, arising annually in small clumps from a tough creeping rhizome $\frac{1}{2}$ - $\frac{3}{4}$ in. thick. Leaves all alternate, shortly petiolate, linear, flat or narrowly revolute at the margins with a prominent midrib beneath, abruptly acute or obtuse at the apex, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, glabrous. Involucre solitary, terminal or falsely lateral at the ends of the branches. Capsule erect, $\frac{1}{4}$ in. in diameter, velvety-puberulous; seeds globose, about $\frac{1}{8}$ in. in diameter, smooth.

Equatoria.

E. cyparissioides Pax.

Perennial herb from a woody rhizome producing a cluster of several or many erect herbaceous stems 10-12 in. high, glabrous. Leaves alternate on the stems and branches, whorled or opposite under the cyme or umbel or at the flowering nodes, sessile, linear, mucronate, with revolute margins, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, glabrous. Involucres solitary or congested in small head-like cymes, terminal. Capsule exserted much beyond the involucre, erect, $\frac{1}{4}$ in. in diameter, glabrous; seeds pale-grey to black, sometimes irregularly spotted with brown, about $\frac{1}{8}$ in. long.

Equatoria.

E. arguta Banks & Soland.

Annual herb 3-15 in. high; stem divided at the top into an umbel of 3-5 rays each 2 $\frac{1}{2}$ -5 in. long, with or without 1 or more rays in the axils of the upper stem leaves, thinly pilose with long fine hairs, sometimes almost glabrous. Leaves alternate, sessile, lanceolate to obovate, thinly pilose to nearly glabrous. Involucre solitary. Capsule erect, $\frac{1}{4}$ in. in diameter, glabrous; seeds dark-brown, with a shortly stalked peltate circular caruncle.

Northern Sudan: Wadi Halfa.

E. schimperiana Scheele.

Erect herb $\frac{1}{2}$ -4 $\frac{1}{2}$ ft. high; stems usually simple below and branching above, the stem and branches sometimes ending in a 3-many-times forked cyme or in 3-5-rayed umbels, glabrous or rather thinly

puberulous. Leaves alternate or with a whorl of 3-5 under the umbel, linear-lanceolate to lanceolate, $\frac{1}{2}$ - $3\frac{1}{2}$ in. long, glabrous. Cyme-branches $2\frac{1}{2}$ -8 in. long, 3-to-many-times-forked; bracts opposite, sessile, triangular-ovate, $\frac{1}{2}$ -1 in. long; involucre solitary. Capsule $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, exserted on a slender pedicel, usually glabrous; seeds at first pale-yellow, then with a dark-brown spot at each end, finally dark-grey or blackish.

Blue Nile: Bunzaga. Equatoria: Dongotona Mountains, 6000 ft.

E. heterophylla L.

E. geniculata Ortega.

Erect annual herb up to 18 in. high; stems simple or rarely branched, glabrous; internodes shortening towards the apex, the lower leaves often opposite and falling early, and the upper ones alternate and forming an open rosette around the terminal inflorescences. Leaves elliptic, acute to acuminate at the apex, cuneate to acute at the base, up to $3\frac{1}{2}$ in. long, 2 in. broad, darker green and becoming glabrous above, paler and sparsely pilose and prominently nerved beneath; petiole up to $1\frac{1}{2}$ in. long. Cymes densely corymbose with very-short-pedicellate involucre; gland 1, flesh-coloured, substipitate; styled bifid. Capsule glabrous, 3-lobed, up to $\frac{1}{2}$ in. diameter; seeds blackish, irregularly granular.

Central Sudan: Khartoum & Gezira. Equatoria. A variable species of American origin.

E. agowensis Hochst. ex Boiss.

Woody undershrub with annual herbaceous flowering branches 6-12 or more in. long, divided at the top into a cyme or umbel of 2-3 branches $\frac{1}{2}$ -1 in. long, sometimes with lateral simple flowering branches below the umbel, usually glabrous. Leaves alternate with a whorl of 3 at the base of the umbel and opposite on its branches, elliptic, thin, apiculate at the apex, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, usually glabrous. Involucre in small cymes of 3 at the ends of the umbel-branches, subsessile between a pair of reduced leaves. Capsule $\frac{1}{2}$ in. long; seeds white with a transverse pale-yellow caruncle, tuberculate-rugose, $\frac{1}{2}$ in. long.

Fung District: Fazoghli.

E. macrophylla Pax.

Erect perennial herb $1\frac{1}{2}$ or more ft. high; stems simple, 12-14 or more in. long and $\frac{1}{2}$ in. thick, bearing at the apex a 3-5-rayed umbel with simple or forked rays 3-8 in. long, glabrous. Leaves alternate, rather few and distant, obovate to elliptic, with a whorl of 3-5 sessile deltoid-ovate or rhomboid-ovate or oblanceolate to elliptic-lanceolate leaves at the base of the umbels, glabrous. Bracts sessile, suborbicular or very broadly ovate, $\frac{1}{2}$ -2 in. long, glabrous; involucre solitary on a peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Capsule up to $\frac{1}{2}$ in. in diameter; seeds brown, without a caruncle, subglobose, about $\frac{1}{2}$ in. long.

Equatoria.



Fig. 28—EUPHORBIA MONACANTHA Pax.
A, inflorescences.

E. triaculeata Forsk.

Bushy leafless succulent undershrub 5-20 in. high; stems and branches about $\frac{1}{2}$ in. thick, usually 3-5-angled, angles often prominent with deep notches forming triangular teeth, each margined with a horny grey linear shield with a short lobe on each side of the apex, bearing 1 straight needle-like spine up to 1 in. long with 2 small prickles at its base. Cymes of 3 involucre, small, solitary in the axils of the teeth.

Red Sea District: Jebel Waratab near Suakin; Khor Seterra.

E. monacantha Pax.

Fig. 28.

Much-branched leafless very spiny succulent herb 4-8 in. high; stems or branches about $\frac{1}{2}$ in. thick, with several spiral series of tubercles or several tuberculate angles, each tubercle bearing 1 spreading grey spine $\frac{1}{2}$ - $\frac{3}{4}$ in. long, with or without a pair of small or minute prickles at its base, on a more or less 3-lobed shortly decurrent horny grey shield. Involucres yellow, 3 together in the axils of the shields, bearing a pair of oblong or ovate toothed bracts at their apex.

Red Sea District: Suakin.

E. thi Schweinf.

Fig. 29.

Leafless spiny bush 2-4 ft. high, branching from the base, glabrous; branches erect, up to 2 in. in diameter, 4-6-angled, constricted at intervals of 1-2 $\frac{1}{2}$ in. and with the angles compressed. lobed by the stem-constrictions with continuous horny dark-grey margins; spines dark-grey, very unequal on the same stem, stout, straight, in pairs up to $\frac{1}{2}$ in. apart, diverging, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Cymes of 3 involucre subsessile, solitary in the axils of the spines. Capsule with the exception of its base exerted, $\frac{1}{2}$ in. in diameter, globose, trigonous; seeds brown, ellipsoid, $\frac{1}{8}$ in. long.

Northern Sudan: between Suakin and Berber; Sinkat.

Var. subinarticulata (Schweinf.) N. E. Br.

Stems and branches more slender and less conspicuously constricted.

Northern Sudan: between Suakin and Berber in Khor Teehke.

E. infausta N. E. Br.

Leafless spiny bush about 5 ft. high, glabrous; branches 5-12 in. long, 4-5- (rarely 6-) angled, with or without slight constrictions; angles with a continuous very narrow horny dark-grey border, bearing pairs of spines $\frac{1}{2}$ - $\frac{3}{4}$ in. apart. Cymes of 3 involucre solitary in the axils of the spine-pairs, 2 of the involucre on very short branches. Capsule $\frac{1}{2}$ in. in diameter with its base just exerted from the involucre; seeds greyish-white, ellipsoid, $\frac{1}{8}$ in. long.

Red Sea District.

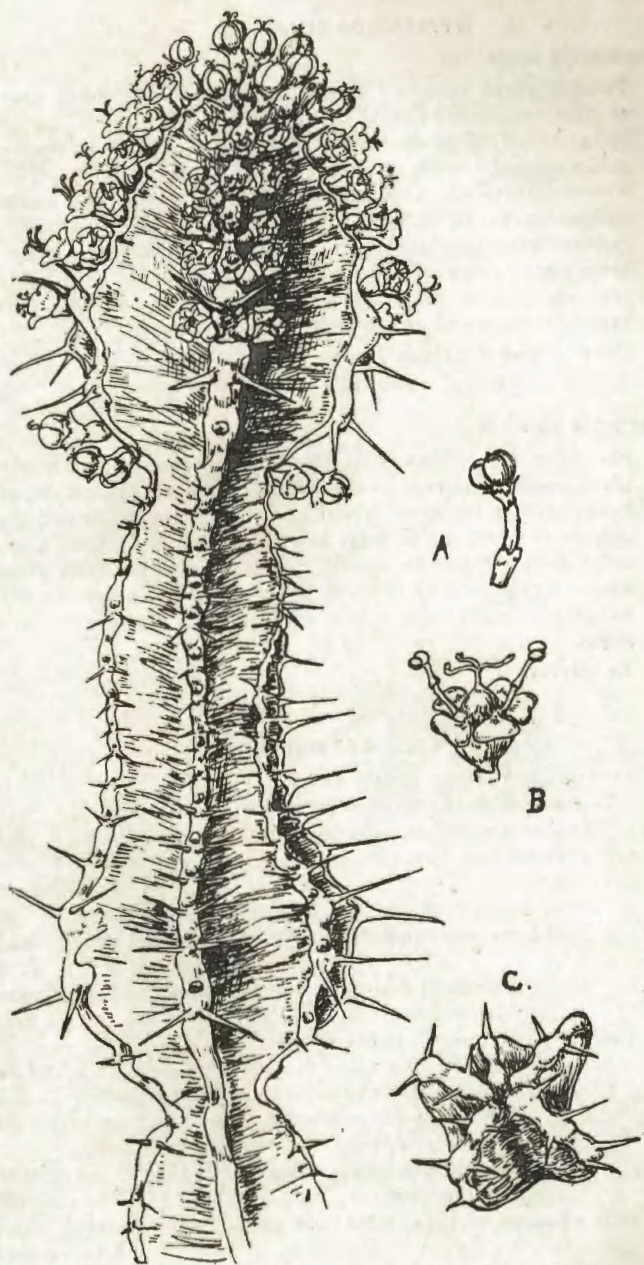


FIG. 29—EUPHORBIA THI Schweinf.
A, fruit. B, inflorescence. C, top of young branch.

16. **HYMENOCARDIA** Wall. ex Lindl.**Hymenocardia acida** Tul.

Fig. 30.

Twisted shrub or small tree up to 20 ft. high; bark grey-brown or rusty-orange. Leaves elliptic-oblong, up to $3\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. broad, pubescent becoming glabrous, densely covered with gold-coloured glands beneath; petiole slender, up to $\frac{3}{4}$ in. long. Flowers dioecious, more or less appearing before the leaves; male spikes up to $2\frac{1}{2}$ in. long; calyx red, cupular, shortly 5-lobed; anthers creamy-white: female flowers axillary on leafy lateral branchlets; calyx divided to the base; styles 2, crimson, spreading, about $\frac{1}{2}$ in. long. Fruit obcordate, 1 in. long and $1-1\frac{1}{2}$ in. broad, compressed, wings not continued to the base.

Central and Southern Sudan.

H. ulmoides Oliv.

Shrub or tree; branchlets slender, glabrous or sparingly hairy when young. Leaves ovate, ovate-elliptic or lanceolate, obtusely acuminate at the apex, about $1\frac{1}{2}$ in. long, $\frac{1}{2}-\frac{2}{3}$ in. broad, glabrous; petiole slender, up to $\frac{1}{2}$ in. long. Male spikes about $\frac{1}{2}$ in. long; calyx deeply 5-lobed: female racemes axillary; styles about $\frac{1}{2}$ in. long. Fruit broadly obovate or suborbicular, $\frac{1}{2}-\frac{2}{3}$ in. in diameter, wings continued to the base and more or less decurrent on the stipe.

Equatoria.

17. **JATROPHA** L.

- A. Leaves glabrous or nearly so:
 B. Leaves sessile or shortly petiolate:
 (a) Leaves sessile; anthers pubescent *J. tuberosa*.
 (aa) Petioles less than $\frac{1}{2}$ in. long; anthers glabrous
J. melanosperma.
 BB. Leaves long-petiolate; petiole $\frac{1}{2}$ or more in. long:
 (b) Leaf-lobes with numerous teeth, more or less doubly dentate ...
J. glauca.
 (bb) Leaf-lobes about 6-toothed, more or less gradually rounded to
 an acute apex *J. aceroides*.
 AA. Leaves tomentose or pubescent:
 C. Stipules reduced to a mass of sessile glands *J. villosa*.
 CC. Stipules thread-like or spiny often gland-tipped:
 (c) Ovary tomentose or pubescent; leaves, all or some, lobed to
 about the middle:
 (d) Leaves with subulate gland-tipped teeth; bracts pectinately
 toothed *J. gallabatensis*.
 (dd) Leaves serrate, teeth not gland-tipped; bracts entire
J. schweinfurthii.
 (cc) Ovary glabrous; leaves 3-lobed nearly to the base or below the
 middle; lobes acute at the apex, serrulate ... *J. aethiopica*.



Fig. 30—HYMENOCARDIA ACIDA Tul.

A, male shoot. B, male flower with rudimentary ovary. C, D, stamen back and front. E, female shoot. F, female flower. G, fruiting branch.



Fig. 31—*JATROPHA ACEROIDES* (Pax & Hoffm.) Hutch.
A, female flower. B, male flower. C, fruit and seeds.

Jatropha tuberosa Pax.

Herb with stems 1-2 ft. high, arising from a turnip-shaped rhizome about 3 in. long. Leaves sessile, the upper ones entire or deeply 3-lobed, 6 in. long, 5½ in. broad, the lower ones entire, lanceolate, sharply serrulate, 3-5½ in. long, ½-1½ in. broad, glabrous. Cymes shortly pedunculate, small, few-flowered; male and female flowers pedicellate. Stamens 8. Ovary smooth.

Equatoria.

J. melanosperma Pax.

Glabrous herb with stems about 18 in. high. Leaves deeply 3-lobed or sub-entire, 2½-6 in. long, 1¼-5½ in. broad, glabrous; lobes lanceolate or oblong-lanceolate, sharply serrulate; lateral nerves prominent beneath; petiole stout, nearly ½ in. long, glabrous. Cymes small, very shortly pedunculate; flowers crowded. Capsule 3-lobed, about ½ in. in diameter.

Equatoria.

J. glauca Vahl.

J. lobata Muell. Arg.

Erect glabrous undershrub about 1 ft. high, branched from the base. Leaves digitately 3-5-lobed to the middle or a little below, broadly obovate or suborbicular in outline, more or less cuneate at the base, 1½-3 in. long, more or less glaucous; petiole ¾-2½ in. long. Cymes few-flowered, pedunculate, about 1 in. in diameter; peduncle ¾-1 in. long. Sepals and petals of female flower larger than in the male. Capsule pale-straw-coloured, scarcely ½ in. long; seeds pale-brown, oblong-ellipsoid, ½ in. long, with a much divided caruncle.

Northern and Central Sudan.

J. aceroides (Pax & Hoffm.) Hutch.

Fig. 31.

Small glabrous glaucous shrub, branched from the base. Leaves digitately 3-5-lobed to about ½ their length, suborbicular or reniform in outline, truncate or slightly cordate at the base, ¾-3 in. long, glaucous when young; petiole ½-1 in. long. Cymes pedunculate, few-flowered; peduncle ¾-1½ in. long. Petals absent in the female flowers.

Northern Sudan: Khor Ashat; Khor Gwob.

J. villosa (Forsk.) Muell. Arg.

Fig. 32.

J. glandulosa Vahl.

Shrub about 3 ft. high; branches thick. Leaves shortly 3-5-lobed, orbicular in outline, closely glandular-dentate, 1-2 in. long, villous on both surfaces; petiole 1-2½ in. long, villous. Cymes few-flowered, the largest cyme about 2 in. in diameter, villous; peduncle 1½-2½ in. long. Petals absent in the female flowers.

Northern Sudan: between Suakin and Kassala (Jebel Iskeneib).



Fig. 32—*JATROPHA VILLOSA* (Forsk.) Muell. Arg.

J. gallabatensis Schweinf.

Shrub 1-3 ft. high arising from a woody rhizome; stems leafy from the base. Leaves shortly petiolate or the upper ones sessile, the lower ones entire, broadly ovate, oblique, acute at the apex, rounded or truncate at the base, the remainder 3-lobed to the middle, almost lacinate-toothed, teeth with a small apical gland, 2-4 in. long, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. broad. Cymes terminal, shortly pedunculate, about $1\frac{1}{2}$ in. in diameter. Capsule $\frac{1}{2}$ in. long, pilose or at length glabrous; seeds pallid, $\frac{1}{3}$ in. long, smooth.

Central Sudan.

J. schweinfurthii Pax.

Densely tomentose herb. Leaves 3-lobed to about the middle, serrate, 3-6 in. long, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. broad, tomentose beneath, more or less pilose above; petiole thick, up to $\frac{1}{2}$ in. long. Cymes overtopping the leaves, pedunculate, tomentose, more or less corymbose; peduncle up to 3 in. long; male flowers rather crowded, subsessile. Capsule $\frac{1}{2}$ in. long, tomentose; seeds ellipsoid, $\frac{1}{2}$ in. long, smooth, shining, with a large lacerate caruncle.

Equatoria.

J. aethiopica Muell. Arg.

Stout densely rusty-tomentose herb up to 18 in. high. Leaves 3-lobed nearly to the base, sharply serrulate, up to 4 in. long and broad, densely tomentose on both surfaces; petiole $\frac{1}{2}$ in. long or absent from the upper leaves. Cymes pedunculate, about $1\frac{1}{2}$ in. in diameter; peduncle $1-1\frac{1}{2}$ in. long, stout, tomentose.

Central and Southern Sudan.

18. **MACARANGA Thou.****Macaranga schweinfurthii Pax.**

Tree usually 30 ft. high but attaining 80 ft.; branchlets glabrous, often spiny. Leaves irregularly toothed, shallowly 3-lobed, ovate, deeply cordate at the base, up to 18 in. long and 16 in. broad; petiole up to 16 in. long with a pair of glandular processes at the apex. Flowers greenish-yellow; male panicles 5-8 in. long in axillary clusters on the bare branches; female flowers in short axillary racemes. Capsule usually 2-lobed, about $\frac{1}{2}$ in. in diameter.

Equatoria.

M. killmanscharica Pax.

Fig. 33.

Tree usually 20-30 ft. high but attaining 80 ft.; bark pale-reddish-grey. Leaves ovate-lanceolate, entire, acuminate at the apex, rounded to subcordate at the base, usually peltate, usually $3-4\frac{1}{2}$ in. long and $2-3\frac{1}{2}$ in. broad, sometimes up to 8 in. long and $5\frac{1}{2}$ in. broad; petiole 2-5 in. long. Flowers greenish-yellow; panicles axillary, up to 4 in. long. Capsule globose, up to $\frac{1}{2}$ in. in diameter, thickly covered with yellow glands.

Equatoria: Imatong Mountains, Itobol Forest.

19. **MALLOTUS Lour.****Mallotus oppositifolius (Geisel.) Muell. Arg.**

Shrub 6-12 ft. high; branchlets often purple, stellate-pubescent, becoming glabrous. Leaves opposite, ovate, acuminate or acute at the apex, cordate or obtuse at the base, 4-7 in. long, 2-4 in. broad, rather deep-green above, paler and rusty-stellate on the nerves and golden-glandular beneath; petiole $1\frac{1}{2}$ -3 in. long, pubescent. Racemes axillary, rhachis tawny-or rusty-pubescent, the male rhachis 4-5 in., the female $2\frac{1}{2}$ -3 in. long; male flowers clus-

tered into heads; pedicels usually longer than the flowers; female flowers solitary. Capsule 3-coccos, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, cocci 2-valved; seeds globose, $\frac{1}{2}$ in. in diameter.

Equatoria.

20. MANIHOT Mill.

Manihot esculenta Crantz.

Manioc; Cassava.

M. utilissima Pohl.

Shrub 6-10 ft. high with thick tuberous root, the colour of bark, tint of foliage, &c., very variable. Leaves long-petiolate, 3-7-lobed; lobes entire, the middle one the longest, the midrib continued to the top, gradually acuminate at the apex, the largest reaching 10-12 in. broad. Racemes lax, few-flowered, from the upper axils; peduncle up to 2 in. long. Capsule $\frac{3}{4}$ in. long, wide-ellipsoid, with 6 undulate almost crenate wings; seeds marbled, ellipsoid, compressed, $\frac{1}{2}$ in. long.

Southern Sudan. Native of Brazil, but cultivated and semi-naturalized in the Sudan.

21. MANNIOPHYTON Muell. Arg.

Manniophyton africanum Muell. Arg.

Shrub or climber up to 30 ft. high; branches scabrous with short stellate hairs. Leaves very variable, entire and ovate or more or less 2-3-lobed, acutely acuminate at the apex, cordate at the base, up to 10 in. long and broad, scabrous-setose with stellate hairs on both surfaces. Flowers small, clustered; male panicles solitary or 2 or 3 together in the axils of the upper leaves, slender, up to 10 in. long; female panicles much smaller, fewer-flowered and less branched than the male. Capsule deeply 3-lobed, about 1 in. long, rusty-tomentose.

Equatoria.

22. MICROCOCCA Benth.

Micrococca mercurialis (L.) Benth.

Sparingly pubescent annual herb, woody at the base, $\frac{1}{2}$ -2 ft. high. Leaves alternate, except the very lowest, oblong or ovate or ovate-lanceolate, obtuse or subacute to shortly acuminate at the apex, usually bluntly toothed, 1-2 in. long, $\frac{1}{2}$ -1 in. broad, glabrous or nearly so, dull, sometimes purple-tinged; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers in slender axillary racemes 2-3 in. long; rhachis pubescent. Capsule strigose, $\frac{1}{2}$ in. in diameter, breaking into 2-4 usually 3 2-valved cocci; seeds pale-brown or pinkish, less than $\frac{1}{8}$ in. long, completely enveloped in a very thin aril.

Southern Sudan.



Fig. 33—MACARANGA KILIMANDSCHARICA Pax.

A, male inflorescence. B, cluster of male flowers with bract swollen at the tip to form a nectary. C, male flower opened. D, female branchlet. E, female flower. F, fruit opened.

23. **NEOBOUTONIA** Muell. Arg.**Neoboutonia macrocalyx** Pax.

Tree up to 60 ft. high; bark white and smooth. Leaves broadly ovate to orbicular, acute or obtuse at the apex, cordate at the base, up to 15 in. long and 12 in. broad, hoary-stellate beneath; petiole often as long as the lamina. Male flowers whitish, pedicellate, in large branched panicles 1 or more ft. long; calyx densely stellate-pubescent: female flowers in simple or sparingly branched racemes much smaller than the male panicle; styles 2-partite. Capsule 3-lobed, about $\frac{1}{2}$ in. in diameter; seeds pale-brown, ovoid, the hilum large and prolonged halfway down on the inner side.

Equatoria.

N. canescens Pax.

Shrub or tree up to 60 ft. high; branches grey- or rusty-stellate, scurfy. Leaves broadly-ovate to orbicular, entire, cordate at the base, usually $3\frac{1}{2}$ -6 in. long and 3-5 $\frac{1}{2}$ in. broad; petiole $1\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, closely and uniformly clothed with a fine felted tomentum intermixed with small flat glands beneath. Male flowers creamy-yellow, sessile or subsessile, in copious panicles 15 or more in. long; calyx usually sparingly hirsute towards the apex; female flowers greenish-white, in branched racemes usually less than 6 in. long; styles 2-partite. Capsule dark-brown, 3-lobed, $\frac{1}{2}$ - $\frac{3}{4}$ in. diameter, densely pubescent; seeds subglobose, the hilum prolonged downwards on the inner side.

Equatoria.

24. **PHYLLANTHUS** L.

- A. Older branches swollen; capsule large and bladder-like
P. inflatus.
- AA. Older branches not swollen; capsule not large and bladder-like:
- B. Flowering branchlets in clusters:
- (a) Branchlets without spines *P. reticulatus.*
- (aa) Branchlets with recurved spines *P. muellerianus.*
- BB. Flowering branchlets not in clusters:
- C. Stamens 3, 4 or 5; filaments free or slightly connate at the base, or rarely some free and others connate, never all connate:
- D. Disk of the male flowers annular *P. discoideus.*
- DD. Disk of the male flower consisting of separate glands:
- (b) Two or three of the filaments connate to the apex, the remainder free and shorter *P. reticulatus.*
- (bb) All the filaments free:
- (c) Pedicels slender, $\frac{1}{2}$ or more in. long:
- (d) Branchlets puberulous or pubescent ... *P. capillaris.*
- (dd) Branchlets glabrous or very slightly rough
P. nummulariifolius.

- (cc) Pedicels shorter and stouter, usually less than $\frac{1}{2}$ in. long *P. pentandrus*.
- CC. Stamens 3; filaments connate their whole length or nearly so:
- E. Sepals of both sexes 5, those of the female in a single series; flowers monoecious *P. amarus*.
- EE. Sepals of both sexes 6, those of the female often in 2 series:
- F. Stems prostrate, rooting at the nodes ... *P. prostratus*.
- FF. Stems erect, never rooting at the nodes:
- (e) Disk of the female flower consisting of separate glands *P. maderaspatensis*.
- (ee) Disk of the female flower annular, saucer-shaped or cupular, entire or lobed or toothed:
- (f) Ovary sessile:
- (g) Disk 5-6-lobed *P. pseudo-niruri*.
- (gg) Disk toothed:
- (h) Leaves oblong or oblong-elliptic *P. niruri*.
- (hh) Leaves orbicular or obovate-orbicular *P. rotundifolius*.
- (ff) Ovary shortly stipitate *P. odontadenius*.

Phyllanthus Inflatu Hutch.

Much-branched forest tree 20-40 ft. high; branchlets drooping; bark pale, small-scaled; leafy branchlets (simulating pinnate leaves) 6-12 in. long, clustered at the ends of the woody twigs. Lower leaves orbicular to broadly obovate, truncate or emarginate at the apex, rounded at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter; upper leaves lanceolate to oblong-lanceolate, obtuse or sub-acutely acuminate at the apex, cuneate at the base, $1\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad; stipules thread-like, persistent. Capsule crustaceous, $1\frac{1}{2}$ in. long.

Equatoria.

P. reticulatus Poir.

Much-branched shrub or small tree; flowering branchlets up to $2\frac{1}{2}$ in. long, sometimes produced in clusters, more often solitary. Leaves oblong to elliptic, rounded at the ends, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, up to $\frac{1}{2}$ in. broad, glabrous or crisped-pubescent. Flowers monoecious, 1 female and 3 male in each cluster. Fruit black when ripe, fleshy, about $\frac{1}{2}$ in. in diameter; seeds dark-brown, irregularly trigonous, punctulate.

Widespread.

P. muellerianus (Kuntze) Exell.

Fig. 34.

P. floribundus Muell. Arg., non Kunth.

Rambling bush, woody climber, or occasionally a small straggling tree; leafy branchlets up to 7 in. long, thickened at the base. Leaves ovate to ovate-elliptic, mucronate or very shortly acuminate from a rounded apex, $1\frac{1}{2}$ -3 in. long, 1 - $1\frac{1}{2}$ in. broad, shining above, glaucous beneath. Flowers pink, monoecious, clustered on

the main axis of each inflorescence, 2 or 3 males surrounding a solitary female; racemes slender, leafless, up to 2 in. long, clustered in the axil of a leafy flowerless shoot. Fruit a drupe, shining-red at first, eventually turning black, about $\frac{1}{2}$ in. in diameter.

Equatoria.

P. discoides (Baill.) Muell. Arg.

Deciduous tree up to 50 ft. high; bark thickly covered with lenticels, very stringy and fibrous and easily torn off; slash pinkish-purple; branches pendulous, with lateral branchlets up to $2\frac{1}{2}$ in. long. Leaves ovate-elliptic to obovate-lanceolate, 1-5 in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad, glabrous or crisped-pubescent beneath; lateral nerves slightly raised on both surfaces. Flowers greenish, dioecious, the male ones numerous in the axils of the leaves or fallen leaves of the young branchlets, the female ones similarly arranged but only 2-3 in each cluster. Capsule green, 3-4-lobed, $\frac{1}{2}$ in. in diameter, glabrous.

Equatoria.

P. capillaris Schumach.

Small weak erect shrub 2-4 ft. high or trailing; branches and branchlets whitish-pubescent. Leaves obovate or elliptic-obovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, glabrous, glaucous-green beneath. Flowers in axillary clusters on the young branchlets, the female ones often solitary; pedicel very slender, up to $\frac{1}{4}$ in. long, glabrous. Capsule depressed-globose, $\frac{1}{12}$ in. in diameter, smooth; seeds brown, minutely and closely pitted.

Equatoria.

P. nummularifolius Poir.

Small much-branched shrub; branches and branchlets glabrous. Leaves obovate or orbicular-obovate, subacute and mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, glabrous, sometimes glaucous beneath. Flowers, fruit and seeds as in *P. capillaris*.

Equatoria.

P. pentandrus Schumach.

Glabrous much-branched woody herb up to 18 in. high. Leaves oblong-lanceolate or linear-lanceolate, up to $\frac{1}{2}$ in. long and $\frac{1}{2}$ in. broad, glabrous, glaucous beneath. Flowers monoecious, the male flowers 2-3 together in the axils of the lower leaves, the female ones solitary in the upper leaves of the branchlets. Capsule depressed-globose, about $\frac{1}{12}$ in. in diameter, scarcely lobed; seeds marked with 5-6 longitudinal lines of dots on the back.

Widespread.



Fig. 34—*PHYLLANTHUS MUELLERIANUS* (Kuntze) Exell.
 A, male shoot. B, male flower. C, stamen. D, female flower. E, pistil with disk-glands. F, cluster of female flowers.
 G, fruit. H, transverse section of fruit.



Fig. 35—*PHYLLANTHUS MADERASPATENSIS* L.

A, branch with male flowers above and female flowers below. B, male flower. C, female flower. D, fruit. E, longitudinal section of fruit. F, transverse section of fruit. G, perianth after fruit has fallen. H, seed.

P. amarus Schumach.

Woody glabrous herb 1-2 ft. high; flowering branchlets spreading, slender, up to $5\frac{1}{2}$ in. long, glabrous. Leaves oblong or elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, glabrous. Flowers monoecious, 1 male and 1 female in each leaf-axil. Capsule depressed-globose, 3-lobed, smooth; seeds with about 5 longitudinal lines on the back.

Central and Southern Sudan.

P. prostratus Welw. ex Muell. Arg.

Perennial herb or small shrub; stems and branches numerous, prostrate or some ascending; flowering branches up to $1\frac{1}{2}$ in. long, glabrous. Leaves elliptic, sharply spinescent at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, with reddish and slightly thickened margins, glabrous, the midrib or nerves not evident. Flowers monoecious, the male flowers axillary and in pairs in the lower parts of the branches, the female ones solitary towards the apex, fewer than the males. Capsule depressed-globose, nearly $\frac{1}{2}$ in. in diameter; seeds about $\frac{1}{8}$ in. long, closely longitudinally striate with about 20 lines on the back.

Khartoum.

P. maderaspatensis L.

Fig. 35.

Erect monoecious herb or woody undershrub of variable habit; flowering branchlets sharply angular, almost winged. Leaves linear-lanceolate or oblanceolate, variable in size, up to $2\frac{1}{2}$ in. long and $\frac{1}{2}$ in. broad. Male and female flowers sometimes together in the leaf-axils, or the female ones more often solitary and much larger than the males. Capsule depressed-globose, $\frac{1}{2}$ in. in diameter, 3-lobed, smooth; seeds trigonous, $\frac{1}{8}$ in. long and broad, marked with 9-10 fine lines of dots on the back.

Widespread.

P. pseudo-niruri Muell. Arg.

Annual herb about 1 ft. high; stems deeply grooved, flattened or slightly winged in the upper part, glabrous, with winged branches. Leaves obovate or obovate-elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous. Male flowers very small, 2 or 3 together in the axils of the lower leaves; female flowers larger, solitary in the axils of the upper leaves.

Equatoria.

P. niruri L.

Fig. 36.

Annual herb about 1 ft. high; stems smooth, sulcate; flowering branchlets up to 4 in. long, compressed or slightly winged. Leaves oblong or oblong-elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous. Flowers monoecious, solitary, the male flowers in the lower, the female ones in the upper parts of the branchlets. Capsule depressed-globose, more or less 3-lobed, about $\frac{1}{2}$ in. in diameter; seeds with about 6 lines on the back.

Widespread.



Fig. 36—*PHYLLANTHUS NIRURI* L.

A, portion of branch from under side with male flowers in lower axils and female flowers above. B, female flower. C, male flower. D, fruits. E, transverse section of fruit. F, seed.

P. rotundifolius Klein ex Willd.

Annual herb about 1 ft. high; stems and branches usually angular and rough; flowering branchlets spreading or drooping, up to 3 in. long, rough. Leaves orbicular to obovate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, glabrous. Flowers monoecious, 2 or 3 male ones and 1 female together in each leaf-axil. Capsule depressed-globose, glabrous; seeds marked with about 7 longitudinal lines on the back.

Red Sea District: Suakin; Erkowit.

P. odontadenius Muell. Arg.

Glabrous woody annual herb 1-3 ft. high; branches slender, ascending, flattened and winged, glabrous. Leaves oblong, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. Male flowers few together in the axils of the lower leaves of the branches; female flowers solitary in the leaf-axils of the upper two-thirds of the branches, much larger than the males. Capsule enclosed by the whitish persistent sepals, globose, about $\frac{1}{2}$ in. in diameter, slightly 3-lobed; seeds $\frac{1}{8}$ in. long, marked with 6 longitudinal lines.

Upper Nile: Jongol's Post.

25. **PYCNOCOMA** Benth.**Pycnocoma chevallieri** Beille.

Shrub 7-10 ft. high. Leaves clustered towards the ends of the twigs, obovate-lanceolate, narrowed from the middle to the acute base which passes into a winged petiole, 10-12 in. long, 3 $\frac{1}{2}$ -4 in. broad, glabrous; petiole below the wing $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Racemes peduncled from the axils of the upper leaves; rachis rather closely pubescent; bracts ovate, loosely silky-pubescent on the outside. Capsule 3-coccos, $\frac{1}{2}$ in. in diameter; cocci 2-valved, closely velvety on the outside, each valve with a projecting short triangular acute horn $\frac{1}{8}$ - $\frac{1}{8}$ in. long; seeds brown, globose, $\frac{1}{2}$ in. in diameter.

Equatoria: gallery-forest near source of R. Yubu.

26. **RICINODENDRON** Muell. Arg.**Ricinodendron heudelotii** (Baill.) Pierre ex Pax.

Fig. 37.

Forest tree up to 150 ft. with thick cylindric bole; branches whorled; bark grey, smooth at first, becoming scaly; buttresses very short; slash reddish. Leaves alternate, digitately 3-5-foliolate; leaflets sessile or subsessile, glandular-denticulate, obovate to obovate-elliptic, long-acuminate at the apex, 5-10 in. long, 1-3 $\frac{1}{2}$ in. broad; petiole up to 8 in. long; stipules large, foliaceous, persistent, deeply toothed. Inflorescence rusty-tomentose; male panicles up to 16 in. long and broad; female panicles shorter and stouter. Fruit 2-3-lobed, 2-3-locular, about $\frac{1}{2}$ in. long and 1 $\frac{1}{2}$ in. broad, 2-3-seeded.

Equatoria: heavy gallery-forest, Khor Yubo at Bandere.



Fig. 37—*RICINODENDRON HEUDELOTII* (Baill.) Pierre ex Pax.

A, male flower. B, male flower with perianth removed. C, stamen. D, female flower. E, pistil. F, transverse section of ovary. G, fruit.

27. *RICINUS* L.

Ricinus communis L.

Castor-oil Plant.

Tall evergreen herb or shrub. Leaves alternate, long-petiolate, deeply palmately lobed, orbicular-peltate, 6 in. to 2 ft. in diameter; lobes 7 or more, green or reddish, sharply glandular-toothed, glabrous and glaucous; petiole 4-12 in. long; stipules large, ovate, connate into an acute bud-sheathing deciduous cap, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers in large pyramidal pseudo-terminal erect panicles, the male flowers below, the female ones higher up. Capsule subglobose, ellipsoid or oblong, smooth or prickly, up to 1 in. long.

Central and Southern Sudan. Cultivated and semi-naturalized.

28. *SAPIUM* Browne

Sapium ellipticum (Hochst.) Pax.

Tree usually 40-50 ft. high; bark grey, rough. Leaves elliptic to oblong-elliptic, acute at the apex, serrulate, 2 $\frac{1}{2}$ -5 in. long, 1-2 in. broad, dark above, paler beneath, turning dark-red before falling; petiole up to $\frac{3}{4}$ in. long. Flowers yellow in terminal spikes 1 $\frac{1}{2}$ -5 in. long; male flowers numerous, borne towards the apex of the spikes: female flowers 1-5 (usually 2 or 3) borne at the base, the female pedicels about twice as long as the male ones. Capsule 2-lobed, $\frac{3}{4}$ - $\frac{1}{2}$ in. broad, carrying the persistent styles; seeds pale-brown, subglobose.

Equatoria: narrow gallery-forest, Mount Kala, 50 miles S.E. of Yei.



Fig. 38.—SECURINEGA VIROSA (Roxb.) Baill.

A, male flower with rudimentary ovary. B, C, sepals. D, stamens from side and back. E, female flower. F, fruits. G, transverse section of fruit. H, longitudinal section of ovary.

29. SECURINEGA Commers.

Securinega virosa (Roxb.) Baill.

Fig. 38.

Fluggea microcarpa Bl.

Shrub or small tree. Leaves alternate, elliptic or obovate, very variable in size, up to $2\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. broad, rigidly membranous, glabrous, often glaucous beneath. Flowers creamy-yellow to yellow-green, sweet-scented; male flowers numerous in axillary clusters on slender pedicels up to $\frac{1}{4}$ in. long, with a rudimentary tripartite ovary; female flowers in axillary clusters. Fruit a drupe, white, depressed-globose, about $\frac{1}{2}$ in. in diameter, edible; styles persistent; seeds shining.

Central and Southern Sudan.

30. SPONDIANTHUS Engler

Spondianthus glaber Engler.

Megabaria ugandensis Hutch.

Tree up to 60 ft. high; crown thick, heavily foliaged. Leaves clustered towards the ends of the branchlets, copper-red when young, broadly elliptic to obovate, 6-11 in. long, $3\frac{1}{2}$ in. broad; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers white, small; male panicles 6-8 in. long, crowded at the ends of the branches, the spikelets up to $\frac{1}{2}$ in. long; female inflorescences in panicles of racemes. Fruit red-brown, ellipsoid, angular, 1 in. long; seeds red, ellipsoid, shining, about $\frac{1}{2}$ in. long.

Equatoria: in gallery-forest.

31. **SYNADENIUM** Boiss.**Synadenium grantii** Hook. f.

Shrub or tree up to 20 ft. high, branching from near the base, with the main stem up to 6 in. in diameter. Leaves fleshy, oblanceolate to obovate, tapering into a stout petiole, entire or minutely toothed, 3-7 in. long, 1-2½ in. broad, grass-green, reticulately veined with darker green, often tinged with red on the prominent midrib, glabrous. Cymes axillary, repeatedly forked, 2-4 in. long and broad; peduncles 1-2 in. long; involucre dark-red, bisexual or entirely male, about ½ in. in diameter.

Equatoria: Imatong Mountains.

32. **TRAGIA** L.**Tragia cannabina** L. f. ex Cooke.

Suberect or rambling herb 2-5 ft. high, sometimes hispid upwards and with white stinging hairs. Leaves alternate, usually deeply 3-partite, sometimes 5-partite at the base or occasionally without lateral lobes; central lobe oblong, 2½ in. long, minutely lobed, nerves bristly beneath. Racemes bi-sexual, leaf-opposed, 1-2 in. long on naked bristly peduncles 2-3 in. long; male flowers rather lax, numerous; female flowers 2-3 below the male ones; calyx-segments 6, densely setose with white bristles when young, accrescent. Capsule 3-coccos, sparingly appressed-setose, ½ in. in diameter; seeds grey mottled with brown, globose.

Central and Southern Sudan.

Var. **brouniana** (Prain) Prain.

Perennial herb; stems erect, 4-6 in. high, hispid, and with white stinging hairs. Leaves deeply 3-partite, narrow-lanceolate; central lobe 2 in. and lateral lobes ½ in. long, with a sparingly toothed margin. Racemes terminal, occasionally leaf-opposed, under 1 in. long.

Central Sudan.

Var. **intermedia** (Muell. Arg.) Prain.

Erect or suberect herb 2-3 ft. high, glabrous or pubescent upwards, covered with white stinging hairs. Leaves usually the lowest ones deeply 3-partite, but the uppermost ones sometimes all without lateral lobes; central lobe lanceolate, 3½ in. long, lateral lobes up to 1 in. long. Racemes lateral, leaf-opposed.

Central Sudan.

T. gallabatensis Prain.

T. tripartita Schweinf. ex Prain, non Beille.

Erect herb 1½-2 ft. high, woody at the base; stems sparsely covered with stinging hairs. Leaves ascending, deeply 3-partite; lobes lanceolate or linear-lanceolate, the central one 4-7 in. long with an undulate or coarsely toothed margin, the lateral ones 1½-2 in. long. Racemes bisexual, terminal and leaf-opposed, 2 in. long on naked peduncles 1-3 in. long, sparsely covered with spreading

white bristles; male flowers rather lax above with 1-3 female ones below. Capsule 3-coccos, $\frac{1}{2}$ in. in diameter; seeds grey mottled with white, globose.

Kassala: Gallabat.

T. pungens (Forsk.) Muell. Arg.

T. cordifolia Vahl.

Slender monoecious twiner; stems finely puberulous, without stinging hairs. Leaves ovate-lanceolate or lanceolate, rarely triangular-ovate, long-acuminate at the apex, shallow to deeply cordate at the base, strongly and sharply serrate, $2\frac{1}{2}$ -4 in. long, $\frac{3}{4}$ -2 in. broad, puberulous and sparingly to copiously bristly on the nerves, especially beneath; petiole $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, sparingly to copiously bristly. Racemes terminal on the stems and branches, bisexual, slender, rather lax, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, with a naked peduncle $\frac{1}{2}$ -2 in. long having numerous solitary male flowers above and a solitary female flower below. Capsule 3-coccos, sparingly silky-puberulous and rather copiously clothed with white bristles, $\frac{1}{2}$ in. in diameter; seeds pale-yellow with small brown blotches.

Central and Southern Sudan.

T. mitis Hochst. ex Muell. Arg.

Slender dioecious twiner without stinging hairs. Leaves shaped as in *T. pungens*, softly puberulous on the nerves and petioles. Racemes unisexual, terminal on the stems and branches; male racemes rather dense at first, soon becoming lax, 2-6 in. long, the flowers in 3-flowered clusters; female racemes lax, $1\frac{1}{2}$ -3 in. long, few-flowered (up to 12) each solitary in its bracts and sessile. Capsule 3-coccos, sparingly hirsute, without bristles, $\frac{1}{2}$ in. in diameter; seeds pale-brown with bright reddish-brown blotches, globose.

Kassala: Gallabat.

T. bongolana Prain.

Slender dioecious climber, sparingly retrorsely hispid but without stinging hairs. Leaves as in *T. pungens*, but sparingly hispid on the nerves on both surfaces and with a few stinging bristles especially near the base on the upper surface; petiole $\frac{3}{4}$ in. long, retrorsely hispid. Male racemes terminal on the stems and branches, up to 4 in. long, rather dense with flowers in 3-flowered clusters. *Equatoria.*

T. benthami Bak.

Slender monoecious twiner; stems puberulous or nearly glabrous, sparingly covered with stinging hairs. Leaves ovate, acute or acuminate at the apex, shallowly less often rather deeply wide-cordate at the base, distinctly and sharply serrate, 2-4 in. long, 1-2 in. wide, sparingly bristly-setose on the nerves; petiole $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long, bristly-setose with stinging hairs. Racemes lateral and terminal on the lateral branches, rather lax, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; peduncles

densely bristly with stinging hairs, and with many male flowers above and 2-3 female flowers below. Capsule 3-coccos, $\frac{1}{2}$ in. in diameter, sparingly bristly with a few appressed hairs intermixed; seeds brown mottled with grey, globose.

Equatoria.

T. schweinfurthii Bak.

Much-branched herb from a woody base 4-8 in. high; stems densely pilose with stiff pubescence but without stinging hairs. Leaves ascending, lanceolate, rounded at the base, minutely serrate, $1\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ in. wide, densely pilose with stiff hairs on both surfaces. Racemes dioecious, terminal on the stems and branches, and leaf-opposed below; male racemes $1\frac{1}{2}$ -4 in. long, flowers close set above, more distant below, very numerous; female racemes $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, flowers few (3-6), rather remote. Capsule 3-coccos, $\frac{1}{2}$ in. in diameter, rather sparingly appressed-pilose; seeds brown with grey blotches, globose.

Equatoria.

33. TRAGIELLA Pax & Hoffm.

Tragiella natalensis (Sond.) Pax & Hoffm.

Herb; stems slender, twining, armed with stinging hairs. Leaves subsessile to long-petiolate, ovate or ovate-oblong, acuminate at the apex, rounded or truncate or shallowly cordate at the base, 2-4 in. long, 1-2 $\frac{1}{2}$ in. broad, closely and sharply serrate, sparingly to densely softly pubescent on both surfaces and bristly setose on the nerves beneath; petiole $\frac{1}{2}$ -3 in. long. Racemes lateral, slender, rather lax, 1-1 $\frac{1}{2}$ in. long, with several male flowers above and 1-2 basal female flowers. Capsule 3-coccos, rather densely setose, $\frac{1}{2}$ in. in diameter; seeds globose, dark-brown with grey blotches.

Equatoria: Didinga Mountains, 5300 ft.

34. UAPACA Baill.

Uapaca sansibarica Pax.

Tree up to 40 ft. high, somewhat resembling a *Terminalia* in habit, but with *Ficus*-like leaves; branches blackish, stout; aerial roots absent. Leaves tufted at the ends of the branchlets, obovate to oblanceolate, usually unequal-sided at the base, 3-6 in. long, $1\frac{1}{2}$ -3 in. broad, slightly rough on the upper surface; petiole $\frac{1}{2}$ -1 in. long. Male flower-heads scattered towards the ends of the branchlets and composed of numerous yellow-green small flowers surrounded by golden-yellow bracts; female flowers similar in general appearance but with a single flower in place of the globose capitulum; styles flabelliform, divided, recurved. Fruit yellow, indehiscent, elliptic-globose, $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter, glabrous; pedicel up to $\frac{1}{2}$ in. long; seeds solitary in each loculus, about $\frac{1}{2}$ in. long, somewhat shining, slightly wrinkled when dry.

Equatoria: on the side of a stream between Jebel Mandu and Jebel Yukanga.

77. ROSACEAE

Trees, shrubs or herbs. Leaves alternate or rarely opposite, simple or compound, sometimes with glandular teeth; stipules usually present, sometimes adnate to the petiole. Flowers actinomorphic or subzygomorphic, usually hermaphrodite. Calyx free or adnate to the ovary; lobes usually 5, imbricate, the 5th lobe adaxial. Disk present and lining the tube of the calyx. Petals present, imbricate and as many as the calyx-lobes or rarely absent. Stamens usually numerous or rarely definite or reduced to 1 or 2; filaments free or rarely connate. Carpels 1 or more, free or variously connate, superior or inferior; styles free or rarely connate; ovules 2 or more in each carpel, superposed. Fruit a drupe, follicle or achene, sometimes on an enlarged fleshy torus.

- A. Stems prickly; scrambling shrubs; leaves compound; ovary apocarpous; carpels numerous on a subglobose torus
RUBUS. 7.
- AA. Stems not prickly:
- B. Herbs with prostrate or decumbent stems:
- (a) Petals absent; leaves digitately lobed ... ALCHEMILLA. 1.
- (aa) Petals present:
- (b) Petals yellow; leaves pinnately 3-5-foliolate
POTENTILLA. 5.
- (bb) Petals very small and inconspicuous; leaves usually with
1-4 obtuse lobes on each side NEURADA. 3.
- BB. Trees or shrubs:
- (c) Leaves simple:
- (d) Flowers in axillary or terminal pyramidal or corymbose
panicles; petals falling early PARINARI. 4.
- (dd) Flowers in simple or clustered racemes PYGEUM. 6.
- (cc) Leaves pinnate HAGENIA. 2.

1. ALCHEMILLA L.

Alchemilla cryptantha Steud. ex A. Rich.

Procumbent herb; branches pilose, rooting at the nodes. Leaves orbicular-reniform, broadly 5-lobed, lobes rounded, rather deeply crenate-serrate, up to 1 in. in diameter, more or less silky-pilose on both surfaces; stipules serrate above or toothed. Flowers shortly pedicellate or sessile, concealed within the sheathing stipulate leaf-axils.

Equatoria: Imatong Mountains, Itobol Forest, 6400 ft.

2. HAGENIA J. F. Gmel.

Hagenia abyssinica J. F. Gmel.

Fig. 39.

Brayera anthelmintica Kunth.

Tree up to 50 ft. high, in mountain forest; crown rounded or umbrella-shaped; bark red-brown, flaking raggedly; branchlets densely villous with golden hairs, ringed by the scars of sheathing leaf-bases, the rings at first hirsute with long ascending hairs.



Fig. 39—HAGENIA ABYSSINICA J. F. Gmel.

A, flowering branchlet. B, flower-bud. C, male flower. E, section through a female flower.

Leaves imparipinnate, tufted; leaf-rhachis densely villous, usually with small leafy lobes inserted between the leaflets; leaflets generally 11 or 13, opposite or subopposite, oblong-lanceolate, acuminate at the apex, obtusely serrate, 2-6 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, becoming glabrous above, silvery villous to pubescent beneath; stipules 1-4 in. long, villous above, pubescent to glabrous beneath, reddish when young, adnate to the petiole throughout their length, and forming two linear wings. Flowers reddish (female) or orange buff (male), polygamo-dioecious; panicles handsome, pendant, 1-2 ft. long, the female one bulkier than the plume-like male.

Equatoria: Imatong Mountains, 7000-10,000 ft.

3. NEURADA L.

Neurada procumbens L.

Fig. 40.

Woody tomentose annual herb with short spreading prostrate branches. Leaves pinnately lobed or deeply toothed, rather long-petiolate, about $\frac{3}{4}$ in. long, densely white-woolly tomentose. Flowers axillary, solitary, orbicular, surrounded with setiform bracteoles. Fruit orbicular, about $\frac{3}{4}$ in. in diameter, woody, spinose, spines often pink-tinged and persisting around the base of the stem.

Red Sea District: Dungunab; between Tokar and Suakin.



Fig. 40—NEURADA PROCUMBENS L.

A, flower. B, longitudinal section of flower. C, D, sections of fruit.

4. **PARINARI** Aubl.**Tragella natalensis** (Sond.) Pax & Hoffm.*Parinari curatellaefolium* Planch. ex Benth.

Shrub or tree up to 40 ft. high; bark dark-brown to almost black with small prominent corky scales $\frac{1}{2}$ -1 in. square; slash dull-red. Leaves oblong-elliptic, rounded or obtuse at each end, up to 5 in. long and $2\frac{1}{2}$ in. broad, closely reticulate, pale-green above, grey-tomentose beneath, and with 12 or more pairs of lateral nerves; petiole with 2 glands near the middle. Flowers small, silky-tomentose, in many-flowered lax open panicles. Calyx 5-lobed, grey-green. Petals 5, pinkish-white. Stamens 10; anthers pink or white. Fruit pale-red-brown, ovoid, 1-1 $\frac{1}{2}$ in. long, shining, covered with small grey lenticels; seeds surrounded by an edible sweet mealy pulp.

Equatoria.

Fig. 41—**PARINARI CURATELLIFOLIA** (Planch.) Hiern.
A, flowering branchlet. B, part of an inflorescence. C, section of flower.
D, fruit. E, section of fruit.

P. tenuifolia (A. Chev.) Dandy, comb. nov.*Parinarium tenuifolium* A. Chev.

Large forest tree. Leaves lanceolate or narrowly oblong-lanceolate, acuminate at the apex, narrowed from about the middle to the base, 2-3½ in. long, ¾-1½ in. broad with 12 or more pairs of close parallel nerves. Other characters as in *P. excelsum*, (see below).

Equatoria: gallery-forest near Iwatoka.

P. polyandra (Benth.) Dandy, comb. nov.*Parinarium polyandrum* Benth.

Fairly tall tree in savannah-forests, but 10-20 ft. high in open country. Leaves elliptic-oblong, not or only slightly acute at the apex, usually broadly rounded at the base, 3½-6½ in. long, 2-3½ in. broad, glabrous or with a few scattered hairs on the nerves, rarely softly tomentellous beneath, with about 10 pairs of rather distant lateral nerves; basal glands conspicuous. Flowers white, in dense many-flowered more or less hoary-tomentose terminal panicles 3-6 in. broad. Fruit broadly ovoid-ellipsoid, about lin. long, puberulous.

Equatoria.



Fig. 42—PARINARI EXCELSA (Sabine) Hiern.

A, base of leaf. B, flowering branch. C, longitudinal section of flower. D, pistil
E, fruit.

P. excelsa (Sabine) Hiern.

Fig. 42.

Evergreen forest tree up to 150 ft. high; crown thick, rounded, dark-green with patches of yellow where the young leaves are unfolding; buttresses short and rounded; bark pale-grey-brown, usually slightly scaly or fissured, sometimes smooth; slash meat-red. Leaves elliptic or ovate-elliptic, acuminate at the apex, 2-5 in. long, 1-2 in. broad, softly and shortly buff-tomentose beneath, with 20-30 pairs lateral nerves; petiole with a pair of glands near the middle. Flowers grey-white to pink, in terminal leafy buff-tomentose panicles. Fruit obliquely-ellipsoid, about 1½ in. long, rough-skinned; seeds embedded in a soft edible yellow flesh.

Equatoria: Lotti Forest.

5. **POTENTILLA** L.**Potentilla supina** L.

Diffuse decumbent herb from a few inches to 1 or more ft. in height, branching from the base, usually more or less pilose. Lower leaves usually pinnately 5-foliolate, but up to 3-foliolate with shorter petioles; leaflets oblanceolate to obovate or (in radical leaves) sometimes nearly ovate, deeply serrate. Flowers yellow; peduncles leaf-opposed.

Northern and Central Sudan.

6. **PYGEUM** Gaertn.**Pygeum africanum** Hook. f.

Forest tree up to 120 ft. high; bark dark-brown, scaling raggedly. Leaves elliptic to oblong, shortly acuminate at the apex, crenate, 2-6 in. long, 1-2½ in. broad, glabrous; petiole reddish, up to ¾ in. long. Flowers creamy-white, fragrant, small, in simple solitary or clustered racemes shorter than the leaves from the lower parts of the branchlets. Petals woolly on the margins. Fruit red, dry, glabrous, depressed-globose, up to ½ in. in diameter, bearing the short persistent style.

Equatoria: Imatong Mountains, Itobol Forest.

7. **RUBUS** L.**Rubus steudneri** Schweinf.

Scrambling shrub; stems angular, greyish-tomentose, with crowded glandular hairs; prickles slightly reflexed, tomentose towards the base. Leaves 3-foliolate; leaflets elliptic, abruptly acuminate at the apex, doubly serrate, nearly glabrous above, densely whitish-tomentose and glandular beneath. Panicles terminal, much-branched; branches glandular-tomentose. Petals purplish.

Equatoria: Imatong Mountains.

Var. *aberensis* Engler ex Gustafsson.

Glandular hairs absent or very rare.

Equatoria: Imatong Mountains.

78. CHAILLETIACEAE

Small trees or shrubs, sometimes climbing. Leaves with stipules, alternate, simple. Flowers small, usually hermaphrodite, actinomorphic or slightly zygomorphic. Sepals 5, free or partially connate, imbricate. Petals usually 2-lobed or 2-partite, free or united with the stamens into a tube. Hypogynous glands opposite to the petals, free or connate. Stamens 5, alternate with the petals, free or united; anthers 3-5, opening lengthwise, the connective often dorsally thickened. Ovary superior to quite inferior, 2-3-locular; style usually simple, 2-3-fid at the apex; ovules 2 in each loculus, pendulous. Fruit dry or rarely fleshy, sometimes the outer skin splitting.

- A. Peduncle usually not adnate to the petiole; fertile stamens 5; petals free, or shortly united at the base, equal, usually bilobed DICHAPETALUM. 1.
 AA. Peduncle adnate to the petiole; fertile stamens 3, united with the petals into a tube; petals unequal TAPURA. 2.

1. DICHAPETALUM Thou.

Dichapetalum schweinfurthii Engler.

Large shrub. Leaves obliquely oblong-elliptic, acute to acuminate at the apex, the larger about 6 in. long, 2½ in. broad, more or less pubescent on the nerves beneath. Flowers white or yellow, sweet-smelling, axillary, clustered. Fruit globose, tomentose.

Equatoria.

2. TAPURA Aubl.

Tapura fischeri Engler.

Bush or tree up to 80 or more ft. high in gallery-forests, and on rocky hills. Leaves sometimes variegated, ovate to obovate-oblong, obtusely acute to acuminate at the apex, rounded to shortly cuneate at the base, up to 4 in. long and 1½ in. broad; petiole ½ in. long, bearing the flower clusters. Flowers creamy-white, clustered on short peduncles. Fruit green, small.

Equatoria.

79. CAESALPINIACEAE

Trees, shrubs or very rarely herbs or scramblers. Leaves pinnate or bipinnate or rarely simple or 1-foliolate; stipels present and frequently deciduous, or absent. Flowers usually showy, racemose, spicate or rarely cymose, zygomorphic to subactinomorphic; bracteoles sometimes large and enclosing the flower in bud. Sepals 5, or the two upper ones connate, usually free, imbricate or rarely valvate, sometimes much reduced and then replaced by the large bracteoles. Petals 5 or fewer or absent, the adaxial (upper) one inside in bud, the others variously imbricate. Stamens usually 10 or rarely numerous, often free or variously connate; staminodes sometimes present; anthers various, sometimes opening by terminal pores. Ovary superior, of 1 carpel. Fruit a legume (pod), dehiscent or indehiscent.

The following introduced ornamental plants are cultivated in the Sudan: *Bauhinia variegata* L.; *Delonix regia* (Boj.) Raf. (*Poinciana regia* Boj. ex Hook.), Golden Mohur, Flamboyant; *Caesalpinia pulcherrima* (L.) Sw., Barbados Pride; *Haematoxylum campechianum* L., Logwood, as a hedge plant; *Peltophorum inerme* (Roxb.) Naves.

- A. Leaves of two fused leaflets, appearing simple and bilobed:
- (a) Flowers dioecious; fruit indehiscent; seeds multiseriate
PILIOSTIGMA. 13.
- (aa) Flowers bisexual; fruit dehiscent; seeds uniseriate
BAUHINIA. 3.
- AA. Leaves compound with one or more free leaflets:
- B. Leaves bipinnate (apparently simply pinnate in *Parkinsonia*):
- C. Sepals free to the base or nearly so:
- D. Common petiole very short, ending in a spine; pinnae very long, stiff, leaf-like with very small leaflets; pod linear, often subtorulose PARKINSONIA. 12.
- DD. Common petiole more developed than above, not ending in a spine:
- (b) Pod not winged or wing-edged DELONIX. 7.
- (bb) Pod winged, wing membranous ... PTEROLOBIUM. 14.
- CC. Sepals connate into a campanulate tube:
- (c) Pod oblong or elliptic-oblong, flat, thinly coriaceous, indehiscent, usually 1-seeded BURKEA. 4.
- (cc) Pod oblong, compressed, thickly coriaceous or woody, pulpy between the seeds, dehiscent, several-to-many-seeded ...
ERYTHROPHLEUM. 10.
- BB. Leaves simply pinnate:
- E. Petals deeply bilobed; anthers versatile; pod surrounded by a wing; tall forest trees AMPHIMAS. 2.
- EE. Petals not as above:
- F. Anthers attached at the base:
- (d) Leaves with an odd terminal leaflet; fruit oblong or ovoid or globose, indehiscent, endocarp pulpy, 1-2-seeded ...
DIALIUM. 9.
- (dd) Leaves without an odd terminal leaflet; fruit cylindric or flat, compressed, dehiscent or indehiscent, several-seeded CASSIA. 5.
- FF. Anthers versatile:
- G. Bracteoles usually large, sometimes petaloid, valvately enclosing the bud and meeting or joining over the top of it:
- (e) Fertile stamens usually 10:
- (f) Petals subequal; pod 4-8-seeded
ISOBERLINIA. 11.
- (ff) Petals very unequal, usually 1, the remainder much smaller or rudimentary; pod usually 1-seeded ...
DANIELLIA. 6.



W. E. T.

Fig. 43—AFZELIA AFRICANA Sm.

A, flower-bud. B, flower. C, longitudinal section of fruit.

- (ee) Fertile stamens 3, alternating with the minute stamens; pod oblong or linear-oblong, indehiscent; petals 5, yellowish or striped with dark-red or brown, three large and 2 minute

TAMARINDUS. 15.

- GG. Bracteoles small, herbaceous or subcoriaceous, sometimes falling early, not meeting or joining over the top of the bud:

- (g) Petals present; pod thick, woody, several-many-seeded; seeds large with an orange or red aril

AFZELIA. 1.

- (gg) Petals absent; pod thick, drupaceous, 1-seeded

DETARIUM. 8.

1. AFZELIA Sm.

Azelia africana Sm.

Fig. 43.

Pahudia africana (Sm.) Prain.

Wide-spreading deciduous woodland tree up to 60 ft. high, with rounded crown, massive limbs and short thick buttresses; bark pale-grey to dark-brown, scaling in large flakes; slash pale-pink. Leaves up to 1½ ft. long; leaflets in 4-6 pairs, opposite, broadly elliptic to oblong-elliptic, acuminate at the apex, 2½-5 in. long, 1½-2½ in. broad; petiolule up to ½ in. long. Flowers fragrant, in flat spreading panicles up to 8 in. long. Petal 1, greenish-white tinged with red or purple. Pod black, 5-6 in. long, 2½-3 in. broad, thick, woody, usually bursting violently to discharge the seeds; seeds black with a cup-shaped orange or red aril, about ¼ in. long. *Equatoria*.

2. AMPHIMAS Pierre ex Harms

Amphimas pterocarpoides Harms.

Tall forest tree; stem cylindrical; crown spreading. Leaves imparipinnate; leaflets in 5-8 pairs, opposite or subopposite, lanceolate to narrowly obovate, rounded or broadly acuminate and mucronate at the apex, 2½-4½ in. long, up to 1½ in. broad, glabrous, rather shiny above, with numerous slender prominent lateral nerves beneath. Flowers in bracteate panicles; bracts ovate, acuminate at the apex, about ½ in. long, tomentellous. Pod flat, oblong-elliptic, up to 6 in. long, 2 in. broad including the nearly ¼ in. broad wing; seed solitary, reniform.

Equatoria: Yambio District, on the bank of R. Sakor.

3. BAUHINIA L.

Bauhinia fassoglensis Kotschy.

Fig. 44.

Climbing shrub with forked tendrils. Leaves bilobed like a camel's foot, suborbicular, 2½-4½ in. broad, paler and, when young, densely rusty-pubescent beneath. Flowers white or yellow, in



Fig. 44—BAUHINIA FASSOGLENSIS Kotschy.

A, branchlet with tendrils. B, flowering branchlet. C, pod.

pedunculate terminal or leaf-opposed rather lax many-flowered simple racemes; peduncle 9-12 in. long; pedicels $\frac{1}{2}$ -2 in. long. Calyx strongly keeled, rusty-pubescent, deeply 5-fid, 2 or 3 times as long as the short campanulate tube. Larger petals orbicular, $\frac{1}{2}$ -1 in. in diameter, narrowed into a short claw; posterior petal with an erect obtuse very prominent bifid callus channelled in front and enclosing the posterior staminode whose filament is abruptly dilated at the middle. Pod brown to blackish, woody, obliquely rhomboid-obovate, up to $4\frac{1}{2}$ in. long, $2\frac{3}{4}$ in. wide, glossy, the valves separating to expose 2 elliptic, flattened, deep-purplish-brown seeds about 1 in. long.

Central and Southern Sudan.

B. rufescens Lam.

Fig. 45.

Much-branched shrub or small tree up to 15 ft. high; bark white, smooth. Leaves bilobed almost to the base, rarely over $\frac{1}{2}$ in. long, glaucous, glabrous. Racemes few-flowered. Calyx spathaceous. Petals cream-white, fragrant. Pod almost black, often twisted, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, several-seeded.

Central and Southern Sudan.



Fig. 45—BAUHINIA RUFESCENS Lam.



Fig. 46—BURKEA AFRICANA Hook.

A, flowering branchlet. B, flower-bud. C, opened flower. D, pistil. E, branchlet with young fruit. F, G, young fruit enlarged. H, fruit.

4. BURKEA Hook.

Burkea africana Hook.

Fig. 46.

Tree up to 30 ft. high; bark grey-brown to blackish, corrugated, scaly; slash dark-red. Leaves 1-2 ft. long, in tufts at the ends of the branches; pinnæ in 2-5 pairs, almost opposite; leaflets up to 9 pairs, alternate, ovate to ovate-lanceolate, unequal-sided, 1-2 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, blue-green above, grey-green beneath.

Flowers creamy-white, fragrant, crowded, small, in terminal panicles up to 1 ft. long. Petals 5, recurved. Pod stipitate about 2 in. long and 1 in. broad, flat except for the twisted apex, thin, brittle, persistent, containing usually a single flat seed.

Equatoria.

5. CASSIA L.

- A. Pod indehiscent:
- B. Inflorescences short or corymbose, under 6 in. long:
- (a) Bracts absent or early deciduous; flowers pink; tall forest tree *C. mannii.*
- (aa) Bracts persistent; flowers yellow; shrub or small tree
C. arereh.
- BB. Inflorescences elongate, pendulous, generally over 6 in. long; flowers yellow; savannah tree *C. sieberiana.*
- AA. Pod dehiscent:
- C. Valves of pod not elastic, pod dehiscing by one or both sutures:
- D. Pod cylindrical or linear:
- E. Seeds arranged longitudinally; pod very narrow-linear; leaflets in 2-3 pairs; flowers solitary or in axillary pairs *C. tora.*
- EE. Seeds arranged transversely or obliquely:
- (b) Pod linear, compressed, with a raised margin; leaves glandular at the base *C. occidentalis.*
- (bb) Pod cylindrical, swollen or compressed:
- (c) Leaflets acute to acuminate at the apex ... *C. petersiana.*
- (cc) Leaflets obtuse to rounded at the apex ... *C. sinqueana.*
- DD. Pod oblong or kidney-shaped, compressed, flat; seeds transverse or oblique, vertically compressed:
- (d) Whole plant softly pubescent; leaflets oblong to ovate-oblong *C. holosericea.*
- (dd) Whole plant more or less glabrous:
- (e) Leaflets obovate; pod with an undulate crest on each side *C. italica.*
- (ee) Leaflets elliptic to lanceolate, acute at the apex; pod without undulate crests on its sides *C. senna.*
- CC. Valves of pod elastic, pod dehiscing by both sutures:
- (f) Pod densely glandular, linear, rather sticky; leaflets usually in 2 pairs *C. absus.*
- (ff) Pod without glands:
- (g) Leaflets usually in 12-30 pairs; flowers almost sessile on supra-axillary pedicels *C. nigricans.*
- (gg) Leaflets usually in 30-80 pairs; flowers axillary on slender pedicels *C. mimosoides.*

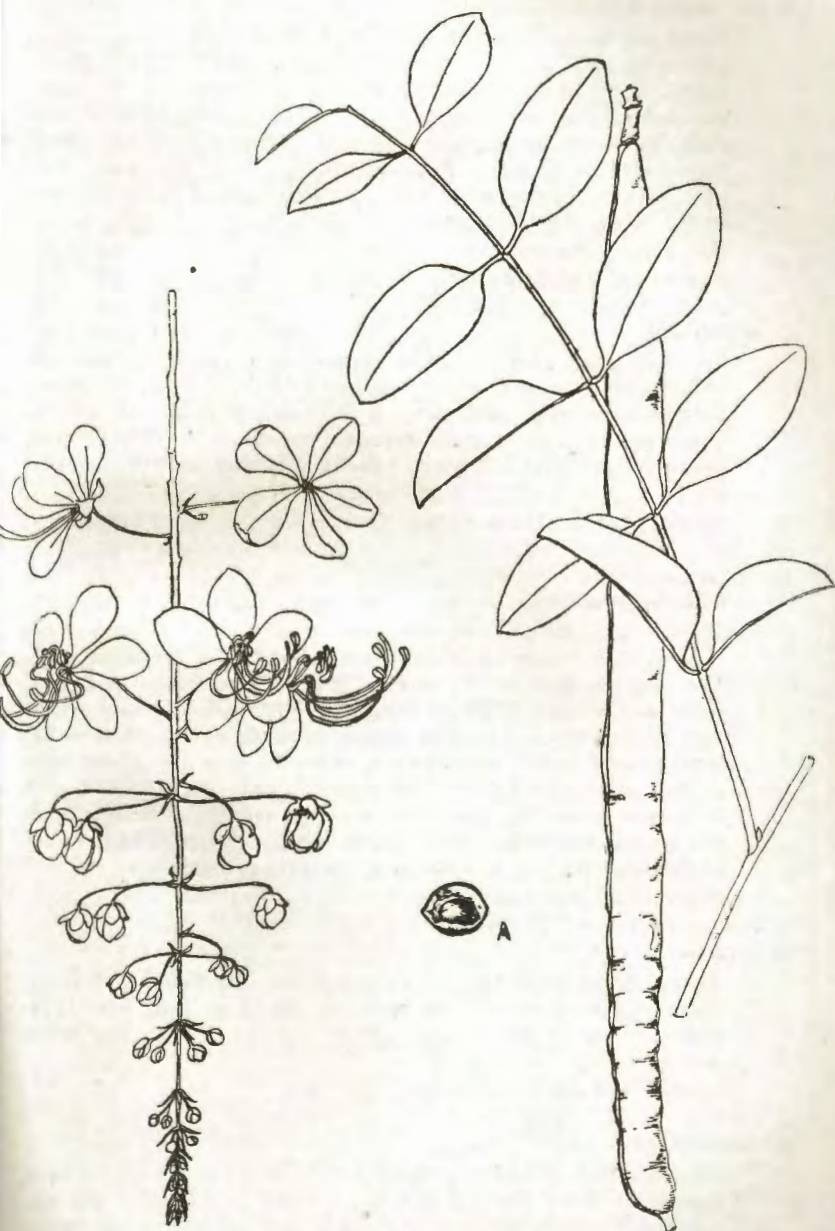


Fig. 47—*CASSIA SIEBERIANA* DC.
A, section across pod.

Cassia mannli Oliv.

Deciduous forest tree up to 80 ft. high; bark dark-brown, shaggy. Leaves up to 14 in. long; leaflets in 5-12 pairs, elliptic to elliptic-ovate, more or less acute or shortly acuminate at the apex, rounded at the base, 2-3½ in. long, 1-1½ in. broad. Flowers rose-pink, handsome, in corymbose racemes clustered below the leaves. Sepals about ½ in. long. Petals about ¾ in. long. Pod up to 3 ft. long, 1-1½ in. in diameter, with both longitudinal and transverse septa; seeds obovoid, compressed, about ½ in. long, ¼ in. broad, and ⅓ in. thick.

Equatoria: Laboni Forest.

C. arereh Del.

Shrub or small tree. Leaflets ovate-elliptic, acute to acuminate at the apex, cuneate at the base, up to 3 in. long, 1½ in. broad, very prominently reticulate with numerous lateral nerves. Flowers yellow, in upright terminal bracteate corymbs. Pod brown, cylindric, 1-2 ft. long, 1 in. in diameter, splitting lengthwise.

Central and Southern Sudan.

C. sieberiana DC.

Fig. 47.

C. kotschyana Oliv.

Tree up to 35 ft. high, flowering usually in the dry months; bark shaggy, dark-brown to almost black; slash yellow. Leaves up to 1 ft. long; leaflets in 6-14 pairs, elliptic to oblong, obtuse to sub-acute at the apex, 1½-3½ in. long, ¾-1½ in. broad, minutely pubescent to glabrous and shining above, minutely pubescent beneath; basal pairs of leaflets about as long as broad, apical pair about twice as long as broad. Flowers pale-yellow, 1½-2 in. in diameter, with 3 stamens exceeding the petals and the remainder shorter than the petals; bracteoles linear, ½-¾ in. long. Pod cylindric, ¾-¾ in. in diameter and up to 3 ft. long, breaking transversely.

Central and Southern Sudan.

C. tora L.

Annual undershrub 3-6 ft. high or smaller. Leaflets in 2-3 pairs, obovate, mucronate at the apex, up to 2½ in. long and 1½ in. broad, ciliate on the margins. Flowers yellow. Pod curved when young, slender, up to 8 in. long.

Central and Southern Sudan.

C. occidentalis L.

Glabrous herb or undershrub up to 5 ft. high, woody at the base, annual or of 2-3 years' duration. Leaflets in 4-5 pairs, the top-most pair usually the largest, broadly lanceolate or ovate, acute to acuminate at the apex, up to 4 in. long, 1½ in. broad; rhachis of leaf with a gland near the base. Flowers yellow. Pod flattish,

up to $5\frac{1}{2}$ in. long and $\frac{1}{2}$ in. broad, abruptly beaked, slightly compressed between the seeds forming a raised margin.

Widespread, particularly near villages.

C. petersiana Bolle.

Bushy shrub or low-branched tree up to 20 ft. high. Leaves 5-12 in. long, usually with small deciduous glands between the leaflets; leaflets shortly petiolulate, in 6-12 pairs, narrow-oblong to lanceolate, acute or acuminate at the apex, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad; stipules subcordate or reniform, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers golden-yellow in simple or branched corymbose racemes. Sepals and petals very unequal. Pod thick-margined, up to 10 in. long and $\frac{1}{2}$ in. broad.

Equatoria.

C. singueana Del.

Fig. 48.

C. goratensis Fresen.

Savannah shrub or tree up to 20 ft. high; bark scaly and fissured, grey or brown; slash brown. Leaves 5-12 in. long, usually with small deciduous glands between the leaflets; leaflets shortly petiolulate, in 4-10 pairs, oblong to ovate or obovate, 1-2 in. long, $\frac{1}{2}$ -1 in. broad. Flowers golden-yellow, usually appearing before the leaves, 1-2 in. in diameter, in short corymbose racemes clustered at the ends of the branches. Pod yellow and sticky when ripe, later turning black, 3-8 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, constricted between the seeds, beaked at the apex.

Central and Southern Sudan.

C. holosericea Fresen.

Shrubby herb, sometimes trailing, usually clothed in a very short rather dense or velvety pubescence; branches ascending or trailing, striate, terete. Leaflets in 5-8 pairs, broadly oblong or ovate-oblong, $\frac{1}{2}$ -1 in. long. Flowers yellow, in erect racemes shorter than the leaves. Pod flat, broadly falcate, oblong, up to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad.

Northern Sudan. Equatoria.

C. italica (Mill.) Lam.

Italian Senna. Fig. 49.

Senna italica Mill.; *C. obovata* Collad.

Undershrub, often with herbaceous branches from a woody base, more or less glaucous. Leaflets in 3-7 pairs, obovate to oblong, up to $1\frac{1}{2}$ in. long. Flowers yellow, in single axillary racemes. Pod flat, curved, broadly oblong, up to 2 in. long, with an undulate crest on each side.

Widespread in the Northern Sudan.

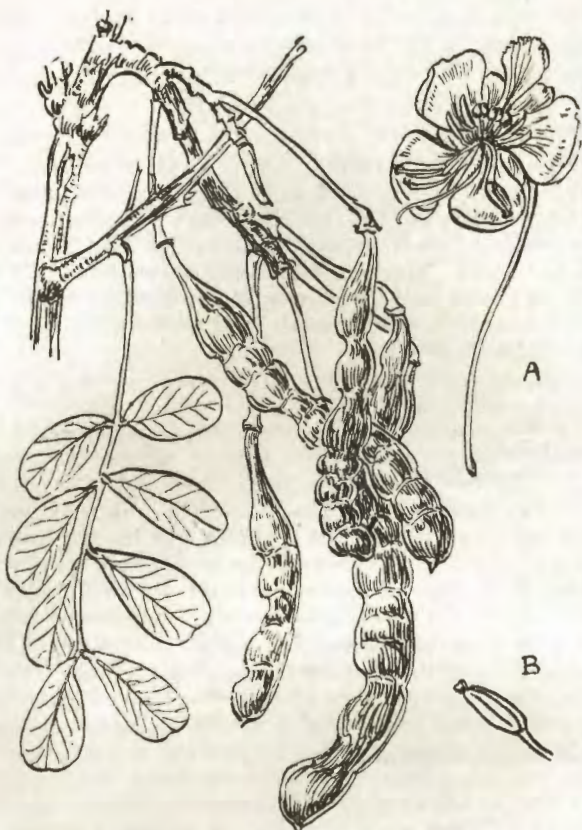


Fig. 48—CASSIA SINGUEANA Del.

A, flower. B, stamen.

C. senna L.

Alexandrian Senna. Fig. 50.

C. acutifolia Del.

Glabrous undershrub with pale more or less zigzag branchlets. Leaflets in 4-6 pairs, elliptic to lanceolate, acute at the apex, up to $1\frac{1}{2}$ in. long, glaucous. Flowers yellow in erect racemes. Pod flat, up to $2\frac{1}{2}$ in. long, without a crest on each side. Northern and Central Sudan.

C. absus L.

Viscid herb or weak undershrub 1-2 or more ft. high, erect or prostrate, sometimes purple-tinged. Leaflets obliquely obovate, $\frac{3}{4}$ - $2\frac{1}{4}$ in. long, pubescent. Flowers red, sometimes yellow, small, in many-flowered inflorescences. Petals dark-veined. Pod flat, linear, up to 2 in. long, $\frac{1}{4}$ in. broad, bristly. Central and Southern Sudan.



Fig. 49—CASSIA ITALICA (Mill.) Lam.



Fig. 50—CASSIA SENNA L.

A, buds. B, flower. C, longitudinal section of flower. D, stamens and 3 staminodes. E, fruit dehiscent. F, fruit opened showing attachment of immature seeds. G, mature seeds. H, habit.

C. nigricans Vahl.

Erect herb up to 5 ft. high; stems more or less sparsely pilose with weak spreading hairs and with a shorter crisped pubescence. Leaves distichous, 2-4 in. long; stipules persistent, lanceolate; leaflets in 12-30 pairs, linear to oblong, obtuse and prominently mucronate at the apex, usually $\frac{1}{2}$ -1 in. long. Flowers small, up to $\frac{1}{2}$ in. in diameter, solitary or 2-5 together on very short supra-axillary pedicels. Pod dark-brown, nearly straight, flat, 2-valved, shortly pubescent, up to 2 in. long, $\frac{1}{2}$ in. broad, on a stout pedicel about $\frac{1}{2}$ in. long, 7-11-seeded.

Central and Southern Sudan.

C. mimosoides L.

Annual herb or a half-woody undershrub, erect or diffuse. Leaflets very numerous, unequal-sided, up to $\frac{1}{2}$ in. long. Flowers yellow on pedicels up to 1 in. long. Pod linear, about 2 in. long, slightly pilose.

Central and Southern Sudan: common on sandy soil.

6. **DANIELLIA** Benn.

Daniellia oliveri (Rolfe) Hutch. & Dalziel. African Copaiba Balsam. *D. thurifera* (non Benn.) Broun & Massey.

Deciduous savannah tree up to 80 ft. high with a thick straight cylindrical bole up to 30 ft. high; crown obconical, flat-topped, dense, spreading; bark pale-grey, scaly; slash crimson with fine white lines, exuding a gum-resin. Leaves generally about 18 in. long; leaflets in 5-10 pairs, opposite, unequal-sided, ovate, obtusely acuminate at the apex, broadly rounded at the base, 3-6 in. long, $1\frac{1}{2}$ -3 in. broad. Flowers fragrant, in large flat panicles; bracteoles petaloid, deciduous. Calyx greenish-white, with 4 petaloid lobes. Petal only visible when the flower is fully open. Pod straw-coloured, flat, smooth, obliquely elliptic, 2-3 in. long, $1\frac{1}{2}$ -1 $\frac{3}{4}$ in. broad, splitting by the sudden curling of the inner layers to expose the single dark-brown seed on its twisted funicle. The open pod with the seed attached remains on the tree for a considerable time before falling.

Equatoria.

7. **DELONIX** Raf.

Delonix elata (L.) Gamble.

Fig. 51.

Poinciana elata L.

Small to medium-sized tree. Pinnae usually in 4-6 pairs; leaflets in 10-14 pairs, oblong or oblanceolate-oblong, obtuse or retuse at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous or on first expansion silky-pubescent. Flowers whitish but turning orange on fading, large, in terminal corymbs or from the upper axils. Filaments much exceeding the petals, 2-4 in. long, pilose below. Pod linear-oblong, or narrowly oblanceolate below to the persistent calyx-tube, up to 8 or more in. long, 1 or more in. broad.

Red Sea Hills.



Fig. 51—*DELONIX ELATA* (L.) Gamble.

8. **DETARIUM** Juss.**Detarium senegalense** J. F. Gmel.

Fig. 52.

D. microcarpum Guillem. & Perrott.

In the forest occurs as a timber tree attaining a bole of 40 ft. high and 12 ft. girth with more or less gland-punctate leaves, creamy fragrant flower-panicles, and round succulent fruit like a flattened mango; in the open savannah occurs as a stunted tree with much smaller less succulent fruit and often forming small abortive or galled fruits. Leaves paripinnate; leaflets 6-12, alternate, oblong-elliptic, rounded at both ends, more or less emarginate at the apex, up to $4\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. broad, leathery, rather glaucous beneath. Flowers small in small axillary panicles shorter than the leaves. Pod disc-shaped, $1\frac{1}{2}$ in. diameter, $\frac{3}{4}$ in. thick, covered with an outer smooth crustaceous skin and an intermediate layer of very fibrous tissue, woody inside; seed flattened.

*Nuba Mountains. Equatoria.*9. **DIALIUM** L.**Dialium** sp.

Large spreading tree 80-100 ft. high; bole deeply and narrowly fluted below, smooth and rounded above; bark light-reddish-brown, grey above; branchlets purplish-brown with numerous small prominent lenticels. Leaflets about 9, shortly acuminate at the apex, the terminal one obovate, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, the lateral ones ovate and shorter. Inflorescence (fruiting) paniculate, twice-branched, about 4 in. long and broad; branches rather slender, puberulous. Fruit drupe-like, ovoid, about $\frac{3}{4}$ in. in diameter, finely velvety and appressed-puberulous, with a crustaceous brittle skin and brick-red pulp round a small hard seed.

*Equatoria: Azza Forest.*10. **ERYTHROPHLEUM** Afz. ex R. Br.**Erythrophleum guineense** Don.

Ordeal Tree.

Forest tree up to 100 ft. high, usually with an undulate bole and short blunt buttresses; crown rounded, spreading, dense; bark dark-brown, scaly; slash red, granular. Pinnæ in 2-4 pairs; leaflets 7-13, alternate or subopposite, ovate-elliptic, acuminate at the apex, up to $4\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. broad. Flowers creamy-white or brownish, very fragrant, small, densely crowded, in lax panicles with short catkin-like branches. Pod reddish-purple, flat, slightly curved, woody-leathery, $2\frac{1}{4}$ -5 in. long, $1-1\frac{1}{4}$ in. broad, containing about 6 (5-10) brown glossy seeds and dehiscing without scattering them.

Equatoria: in gallery-forests.



Fig. 52—*DETARIUM SENEGALENSE* J. F. Gmel.
A, flowering branchlet. B, flower. C, longitudinal section of fruit.

E. africanum (Welw.) Harms.

Fair-sized tree with a spreading crown, the young parts softly tomentose, and the foliage very like that of *Burkea africana*. Leaflets more or less obliquely oblong, rounded or emarginate at the apex, unequal-sided at the base, $1\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad, softly pubescent when young. Flowers white; branchlets of inflorescences catkin-like, pubescent. Pod oblong, acute at the apex, up to 5 in. long, 1 in. broad, few-seeded, glabrous.

Equatoria.

11. **ISOBERLINIA** Craib & Stapf**Isobertinia doka** Craib & Stapf.

Berlinia acuminata (non Soland.) Broun & Massey p.p.

Medium-sized tree, often gregarious; bark exuding a red resin. Leaflets usually in 3 pairs, subopposite or occasionally more numerous and alternate, ovate or elliptic-ovate, oblique, up to 8 in. long, 4 in. broad, glabrous or becoming glabrous beneath, shining. Flowers white, fragrant, small, sessile in branched panicles. Pod brown, woody, up to 15 in. long, 3 in. broad, finally glabrous, the two valves curling up spirally after dehiscing.

Equatoria.

I. tomentosa (Harms) Craib & Stapf.

Berlinia acuminata (non Soland.) Broun & Massey p.p.

Deciduous tree up to 40 ft. high, with steeply ascending branches and spreading crown; bark grey, scaly; slash red. Leaves usually about 18 in. long (much longer on saplings); leaflets bright-red and shining when young, usually in 3 pairs, opposite or subopposite, ovate-oblong to ovate-elliptic, generally 4-8 in. long, $1\frac{1}{2}$ -3 in. broad, but up to 15 in. long and 10 in. broad on young plants, more or less densely tomentose beneath. Flowers white, in large tomentose panicles; bracteoles blackish-green, hard, enclosing the bud. Pod pale-brown, velvety-pubescent, flat, obliquely oblong, up to 12 in. long and 3 in. broad, the valves separating with a report, curling up in spirals and ejecting the seeds.

Equatoria.

I. angolensis (Welw.) Hoyle & Brenan.

Small tree. Leaflets in 3-4 pairs, elliptic to elliptic-oblong, unequal-sided, the broader obtuse or retuse, the narrower acuminate at the apex, 4-6 in. long or on sterile branches occasionally attaining 1 ft., prominently penninerved, glabrous or almost so beneath. Flowers white, small, in short paniculate or corymbose silky-tomentose-tawny or rusty racemes, much overtopped by the uppermost leaves. Pod flat, broadly oblong, thickly coriaceous, obliquely rugose, about 9 in. long.

Equatoria: gallery-forest near Iwatoka.



Fig. 53—*PILIOSTIGMA RETICULATUM* (DC.) Hochst.

12. **PARKINSONIA** L.**Parkinsonia aculeata** L.

Shrub or small tree 10-15 ft. high; trunk often green and smooth; branchlets armed with rigid prickles which are modified common petioles. Leaves bipinnate; pinnae 2-4; rhachis elongated, leaf-like, flattened, spine-pointed, with numerous very small obovate leaflets along the margins. Flowers yellow, fairly conspicuous. Pod linear, torulose, up to 5½ in. long, beaked.

Widespread. Native of tropical America but now naturalized.

13. **PILIOSTIGMA** Hochst.**Piliostigma reticulatum** (DC.) Hochst.

Fig. 53.

Bauhinia reticulata DC.

Small much-branched tree. Leaf-lamina widely bi-lobed for about ¼ of its length from the apex, widely and shallowly cordate at the base, up to 4 in. long, 4¾ in. broad, glaucous and quite glabrous between the very close veins beneath. Flowers white with a green centre. Anthers brown; pollen pale-mauve. Pod linear, straight or falcate, up to 9 in. long and 1½ in. broad, glabrous and somewhat glaucous.

Central and Southern Sudan.

P. thonningii (Schumach.) Milne-Redh.

Bauhinia reticulata (non DC.) Broun & Massey p.p.

Shrub or tree up to 20 ft. high, often of crooked growth; bark dark-brown to nearly black, thick, fissured. Leaves digitately 9-11 nerved (the central nerve prolonged as a point into the notch between the lobes of the leaf), cordate at the base, 3-7 in. long, 3-6 in. broad, leathery, very strongly reticulate and pubescent between the nerves beneath. Flowers white, fragrant, drooping, about 1 in. long, in racemes alternately leaf-opposed and axillary along each branch and borne somewhat horizontally. Calyx rufous-tomentose. Petals 5, white, crinkled. Pod shortly pedicellate, oblong, usually 6-8 in. long (occasionally up to 12 in. long), 1-2 in. broad, at first densely red-brown-tomentose, ultimately glabrous.

Central and Southern Sudan.

14. **PTEROLOBIUM** R. Br.**Pterolobium exosum** (J. F. Gmel.) Bak. f.

Shrub or small tree; bark dark, rough; branches armed with short recurved stipular and sparsely scattered spines. Pinnae in 8-12 pairs with recurved prickles on the rhachis at their insertion; leaflets in 9-14 pairs, oblong, obtuse at the apex, about ¾ in. long, glabrous or pubescent at least beneath. Flowers white, in many-flowered rather densely spicate puberulous racemes collected in terminal panicles overtopping the leaves. Pod bright-crimson at least when young, obliquely oblanceolate-oblong, usually obtuse



Fig. 54—TAMARINDUS INDICA L.

at the apex, with the scar of the style immediately under the apex, 1-2 in. long, wing submembranous and the upper margin thickened, 1-seeded.

Red Sea Hills: Dris Pass, 6500 ft.

15. TAMARINDUS L.

Tamarindus indica L.

Tamarind. Fig. 54.

Evergreen tree up to 50 ft. high with a stout bole and compact rounded crown with drooping branches which often reach to within a few feet of the ground; bark pale-grey with scales about 1 in. in diameter; slash pale-red. Leaves up to 6 in. long; leaflets usually in 10-15 pairs, opposite, oblong, rounded or emarginate at the apex, unequally rounded at the base, $\frac{1}{2}$ -1 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Flowers about 1 in. in diameter, in small slender drooping racemes usually about 3 in. long; bracteoles valvate, enclosing the flower-bud, falling early. Sepals 4, yellow inside, reddish outside. Petals 3, yellow streaked with red or orange. Pod pale-brown, variable, more or less oblong, about 4 in. long, usually curved, with a brittle shell containing 1-10 seeds joined one to another by tough fibres running through the sticky pulp.

Central and Southern Sudan.

80. MIMOSACEAE

Trees or shrubs, very rarely herbs. Leaves usually bipinnate, rarely simply pinnate, often with large glands on the rachis. Flowers hermaphrodite or rarely unisexual or neuter, actinomorphic, small, spicate, racemose or capitate. Calyx tubular, valvate or very rarely imbricate, 5-lobed or toothed. Petals valvate, free or connate into a short tube, usually hypogynous. Stamens as many as the sepals or more numerous or indefinite, free or monadelphous; anthers opening lengthwise, often with a deciduous gland at the apex. Ovary superior of 1 carpel. Fruit a legume or pod.

The following introduced plants are cultivated in the Sudan: *Acacia farnesiana* (L.) Willd.; *Albizia lebbek* (L.) Benth.; *A. procera* (Roxb.) Benth.; *Leucaena glauca* (L.) Benth.; *Pithecellobium dulce* (Roxb.) Benth., Madras Thorn, as a hedge plant; *Prosopis chilensis* (Molina) Stuntz, Mesquite.

- A. Sepals imbricate in bud; flowers in very dense globose or club-shaped heads on long stout peduncles PARKIA. 9.
- AA. Sepals valvate in bud:
 - B. Filaments free or united only with the disk at the base; flowers spicate, racemose, or capitate:
 - C. Stamens definite, as many as or twice as many as the petals:
 - D. Flowers in spikes or racemes:
 - E. Upper flowers of spikes bisexual, the lower neuter; pods twisted and crowded; branches armed with axillary spines DICHROSTACHYS. 5.

- EE. Flowers not as above:
- (a) Pod dehiscent:
 - (b) Pod not breaking into 1-seeded segments PIPTADENIA. 10.
 - (bb) Pod breaking up into 1-seeded segments and leaving the continuous persistent sutures ENTADA. 6.
 - (aa) Pod indehiscent, more or less swollen:
 - (c) Pod not winged:
 - (d) Pod subterete PROSOPIS. 11.
 - (dd) Pod tetragonal, very thick and woody AMBLYGONOCARPUS. 3.
 - (cc) Pod with a wing-like ridge along the back of each valve TETRAPLEURA. 12.
- DD. Flowers capitate; leaves often sensitive to touch:
- (e) Shrubs or herbs, not aquatic but often growing at the water's edge; pod flat, prickly or setose MIMOSA. 7.
 - (ee) Aquatic herbs with some leaves submerged; pod flat, glabrous NEPTUNIA. 8.
- CC. Stamens more than twice as many as the petals; flowers in spikes or heads; branchlets often armed with stipular thorns or prickles ACACIA. 1.
- BB. Filaments united into a short or long tube:
- F. Flowers spicate ACACIA. 1.
 - FF. Flowers capitate:
 - (f) Pod not jointed, flat ALBIZZIA. 2.
 - (ff) Pod jointed, coiled or straight and indented between the seeds CATHORMION. 4.

1. ACACIA Mill.

- A. Inflorescence spicate, more or less cylindrical:
- B. Stipules spinescent, white with brown bases, straight, up to $\frac{1}{2}$ in. long; branches white or grey; pod orange-yellow, thick, broad, falcate or annular, 3-6 in. long; flowers white or cream, fragrant *A. albida*.
- BB. Stipules not spinescent; prickles just below the stipules or scattered:
- C. Prickles below the stipules:
- D. Prickles in 3's:
- (a) Leaflets in 5-10 pairs; shrubs or small trees; pod linear-oblong, flat, coriaceous, up to 7-seeded ... *A. venosa*.
 - (aa) Leaflets in 10-20 pairs:
 - (b) Spikes usually shorter than the leaves; pod $\frac{1}{2}$ - $\frac{3}{4}$ in. broad *A. glaucophylla*.
 - (bb) Spikes usually longer than the leaves; pod $\frac{1}{2}$ -1 in. broad *A. senegal*.
- DD. Prickles in 2's:
- (c) Pinnae in 2-8 pairs:
 - (d) Pinnae in 2 pairs:

- (e) Leaflets in 1 or rarely 2 pairs, obovate ... *A. mellifera*.
- (ee) Leaflets in 3-5 pairs, oblanceolate-oblong to ovate or obovate *A. laeta*.
- (dd) Pinnae in 4-8 pairs *A. eggelingii*.
- (cc) Pinnae in 10-40 pairs:
 - (f) Leaflets $\frac{1}{4}$ in. long, more or less acute at the apex, not glaucous *A. campylacantha*.
 - (ff) Leaflets $\frac{1}{4}$ - $\frac{3}{8}$ in. long, obtuse at the apex, glaucous *A. hecatophylla*.
- CC. Prickles scattered, not all just below the stipules:
 - (g) Petiolar gland stipitate *A. ataxacantha*.
 - (gg) Petiolar gland sessile; plant rusty-pubescent *A. macrostachya*.
- AA. Inflorescence capitate, globose:
 - E. Stipules spinescent:
 - F. Valves of pod thick and more or less woody; branchlets with pale-to darkish-brown often sparsely pubescent bark *A. sieberiana*.
 - FF. Valves of pod thickly coriaceous to membranous:
 - G. Pod spirally twisted or falcate, sometimes very slender, the margins more or less torulose or straight:
 - H. Pod annular or spirally contorted:
 - (h) Pod and branchlets glabrous *A. raddiana*.
 - (hh) Pod and branchlets pubescent *A. tortilis*.
 - HH. Pod falcate:
 - I. Spines broadly swollen-galled at the base, or at least some of them:
 - (i) Galls whitish; flowers bright-yellow *A. fistula*.
 - (ii) Galls black; flowers cream to white *A. drepanolobium*.
 - II. Spines not galled:
 - (j) Pinnae in 1-2 pairs; pod up to $\frac{1}{2}$ in. broad *A. ehrenbergiana*.
 - (jj) Pinnae in 3-12 pairs:
 - (k) Bark cinnamon-coloured, greenish-brown beneath:
 - (l) Spines straight, strong, white, grey-flecked and brown-tipped, up to $2\frac{1}{2}$ in. long ... *A. seyal*.
 - (ll) Spines straight, rather weak, brownish, usually less than 1 in. long *A. seyal* var. *multijuga*.
 - (kk) Bark greyish-yellow or grey-brown; young branches softly tomentellous *A. hebecladoides*.
 - GG. Pod straight or only slightly curved:
 - J. Pod markedly torulose or moniliform:
 - K. Pod distinctly moniliform, the margins sometimes deeply constricted between the seeds:
 - (m) Ovary and pod tomentose *A. arabica*.
 - (mm) Ovary and pod glabrous *A. nilotica*.



Fig. 55—ACACIA ALBIDA Del.

A, flower.

KK. Pod with crenate or sub-moniliform margins:

(n) Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, grey-tomentose
A. arabica var. *adansoniana*.

(nn) Pod $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, glabrous *A. mildbraedii*.

JJ. Pod not torulose, the margins parallel or casually and irregularly constricted:

L. Pod with a flat margin, the centre part rather thick
A. nubica.

LL. Pod not margined as above:

M. Inflorescences not paniculate:

N. Pinnae usually in 10-15 pairs or rarely fewer or more; young branches and rhaches densely yellowish-tomentose *A. xiphocarpa*.

NN. Pinnae in 3-6 pairs; peduncle more or less grey-puberulous; pod $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, more or less 6-seeded *A. etbaica*.

MM. Inflorescences paniculate; leaflets $\frac{1}{2}$ - $\frac{3}{4}$ in. long
A. macrothyrsa.

EE. Stipules not spinescent; prickles scattered; scrambling plant with pale-cream flowers *A. pennata*.

Acacia albidula Del.

Fig. 55.

Tree up to 60 ft. high, probably the largest of the Sudan Acacias; bark dull-grey, fissured and scaly; slash pale-brown, fibrous. Pinnae in 3-10 pairs; leaflets grey-green, 6-20. Flower-spikes 3-4 in. long. Pod orange-yellow, twisting into strange shapes as it ripens, frequently forming hoops and spirals.

Widespread.

A. venosa Hochst. ex Benth.

Shrub or small tree; branches pale, wholly glabrous, or young shoots at first as well as the peduncles puberulous; infra-stipular prickles very short, hooked, often absent. Leaf-rhachis 2-3 in. long, slender; pinnae in 3-5 (-7) subdistant pairs; leaflets broadly oblanceolate, obovate-oblong or oblong, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, paler or glaucous beneath. Flowers rose-coloured, rather lax, sessile, glabrous, in axillary clusters of 2-5 spikes 1-1 $\frac{1}{4}$ in. long, developed before or with the young leaves. Pod linear-oblong, flat, straight, 4-6 in. long, $\frac{1}{2}$ -1 in. broad, glabrous, up to 7-seeded.

Eastern Sudan.

A. glaucophylla Steud. ex A. Rich.

Fig. 56.

Large shrub or small tree, glabrous, or with the extremities puberulous; branches brown or reddish-brown or grey; infra-stipular prickles short, straight, or slightly recurved, or absent. Pinnae with a small gland at the base of the rhachis; leaflets oblong, $\frac{1}{2}$ - $\frac{1}{4}$ in. long. Flowers white, in 1-3 spikes in the axils of the leaves. Pod linear, flat, narrowed at each end, 3-4 in. long.

Northern and Central Sudan.



Fig. 56—*ACACIA GLAUCOPHYLLA* Steud. ex A. Rich.

A, flower.

A. senegal (L.) Willd.

Gum-arabic Tree. Fig. 57.

A. verec Guillem. & Perrott.

Bush or tree usually less than 15 ft. high, occasionally attaining 30 ft. high, frequently forming thickets; stems short, usually low-branched; crown eventually flattened; bark pale-brown to pale-grey, scaly on the older parts; slash mottled-red; prickles up to $\frac{1}{4}$ in. long, the centre one sharply recurved, the other two more or less straight and directed forward. Leaflets grey-green. Flowers creamy-white (red in bud), usually appearing before the leaves, in spikes 2-4 in. long either solitary or 2-3 together. Pod brown, flat, papery, oblong, 1-5 in. long, sometimes constricted owing to the abortion of some of the seeds; seeds greenish-brown, 1-5.

Widespread.

Fig. 57—ACACIA SENEGAL (L.) Willd.

A, seed. B, flower.

A. mellifera (Vahl) Benth.

Fig. 58.

Glabrous shrub or tree up to 25 ft. high, often gregarious and forming almost impenetrable thorny thickets; branchlets ash-grey to pale-brown; prickles black, sharply recurved, about $\frac{1}{2}$ in. long. Leaflets very unequal-sided at the base, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, about $\frac{1}{3}$ in. broad, very pale beneath. Flowers white, scented, in spikes 1-1 $\frac{1}{2}$ in. long. Pod reticulate, flat, oblong, 1-2 in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad, 2-4-seeded.

Northern and Central Sudan.



Fig. 58—ACACIA MELLIFERA (Vahl) Benth.

A, flower.

A. laeta R. Br. ex Benth.

Small to medium-sized tree; prickles black, short-hooked, shining, or sometimes absent. Leaves 1½-3 in. in length, glaucous; leaflets ½-¾ in. long. Spikes axillary, solitary or clustered. Pod flat, oblong, often once or twice constricted owing to the abortion of the seeds, 2-3 in. long, ¾-1 in. broad, glabrous.

Northern and Central Sudan.

A. eggelingii Bak. f.

Tree usually 15-20 ft. high, sometimes attaining 50 ft.; crown flat-topped; bark brown, scaling in vertical strips which recurve from the ends and give the stem a ragged appearance; prickles few, small, recurved, grey-brown with black tips. Pinnae 4-8 pairs; leaflets 8-18 pairs, not contiguous. Flower-spikes 1-2 in. long, in clusters of 2-4 together; flowers, appearing before the leaves, consisting of a dark-red corolla and numerous white stamens. Pod pale-brown, thin, flat, 3-7 in. long, ¾-1 in. broad, persistent, dehiscing on the tree; seeds dark-brown, 3-9.

Equatoria: Didinga Mountains, Naligede, 5800 ft.

A. campylacantha Hochst. ex A. Rich.

Fig. 59.

A. suma (non Kurz) Broun & Massey.

Fast-growing flat-topped gregarious tree up to 40 ft. high, usually found on the banks of streams or at the edges of marshes, but sometimes growing on dry stony hillsides; bark ash-grey to pale-yellow, rough with yellow-brown scales; slash red with white streaks, granular and fibrous; prickles brown with black tips resembling falcon's claws, up to ¾ in. long, but usually much smaller, strong, recurved, with a swollen base, sometimes small and infrequent on the young branchlets. Leaves usually 4-10 in. long; pinnae usually in 15-40 pairs. Flowers creamy-white, in spikes 4-5 in. long. Pod broadly linear, 4-6 in. long, ½-¾ in. wide, flat, persistent; seeds dark-brown, about 6, showing through the pod.

Central and Southern Sudan.

A. hecatophylla Steud. ex A. Rich.

Tree up to 25 ft. high; branchlets hoary-tomentose; slash red; prickles brown often with dark tips, up to ¼ in. long, recurved. Leaves up to 15 in. long, darkish-green above, glaucous and paler beneath; rachis sometimes weakly armed on the lower side; pinnae in 10-20 pairs. Flowers white, in spikes 3-5 in. long. Pod brown, coriaceous, oblong, 5-8 in. long, ¾-1 in. broad, 3-7-seeded.

Darfur. Equatoria.



Fig. 59—*ACACIA CAMPYLACANTHA* Hochst. ex A. Rich.
A, flower.



Fig. 60—ACACIA SIEBERIANA DC.
A, flower.

A. ataxacantha DC.

Scrambling shrub or climber; prickles brown, recurved, about $\frac{1}{4}$ in. long, sometimes absent. Leaf-rhachis 3-6 in. long; pinnae in 7-20 pairs; leaflets linear, about $\frac{1}{4}$ in. long. Flowers white, rather dense, in axillary spikes 2-3 in. long, either solitary or in pairs. Pod thin, linear-oblong, acutely beaked, 3-5 in. long, flat, papery, glabrous, several-seeded.

Equatoria.

A. macrostachya Reichb. ex Benth.

Tree; branchlets rusty-pubescent; prickles short, recurrent. Leaf-rhachis 4-9 in. long; pinnae in 14-30 pairs; leaflets in 25-50 pairs, linear, subfalcate, acute at the apex, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, thinly silky, pubescent at least beneath. Flowers creamy-white or pale-yellow in axillary usually clustered spikes 3-4 in. long, rather lax, sometimes racemose towards the extremities from the axils of reduced leaves. Pod slightly pubescent, flat, few-seeded.

Equatoria.

A. sieberiana DC.

Fig. 60.

A. verugera Schweinf.

Tree up to 50 ft. high; crown flat-topped, umbrella-shaped or irregular; bark yellow-brown, scaly; branchlets pale to dark, glabrous or pubescent, the bark scaling to expose a powdery yellow surface; slash reddish-yellow with a red margin; spines white, strong, straight, up to 4 in. long. Pinnae in 10-30 pairs; leaflets in 15-40 pairs. Flowers creamy-white, fragrant. Pod brown, linear-oblong, 4-8 in. long, $\frac{3}{4}$ -1 in. broad, up to $\frac{1}{2}$ in. thick, straight or slightly curved, indehiscent, containing 12-15 brown seeds.

Central and Southern Sudan.

A. raddiana Savi.

Fig. 61.

A. tortilis Hayne p.p.

Small to large tree, glabrous, the extremities brown or reddish brown; spines on the flowering branches very short and slightly recurved, on barren branches 1 in. long, straight. Pinnae in 2-5 pairs; leaflets in 8-12 pairs, linear-oblong, obtuse at the apex, $\frac{1}{2}$ - $\frac{1}{4}$ in. long. Peduncles slender, 1-5 from each axil. Pod contorted or spirally twisted, flat, narrow-linear, 3-6 in. long, about $\frac{1}{4}$ in. broad.

Northern and Central Sudan.



Fig. 61.—ACACIA RADDIANA Savi.

A. tortilis (Forsk.) Hayne.

Fig. 62.

A. spirocarpa Hochst. ex A. Rich.

Gregarious wide-spreading flat-topped or umbrella-shaped tree up to 40 ft. high; branchlets pubescent, red-brown; spines mixed, some white, straight, slender, and up to 3 in. long, others grey with black or brown tips, sharply recurved, very small. Pinnae in 3-10 pairs; leaflets in 7-15 pairs. Flower-heads white to cream. Pod yellow-brown, pubescent or puberulous, contorted or spirally twisted, slightly constricted between the seeds, circular in cross-section, 3-6 in. long, $\frac{1}{4}$ - $\frac{1}{3}$ in. thick.

Northern and Central Sudan.



Fig. 62—ACACIA TORTILIS (Forsk.) Hayne.

A, flower. B, pods.

A. fistula Schweinf.*A. seyal* var. *fistula* (Schweinf.) Oliv.

Similar to *A. seyal*, but the bark is smooth, milk-white, the leaflets are often $\frac{1}{2}$ in. long and the spines are often galled becoming greatly swollen at the base.

Central and Southern Sudan.

A. drepanolobium Harms ex Sjöstedt.

Whistling Thorn.

Bush or tree up to 15 ft. high, sometimes forming pure stands in seasonal swamps on heavy clay soil; stems usually almost unbranched but often densely beset with slender horizontal twigs 1-2½ ft. long; bark blackish-brown, rough; spines white, brown-tipped, straight, slender, up to 3 in. long; galls numerous, soft and grape-purple when young, hardening and turning black and becoming inhabited by ants on age. Leaves 1-2½ in. long, glaucous; pinnae in 4-10 (usually 5-8) pairs; leaflets in 12-20 pairs. Flowers white or pale-yellow, in small relatively few-flowered heads; involucrel at the base of the peduncle. Pod red-brown, narrow-lanceolate, about 2 in. long, glabrous or nearly so.

Central Sudan.

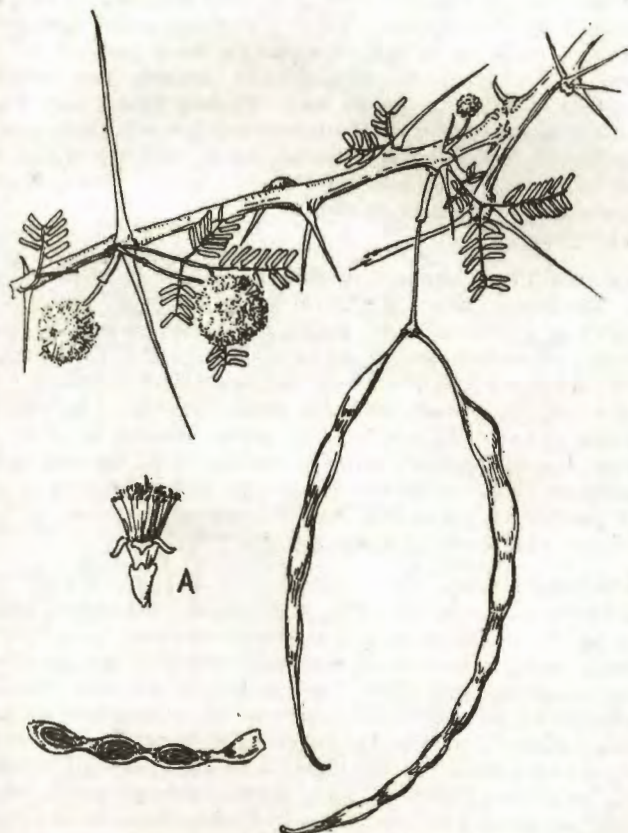


Fig. 63—ACACIA EHRENBURGIANA Hayne.

A, flower.

A. ehrenbergiana Hayne.

Fig. 63.

Shrub or small tree with brown papery peeling bark and smooth shining chestnut-brown extremities; spines usually exceeding the leaves, slender, spreading, straight. Leaflets in 8-10 pairs, oblong, obtuse at the apex, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, midrib obscure. Flower-heads golden-yellow, globose; peduncles solitary or clustered in the axils, exceeding the leaf, bearing the involucre near or below the middle. Pod narrow-linear, falcate, broadly constricted between the seeds, up to $4\frac{1}{2}$ in. long, glabrous.

Northern Sudan: usually in arid tracts.

A. seyal Del.

Fig. 64.

Gregarious flat- or umbrella-topped tree up to 30 ft. high, often on flats of black heavy clay soil; stems smooth, covered at the time of new growth with a rust-red powder which comes off when rubbed to expose the very thin bright-green bark beneath, the bark being shed annually and scaling off very regularly in rectangles; spines white usually with grey fleckings and brown tips, straight, strong, sharp, up to $2\frac{1}{2}$ in. long on the lower parts of the twigs, replaced by short recurved prickles towards the extremities. Leaflets in 8-25 pairs, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers yellow, very fragrant, usually appearing before the leaves and borne in great profusion. Pod brown, dehiscent, flat, curved, 3-6 in. long, up to $\frac{1}{2}$ in. broad, slightly constricted between the 6-10 seeds, usually borne in clusters and remaining on the tree.

Widespread.

Var. **multijuga** Schweinf. ex Bak. f.

A. stenocarpa (non Hochst.) Broun & Massey.

Shrub or tree usually less than 15 ft. high, occasionally attaining 40 ft.; crown flattened; bark on main stem greenish-brown, peeling in papery rolls, that on the branchlets red-brown; spines brownish, rather weak, straight, usually less than 1 in. long, sometimes absent. Pinnae in 4-12 pairs; leaflets in 10-25 pairs. Flowers golden-yellow; involucre usually about the middle of the peduncle. Pod narrow-linear, strongly curved, slightly or not at all constricted, up to 5 in. long, dehiscing on the tree.

Central and Southern Sudan.

A. hebecadoides Harms.

Gregarious tree up to 40 ft. high; crown flat-topped, umbrella-shaped or irregular; bark grey-brown, fissured; branchlets grey-brown, softly tomentellous, the bark tending to split to expose an underlying rust-red layer; spines grey-brown with brown tips, straight or recurved, usually short but sometimes as much as 2 in. long. Pinnae in 4-10 pairs; leaflets in 10-20 pairs. Flowers white, often with a faint pinkish tinge; involucre at or near the base of the peduncle. Pod pale-brown, falcate, ashy-pubescent, $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long and about $\frac{1}{2}$ in. broad, usually thickly clustered and dehiscing on the tree.

Nuba Mountains. Equatoria.



Fig. 64—ACACIA SEYAL Del.
A, flower.



Fig. 65—ACACIA ARABICA (Lam.) Willd.
A, flower.

A. arabica (Lam.) Willd.

Fig. 65.

Tree 25 or more ft. high; stems and branchlets usually dark-coloured; spines straight, sharp, up to 2½ in. long. Pinnae usually in 3-12 pairs; leaflets in 10-30 pairs, linear-oblong, about ½ in. long. Flower-heads yellow. Pod grey, softly tomentose, straight or slightly curved, 4-6 in. long on a pedicel ½-¾ in. long. *Northern and Central Sudan but rare south of Jebelein.*

Var. **adansoniana** Dubard.

A. arabica var. *adansonii* (Guillem. & Perrott.) A. Chev.

Differs from typical *A. arabica* in the pods having their margins only slightly constricted between the seeds.

A. nilotica (L.) Willd. ex Del.

Differs from *A. arabica* in the pods being wholly glabrous. *Northern and Central Sudan.*

A. mildbraedii Harms.

Gregarious flat-topped tree up to 50 ft. high, often occurring in swamps or on the margins of lakes or rivers; bark pale-green, smooth, thin, shining; slash bright-red; spines grey-brown or white with dark tips, slender, straight, flattened above, up to 3 in. long. Pinnae 5-12 pairs; leaflets in 15-25 pairs. Flowers white, crimson in bud; involucre at or near the base of the peduncle. Pod pale-brown, 3-4 in. long, ½-¾ in. broad, glabrous, reticulate, with an appendage over each of the 5-9 seeds.

Equatoria.



Fig. 66—ACACIA NUBICA Benth.
A, flower.

A. nubica Benth.

Fig. 66.

Somewhat obconical shrub with branches often radiating in all directions; branchlets grey-white; spines grey-white with brown tips, straight, stout, usually $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Pinnae in 3-12 pairs; leaflets in 5-15 pairs, about $\frac{1}{2}$ in. long. Flowers dirty-white, very fragrant; flower-heads 1-3 together; involucrel at or below the middle of the peduncle; peduncle about $\frac{1}{2}$ in. long. Pod pale-yellow, longitudinally striate, linear-elliptic, pointed at both ends, 2-4 in. long, about $\frac{1}{2}$ in. broad; seeds olive-green, 5-10.

Northern and Central Sudan.

A. xiphocarpa Hochst. ex Benth.

A. abyssinica Hochst. ex Benth.

Gregarious flat-topped tree up to 50 ft. high; crown obconical, spreading, the bole dividing into a number of more or less equally sized limbs which rise steeply to the same height; bark brown, fissured; spines brownish-white, straight, sharp, usually less than 1 in. long. Leaflets in 20-40 pairs, very small. Flowers white (red in bud); involucrel near the base of the peduncle. Pod red-brown, linear-oblong, straight or very slightly curved, shortly and broadly pointed at the apex, $2\frac{1}{2}$ -4 in. long, about $\frac{1}{2}$ in. broad, toughly coriaceous, prominently nerved, 6-12-seeded.

Equatoria: Imatong and Didinga Mountains, 5000 ft. and upwards.

A. etbaica Schweinf.

Fig. 67.

Shrub or somewhat flat-topped gregarious tree up to 40 ft. high; bark pale-brown to brownish-black, very deeply furrowed; branchlets red-brown; slash creamy-yellow, fibrous; spines brownish-white, paired, some straight and slender and up to 2 in. long, others small and recurved. Leaflets in 10-30 pairs. Peduncles 2-5 in each axil bearing rather few-flowered heads. Pod red-brown, shining, straight, linear-oblong, 2-4 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, glabrous, conspicuously nerved, dehiscing on the tree, about 8-seeded.

Northern Sudan. Equatoria: Kapoeta.

A. macrothyrsa Harms.

Tree usually 25 ft. high, occasionally higher; bark grey-brown, fissured and scaly; slash dull-red; spines straight, or slightly curved, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Leaves large, drooping, very shiny; pinnae in 10-20 pairs; leaflets in 20-40 pairs, not contiguous, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers yellow, scented, in panicles up to 18 in. long; involucrel at about the middle of the peduncle. Pod dark-red-brown, flat, oblong, 3-5 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, persisting on the tree for a long period, 6-12-seeded.

Equatoria.



Fig. 67—ACACIA ETBAICA Schweinf.
A, flower.

A. pennata (L.) Willd.

Lofty climber or a climbing thicket-forming shrub or small tree; prickles brownish, small, numerous or sparse, compressed, recurved, frequently present on the leaf-rhachis and inflorescences as well as on the stems. Pinnæ in 8-20 (usually 10-15) pairs; leaflets in 30-70 pairs, contiguous. Flower-heads pale-cream; peduncle about $\frac{1}{2}$ in. long. Pod reddish, flat, coriaceous, linear-oblong, 2-7 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, sometimes faintly constricted between the 3-9 seeds.

Darfur. Equatoria.

2. **ALBIZZIA** Durazz.

A. Staminal tube included or only slightly exerted:

B. Pinnæ in 1-8 pairs:

C. Leaflets $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, oblong, subfalcate, obliquely pointed at the apex, in 11-20 pairs *A. schimperiana*.

CC. Leaflets more than $\frac{1}{2}$ in. broad:D. Leaflets usually oblong to orbicular, up to $\frac{3}{4}$ in. broad:

(a) Leaflets in 1-5 pairs *A. anthelminthica*.

(aa) Leaflets in 5-22 pairs:

(b) Leaf-rhachis and leaflets softly grey-yellow tomentose *A. malacophylla*.

(bb) Leaf-rhachis and under-surface of leaflets glabrous or becoming glabrous:

(c) Young branches not golden-tomentose ... *A. coriaria*.

(cc) Young branches golden-tomentose *A. maranguensis*.

DD. Leaflets broad-oblong, often rhomboid, usually $\frac{3}{4}$ or more in. broad, distal leaflet larger than the proximal one:

(d) Flowers small, grey-pubescent, on slender pedicels about $\frac{1}{2}$ in. long; leaflets in 3-5 pairs, usually acute at the apex, papery *A. warneckei*.

(dd) Flowers larger, grey-pubescent, on short stout pedicels or subsessile; leaflets in 5-8 pairs, usually obtuse to rounded at the apex, whitish beneath ... *A. aylmeri*.

BB. Pinnæ in 10-20 pairs; leaflets thinly silky, $\frac{1}{16}$ - $\frac{1}{8}$ in. long, $\frac{1}{16}$ in. broad *A. sericocephala*.

AA. Staminal tube much exerted beyond the corolla:

(e) Bract at the base of the peduncle conspicuous, petaloid, more or less orbicular *A. grandibracteata*.

(ee) Bracts inconspicuous:

(f) Pinnæ usually 2-5 pairs *A. zygia*.

(ff) Pinnæ usually 5-8 pairs *A. gummiifera*.

Albizzia schimperiana Oliv.

Large forest tree. Leaf-rhachis 3-4 in. long on flowering branches, pubescent, at length nearly glabrous, with a small gland near the base and between the uppermost pinnæ; pinnæ in 4-5 pairs; leaflets almost glabrous, shiny above, paler and

slightly silky beneath. Pod very thin, up to $8\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, rather abruptly narrowed at the base into the $\frac{1}{2}$ - $\frac{2}{3}$ in. long stipe.

Equatoria: *Didinga Mountains, Naligede*, 5800 ft.; *Nagichot*, 6500 ft.

A. anthelmintica Brongn.

Fig. 68.

Glabrous bush or tree up to 15 ft. high; bark grey. Pinnae in 1-4 pairs. Leaflets obliquely obovate to suborbicular, obtuse and mucronate at the apex, $\frac{1}{2}$ - $1\frac{1}{4}$ in. long, glabrous, pale beneath. Flowers usually appearing before the leaves; peduncles solitary or clustered usually from leafless nodes on the older wood. Calyx and corolla pale-green. Stamens white. Pod straw-coloured, papery, oblong, 3-6 in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad, tapered at both ends, 3-5-seeded.

Widespread.

A. malacophylla (A. Rich.) Walp.

A. ferruginea Benth. p.p.

Small tree up to 30 ft. high; bark pale-brown. Pinnae in 3-6 pairs; leaflets in 6-12 pairs, $\frac{2}{3}$ in. long, $\frac{1}{2}$ in. broad. Flowers white, fragrant. Pod oblong, 5-6 in. long, 1- $1\frac{1}{2}$ in. broad.

Equatoria: *Nyin Akok; Yet.*

Var. *ugandensis* Bak. f.

Leaflets oblong to oblong-ovate, obtuse to emarginate at the apex, usually $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, puberulous above, softly grey-tomentose beneath.

Equatoria.

A. coriaria Welw. ex Oliv.

Deciduous tree up to 60 ft. high in savannah and 120 ft. in forest; bark red-brown to brownish-black, scaling raggedly; buttresses short and blunt. Pinnae in 3-5 pairs; leaflets in 5-12 pairs, narrow-oblong, obtuse or rounded at the apex, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, up to $\frac{1}{2}$ in. broad. Corolla white. Upper half of stamens red. Pod brown, oblong, glossy, straight, flat, coriaceous, 5-8 in. long, about $1\frac{1}{2}$ in. broad, apiculate, few-seeded.

Equatoria.

A. maranguensis Taub.

Flat-topped tree up to 60 ft. high. Leaflets in 7-22 pairs, sub-falcate to oblong-subrhomboidal, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, $\frac{1}{2}$ in. broad, dark above, paler beneath, glabrous to puberulous. Flowers white. Calyx grey-puberulous. Pod pale-brown, oblong, 7-12 in. long, 1- $1\frac{1}{2}$ in. broad, very numerous, papery, persisting on the tree; seeds numerous.

Equatoria: *forest on Didinga Mountains.*



Fig. 68—ALBIZZIA ANTHELMINTHICA Brongn.
A, flower.



Fig. 69—*ALBIZZIA SERICOCEPHALA* Benth.
A, flower. B, stamens and pistil.

A. warneckel Harms.

Medium to large tree. Pinnae in 1-2 pairs. Leaflets acute at the apex. Pod flat, 6-7½ in. long, 1-1½ in. broad, many-seeded.
Equatoria.

A. aylmeri Hutch.

Large tree up to 75 ft. high and 8 ft. in girth. Leaflets 1-2 in. long, ½-1½ in. broad, more or less pubescent beneath. Peduncle up to 2 in. long, thinly pubescent. Pod 7-8 in. long, 1½ in. broad, glabrous.

Central Sudan: R. Dinder; Khor Tumat; Jebel Daier.

A. sericocophala Benth.

Fig. 69.

A. amara (non Boivin) Broun & Massey.

Deciduous *Acacia*-like savannah tree or shrub; crown rounded; bark dark-brown, fissured; slash pink with red edges, fibrous; branches grey-brown. Leaf-rhachis usually pubescent; leaflets linear, in 25-35 pairs, sometimes fewer. Flowers white tinged with pink, fragrant; peduncles clustered at the nodes of short lateral branches. Pod pale-brown, linear-oblong, papery, 5-11 in. long, ¾-1½ in. broad.

Central and Southern Sudan.

A. grandibracteata Taub.

Deciduous tree up to 65 ft. high; crown usually flat-topped. Leaf-rhachis shortly pubescent; pinnae in 2-4 pairs; leaflets in 2-9 pairs, very unequal-sized, oblong to elliptic, more or less acuminate at the apex, the largest pair 1½-2½ in. long, ½-1½ in. broad. Flowers white tinged with pink; peduncles subtended by petaloid reddish bracts. Staminal tube and anthers dark-red. Pod pale-brown, linear-oblong, 3-4 in. long, ¼-¾ in. broad, reticulate, flat, papery, shortly pubescent when young, 5-8-seeded.

Equatoria.

A. zygia (DC.) J. F. Macbr.

A. brownei (Walp.) Oliv.; *A. velwitschii* Oliv. p.p.

Spreading deciduous tree up to 120 ft. high in forest and 40 ft. in savannah; buttresses small to medium-sized; bole grey-brown, often with orange patches, smooth; slash orange-brown, granular. Leaf-rhachis glabrous or puberulous; pinnae in 2-5 pairs; leaflets in 3-8 pairs (usually 3-6 pairs) obliquely obovate-elliptic to rhomboid (terminal pair falcate), very unequal-sized, the largest usually 1½-3 in. long, ¾-1½ in. broad. The leaflets of forest-grown trees are usually smaller and more numerous than those of the savannah trees. Inflorescence a corymbose raceme. Female flower white, solitary in the centre of the head and surrounded by male flowers; styles white with black stigmas, numerous, radiating; male flower white, smaller; staminal column red; anthers

black. Pod pale-brown, flat, usually 4-6 in. long, 1 in. broad, sometimes up to 12 in. long, $1\frac{1}{2}$ in. broad, usually 9-12-seeded.

Equatoria.

A. gummifera (J. F. Gmel.) C. A. Sm.

Deciduous tree up to 40 ft. high in savannah and 100 ft. in forest; crown flat-topped or umbrella-shaped; bark grey, often tinged with red, smooth. Pinnae in 5-8 pairs; leaflets in 8-16 pairs, subequal, rhomboid (one corner rounded) to falcate, usually $\frac{1}{2}$ - $\frac{3}{4}$ in. long, up to $\frac{3}{8}$ in. broad, truncate at the base, glabrous on both surfaces. Flowers numerous, in clustered corymbose heads. Corolla white. Staminal tube white tipped with red. Pod thin, reticulate, straw-coloured, oblong, 4-8 in. long, $1-1\frac{1}{2}$ in. broad; seeds 8-14.

Equatoria: *Imatong and Didinga Mountains*, 6000-7000 ft.

3. **AMBLYGONOCARPUS** Harms

Amblygonocarpus schweinfurthii Harms.

Spreading savannah tree up to 40 ft. high, occasionally up to 70 ft.; bark grey-black to black-brown, scaling raggedly to leave red scars. Pinnae in 3-5 pairs, opposite or sub-opposite; leaflets 12-18, alternate, grey-green, broadly obovate-elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous. Flowers creamy-yellow to white, scented, crowded. Pod dark-brown, 4-6 in. long, $1-1\frac{1}{2}$ in. broad, glossy, woody, pendant on a 3-inch stalk; seeds 6-10, about $\frac{3}{8}$ in. long, lying across the pod.

Equatoria.

4. **CATHORMION** Hassk.

Cathormion altissimum (Hook. f.) Hutch. & Dandy.

Flat-topped spreading deciduous forest tree up to 80 ft. high. Leaf-rhachis rusty-pubescent; pinnae in 5-7 pairs; opposite; leaflets in 12-25 pairs, opposite, oblong-lanceolate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous. Flowers white, on shortly pubescent peduncles up to 1 in. long, solitary or clustered or shortly racemose on lateral branchlets. Pod coiled, compressed, 6-10 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, 14-20-seeded.

Equatoria: *gallery-forests*.

C. eriorhachis (Harms) Dandy, comb. nov.

Albizzia eriorhachis Harms.

Slender tree about 30 ft. high; crown spreading, drooping; young branchlets densely short-rusty-tomentose. Leaf-rhachis sparsely brown-tomentose, 4-6 in. long; pinnae in about 8-12 (often 10) pairs; leaflets in 15-35 pairs, lanceolate or oblong, up to $\frac{3}{4}$ in. long. Flowers greenish with greenish-cream stamens, on solitary or clustered brown-tomentose peduncles up to 1 in. long. Pod crimson-brown, more or less straight, thick, rounded at both ends, transversely impressed, 3-5 in. long.

Equatoria: *road between Raga and Said Bundas*.

5. **DICHRSTACHYS** (DC.) Wight & Arn.**Dichrostachys glomerata** (Forsk.) Chiov.

Fig. 70.

D. nutans (Pers.) Benth.

Acacia-like shrub or tree usually 10-15 ft. high; branchlets armed with sharp woody spines which terminate the lateral branchlets and often bear leaves. Leaf-rhachis pubescent; pinnae in 7-15 pairs, with a rod-like gland between each pair; leaflets in 15-30 pairs, variable in size, usually less than $\frac{1}{4}$ in. long. Flower-spikes pendulous, 1 $\frac{1}{2}$ -3 in. long; distal (functional) flowers composed of a pistil and 10 short yellow stamens; proximal (neuter) flowers composed of 10 long pink or mauve staminodes. Pod dark-brown, about 4 in. long, indehiscent, glabrous, twisting to form strangely shaped bundles which remain on the tree for a long period, about 4-seeded.

Central and Southern Sudan.



Fig. 70—**DICHRSTACHYS GLOMERATA** (Forsk.) Chiov.

A, branch showing inflorescences. B, neuter-flower from base of inflorescence. C, bisexual flower from upper part of inflorescence. D, anther. E, pistil. F, fruiting branch.

6. ENTADA Adans.

Entada flexuosa Hutch. & Dalziel.*E. wahlbergii* (non Harv.) Broun & Massey.

Woody climber; stems slender; branchlets very zigzag. Pinnae in 2 pairs; leaflets in about 15 pairs, linear, about $\frac{3}{4}$ in. long, glabrous. Flowers brown-purple, in glabrous racemes about 2 $\frac{1}{2}$ in. long. Pod sickle-shaped, about 8 in. long, 1 $\frac{1}{2}$ in. broad, breaking up into rather narrow segments.

*Equatoria.**E. sudanica* Schweinf.

Fig. 71.

Low-branching deciduous tree up to 30 ft. high; bark pale-grey, fissured, peeling in long strips; slash crimson with narrow white streaks. Pinnae in 4-8 pairs; leaflets in 14-20 pairs, obtuse or emarginate at the apex, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, pale-green above, glaucous beneath, waxy, copper-tinged when young. Flowers creamy-white, fading to yellow-brown, fragrant, usually in clusters of 3-4, in supra-axillary racemes 4-6 in. long. Pod flat, undulate, up to 15 in. long, 2 in. broad, 12-15-seeded.

Central and Southern Sudan.

Fig. 71—ENTADA SUDANICA Schweinf.

A, inflorescences. B, longitudinal section of flower. C, leaf. D, fruit.

E. abyssinica Steud. ex A. Rich.

Acacia-like tree usually 15-30 ft. high; bark dark-grey to dark-brown, scaling irregularly. Pinnae in 10-18 pairs; leaflets in 22-50 pairs, linear, mucronate at the apex, up to $\frac{1}{2}$ in. long. Flowers creamy-white, in erect slender racemes 2-6 in. long solitary or in terminal panicles or in clusters of 2-4 from just above the axils of the upper leaves. Pod flat, straight or slightly curved, undulate, 6-14 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad.

Equatoria.

E. phaseoloides (L.) Merr.

Lofty woody climber; stems very stout. Pinnae in 2-3 pairs, the end pair usually tendriform; leaflets in 2-5 pairs, obliquely elliptic, emarginate at the apex, 1- $2\frac{1}{2}$ in. long, glabrous. Flowers subsessile or shortly pedicellate in very slender inflorescences up to 12 in. long. Pod very large, woody, up to 3 ft. long, $3\frac{1}{2}$ -4 in. broad.

Equatoria: Aga Falls near Yei.

7. **MIMOSA** L.**Mimosa pigra** L.

M. asperata L.

Prickly shrubby plant; branchlets and leaf-rhachis prickly and roughly hirsute. Pinnae in 7-16 pairs, arranged along the prickly leaf-rhachis; leaflets in 25-40 pairs, linear, margined with bristly hairs and thinly appressed-pubescent on both surfaces. Flower-heads pale-mauve, globose, on axillary peduncles about 1 in. long. Pod densely bristly all over, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, segments narrow and numerous.

Widespread, often forming dense thickets on river banks.

8. **NEPTUNIA** Lour.**Neptunia oleracea** Lour.

Aquatic herb; stems thickish, rooting at the nodes. Pinnae in 2-3 pairs; leaflets in 8-20 pairs, linear-oblong, rounded at the apex, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, glabrous; submerged leaves finely dissected, stipules broadly ovate. Flowers capitate on elongated stout peduncles up to 8 in. long, the upper flowers bisexual, the lower ones neuter. Pod shortly stipitate, oblong, sharply beaked, up to 1 in. long, flat, glabrous.

Central and Southern Sudan.

9. **PARKIA** R. Br.**Parkia filicoidea** Welw. ex Oliv.

Spreading flat-topped forest tree up to 60 ft. high; buttresses small, rounded; bark dark-brown to grey, scaly or fissured; slash brick-red, fibrous. Pinnae in 5-9 pairs, opposite or subopposite; leaflets usually in 15-30 pairs, 3-nerved from the base (one nerve

short and indistinct), oblong, slightly curved, auriculate at one side at the base, $\frac{1}{2}$ -1 in. long, about $\frac{1}{2}$ in. broad, shiny, reddish when young. Flower-heads brick-red, strongly and unpleasantly scented, pendulous, club-shaped, 2-2 $\frac{1}{2}$ in. in diameter, with small extremely numerous densely packed flowers; peduncles up to 12 in. long. Pod dark-brown to purple-black, 6-18 in. long, $\frac{3}{4}$ -1 in. broad, clustered, few in relation to the number of flowers; fruiting pedicel about 2 in. long; seeds black, embedded in a dry mealy sweet-tasting yellow pulp.

Equatoria: gallery-forests.

P. oliveri J. F. Macbr.

Savannah tree up to 50 ft. high. Pinnae in 8-13 pairs; leaflets in 25-30 pairs, linear-oblong, auriculate at one side of the base, about $\frac{1}{2}$ in. long. Flowers crimson, in small globose heads. Pod about 8 in. long, 1 in. broad, slightly falcate.

Equatoria.

P. biglobosa (Jacq.) Benth.

Large spreading tree. Pinnae in 14-30 pairs; leaf-rhachis shortly greyish-pubescent; leaflets in 50-70 pairs, opposite, linear, auriculate-toothed on the lower side at the base, shortly ciliate on the margin. Flowers red, sometimes yellow, in heads globose in the upper part shortly cylindrical at the base about 1 $\frac{1}{2}$ in. in diameter on slender peduncles up to 8 in. long. Calyx-lobes golden-tomentellous outside. Pod linear, shortly stipitate, about 8 in. long, $\frac{3}{4}$ in. broad.

Upper Nile.

P. bicolor A. Chev.

Forest tree. Similar to *P. biglobosa* but the rhachis of the leaves densely rusty-tomentose and the peduncle up to 4 $\frac{3}{4}$ in. long. Flowers orange.

Equatoria.

10. **PIPTADENIA** Benth.

Piptadenia africana Hook. f.

Fig. 72.

Very flat-topped deciduous forest tree up to 150 or more ft. high, with strongly developed plank buttresses extending 10-15 ft. up the stem and as much outward; branches wide-spreading, storeyed; bark grey, smooth; slash creamy-yellow. Pinnae in 10-16 pairs; leaflets in 30-60 pairs, feathery and forming a delicate tracery, contiguous, linear, auriculate at the base, up to $\frac{1}{2}$ in. long. Flowers creamy-white fading to orange-brown, in spikes 1 $\frac{1}{2}$ -4 in. long, borne in great profusion. Pod broadly linear, usually about 12 in. long and 1-1 $\frac{1}{2}$ in. broad, coriaceous, dehiscing by one suture only; seeds 6-8, rich-brown, flat, attached in the middle, about 2 in. long including the wing.

Equatoria.



Fig. 72—PIPTADENIA AFRICANA Hook. f.

A, flowering branchlet. B, flower-bud. C, flower. D, young stamen with gland.
E, longitudinal section through the ovary. G, seed.



Fig. 73—*PROSOPIS AFRICANA* (Guillen. & Perrott.) Taub.

A, branchlet with inflorescences. B, portion of leaf with glands on the rachis at the base of the leaflets. C, flower. D, stamens. E, ovary. F, fruit. G, fruit in cross-section.



Fig. 74—*TETRAPLEURA TETRAPTERA* (Schumach.) Taub.

A, leaflet. B, portion of stem with leaf and inflorescence. C, flower. D, longitudinal section of flower. E, petal. F, anther. G, fruit. H, cross-section of fruit. I, seed. J, cross-section of seed.

11. **PROSOPIS** L.**Prosopis africana** (Guillem. & Perrott.) Taub.

Fig. 73.

P. oblonga Benth.

Savannah tree up to 40 ft. high; buttresses slight, rounded; bark rough with blackish scales which leave pale-brown patches when they fall; slash red-brown to orange, hard. Leaf-rhachis drooping and swollen at the base; pinnae in 2-4 pairs; leaflets in 6-12 pairs, grey-green, mucronate at the apex, lanceolate to narrowly elliptic, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long. Flowers creamy-white, fragrant, in dense solitary (rarely paired) axillary spikes 2-3 in. long. Pod dark-purple-brown, indehiscent, persistent, woody, smooth, shiny, 3-6 in. long; seeds about 10, embedded transversely in a dry cream-coloured spongy pulp, separated by thin transparent membranes and rattling in the ripe pod.

*Central and Southern Sudan.*12. **TETRAPLEURA** Benth.**Tetrapleura tetraptera** (Schumach.) Taub.

Fig. 74.

Deciduous forest tree up to 90 ft. high; buttresses small and sharp; bark grey tinged with red, smooth and thin. Pinnae in 4-9 pairs, opposite or sub-opposite; leaflets in 6-12 pairs, alternate, sessile, oblong to oblong-elliptic, rounded at both ends and often emarginate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, up to $\frac{1}{2}$ in. broad. Flowers yellow-brown to orange-yellow, in axillary solitary or paired racemes 2-3 in. long. Pod dark-reddish-purple to almost black, 6-9 in. long, glabrous, glossy, 4-sided, with two hard woody sutural ridges and two rather similar wing-like ridges, one on the back of each valve, these latter wings filled with a soft sugary edible pulp with a peculiar caramel-like odour which is especially noticeable after the fruit has fallen and lies rotting on the ground; seeds small, rattling in the ripe pod.

*Equatoria.*81. **PAPILIONACEAE**

Trees, shrubs or herbs. Leaves compound or simple, usually with stipules; leaflets sometimes with stipels. Flowers zygomorphic, usually hermaphrodite. Sepals usually 5, more or less connate into a tube. Petals 5 or absent, imbricate, free or adnate below to the staminal tube, the upper (adaxial) petal exterior and forming the standard (vexillum), the two lateral the wings (alae) more or less parallel with each other, and the lower two interior and connate by their lower margins into a keel (carina). Stamens often 10, monadelphous or diadelphous or rarely free, usually all perfect; anthers usually opening lengthwise by slits. Ovary superior, of 1 carpel; ovules one or more on the ventral suture. Fruit (legume or pod) 1-locular, with or without false septa, 2-valved, many-seeded, dehiscent or indehiscent, sometimes drupaceous.

The following plants of this family are cultivated in the Sudan: *Vicer arietinum* L., Chick Pea; *Faba bona* Medic. (*Vicia faba* L.), Broad Bean; *Lathyrus sativus* L., Chickling Vetch; *Medicago sativa* L., Lucerne, Alfalfa; *Trifolium alexandrinum* L.; *Crotalaria juncea* L., Sunn-hemp; *Lupinus termis* Forsk., Lupin; *Cajanus cajan* (L.) Millsp. (*C. indicus* Spreng.), Pigeon Pea; *Lens culinaris* Medic. (*L. esculenta* Moench), Lentil; *Erythrina brucei* Schweinf.; *Phaseolus vulgaris* L., Haricot Bean; *P. mungo* L.; *P. lunatus* L., Lima or Madagascar Bean; *P. trilobus* (L.) Ait.; *Pisum sativum* L., Garden Pea; *Trigonella foenum-graecum* L., Fenugreek.

KEY TO GROUPS.

- A. Stamens free (or nearly free) from each other, not united into a tube or sheath GROUP 1.
- AA. Stamens all (or all but one) united into a tube or sheath, or very rarely into 2 bundles of 5:
- B. Pod not jointed:
- (a) Trees, tall woody shrubs or lofty woody climbers ... GROUP 2.
- (aa) Low shrubs, undershrubs, erect or procumbent herbs or herbaceous to subwoody climbers:
- (b) Leaves simple or 1-foliolate GROUP 3.
- (bb) Leaves compound:
- (c) Leaves with a terminal leaflet but without tendrils:
- (d) Stipels (subtending the *leaflets*) absent; usually erect herbs or undershrubs GROUP 4.
- (dd) Stipels (subtending the *leaflets*) present, sometimes minute; small trees, shrubs, undershrubs, erect or climbing herbs GROUP 5.
- (cc) Leaves without a terminal leaflet, the rhachis sometimes prolonged into a tendril or bristle GROUP 6.
- BB. Pod jointed, constricted between the seeds and sometimes breaking into 1-seeded portions GROUP 7.

GROUP 1.

- A. Stamens more than 10; petals absent; trees with pinnate leaves; fruit drupaceous:
- (a) Stamens indefinite, inserted half-way up the calyx; fruit large, ovoid, pulpy within; savannah tree CORDYLA. 17.
- (aa) Stamens about 16, inserted round the edge of the disc at the base of the calyx; fruit large, ovoid, pulpy within; tall forest tree MILDBRAEDIODENDRON. 37.
- AA. Stamens 10; petals 5; trees or tall shrubs; leaves simple or 1-foliolate or pinnate; fruit not drupaceous:
- (b) Leaves simple or 1-foliolate BAPHIA. 12.
- (bb) Leaves pinnate:
- (c) Trees; pod coriaceous, up to 1½ in. broad AFRORMOSIA. 5.
- (cc) Shrubs; pod membranous, up to ¾ in. broad CALPURNIA. 14.

GROUP 2.

- A. Pod indehiscent:
 B. Pod drupaceous, ovoid; seed solitary, pendulous
 ANDIRA. 8.
 BB. Pod not drupaceous:
 (a) Leaflets alternate (rarely subopposite):
 (b) Anthers basifixed; pod linear or oblong, not winged, few to
 1-seeded DALBERGIA. 21.
 (bb) Anthers versatile; pod suborbicular, winged, 1-seeded
 PTEROCARPUS. 47.
 (aa) Leaflets opposite:
 (c) Pod finely tomentose, 6-8-seeded MUNDULEA. 40.
 (cc) Pod glabrous, 2-3-seeded LONCHOCARPUS. 33.
 AA. Pod at length dehiscent:
 C. Leaves 3-foliolate:
 (d) Flowers white CRAIBIA. 18.
 (dd) Flowers scarlet to orange ERYTHRINA. 25.
 CC. Leaves more than 3-foliolate:
 (e) Leaflets opposite; woody climbers MILLETTIA. 38.
 (ee) Leaflets alternate; trees CRAIBIA. 18.

GROUP 3.

- A. Style abruptly bent over near the base, more or less bearded along
 the inner side CROTALARIA. 19.
 AA. Style not as above:
 B. Leaves gland-dotted ERIOSEMA. 24.
 BB. Leaves not gland-dotted:
 (a) Anthers apiculate; hairs medifixed INDIGOFERA. 30.
 (aa) Anthers blunt; hairs (if present) not medifixed:
 (b) Pod 1-seeded, about $\frac{1}{2}$ in. long REQUIENIA. 48.
 (bb) Pod more than 1-seeded, $\frac{3}{4}$ -1 $\frac{1}{2}$ in long GLYCINE. 27.

GROUP 4.

- A. Stamens monadelphous:
 B. Anthers of 2 kinds; leaves 3-5-foliolate:
 C. Staminal tube slit in the upper part:
 (a) Calyx with the four upper teeth more or less connate
 LOTONONIS. 34.
 (aa) Calyx deeply cleft:
 (b) Calyx 5-cleft; style abruptly bent near the base, more or
 less bearded along the inner side
 CROTALARIA. 19.
 (bb) Calyx bilabiate, the two upper teeth sometimes free,
 sometimes connate, the lower ones more or less con-
 nate; style upcurved, glabrous
 ARGYROLOBIUM. 10.
 CC. Staminal tube not slit in the upper part:
 (c) Pod pubescent or silky ARGYROLOBIUM. 10.
 (cc) Pod densely viscous-glandular ADENOCARPUS. 2.

- BB. Anthers all of one kind:
- D. Anthers blunt; hairs on leaves beneath not medifixed:
- (d) Leaves 3-foliolate ROTHIA. 50.
- (dd) Leaves 7-foliolate HELMINTHOCARPON. 29.
- DD. Anthers apiculate; hairs on leaves beneath medifixed
CYAMOPSIS. 20.
- AA. Stamens diadelphous (usually 9 and 1):
- E. Leaflets entire or more or less crenate, not serrate:
- F. Filaments not broadened at the apex; flowers in racemes or panicles or rarely the flowers solitary and axillary:
- G. Anthers blunt; hairs on the leaves, &c. (if present) not medifixed:
- H. Racemes or panicles terminal or leaf-opposed; leaves pinnate; leaflets with numerous closely parallel nerves ...
TEPHROSIA. 56.
- HH. Racemes axillary or rarely the flowers solitary and axillary:
- I. Leaves not gland-dotted:
- (e) Pod more than 3 in. long, often torulose, rarely winged; herbs, shrubs or small trees, with glaucous leaves and often showy flowers
SESBANIA. 51.
- (ee) Pod less than 3 in. long:
- (f) Pod not winged nor torulose; small procumbent grey-silky or erect glabrous shrubby herbs
ASTRAGALUS. 11.
- (ff) Pod with broad dentate wings; weak slender herbs
BISERRULA. 13.
- II. Leaves gland-dotted:
- J. Pod 1-seeded PSORALEA. 46.
- JJ. Pod more than 1-seeded:
- (g) Leaves 3-5-foliolate:
- (h) Funicle of seeds joined at the end of the hilum; erect shrubs, undershrubs, or herbs
ERIOSEMA. 24.
- (hh) Funicle of seeds joined at the centre of the hilum; mostly twiners or climbers
RHYNCHOSIA. 49.
- (gg) Leaves more than 5-foliolate
GLYCYRRHIZA. 28.
- GG. Anthers apiculate; hairs always present and medifixed on the leaves, at least some on the lower surface and on the younger leaves; racemes or spikes axillary
INDIGOFERA. 30.
- FF. Filaments (some or all) broadened at the apex; flowers umbellate or in clusters or solitary; leaves 3-5-foliolate
LOTUS. 35.

- EE. Leaflets distinctly serrate:
- (i) Pod straight or nearly so, rarely falcate:
- (j) Petals quite free from the staminal column
TRIGONELLA. 59.
- (jj) Petals adnate below to the staminal column
TRIFOLIUM. 58.
- (ii) Pod spirally coiled MEDICAGO. 36.

GROUP 5.

- A. Leaves gland-dotted beneath:
- (a) Flowers in lax terminal panicles; leaves 3-5-foliolate; erect shrubby plants ADENODOLICHOS. 3.
- (aa) Flowers in racemes or rarely solitary:
- (b) Flowers usually in spike-like racemes or heads; leaves 3-5-foliolate; erect herbs, usually short ... ERIOSEMA. 24.
- (bb) Flowers usually in lax racemes or rarely solitary; leaves 3-foliolate; climbers or trailers or rarely suberect herbs
RHYNCHOSIA. 49.
- AA. Leaves not gland-dotted beneath:
- B. Anthers apiculate; leaves with medifixed hairs beneath
INDIGOFERA. 30.
- BB. Anthers blunt:
- C. Style glabrous or more or less pubescent, not bearded below the stigma:
- D. Nodes of racemes not swollen:
- (c) Anthers all fertile; pod not hook-tipped:
- (d) Style without a boss at the base:
- (e) Leaves more than 3-foliolate SESBANIA. 51.
- (ee) Leaves 3-foliolate:
- (f) Small erect herbs or climbers GLYCINE. 27.
- (ff) Undershrubs or shrubs PSEUDARTHRIA. 44.
- (dd) Style with a very distinct boss at the base
NEORAUTANENIA. 41.
- (cc) Anthers alternately abortive; pod with a hook at the apex
TERAMNUS. 57.
- DD. Nodes of racemes swollen:
- (g) Petals very unequal; climbers; pod with stinging hairs ...
MUCUNA. 39.
- (gg) Petals more or less equal; upper lip of calyx projecting, large, truncate or bifid at the apex, longer than the rest; climbers; pod without stinging hairs
CANAVALLIA. 15.
- CC. Style bearded or tufted-hairy below the stigma:
- E. Stigma oblique:
- F. Keel and style spirally twisted:
- (h) Leaflets usually more than 1 in. long
PHASEOLUS. 43.
- (hh) Leaflets usually less than 1 in. long VIGNA. 61.

- FF. Keel not twisted:
- (i) Pod maturing underground VOANDZEIA. 62.
 - (ii) Pod maturing above ground VIGNA. 61.
- EE. Stigma terminal:
- G. Petals very unequal in length CLITORIA. 16.
- GG. Petals more or less equal in length:
- H. Pod 4-winged; stigma densely penicillate-villous PSOPHOCARPUS. 45.
- HH. Pod not as above:
- (j) Stigma more or less spatulate and fringed with hairs SPHENOSTYLIS. 53.
 - (jj) Stigma not spatulate:
 - (k) Stigma surrounded by a collarete of hairs DOLICHOS. 23.
 - (kk) Stigma not surrounded by a collarete of hairs; style bearded on the inner surface LABLAB. 31.

GROUP 6.

- A. Slender herbaceous climbers with tendrils; vexillary stamen present LATHYRUS. 32.
- AA. Erect or wide-climbing shrubs without tendrils; vexillary stamen absent ABRUS. 1.

GROUP 7.

- A. Vexillary stamen wholly free, or free at the apex of the staminal sheath:
- B. Leaves simple or 3-foliolate:

 - (a) Spiny shrubs ALHAGI. 6.
 - (aa) Unarmed shrubs, undershrubs or herbs:

 - (b) Leaves about $\frac{1}{2}$ in. long TAVERNIERA. 55.
 - (bb) Leaves greatly exceeding $\frac{1}{2}$ in. long:

 - (c) Articulations of pod flat DESMODIUM. 22.
 - (cc) Articulations of pod cylindric or somewhat compressed, not flat ALYSICARPUS. 7.

- BB. Leaves (at least some of them) more than 3-foliolate; pod bent back into the calyx URARIA. 60.
- AA. Stamens wholly connate into a sheath:
- C. Staminal sheath slit above:
- D. Flowers and pods not hidden by large bracts:
- E. Pod exerted from the calyx:

 - (d) Pod articulated with oblong sections ORMOCARPUM. 42.
 - (dd) Pod articulated with quadrate to semi-circular sections ... AESCHYNOMENE. 4.

- EE. Pod included by the calyx, not exerted ... SMITHIA. 52.
- DD. Flowers and pods hidden by large membranous bracts; leaflets in 2 pairs, the rhachis prolonged GEISSASPIS. 26.

- CC. Staminal sheath a closed tube, not slit above; anthers alternately long and short:
- F. Calyx-tube elongate, stalk-like:
- (e) Pod ripening above ground, not bristly; leaves 3-foliolate ...
STYLOSANTHES. 54.
- (ee) Pod ripening underground; leaves 4-foliolate
ARACHIS. 9.
- FF. Calyx-tube not elongate; leaves 2-4-foliolate, pod ripening above ground, bristly ZORNIA. 63.

1. **ABRUS** Adans.**Abrus precatorius** L.

Woody twining shrub; branchlets glabrous or slightly pubescent. Leaflets in 10-15 pairs, oblong or obovate, up to $\frac{3}{4}$ in. long, glabrous or slightly pubescent beneath. Flowers lilac or reddish-purple, in stiff dense racemes becoming recurved. Pod oblong, clustered, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, bursting to expose the brilliant red and black seeds.

Central and Southern Sudan.

A. schimperi Hochst. ex Bak.

Shrub up to 6 ft. high; branches slender, woody, slightly silky upwards. Leaflets in 12-15 pairs, oblong or obovate, $\frac{3}{4}$ -1 in. long, glabrous above, slightly pubescent or becoming glabrous beneath. Flowers reddish-purple, in lax interrupted often terminal racemes 3-4 in. long and sometimes extending down amongst the leaves; peduncle tomentose, pedicels tawny-silky. Pod 2-2 $\frac{1}{2}$ in. long, $\frac{3}{8}$ in. broad, 7-9-seeded; seeds dark-brown, oblong.

Northern and Southern Sudan.

A. canescens Welw. ex Bak.

Wide-climbing shrub; branchlets densely grey-pubescent. Leaflets 12-18, oblong-lanceolate, conspicuously mucronate at the apex, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, densely grey-pubescent beneath. Flowers deep-red-purple, clustered in terminal slender pubescent racemes $\frac{1}{2}$ -3 in. long. Pod narrowly oblong, straight, 1 $\frac{1}{4}$ -2 $\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad, shortly pubescent; seeds 6-9, blackish and small.

Equatoria.

2. **ADENOCARPUS** DC.**Adenocarpus mannii** (Hook. f.) Hook. f.

Undershrub or shrub up to 6 or more ft. high; branches rigid, densely brown-silky. Leaves dense, often clustered, digitately 3-foliolate; leaflets oblong-lanceolate, acute at the apex, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Flowers yellow, in dense sessile terminal heads. Pod shortly bristly, about 1 in. long, 5-6-seeded, densely viscous-glandular.

Equatoria: Imatong Mountains, Mount Kineti summit, 10,400 ft.

3. **ADENODOLICHOS** Harms**Adenodolichos paniculatus** (Hua) Hutch. & Dalziel.*A. macrothyrsus* (Harms) Harms.

Erect shrubby plant up to 15 ft. high; young parts reddish-tomentose. Leaves opposite, 3-foliolate or occasionally 5-foliolate; leaflets subequal, broadly ovate, rounded and mucronate at the apex, strongly nerved, $2\frac{1}{2}$ - $7\frac{1}{4}$ in. long, 2-6 in. broad, more or less rusty-pubescent on the nerves and gland-dotted beneath. Flowers pinkish, in lax terminal panicles with elongated branches. Pod oblong, sharply beaked, $1\frac{1}{2}$ -2 in. long, 1-3-seeded, loosely tomentose.

*Equatoria.*4. **AESCHYNOMENE** L.

- A. Stipules spurred straight below the point of insertion; pod more or less straight; ovary many-ovuled:
- B. Flowers medium, $\frac{1}{2}$ - $\frac{2}{3}$ in. long:
- (a) Flowers usually solitary (rarely 2); corolla about $\frac{1}{2}$ in. long; pod very papillose *A. uniflora*.
- (aa) Flowers 2-4 together; pod not or only slightly papillose:
- (b) Lower suture of pod deeply indented; leaves $1\frac{1}{2}$ - $1\frac{1}{2}$ in. long *A. sensitiva*.
- (bb) Lower suture of pod only slightly indented; leaves 2-4 in. long *A. indica*.
- BB. Flowers large, usually over $\frac{2}{3}$ in. long:
- C. Flowers 1- $1\frac{1}{2}$ in. long; sutures of pod much indented; pod about 7-seeded *A. cristata*.
- CC. Flowers $\frac{2}{3}$ -1 in. long:
- D. Leaves 4-6 in. long; stem thick, aquatic; pod scabrous-tuberculous in the centre of the articulations ... *A. aspera*.
- DD. Leaves usually under $2\frac{1}{2}$ in. long:
- (c) Pod hairy, 10-15-jointed, sutures of pod scarcely or not at all indented *A. schimperii*.
- (cc) Pod glabrous, 5-6-jointed, sometimes more or less papillose, sutures of pod slightly indented ... *A. nilotica*.
- AA. Stipules not spurred; flowers very large; ovary many-ovuled:
- (d) Pod spirally contorted; plant prickly *A. elaphroxyloides*.
- (dd) Pod straight; plant not prickly; flowers smaller than the preceding *A. pfundii*.
- AAA. Stipules usually not spurred, occasionally auriculate or spurred at the base; ovary 1-2-rarely more-ovuled; pod usually straight, segments semilunar; leaflets about $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad *A. abyssinica*.

Aeschynomene uniflora E. Mey.

Undershrub up to 4 ft. high; branches half-woody, densely bristly. Leaflets in 10-20 pairs, linear-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, sensitive to touch, glaucous. Flowers pale-yellow, on a viscid bristly

peduncle $\frac{1}{2}$ -1 in. long. Pod 1-2 in. long, $\frac{1}{2}$ in. broad, nearly straight, 6-8-jointed.

Upper Nile: Meshra el Zeraf.

A. sensitiva Sw.

Undershrub; branches slightly viscid. Leaflets up to 20 pairs, about $\frac{2}{3}$ in. long. Flowers bright-yellow, small. Pod $1\frac{1}{2}$ -2 in. long, 6-9-jointed.

Equatoria.

A. indica L.

Undershrub 2-4 ft. high; stems slender. Leaflets in 10-20 pairs, up to $\frac{2}{3}$ in. long. Flowers pale-yellow, faintly striate, on slender leafy axillary racemes, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Pod straight or somewhat curved, smooth or finally more or less papillose, 6-10-jointed, 1-1 $\frac{1}{4}$ in. long.

Central and Southern Sudan: in muddy places near rivers or swamps.

A. cristata Vatke.

Shrub or undershrub up to 20 ft. high; stems hollow; branches as well as the peduncles at first setose, becoming glabrous. Leaflets about 20 pairs, oblong-lanceolate, about $\frac{2}{3}$ in. long. Flowers axillary. Pod about 4 in. long, glabrous.

Upper Nile: Sudd region.

A. aspera L.

Sola Pith Plant.

Undershrub 3-6 ft. high; stems thick, soft, pithy. Leaflets in 30-70 or more pairs, linear-oblong, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers in 2-4-flowered lax axillary corymbs. Pod undulate on one side, 2 $\frac{1}{2}$ in. long, 6-10-seeded.

Central and Southern Sudan: often occurring in swampy places.

A. schimperii Hochst. ex A. Rich.

Annual erect undershrub 2-3 ft. high; branches half-woody, rough with short almost spicular hairs. Leaflets in 12-30 pairs, close, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers yellow, solitary or in pairs, about $\frac{2}{3}$ in. long. Pod 1-2 $\frac{1}{2}$ in. long, 10-15-jointed.

Central Sudan.

A. nilotica Taub.

Similar to *A. schimperii*; stems branched and with a white cortex. Leaflets about $\frac{1}{2}$ in. long.

Blue Nile: near Jebel Nyemati.



Fig. 75—*AESCHYNOMENE ELAPHROXYLON* (Gullem. & Perrott.) Taub.
 A, parts of flowers. B, seed.

- A. elaphroxylon** (Guillem. & Perrott.) Taub. Ambatch. Fig. 75.
Herminiera elaphroxylon Guillem. & Perrott.; ? *H. excelsa* Kotschy; ? *H. humilis* Kotschy.

Tree or shrub up to 20 ft. high; stems short, swollen, quickly tapered (often almost conical), armed with prickles; bark green, smooth; branchlets densely hispid, armed with up-curved brown prickles up to $\frac{1}{2}$ in. long. Leaves paripinnate, 2-4 in. long, the rhachis frequently prickly; leaflets in 10-20 pairs, oblong, emarginate and mucronate at the apex, usually $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers handsome, orange-yellow, in short 2-3-flowered axillary racemes. Corolla more than $1\frac{1}{2}$ in. long. Pod bristly.

Central and Southern Sudan: rivers and their effluents.

- A. ptundli** Taub.

Shrub up to 9 ft. high; stems, etc., golden-tomentose, not prickly. Leaflets numerous, serrulate, about 1 in. long. Flowers few in racemes. Pod up to $\frac{3}{4}$ in. broad, densely pilose, breaking up into narrowly oblong segments.

Central and Southern Sudan: usually near water.

- A. abyssinica** (A. Rich.) Vatke.

A. ruppellii Bak.

Viscid undershrub 2-6 ft. high; branches dark-brown, rather viscid. Leaflets in 8-12 pairs, narrowly oblong, sharply mucronate at the apex, glabrous. Flowers yellow, purple-veined, in few-flowered racemes up to 5 in. long. Pod $\frac{1}{2}$ - $\frac{1}{2}$ in. long, 1-2-seeded, glabrous, segments semilunar.

Equatoria.

5. **AFRORMOSIA** Harms

- Afrormosia laxiflora** (Benth.) Harms.

Savannah or forest tree up to 40 ft. high; stems usually tortuous; bark red-or yellow-blotched; branchlets grey-pubescent. Leaves imparipinnate; leaflets variable in shape from narrowly lanceolate to broadly ovate-elliptic, acute to subcordate at the base, shortly acuminate and emarginate at the apex, $1\frac{1}{2}$ -4 in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad, slightly pubescent to glabrous beneath. Flowers greenish-white or cream, paniculate. Pod linear-oblong, up to 6 in. long, $1\frac{1}{2}$ in. broad, flat, thin, usually 1-3-seeded, with a faint intramarginal nerve.

Equatoria.

6. **ALHAGI** Adans.

- Alhagi maurorum** Medic.

Fig. 76.

Erect wiry glabrous shrub 1-3 ft. high, armed with copious spreading spines about 1 in. long. Leaves simple, obovate-oblong, up to $\frac{1}{2}$ in. long, drooping from the spines and branches. Flowers red, solitary or in pairs from the spines. Pod linear, fairly thick, falcate, 1 in. long.

Northern Sudan: Nubia.

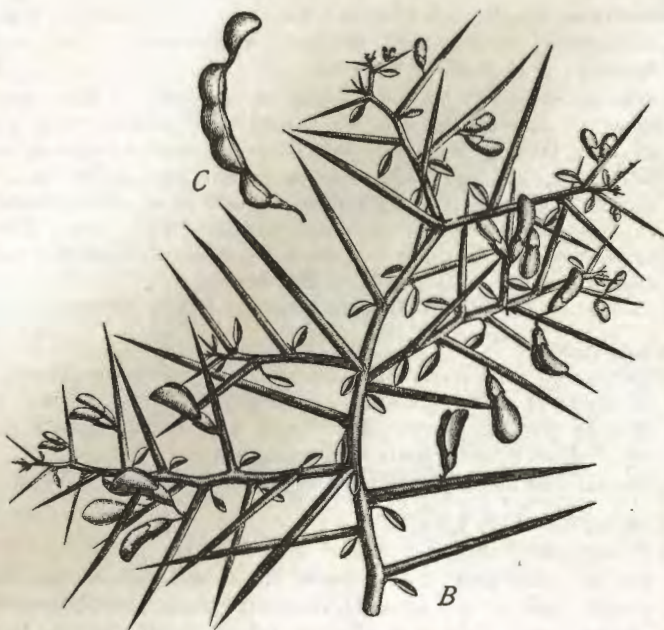


Fig. 76—ALHAGI MAURORUM Medic.
B, branchlet with flowers. C, fruit.

7. ALYSICARPUS Neck.

Alysicarpus monilifer (L.) DC.

Diffuse herb. Leaves ovate or oblong or lanceolate, cordate at the base, 1-3 in. long, firm, both surfaces pale-green, prominently nerved, glabrous or sparsely pubescent beneath. Racemes axillary and terminal, laxly 4-6-flowered. Calyx not longer than the first joint of the pod. Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. thick, 3-5-jointed, distinctly moniliform, glabrous or sparsely pubescent.

Central Sudan.

A. vaginalis (L.) DC.

Diffuse herb 1-2 or more ft. high. Leaves 1-2 $\frac{1}{2}$ in. long, ovate or oblong or lanceolate, sub-cordate at the base, firm, both surfaces pale-green, prominently nerved, slightly pubescent. Flowers reddish, small, in axillary terminal racemes. Calyx not longer than the first joint of the pod. Pod cylindrical, about 1 $\frac{1}{2}$ in. long, more or less flattened, hardly moniliform; segments reticulate over the surface, swollen at the joints, pubescent.

Widespread.

A. glumaceus (Vahl) DC.*A. rugosus* (Willd.) DC.

Copiously branched herb, woody at the base, 1-2 or more ft. high. Leaves narrowly oblong-elliptic or usually linear-lanceolate, up to 3½ in. long, slightly pubescent. Flowers reddish, small. Calyx much longer than the first joint of the pod. Pod about ¾ in. long, moniliform, 4-5-jointed; segments transversely ribbed, glabrous.

*Widespread.***A. zeyheri** Harv.

Slightly woody herb 1-2 ft. high; branches obscurely grey-downy. Leaves lanceolate to linear-lanceolate, up to 2¾ in. long, shortly pubescent. Racemes terminal, lax. Calyx much longer than the first joint of the pod, finely ciliate. Pod about ¾ in. long, with 3-4 smooth but pubescent segments.

*Equatoria.*8. **ANDIRA** Lam.**Andira inermis** (Wright) DC.

Tree 20-30 ft. high; branchlets softly tomentellous. Leaves imparipinnate, alternate to subopposite; leaflets in 5-6 pairs, oblong, slightly acuminate and emarginate at the apex, up to 4 in. long and 1½ in. broad, at first pubescent beneath, soon glabrous and shiny on both surfaces, the terminal leaflet rather long-stalked and more obovate. Flowers pink, in large spreading panicles. Fruit ovoid, shortly acute at the apex, about 1½ in. long, glabrous, 1-seeded.

*Equatoria.*9. **ARACHIS** L.**Arachis hypogaea** L.

Ground- or Monkey-nut.

Diffuse herb; stems pilose. Leaflets in 2 pairs, obovate, mucronate and sometimes emarginate at the apex, about 1½ in. long, with numerous parallel lateral nerves. Flowers yellow, axillary, solitary, on long slender pedicels or sub-sessile, only the lower ones fertile and burying their fruit in the soil.

Widespread. Introduced from South America but now cultivated for food and semi-naturalized.

10. **ARGYROLOBIUM** Eckl. & Zeyh.**Argyrobium abyssinicum** Jaub. & Spach.

Diffusely branched herbaceous annual herb 6-18 in. high. Leaves 3-foliolate; leaflets linear or oblanceolate, ¼-¾ in. long. Flowers pale-yellow, in axillary short-stalked 2-3-flowered racemes. Pod linear, grey-silky, about 1 in. long, 6-9-seeded.

Northern Sudan.

A. schimperianum Hochst. ex A. Rich.

Small shrub. Leaves 3-foliolate; leaflets oblong-obovate, $\frac{3}{4}$ -1 in. long. Flowers yellow, in dense 3-8-flowered terminal heads. Pod densely brown-silky, 1-1 $\frac{1}{4}$ in. long, 7-8-seeded.

Kordofan.

11. **ASTRAGALUS** L.**Astragalus vogelii** (Webb) Bornm.

A. prolixus Sieber ex Bak.

Procumbent annual herb 1 or more ft. high, grey-silky. Leaves imparipinnate; leaflets in 5-8 pairs, oblong-lanceolate, rounded at the apex, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, almost villous. Racemes axillary, 6-12-flowered, about as long as the leaves. Pod swollen, oblong, about $\frac{1}{4}$ in. long, appressed-pilose, partly divided inside by a longitudinal membrane.

Northern and Central Sudan.

A. abyssinicus (Hochst.) Steud. ex A. Rich.

Shrubby herb up to 5 ft.; stems erect, often very thick, glabrous. Leaves nearly sessile; leaflets elliptic-oblong, glabrous, glaucous-green. Flowers red or purple in long dense racemes. Pod not swollen, linear, 1 in. long, 8-12-seeded, completely divided inside by a longitudinal membrane.

Darfur: Jebel Marra, 8000-9000 ft. Equatoria: Imatong Mountains, Mount Itobol.

A. eremophilus Boiss.

Prostrate or procumbent herb 2-3 ft. high; stems grey-silky-tomentose. Leaflets in about 5 pairs, obovate, obtuse at the apex, up to $\frac{1}{4}$ in. long, grey-silky-pubescent. Flowers light-red, in 1-4-flowered lax axillary racemes. Pod linear, strongly curved, swollen, about 1 in. long, grey-silky-tomentose, partly divided inside by a longitudinal membrane.

Red Sea Hills: Erkowit.

12. **BAPHIA** Lodd.**Baphia wollastoni** Bak. f.

Forest shrub or tree up to 30 ft. high. Leaves dark-green, oblong-lanceolate to oblong-oblong-lanceolate, acuminate but with an obtuse tip at the apex, rounded at the base, 1 $\frac{1}{2}$ -3 in. long, $\frac{1}{4}$ -1 in. broad. Flowers white, solitary or in very short condensed racemes. Pod dark-brown, linear, 2 $\frac{1}{4}$ -3 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, long-pointed and slightly recurved at the apex.

Equatoria: Imatong Mountains.

13. **BISERRULA** L.**Biserrula pelecinus** L.

Weak erect annual herb; branches slender. Leaflets in about 12 pairs, oblanceolate, widely emarginate at the apex, thinly grey-silky. Flowers cream-coloured, few in axillary racemes. Pod linear, 1-1½ in. long with broad dentate wings.

Darfur: *Jebel Kurku*, 3600 ft.

14. **CALPURNIA** E. Mey.**Calpurnia subdecandra** (L'Hérit.) Schweick.

Shrub 10-15 ft. high; branches slender, thinly grey-silky. Leaflets 13-25, opposite, elliptic, bluntly rounded at both ends, pubescent beneath especially when young. Flowers vivid-yellow, in copious 10-20-flowered axillary racemes equalling the leaves. Corolla twice as long as the calyx. Pod 3-4 in. long, ½ in. broad, membranous, short-stalked, the upper suture with a narrow erect wing less than ¼ in. broad, glabrous.

Equatoria: *Didinga Mountains*, *Nagichot*, 6500 ft.

15. **CANAVALIA** DC.**Canavalia ensiformis** (L.) DC.

C. virosa (Roxb.) Wight & Arn.; *C. regalis* Dunn.

Herbaceous climber. Leaflets 3, ovate or ovate-elliptic, acute or acutely acuminate at the apex, broadly cuneate at the base, up to 8 in. long, 4 in. broad, glabrous and with 6-7 pairs of lateral nerves. Flowers rose, mauve or white with a red base, about 1 in. long, few on a stout axis. Pod variable, sword-shaped, elongate, 12 or more in. long, with 2 longitudinal ribs near the upper suture; seeds narrowly ellipsoid, smooth.

Central and Southern Sudan. Wild and cultivated.

16. **CLITORIA** L.**Clitoria ternatea** L.

Kordofan Pea.

Climber, somewhat shrubby at the base. Leaflets 5-7, elliptic to narrowly lanceolate, rounded and emarginate or mucronate at the apex, 1½-2 in. long, shortly pubescent beneath. Flowers deep-blue, occasionally pure white, solitary, very shortly pedicellate, 1½-2 in. long. Pod flat, linear, beaked, about 4 in. long, sparingly pubescent.

Widespread. Wild and cultivated.

17. **CORDYLA** Lour.**Cordyla richardi** Planch. ex Milne-Redh.

C. africana (non Lour.) Broun & Massey.

Savannah tree up to 40 ft. high; bark rough, dark-brown on the trunk, pale-brown to grey-brown on the branchlets. Leaves imparipinnate; leaflets subopposite to nearly alternate, ovate-oblong, rounded at both ends, often emarginate at the apex, 1-2 in. long,

glabrous to puberulous, pale-grey-green or glaucous; rhachis and petiolules pubescent. Flowers appearing before the leaves, in dense woolly-tomentose racemes 2-4 in. long borne chiefly on the older twigs. Stamens white, numerous, $\frac{3}{4}$ -1 in. long. Fruit yellow, edible, long-stipitate, ellipsoid, about 2 in. long; seeds black, kidney-shaped.

Equatoria.

18. CRAIBIA Harms & Dunn

Craibia utilis M. B. Moss.

Tree up to 60 ft. high; branchlets longitudinally striate, glabrous or with dark hairs below the stipules. Leaves 3-5-foliolate; leaflets alternate, shortly petiolulate, ovate-oblong, obtuse at the apex, broadly cuneate at the base, 4-5 $\frac{1}{2}$ in. long, glabrous on both surfaces, lateral nerves prominent beneath. Flowers white, in terminal panicles; peduncle densely rusty-tomentose. Ovary glabrous, sessile.

Equatoria: Lotti Forest.

C. grandiflora (M. Mich.) Harms ex Bak. f.

Large tree. Leaves 8-12 in. long; leaflets 9, narrow-elliptic with a long point, more or less glabrous. Flowers white, 1 in. or more long, in leaf-opposed inflorescences shorter than the leaves. Ovary silky, stipitate, 5-ovuled.

Equatoria.

19. CROTALARIA L.

A. Leaves simple:

B. Flowers small, keel $\frac{1}{16}$ - $\frac{1}{8}$ in. long:

C. Herbs, annual or perennial, scarcely spinescent:

- (a) Stems 1-3 ft. long, very slender; leaves linear to lanceolate:
 (b) Leaves glabrous, glaucous; flowers yellow mottled purple *C. glauca.*
 (bb) Leaves more or less pubescent; flowers yellow with purple lines *C. vogelii.*
 (aa) Stems up to 9 in. long; leaves linear to lanceolate, more or less hirsute *C. bongensis.*

CC. Stiff subspinescent shrubby herbs or shrubs:

- (c) Pod and plant densely pubescent; corolla as long as the calyx *C. thebaica.*
 (cc) Pod (full grown) glabrous; plant glabrous to appressed-canescenscent; corolla two to three times as long as the calyx *C. aegyptiaca.*

BB. Flowers larger; keel $\frac{1}{2}$ -1 in. long:

- (d) Flowers solitary in the upper axils; calyx long, densely brown-pilose outside, hiding the corolla *C. calycina.*
 (dd) Flowers numerous in stiff racemes; calyx not hiding the corolla *C. retusa.*

AA. Leaves 3-foliolate or rarely simple and 3-foliolate, or rarely 4-5-foliolate.

- D. Pod woolly inside *C. saltiana*.
- DD. Pod glabrous inside:
- E. Spinescent herbs:
- (e) Pod elliptic-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, usually 8-10-seeded
C. spinosa.
- (ee) Pod subcylindric, about $\frac{3}{4}$ in. long; seeds numerous
C. claessensii.
- EE. Herbs, undershrubs or shrubs without spines:
- F. Pod globose or oblong-globose:
- G. Pod very small, 2-4-seeded; flowers small, keel up to $\frac{1}{2}$ in. long:
- H. Flowers in heads or dense racemes:
- (f) Flowers small, keel up to $\frac{1}{2}$ in. long; flower-heads scarcely exerted from the upper crowded leaves; slightly woody herbs *C. cephalotes*.
- (ff) Flowers larger, keel up to $\frac{1}{2}$ in. long; herbs or undershrubs *C. stenorhampha*.
- HH. Flowers in lax racemes:
- (g) Leaflets oblanceolate or oblong-obovate; keel $\frac{1}{2}$ in. long *C. sphaerocarpa*.
- (gg) Leaflets linear or oblong, cuneate at the base; keel $\frac{1}{2}$ in. long ... *C. sphaerocarpa* var. *angustifolia*.
- (ggg) Leaflets linear-oblanceolate; flowers larger, keel up to $\frac{1}{2}$ in. long ... *C. sphaerocarpa* var. *grandiflora*.
- GG. Pod 6-10-seeded; flowers medium, keel $\frac{3}{4}$ in. long, spicate or in compact clusters:
- (h) Flowers in subglobose racemes; leaves almost sessile; plant yellowish-silky-hairy *C. atrorubens*.
- (hh) Flowers in dense globose heads; petioles $\frac{1}{2}$ - $\frac{3}{4}$ in. long; plant brownish-silky-hairy *C. ononoides*.
- FF. Pod cylindric, oblong, ovoid or obovoid, stipitate or sessile, never globose, several-to many-seeded; flowers large medium or small:
- I. Stipules small, narrow or indistinct:
- J. Flowers in racemes:
- K. Keel usually $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long:
- L. Keel usually $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long:
- M. Calyx $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long:
- N. Flowers very large, keel $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long:
- (i) Petiole 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long; flowers in lax racemes, not hirsute ... *C. laburnifolia*.
- (ii) Petiole $\frac{3}{4}$ - $\frac{1}{2}$ in. long; racemes short, densely flowered; flowers densely hirsute
C. lachnosema.
- NN. Flowers large, keel $\frac{3}{4}$ -2 in. long:
- (j) Plant rusty-pilose:
- (k) Pod about 1 $\frac{1}{2}$ in. long, densely rusty-pilose, sessile; racemes dense; undershrubs or shrubs
C. lachnocarpoides.

81. PAPILIONACEAE

- (kk) Pod $1\frac{1}{2}$ -2 in. long, rusty-villous, shortly pedicellate; racemes lax, 6-flowered; herbs *C. polysperma*.
- (jj) Plant covered with short grey fine spreading pubescence; racemes 6-12-flowered ... *C. grantii*.
- MM. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- O. Racemes short or medium length; keel about $\frac{3}{4}$ in. long, herbs *C. brevidens*.
- OO. Racemes elongated:
- (I) Leaflets linear or linear-lanceolate, $\frac{3}{4}$ -6 $\frac{1}{2}$ in. long, undershrub *C. intermedia*.
- (II) Leaflets elliptic or oblong-elliptic, 2-2 $\frac{1}{2}$ in. long *C. intermedia* var. *abyssinica*.
- (III) Leaflets oblong or oblong-elliptic, 2-4 $\frac{1}{2}$ in. long, grey-green beneath; pod about $\frac{3}{4}$ in. broad *C. cannabina*.
- LL. Keel usually $\frac{3}{4}$ - $\frac{1}{2}$ in. long:
- P. Keel bent sharply at right angles, passing into a long-attenuated rostrum:
- Q. Racemes lax, several-flowered:
- (m) Keel about $\frac{1}{2}$ in. long; leaflets obovate or oblong, cuneate at the base; racemes 3 $\frac{1}{2}$ -6 in. long *C. senegalensis*.
- (mm) Keel about $\frac{1}{2}$ in. long; leaflets elliptic or oblong-elliptic; racemes 1 $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long ... *C. senegalensis* var. *carinata*.
- QQ. Racemes lax, many-flowered, elongated; leaflets oblong, cuneate at the base, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long; pod $\frac{3}{4}$ in. long *C. maxillaris*.
- PP. Keel rounded, often falcate or sub-falcate:
- R. Keel $\frac{3}{4}$ - $\frac{1}{2}$ in. long; leaflets narrow-elliptic, obovate or oblong-obovate; petiole 1 $\frac{1}{2}$ -3 in. long; flowers yellow with purple lines *C. mucronata*.
- RR. Keel $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (n) Leaflets ovate, obovate or oblanceolate; stems silky only when young ... *C. recta*.
- (nn) Leaflets narrow-elliptic; stems white-pubescent *C. lynesii*.
- KK. Keel usually $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- S. Keel rounded, not bent sharply at right angles:
- T. Racemes lax *C. onobrychis*.
- TT. Racemes dense:
- U. Short herbs or rarely shrubs; flowers in dense racemes or in heads:
- (o) Keel purple, violet or brown-striated:

- (p) Leaflets elliptic-obovate; racemes dense ...
C. vallicola.
- (pp) Leaflets narrowly oblong or elliptic, cuneate at the base; racemes short, dense-flowered; wing of flower with purple lines *C. impressa.*
- (ppp) Leaflets obovate or elliptic-obovate; racemes not so dense; wing of flower with red streaks *C. chrysochlora.*
- (oo) Keel yellow; leaflets oblong, cuneate at the base *C. pycnostachya.*
- UU. Tall herbs 2-6 ft. high; keel about $\frac{1}{4}$ in. long; leaflets broadly linear, linear-lanceolate or oblanceolate *C. petitiiana.*
- SS. Keel bent at right angles:
- (q) Pod elliptic; leaflets elliptic, glabrous above
C. kikangaensis.
- (qq) Pod club-shaped; leaflets obovate, more or less pubescent above *C. laxa.*
- JJ. Flowers solitary or few, usually 1-3; keel $\frac{1}{4}$ - $\frac{1}{2}$ in. long:
- V. Keel $\frac{3}{4}$ - $\frac{1}{2}$ in. long; pod hirsute or pilose; flowers usually solitary *C. taubertii.*
- VV. Keel $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (r) Decumbent thread-like herbs 4-8 in. long; pod shortly stipitate, oblong, pubescent
C. microphylla.
- (rr) Dichotomously branched diffuse herb; branches thinly clothed with brown-silky hairs; pod sessile or subsessile *C. microcarpa.*
Diffuse perennial with few-flowered short racemes *C. microcarpa* var. *dawei.*
Slender little plant with narrow ash-grey leaves; racemes lax, 2-3-flowered
C. microcarpa var. *sudanica.*
- II. Stipules large and leafy, usually falcate; flowers in racemes:
- (s) Keel $\frac{3}{4}$ -1 in. long:
- (t) Pod glabrous, oblong, stipitate:
- (v) Stems weakly pilose; flowers in few-flowered racemes; leaflets about $1\frac{1}{2}$ in. long
C. podocarpa.
- (vv) Stems pubescent, angular; flowers in crowded terminal racemes; leaflets up to 1 in. long
C. natalitia.
- (tt) Pod densely-rusty-tomentose, oblong-cylindric, not stipitate *C. lachnophora.*
- (ss) Keel $\frac{1}{2}$ in. long; pod sessile, puberulous; young stems densely pubescent *C. gorensis.*

Crotalaria glauca Willd.

Erect glabrous annual herb 1-3 ft. high. Leaves sessile, mucronate at the apex, 1-3 in. long. Flowers in 2-8-flowered very lax peduncled terminal and lateral racemes. Pod linear-oblong, pendulous, $\frac{1}{2}$ -1 in. long, glabrous, shortly stipitate, 8-12-seeded.

Equatoria.

C. vogelii Benth.

Erect branched herb 2-3 or more ft. high, covered with soft spreading yellowish hairs. Leaves 1-2 in. long, more or less pubescent on both surfaces. Flowers yellow, the wing with purple lines, in slender lax-flowered racemes. Pod cylindrical, about $\frac{1}{2}$ in. long.

Equatoria.

C. bongensis Bak. f.

Erect branched hirsute herb, slightly woody at the base, up to 9 in. high. Leaves $1\frac{1}{2}$ -2 in. long, more or less hirsute. Flowers yellow, purple-veined, very small, in short and very few-flowered racemes. Pod $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Equatoria.

C. thebalca (Del.) DC.

Shrubby herb 1 or more ft. high. Leaves sessile, oblong to lanceolate, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, both surfaces densely silky. Flowers pale-yellow, in 4-8-flowered lax terminal and lateral racemes. Pod oblong, sessile, about $\frac{1}{2}$ in. long, densely pubescent, 2-3-seeded.

Northern and Central Sudan.

C. aegyptiaca Benth.

Shrubby herb; branches erect, glabrous or appressed-canescant, at length spinescent. Leaves shed early, shortly petiolate, ovate, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, canescent. Flowers yellow, small, in racemes. Pod ovoid, $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Northern Sudan.

C. calycina Schrank.

Erect densely brown-silky herb, simple or with a few branches. Leaves subsessile, linear to obovate-oblong, mucronate at the apex, up to 5 in. long, brown-silky-pilose beneath. Flowers yellow, up to 1 in. long. Pod glabrous, $\frac{1}{2}$ in. long, surrounded by the densely brown-pilose persistent calyx.

Equatoria.

C. retusa L.

Half-shrubby herb 2-4 ft. high. Leaves oblanceolate or obovate-oblong, rounded or retuse at the apex, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 in. broad, minutely and rather closely pubescent beneath. Flowers yellow with purple veining, $\frac{1}{2}$ -1 in. long. Pod about $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, glabrous.

Equatoria.



Fig. 77—*CROTALARIA SALTIANA* Andr.

A, inflorescence and leaf. B, flower. C, standard, wing and keel. D, staminal tube. E, staminal tube opened out. F, longitudinal section of flower, G, half pod. H, pod cut transversely. I, seeds.

C. saltiana Andr.

Fig. 77.

C. lupinoides Hochst. ex Benth.

Shrubby plant; branches long, spreading, upper part thinly silky. Petiole about 1-1½ in. long, pubescent; leaflets 3, oblong-obovate, the central one 1-1½ in. long, glabrous above, thinly silky beneath. Flowers bright-yellow, in elongate many-flowered lax terminal and lateral racemes the main ones ultimately 8-12-in. long. Pod short-stalked, cylindric, much curved upwards ¾-1 in. long, silky on the outside.

*Northern and Central Sudan.***C. spinosa** Hochst. ex Benth.

Robust diffuse annual herb; upper part of stems covered with grey pubescence; spines about 1 in. long. Leaves close and numerous; petiole very short; leaflets 3, oblanceolate, with a distinct notch at the apex, the central one ¾-½ in. long, glabrous above, slightly silky beneath. Flowers yellow, much scattered, solitary or in pairs, many of them pendulous from the spines. Pod shortly stalked, finely pubescent, 8-10-seeded.

*Central and Southern Sudan.***C. claessensli** De Wild.

Pubescent erect herb. Leaves clustered; petiole ¾-½ in. long; leaflets 3, obovate, cuneate at the base, up to ¾ in. long, becoming glabrous above, pubescent beneath. Flowers solitary or subsolitary. Pod sessile, appressed-pilose.

*Southern Sudan.***C. cephalotes** Steud. ex A. Rich.

Slightly woody herb 6-18 in. high, often unbranched, densely silky. Petiole ¾-½ in. long, villous; leaflets 3, narrowly oblanceolate, the lateral ones falcate, mucronate at the apex, up to 1½ in. long. Flowers yellow marked with red, small. Pod oblong-globose, about ½ in. long, villous-tomentose.

*Equatoria.***C. stenorhampha** Harms.

Herb or undershrub; stems sparsely appressed-pilose. Leaflets 3, oblanceolate or oblong, obtuse or rounded at the apex, cuneate at the base, ⅓-½ in. long, sparsely pilose beneath. Flowers yellow tinged and speckled with brown, in terminal several-to-many-flowered racemes. Calyx pubescent. Vexillum oblong, pubescent outside.

*Equatoria.***C. sphaerocarpa** Perrott. ex DC.

Diffusely branched herb up to 1 or more ft. high, slightly pubescent. Petiole ¾-½ in. long; leaflets 3, the central leaflet up to 1 in. long but usually less. Flowers yellow. Pod ¾ in. long, glabrous.

Central and Southern Sudan.

Var. **angustifolia** Hochst. ex Bak. f.

Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets glabrous above, appressed-pubescent beneath. Racemes many-flowered, 3-6 in. long. Pod $\frac{1}{4}$ in. long, pubescent

Central and Southern Sudan.

Var. **grandiflora** Schweinf. ex Bak. f.

Leaflets linear-oblongate; flowers larger, keel up to $\frac{1}{2}$ in. long.
Equatoria.

C. atrorubens Hochst. ex Benth.

Erect or suberect herb 1-3 ft. high, woody at the base, yellowish-silky-hairy. Leaflets 3, the terminal one oblongate, 1-1 $\frac{1}{2}$ in. long, glabrous above, thinly clothed with appressed silky pubescence beneath. Flowers yellow- or reddish-tinged, crowded at the ends of the branches. Pod sessile, $\frac{3}{8}$ in. long, thinly silky.

Central Sudan.

C. ononoides Benth.

Herb, woody at the base, 1-4 ft. high, suberect, the lower branches often procumbent, brownish-silky hairy. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets 3, linear-oblong to elliptic, the central one narrowed to an acute point at the apex, 1-2 in. long, glabrous above, thinly coated with fine silky hairs beneath. Flowers yellow or reddish, in heads at the ends of the branches. Pod $\frac{3}{8}$ in. long, glabrous or thinly silky.

Equatoria.

C. laburnifolia L.

Shrubby erect glabrous herb. Petiole 1 $\frac{1}{2}$ -3 $\frac{1}{4}$ in. long; leaflets 3, elliptic or obovate-oblong, obtuse or mucronate at the apex, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long. Flowers yellow. Pod cylindrical-oblong, about 2 in. long, glabrous, about 20-seeded.

Central and Southern Sudan.

C. lachnosema Stapf.

Woody undershrub 3-6 ft. high, more or less tawny-tomentose all over. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets 3, oblong-oblongate, mucronate at the apex, 1 $\frac{1}{2}$ -2 $\frac{1}{4}$ in. long, up to 1 $\frac{1}{4}$ in. broad, appressed-tomentose on both surfaces. Flowers yellow, orange-streaked. Pod about 1 $\frac{1}{4}$ in. long, densely rusty-tomentose.

Equatoria: N.W. of Said Bundas.

C. lachnocarpoides Engler.

Rusty-pilose undershrub or shrub up to 8 ft. high; branchlets densely rusty-pilose. Leaves shortly petiolate or the upper ones sessile; leaflets lanceolate or linear-oblong, 1-2 $\frac{1}{4}$ in. long, densely pilose above, densely rusty-pilose beneath. Flowers yellow, later orange-red, in short dense-flowered racemes. Pod oblong-ovoid, about 1 $\frac{1}{4}$ in. long, densely rusty-pilose, sessile, rather woody.

Equatoria: Imatong Mountains.

C. polysperma Kotschy ex Schweinf.

Densely rusty-villous herb. Petiole $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long; leaflets 3, shortly petiolulate, obovate-oblong, acute and mucronate at the apex, the central leaflet 2 in. long, both surfaces silky. Flowers violet-blue; vexillum densely silky on the back. Seeds 20 or more.
Upper Nile.

C. grantii Bak.

C. polysperma subsp. *grantii* (Bak.) Bak. f.

Bushy grey-pubescent herb. Petiole 1-2 in. long; leaflets 3, obovate, bluntish with a mucro at the apex, 1 $\frac{1}{4}$ -1 $\frac{3}{4}$ in. long, nearly glabrous above, thinly silky beneath. Vexillum brown-silky on the back. Pod oblong, shortly stalked, 1 $\frac{1}{2}$ -2 in. long, clothed with fine pale-brown spreading hairs, 30-40-seeded.

Southern Sudan.

C. brevidens Benth.

Erect herb; branches striate, nearly glabrous. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous; leaflets 3, linear, the central one 2-3 in. long, narrowed at both ends. Pod sessile, cylindrical, 1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. thick, glabrous, many-seeded.

Central Sudan.

C. intermedia Kotschy.

Erect undershrub 3-4 ft. high; branches sulcate, shortly appressed-pubescent. Petiole $\frac{2}{3}$ -1 $\frac{1}{2}$ in. long; leaflets 3, linear to linear-lanceolate, up to 6 $\frac{1}{2}$ in. long and $\frac{3}{4}$ in. broad, shortly pubescent beneath. Flowers whitish or pale-yellow with dark-purple veining, about $\frac{4}{5}$ in. long, in long intermittent racemes. Pod about 2 in. long, $\frac{2}{3}$ in. broad, soon glabrous.

Central and Southern Sudan.

Var. *abyssinica* Taub.

Leaflets elliptic or oblong-elliptic, 2-2 $\frac{1}{2}$ in. long.

Nuba Mountains.

C. cannabina Schweinf. ex Bak. f.

Tall shrubby erect herb; stems sulcate. Petiole $\frac{2}{3}$ -1 $\frac{1}{2}$ in. long; leaflets 3, mucronate at the apex, cuneate at the base. Flowers golden, the standard with wine-red lines. Pod oblong-cylindrical, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, becoming glabrous.

Equatoria.

C. senegalensis (Pers.) Bacle ex DC.

C. deflersii Schweinf.

Suberect or prostrate half-woody herb 1-2 ft. high, shortly pale-pubescent. Petiole $\frac{1}{2}$ -1 in. long; central leaflet usually 1-1 $\frac{1}{4}$ in. long (sometimes much smaller), glabrous above, finely silky beneath. Flowers yellow, turning orange. Pod oblong-ellipsoid, about $\frac{1}{2}$ in. long, softly pubescent.

Widespread.

Var. *carinata* (Steud.) Bak. f.

Leaflets $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Pod elliptic, sessile, $\frac{3}{4}$ in. long, pubescent, hanging

Equatoria: Imatong Mountains.

***C. maxillaris* Klotzsch.**

Shrubby herb 2-3 ft. high, finely downy upwards. Petiole $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, slightly silky; leaflets 3, glabrous above, more or less silky beneath, the central leaflet 1-1 $\frac{1}{2}$ in. long. Flowers yellow, in terminal racemes 6-12 in. long. Pod sessile, oblong, $\frac{3}{4}$ in. long, very silky, 8-12-seeded.

Northern and Central Sudan.

***C. mucronata* Desv.**

Fig. 78.

***C. striata* DC.**

Erect undershrub 3-6 ft. high, grey-or yellowish-silky on the younger parts. Petiole 1 $\frac{1}{2}$ -3 in. long; leaflets 3, rounded or emarginate or mucronate at the apex, cuneate at the base, 1-4 in. long, pubescent beneath. Pod straight, linear-oblong, stipitate, up to 1 $\frac{1}{2}$ in. long, sparsely pubescent, 20-30-seeded.

Widespread.



Fig. 78—*CROTALARIA MUCRONATA* Desv.

A, flowering shoot. B, standard. C, wing. D, pistil. E, fruits. F, seed.

C. recta Steud. ex A. Rich.

Shrubby herb 2-3 ft. or more high, silky only when young. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets 3, blunt with a mucro at the apex, up to 3 in. long, glaucous, glabrous or pubescent beneath. Racemes up to 12 or more in. long. Pod shortly stalked, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long, $\frac{1}{2}$ in. thick, swollen, glaucous, glabrous, 20-24-seeded.

Darfur: *Jebel Marra*, *Sunni*. *Equatoria*.

C. lynesii Bak. & Martin.

Erect rather woody herb; young stems and peduncles white-pubescent. Leaves 3-foliolate, long-petiolate; leaflets subsessile, narrow-elliptic, obtuse at the apex, the terminal leaflet 1- $1\frac{1}{2}$ in. long, the lateral leaflets smaller, more or less velvety-pubescent and prominently nerved on both surfaces. Flowers greenish-yellow to golden with purple streaks, in dense velvety racemes. Pod shortly-stipitate, $\frac{3}{4}$ -1 in. long, shortly silky-pubescent, about 8-seeded.

Darfur: *Jebel Marra*.

C. onobrychis A. Rich.

Similar to *C. impressa* but the petiole is 1- $1\frac{1}{2}$ in. long; leaflets 3, oblong-obovate or elliptic, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long. Flowers purplish. Pod oblong, glabrous, short-stipitate.

Kassala: *Gallabat*.

C. vallicola Bak. f.

Undershrub; stems more or less grey-pubescent. Petiole $\frac{3}{4}$ - $\frac{1}{2}$ in. long; leaflets 3, 1- $1\frac{1}{2}$ in. long. Racemes 2-4 in. long. Pod oblong, subsessile, about $\frac{1}{2}$ -in. long, depressed, pubescent.

Equatoria.

C. impressa Nees.

C. astragalina Hochst. ex A. Rich.

Herb, woody at the base; branches slender, erect or more or less diffuse, shortly silky-pubescent above. Petiole $\frac{3}{4}$ - $\frac{1}{2}$ in. long; leaflets 3, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, glabrous above, appressed-pubescent and glaucous beneath. Pod oblong, about $\frac{1}{2}$ in. long, subsessile, 10-14-seeded.

Widespread.

C. chrysochlora Bak. f. ex Harms.

Semi-prostrate herb 4-6 in. high, arising from a woody rhizome, often appearing after a bush-fire. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets 3, obovate or elliptic-obovate, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, strigose-pubescent beneath. Flowers yellow with red streaks. Pod oblong, about $\frac{3}{4}$ in. long, sessile, pubescent.

Equatoria.

C. pycnostachya Benth.

Fig. 79.

Herb 12-18 in. high; branches striate, finely silky upwards. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets 3, obtuse and emarginate at the apex, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, glabrous or sparsely pubescent. Flowers yellow, 20-50 in dense nearly sessile lateral racemes 2-3 in. long. Pod subsessile, oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 6-10-seeded, minutely puberulous. *Central Sudan: abundant in the Gezira.*



Fig. 79—CROTALARIA PYCNOSTACHYA Benth.

A, flower. B, standard wing and keel. C, calyx with staminal tube. D, staminal tube opened out to show stamens. E, longitudinal section of flower. F, pod open showing seeds. G, pod.

C. petitiiana (A. Rich.) B. D. Jackson.*C. dilloniana* Bak.

Young branches finely grey-pubescent, angular. Petiole $\frac{2}{3}$ -3 in. long; leaflets 3, mucronate at the apex, $1\frac{1}{2}$ -5 in. long, pale-green, glabrous above, pubescent beneath. Flowers in many-flowered elongated racemes; vexillum white or yellow, purple-veined. Pod subsessile, oblong, $\frac{2}{3}$ -1 in. long, more or less grey-silky, 15-20-seeded.

*Central and Southern Sudan.***C. kikangaensis** De Wild.

Rather woody herb; stems about 20 in. long, more or less appressed-pilose. Leaves petiolate; leaflets 3, elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous above, sparsely appressed-pilose beneath. Flowers yellow, in 4-16-flowered lax racemes. Ovary densely velvety. Pod apiculate at the apex, about 1 in. long, about 10-seeded.

*Equatoria.***C. laxa** Franch.

Undershrub or shrub. Petiole up to $\frac{1}{2}$ in. long, pubescent. Leaflets obovate, cuneate at the base, up to $\frac{1}{2}$ in. long, pubescent. Flowers yellow, in lax few-flowered racemes. Pod club-shaped, about $\frac{1}{2}$ in. long, pubescent.

*Red Sea Hills: Erkowit.***C. taubertii** Bak. f.

C. quartiniana (non A. Rich.) Broun & Massey; *C. platycalyx* (non Steud.) Broun & Massey.

Annual herb; stems flexuous, hirsute. Petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, hirsute; leaflets 3, ovate or ovate-elliptic to obovate-elliptic, $\frac{2}{3}$ - $1\frac{1}{2}$ in. long. Flowers axillary, usually solitary. Pod obovoid, about $\frac{1}{2}$ in. long, shortly stipitate, more or less hirsute.

*Central and Southern Sudan.***C. microphylla** Vahl.

Decumbent herb; branches thread-like, glabrous or strigose-pubescent. Petiole short; leaflets 3, oblong or oblong-obovate up to $\frac{2}{3}$ in. long, glabrous above, thinly silky beneath. Flowers 1-2 together, the keel petals white or yellow veined with mauve. Pod up to $\frac{1}{2}$ in. long, pubescent.

*Northern and Central Sudan.***C. microcarpa** Hochst. ex Benth.

Diffusely branching brownish-silky herb, woody at the base, from a few inches to a foot or more long. Petiole very short; leaflets 3, oblong, cuneate at the base, up to $\frac{1}{2}$ in. long, more or less glabrous above, silky-pilose beneath. Flowers yellow, solitary or up to 3 or 4 in a cluster. Pod silky, about 8-seeded.

Central Sudan.

Var. *dawei* Bak. f.

Stems 6-8 in. long; corolla tinged with red.

Equatoria.

Var. *sudanica* Bak. f.

Slender little plant with narrow ash-grey leaves; racemes lax, 2-3-flowered.

Nuba Mountains.

C. podocarpa DC.

Erect branched herb 1-2 ft. high; stems weakly pilose with slender spreading hairs. Petiole $\frac{1}{2}$ -1 in. long; leaflets 3, obovate or oblong, about $1\frac{1}{2}$ in. long, thinly pilose on the midrib. Flowers yellow, in leaf-opposed or terminal few-flowered racemes or rarely solitary, keel about $\frac{2}{3}$ in. long. Pod stipitate, oblong, about 1 in. long, bladder-like.

Central and Southern Sudan.

C. natalitia Meisn.

Suffruticose herb 3-6 ft. high; branches angular, pubescent. Petiole $\frac{1}{2}$ - $\frac{2}{3}$ in. long; leaflets 3, oblong or oblong-obovate, obtuse or mucronate at the apex, cuneate at the base, the central one $\frac{3}{4}$ -1 in. long. Flowers yellow, in terminal racemes. Pod with stalk $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, many-seeded.

Equatoria: Imatong Mountains, Itobol.

C. lachnophora Hochst. ex A. Rich.

C. elata Welw. ex Bak.

Bushy plant 3-6 ft. high, clothed with brown hairs; stems and leaves rather roughly pilose-pubescent. Petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long; leaflets 3, obovate or oblong, conspicuously mucronate at the apex, cuneate at the base, $1\frac{1}{2}$ -2 in. long, strigose-pubescent beneath. Flowers about $\frac{2}{3}$ in. long. Calyx densely rusty-tomentose outside. Pod $1-1\frac{1}{2}$ in. long, many-seeded.

Equatoria.

C. goreensis Guillem. & Perrott.

Herb with stems woody below, or undershrub up to 5 ft. high, finely pubescent. Petiole $\frac{1}{2}$ -2 in. long; leaflets 3, oblong to obovate, cuneate at the base, often emarginate at the apex, $\frac{3}{4}$ -2 in. long. Flowers yellow, in few-flowered racemes. Pod oblong-cylindric, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, 10-12-seeded.

Widespread.

20. **CYAMOPSIS** DC.**Cyamopsis senegalensis** Guillem. & Perrott.

Erect herb, woody at the base, 6-12 in. high; stems appressed-pubescent. Leaflets 3-7, subsessile, linear to oblanceolate, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, thinly appressed-pubescent with medifixed hairs beneath. Flowers pinkish in axillary racemes. Pod linear, $1-1\frac{1}{2}$ in. long, finely appressed-setulose, about 6-9-seeded, beaked.

Northern and Central Sudan.

21. **DALBERGIA** L. f.**Dalbergia melanoxyton** Guillem. & Perrott.African Blackwood
African Ebony

Much-branched usually multi-stemmed deciduous savannah tree or shrub 10-25 ft. high; stems short, seldom cylindric, rarely over 1 ft. in diameter; branchlets spinose, the spines being the hardened tips of short branches and often bearing leaves and flowers; bark pale-grey to grey-brown, thin, smooth, flaking irregularly; slash yellow-white. Leaves imparipinnate, 3-8 (usually 3-4) in. long; leaflets 9-13, alternate, oblong to obovate or obovate-elliptic, truncate and emarginate at the apex, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Flowers white, sweet-scented, in many-flowered panicles about as long as the leaves. Stamens 9 and 1 or all connate. Pod indehiscent, flat, oblong to elliptic-lanceolate, about 1 $\frac{1}{2}$ in. long, containing 1-4 reniform seeds.

*Central and Southern Sudan.***D. lactea** Vatke.

Wide-spreading woody climber. Leaflets 8-10, elliptic-oblong, obtuse or emarginate at the apex, about 2 in. long, pubescent or glabrous. Flowers milk-white fading to mauve, in large terminal panicles. Calyx rusty-tomentose. Stamens in two bundles of 5. Pod indehiscent, flat, oblong, up to 5 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ in. broad, glabrous, 1-2-seeded.

*Equatoria: Imatong Mountains, Itobol forest.***D. elata** Harms.

Small to tall straight tree of graceful habit; bark pale-brown, flaky; slash cream; branches without spines. Leaflets 11-13, crenulate and slightly undulate, broadly lanceolate or lanceolate-ovate or elliptic or oblong, or almost orbicular, usually acute and apiculate at the apex, about 1 $\frac{1}{2}$ in. long. Panicles dense, the flowers and young leaves appearing together. Pod indehiscent, flat, oblong, acuminate but obtuse at the apex, about 3 in. long, $\frac{1}{2}$ in. broad, 1-4-seeded.

*Nuba Mountains.*22. **DESMODIUM** Desv.

- A. Calyx teeth 5, the upper two connate, the lowest often longer than the rest:
- B. Leaves simple:
- (a) Pod densely hairy *D. lasiocarpum*
- (aa) Pod sparsely pubescent *D. gangeticum*
- BB. Leaves 3-foliolate:
- C. Upper suture of pod more or less straight:
- D. Flowers 1-3 in the leaf axils; stems wide-creeping
D. triflorum.
- DD. Flowers in racemes:
- E. Racemes lax, much longer than the leaves:
- (b) Pod stipitate *D. repandum*

- (bb) Pod not stipitate:
- (c) Pod $\frac{1}{2}$ in. broad *D. schweinfurthii*.
- (cc) Pod $\frac{1}{4}$ or more in. broad:
- (d) Articulations as broad as long; racemes sessile, 2-4-flowered; pedicels slender; slender annual *D. delicatulum*.
- (dd) Articulations longer than broad:
- (e) Leaflets obovate; pod sparsely pubescent
D. adscendens.
- (ee) Leaflets obovate-oblong; pod densely pubescent. *D. ramosissimum*.
- EE. Racemes dense, more or less exceeding the leaves; terminal leaflet ovate-lanceolate *D. salicifolium*.
- CC. Upper suture of pod more or less deeply indented:
- (f) Pod more or less spirally twisted; articulations of pod unequal in size; rather weak plant ... *D. ospriostreblum*.
- (ff) Pod not spirally twisted *D. dichotomum*.
- AA. Calyx-teeth 5, narrow, bearded, all equal; leaves 1- or 3-foliolate; leaflets usually oblong *D. dimorphum*.

Desmodium laslocarpum (Beauv.) DC.

Half-woody erect hairy undershrub 3-6 ft. high; branches densely brown-pubescent. Leaves ovate or rhomboid, rounded to acute at the apex, up to 6 in. long, $3\frac{1}{2}$ in. broad, tomentose on both surfaces. Flowers pink or purplish, small, in dense sessile racemes. Pod about $\frac{3}{4}$ in. long, densely hairy, deeply indented on one side.
Equatoria.

D. gangeticum (L.) DC.

Erect half-woody undershrub up to 5 ft. high. Leaves lanceolate or ovate-lanceolate, subacute or acuminate at the apex, $1\frac{1}{2}$ -5 in. long, more or less appressed-grey-silky beneath. Flowers white and pink or bluish, small, in fairly dense to lax sessile racemes. Pod about $\frac{3}{4}$ in. long, nearly straight on one side, deeply indented on the other, thinly pubescent.

Central and Southern Sudan.

D. triflorum (L.) DC.

Herb; stems much-branched, prostrate, creeping and forming dense mats. Leaflets broadly obovate, broad and emarginate at the apex, about $\frac{3}{4}$ in. long, glabrous to finely appressed-pilose beneath. Flowers pink or purplish, 1-3 in the leaf-axils. Pod about $\frac{3}{4}$ in. long, deeply indented on one side, about 5-seeded, pubescent.

Southern Sudan.

D. repandum (Vahl) DC.*D. scalpe* DC.

Undershrub; branches slender, thinly spreading-grey-pubescent, straggling or more or less climbing. Leaflets triangular-acute at the apex, the terminal one broadly obovate or rhomboid, up to $3\frac{1}{2}$ in. long, thinly pilose beneath. Flowers usually light or deep-red with white keel, very few and often paired on the long raceme. Pod very deeply indented, stipitate, 3-5-seeded, tomentellous.

*Central and Southern Sudan.***D. schweinfurthii** Schindl.

Annual herb with rusty-villous procumbent stems up to 20 in. long. Lower leaves simple, suborbicular, shortly emarginate at the apex; upper leaves 3-foliolate, sparsely pubescent or glabrous above, the terminal leaflet oblong or elliptic, obtuse or shortly emarginate at the apex, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, the lateral leaflets oblong-elliptic, somewhat smaller. Flowers in few-flowered racemes up to 6 in. long, the peduncle pilose. Pod linear, $\frac{1}{2}$ constricted on the ventral side, pubescent, dehiscent, 2-8-articulated; seeds brownish-black, shining.

*Equatoria.***D. delicatulum** A. Rich.

Slender silky annual herb. Leaflets oblanceolate-elliptic, up to 2 in. long, pilose on both surfaces. Pod about $\frac{3}{4}$ in. long, setulose, about 6-seeded, indented on one side.

*Southern Sudan.***D. adscendens** (Sw.) DC.

Herb to undershrub; branches slender, thinly to densely pubescent, straggling, sometimes prostrate and rooting. Terminal leaflet $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, shortly pubescent beneath. Flowers pink or whitish, few in lax racemes. Pod 3-4-seeded, indented about half-way on one side.

*Equatoria.***D. ramosissimum** Don.*D. mauritianum* DC. p.p.

Erect slightly woody herb; branches slender. Leaflets usually under $1\frac{1}{2}$ in. long. Flowers bright-pink or purple, in moderately lax usually terminal racemes. Pod rather deeply indented, about 5-seeded, pubescent.

Equatoria.

D. salicifolium (Poir.) DC.*D. paleaceum* Guillem. & Perrott.

Half-woody erect undershrub 3-4 ft. high. Leaflets lanceolate to ovate-lanceolate, acute at the apex, up to 6 in. long, pubescent only on the nerves beneath. Flowers red or yellowish in slender more or less paniced spike-like axillary and terminal racemes. Pod about 1 in. long, only slightly indented, 3-5-seeded, at length reticulate, thinly clothed with long stiff hairs.

*Darfur: Jebel Marra. Equatoria.***D. ospriostreblum** Steud. ex Chiov.*D. spirale* (non DC.) Broun & Massey.

Rather weak herb. Leaflets 3, the terminal one roundish or ovate, 1-2 in. long, $\frac{1}{2}$ -1 in. broad, the lateral ones smaller, both surfaces green, glabrous. Flowers greenish variegated with purple, in lax terminal and axillary racemes the former often compound. Pod more or less spirally twisted, $\frac{3}{4}$ -1 in. long, with 4-6 unequal-sized articulations.

*Central Sudan.***D. dichotomum** (Klein) DC.*D. sennaarensis* Schweinf.

Undershrub 1-several feet high; branches robust, angular, sulcate, more or less densely hispid. Stipules persistent, cordate at the base, amplexicaul, foliaceous; petiole $\frac{1}{2}$ -3 in. long, spreading, hispid; leaflets 3, the central one ovate, blunt at the apex, broadly rounded at the base, 1-4 in. long, the lateral leaflets smaller, scabrous above, thinly grey-pubescent beneath; stipellae $\frac{1}{2}$ -1 in. long, lanceolate, foliaceous, persistent. Flowers reddish, in moderately lax racemes up to 12 or more in. long. Pod $\frac{1}{2}$ -1 in. long, lower suture not waved half-way down; articulations 4-6, the faces hairy.

*Central and Southern Sudan.***D. dimorphum** Welw. ex Bak.*D. dregeanum* (non Benth.) Broun & Massey.

More or less woody undershrub 1-2 or more ft. high; branches grey-silky-pubescent. Leaves and leaflets usually oblong, mucronate at the apex, glabrous above, grey-silky beneath. Flowers pink or purplish in short bracteate congested very hairy racemes scarcely as long as the leaves. Pod up to $\frac{1}{2}$ in. long, lower margin deeply sinuate.

Central and Southern Sudan.

23. DOLICHOS L.

Dolichos schweinfurthii Taub. ex Harms.*D. bongensis* Taub. ex Harms.

Herb; stems erect, simple, about 1 ft. high. Leaflets 3, linear-lanceolate or narrow-oblong to spatulate, 3-5 in. long, glabrous except on the edges and margins beneath, longitudinally 3-nerved. Flowers purple, about $\frac{3}{4}$ in. long, pedicellate, clustered in the axils of the bracts or the leaves.

*Equatoria.***D. oliveri** Schweinf.

Erect herb; stems woody, finely grey-silky, with elongated branches. Petiole silky, $\frac{3}{4}$ -1 in. long; leaflets 3, with stipels, the central leaflet rhomboid with two shallow rounded lobes below the middle, 1 $\frac{1}{2}$ -2 in. long, the lateral leaflets unequal-sided, both surfaces especially the lower one grey-silky. Flowers yellow, glabrous, 1-2 in the axils of the leaves or laxly racemose to the ends of the branches. Pod linear, falcate, 2 in. long, 6-7-seeded, glabrous when mature.

Equatoria: between Borichabi and Arat Ambo near the Abyssinian border.

D. malosanus Bak.

Erect herb, densely pubescent when young, with a tuberous root streaked with red and white inside. Leaves often appearing after the flowers; leaflets 3, ovate-lanceolate. Flowers violet, up to $\frac{3}{4}$ in. long, 2-4 at the nodes.

*Equatoria.***D. formosus** A. Rich.

Climbing herb; stems wide-twining, finely downy when young. Leaflets 3, ovate, acuminate at the apex, glabrous on both surfaces when mature, the central leaflet 2-3 $\frac{1}{4}$ in. long. Flowers bluish-pink, on 3-4 or more-flowered racemes with spreading peduncles 2-3 or more in. long. Pod much-reflexed, blunt at the apex, 2-3 in. long, glabrous or slightly pubescent, 8-10-seeded.

*Equatoria.***D. biflorus** L.*D. uniflorus* Lam.

Climbing herb; stems slender, slightly pubescent. Leaflets 3, oblong, blunt at the apex, the terminal one $\frac{3}{4}$ -1 in. long, the lateral ones very unequal-sided. Flowers yellow or greenish-yellow, 1-3 on very short pedicels in the axils of the leaves. Pod linear-oblong, slightly curved, sessile, 1-2 $\frac{1}{4}$ in. long, glabrous or sparsely pubescent, 6-8-seeded, tipped with a persistent style $\frac{1}{4}$ in. long.

Central and Southern Sudan.

24. **ERIOSEMA** (DC.) Desv.

- A. Leaves simple:
- (a) Leaves ovate or ovate-lanceolate:
- (b) Plant softly and densely white-tomentose; leaves ovate, shortly petiolate *E. pulcherrimum*.
- (bb) Plant more or less pubescent; leaves ovate-lanceolate, subsessile *E. schoutedenianum*.
- (aa) Leaves narrowly lanceolate *E. schweinfurthii*.
- AA. Leaves 3-5-foliolate:
- B. Leaves all 5-foliolate or rarely some of them 3-foliolate, linear to narrowly lanceolate *E. linifolium*.
- BB. Leaves all 3-foliolate:
- C. Shrubs or undershrubs:
- (c) Flowers in racemes:
- (d) Flowers pale- to deep-red; plant densely yellowish-grey- or rusty-downy *E. flemingioides*.
- (dd) Flowers yellow; plant densely appressed-grey- or brownish-grey-silky:
- (e) Lateral leaflets usually equal-sided; lateral nerves from the base of the lateral leaflets never reaching half the length of the lamina *E. psoraloides*.
- (ee) Lateral leaflets usually unequal-sided; lateral nerves from the base of the lateral leaflets always reaching at least half the length of the lamina *E. richardi*.
- (cc) Flowers in axillary or terminal subglobose heads surrounded by conspicuous bracts; plant grey-pubescent; leaflets silvery or whitish beneath *E. griseum*.
- CC. Herbs:
- (f) Densely rusty-pubescent *E. pauciflorum*.
- (ff) Pubescent, but not as above:
- (g) Stipules $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long *E. macrostipula*.
- (gg) Stipules $\frac{1}{2}$ in. long; leaflets 2- $2\frac{1}{2}$ in. long *E. sparsiflorum*.

***Eriosema pulcherrimum* Taub.**

Erect softly white-tomentose herb a few inches to 1 ft. high, with a woody rhizome. Leaves ovate or broadly elliptic, mucronate at the apex, rounded or subcordate at the base, $2\frac{3}{4}$ - $6\frac{1}{2}$ in. long, white-hairy beneath; stipules up to $1\frac{1}{2}$ in. long, appressed-pilose. Flowers deep-crimson, in short dense cylindric racemes over which the leaves fold. Pod very densely villous.

Equatoria.

***E. schoutedenianum* Staner & Craene.**

Pubescent herb or undershrub from a small turnip-like root, up to 18 in. high. Leaves ovate-lanceolate, acute at the apex, cordate at the base, $1\frac{1}{2}$ -4 in. long, more or less villous above and beneath;

stipules ovate-lanceolate, striate, up to $\frac{1}{2}$ in. long. Flowers yellow, in axillary or terminal racemes 1-1 $\frac{1}{2}$ in. long. Pod broadly elliptic, villous.

Equatoria: Imatong Mountains, Mount Baghanj, 6000-7000 ft.

E. schweinfurthii Bak. f.

Erect herb; stems 3-4 in. high from a tuberous root. Leaves sessile, narrow-lanceolate, 4-7 in. long, up to $\frac{1}{2}$ in. broad, grey-canescens beneath; stipules lanceolate, $\frac{1}{2}$ in. long. Flowers closely racemose; peduncles grey-pubescent.

Equatoria.

E. linifolium Bak. f.

Erect herb 1-3 ft. high from a woody more or less tuberous base. Leaflets very acute at the apex, up to 7 $\frac{1}{2}$ in. long, $\frac{3}{8}$ - $\frac{1}{2}$ in. broad, softly white-tomentose beneath. Flowers greenish-yellow, numerous, reflexed, in terminal slender lax racemes 2-6 in. long. Pod broadly elliptic, $\frac{2}{3}$ in. long, densely long-pilose.

Equatoria.

E. flemingoides Bak.

Shrub or undershrub; branches densely clothed with fine yellowish-grey or rusty down. Stipules ovate, silky, $\frac{3}{8}$ - $\frac{1}{2}$ in. long; leaflets 3, the central one oblong-ovate, acute to rounded at both ends, 4-5 in. long, the lateral ones spreading, finely downy at first above, grey-downy beneath, with bright-rusty raised nerves and nervelets. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in short-stalked moderately dense racemes 2-3 in. long. Pod $\frac{3}{4}$ - $\frac{1}{2}$ in. long, thickly clothed with long tawny-silky hairs.

Equatoria.

E. psoraloides (Lam.) Don.

E. cajanoides (Guillem. & Perrott.) Benth. & Hook.

Erect grey-silky more or less branched undershrub or shrub 4-5 or more ft. high. Leaflets 3, the central one oblanceolate or narrow-oblong, acute to blunt and emarginate at the apex, 1 $\frac{1}{4}$ -4 in. long, strongly nerved, completely covered or almost completely covered beneath with a close white felt of hairs. Flowers golden-yellow, recurved, up to $\frac{3}{4}$ in. long, in long spike-like racemes. Pod elliptic, up to $\frac{1}{2}$ in. long, 2-seeded, densely pilose outside, glossy inside.

Southern Sudan.

E. richardi Benth. ex Bak. f.

Undershrub about 3 ft. high; branchlets densely brownish-grey, silky-pubescent with often scattered longer hairs. Leaflets lanceolate, ovate-lanceolate, or elliptic-lanceolate, mucronate at the apex, 2-3 in. long, silky-pubescent above, densely brownish-grey

on the nerves beneath. Flowers yellow, in spiciform axillary or terminal racemes; peduncles densely yellow-brown-pubescent, 2-3½ in. long. Pod oblong, about ½ in. long, covered with a long yellowish-brown tomentum.

Equatoria: *Imatong Mountains, Mount Baghanj*, 6000-7000 ft.

E. griseum Bak.

Low-branched undershrub from a thick woody root, sometimes less than 1 ft. high, closely grey-pubescent. Leaflets 3, the central one oblanceolate, acute or blunt at the apex, 1-2 in. long, silvery or whitish beneath. Flowers yellow, in dense rounded heads 1 or more in. in diameter, completely concealed by broadly lanceolate bracts longer than the flowers and with long slender tips. Pod oblong, about ½ in. long, pilose outside, glossy inside, the valves curling up.

Equatoria.

E. pauciflorum Klotzsch.

E. oblongum Benth. ex Harv.

Herb up to 1 or more ft. high; stems branched from a woody rhizome, densely clothed with spreading rusty-pubescent. Leaves nearly sessile; stipules ½ in. long, lanceolate; the central leaflet oblanceolate, blunt at the apex, 1½ in. long; the lateral leaflets scarcely unequal-sided, becoming glabrous above, finely grey-woolly beneath with raised rust-coloured nerves. Flowers 6-8, in moderately dense racemose heads on pubescent peduncles 3-5 in. long. Pod 1 in. long, densely villous.

Equatoria.

E. macrostipula Bak. f.

Erect herb; stem up to 2½ ft. high, pubescent. Stipules ¾ in. long, striate; leaflets 3, ovate, acute at the apex, rounded at the base, softly pubescent. Flowers crowded in racemes up to 2 in. long. Pod oblong, ½ in. long, villous.

Equatoria.

E. sparsiflorum Bak. f.

Erect pubescent herb 1-1½ ft. high, woody below from a woody rhizome. Stipules subulate-lanceolate, about ¾ in. long, strongly nerved; leaflets lanceolate to narrow-oblong, mucronate at the apex, 1½-2½ in. long, reddish-pubescent on the nerves beneath. Flowers orange-yellow, subsessile in lax axillary racemes 3-6 in. long. Pod elliptic, ¾ in. long, loosely pilose.

Equatoria.



Fig. 80—ERYTHRINA ABYSSINICA Lam.

A, flower. C, pod with seeds.

25. **ERYTHRINA L.****Erythrina senegalensis DC.**

Small tree up to 15 ft. but sometimes reaching 50 ft. high, armed with stout slightly recurved prickles from a woody base; branches often prickly. Leaflets 3, lanceolate to broadly ovate, up to 6 in. long, glabrous or nearly so, sometimes with a few prickles on the midrib. Flowers scarlet, in lax racemes, usually appearing when the tree is leafless. Calyx entire, or at most shortly and irregularly lobed at the apex. Pod moniliform, stipitate, becoming twisted, about $4\frac{1}{2}$ in. long, closely puberulous; seeds bright-red, smooth and shining.

Equatoria.

E. sudanica Bak. f.

E. dybowskii (non Hua) Broun & Massey.

Grey-tomentose shrub up to 8 ft. high; branches armed with prickles. Petiole $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, sparsely armed; leaflets 3, the terminal one obovate, $2\frac{1}{2}$ in. long and broad, the lateral leaflets unequal-sided, grey-tomentose. Flowers brilliant-scarlet in spikes. Calyx-teeth very short. Pod tomentose, constricted.

Darfur: Kulme, 3600 ft.

E. erlotricha Harms.

Tree 30-60 ft. high. Leaves very thickly tomentose, ultimately glabrous above. Flowers small. Calyx-teeth very short. Pod falcate, tomentose, 3-9-seeded.

Darfur: Jebel Marra.

E. abyssinica Lam.

Fig. 80.

E. tomentosa (Hochst.) R. Br. ex A. Rich.

Tree up to 40 ft. high; bark yellow-brown, thick, corky, deeply fissured, often armed with blunt woody prickles; branchlets stoutly armed with strong recurved prickles, densely tomentose when young. Leaflets very broadly ovate to rhomboid or sub-orbicular, usually sparingly pubescent above, when mature densely grey-tomentose beneath, the terminal leaflet blunt at the apex, broadly rounded to cordate at the base, up to 8 in. broad, with the midrib armed or unarmed. Flowers coral-red to scarlet, in inflorescences 2-6 in. long, appearing when the tree is leafless. Calyx cleft on one side with 5 thread-like segments. Pod 4-5 in. long, velvety-pubescent, woody, moniliform; seeds vermilion and black, very shiny.

Central and Southern Sudan.

E. comosa Hua.

Medium tree; bark light-brown, corky, longitudinally fissured, with scattered prickles. Differs from *E. abyssinica* in the leaflets being finally glabrous above and only sparsely pubescent beneath,

the thread-like bracteoles, the lanceolate vexillum pointed at the apex, the ovules being 12 instead of 8-9, and the pod being covered with a rusty pubescence.

Blue Nile Province. Equatoria.

E. excelsa Bak.

Forest tree up to 100 ft. high; bole up to 60 ft. long, armed with strong woody conical prickles; bark greyish-brown, thick, fissured; branches and twigs covered with short prickles. Leaflets 3, usually 4-7 in. long, 2½-6 in. broad, sometimes prickly on the nerves and midribs. Flowers dull-orange to salmon-red, in 2's or 3's on many-flowered stiff racemes up to 6 in. long, appearing before the leaves. Pod reddish, moniliform, velvety; seeds scarlet and black.

Equatoria: Azza Forest.

26. **GEISSASPIS** Wight & Arn.

Geissaspis sp.

Erect shrub; branchlets scabrous, covered with short stiff hairs. Leaves abruptly pinnate, the rachis armed with minute stiff hairs and prolonged ¼ in. beyond the terminal pair of leaflets; leaflets in 2 pairs, elliptic, often unequal-sided, obtuse and mucronate at the apex, cuneate at the base, closely and sharply serrate, up to 2 in. long, ⅔ in. broad, glabrous above and beneath but the midrib beneath armed with minute stiff hairs. Flowers yellow, in drooping dense bracteate racemes up to 2½ in. long, clustered at the end of the branchlet; bracts broadly ovate, closely and sharply serrate, up to ¾ in. long, prominently nerved.

Equatoria: River Sue about 40 miles N.E. of Yambio.

27. **GLYCINE** L.

Glycine holophylla (Bak. f.) Taub.

Eriosema holophyllum Bak. f.

Erect half-woody branched pubescent herb 18 in. high. Leaves simple (rarely 3-foliolate), ovate, mucronate at the apex, broadly rounded at the base, 3½-6 in. long, 2¼-3½ in. broad. Flowers whitish, small, in subglobose or spike-like axillary and terminal racemes; pedicels 2-flowered. Pod oblong, ¾-¾ in. long, rigidly pilose outside, satiny inside.

Equatoria.

G. borianii (Schweinf.) Bak.

Herbaceous twiner; stems thinly grey-silky. Leaves usually 3-foliolate, sometimes mixed with 1-foliolate leaves, nearly glabrous above, glaucous beneath with pubescent nerves; terminal or only leaflet oblong, acute or obtuse or rounded at the apex, up to 4 in. long. Flowers red, 12-20 in copious congested sessile axillary racemes. Pod linear, thinly silky, 2-seeded.

Kassala: Gallabat. Blue Nile Province.

G. hedysaroides Willd.

Climbing perennial; stems woody at the base, shortly pubescent with spreading hairs. Leaflets 3, narrowly elliptic, rounded at each end, mucronate at the apex, $1\frac{1}{2}$ -2 in. long, pubescent beneath. Flowers white or pinkish, on very short leafy axillary branchlets. Pod broadly linear, slightly curved, flat, about $1\frac{1}{2}$ in. long, thinly appressed-pubescent.

Equatoria.

G. javanica L.

Herbaceous twiner; stems more or less densely clothed with silky pubescence. Leaflets 3, the terminal one ovate, acute at the apex, 2-4 in. long, the lateral ones very unequal-sided, nearly glabrous above, finely grey-downy beneath. Flowers bright-red, in copious usually peduncled axillary racemes 3-6 in. long. Pod linear, nearly straight, about 1 in. long, 4-6-seeded, densely silky.

Central and Southern Sudan.

28. **GLYCYRRHIZA** L.**Glycyrrhiza glabra** L.

Liquorice.

Erect perennial undershrub $1\frac{1}{2}$ -3 or more ft. high from a thick rhizome. Leaflets in 4-7 pairs, oblong to elliptic-lanceolate, $1\frac{1}{2}$ in. long, $\frac{2}{3}$ in. broad. Flowers in slender loose axillary racemes. Pod oblong to linear, $\frac{2}{3}$ - $1\frac{1}{2}$ in. long, flattened, almost straight.

Northern Sudan.

29. **HELMINTHOCARPON** A. Rich.**Helminthocarpon abyssinicum** A. Rich.

Slender wiry herb, copiously branched from the base, 6-15 in. long, thinly clothed with silky pubescence. Leaflets 7, subsessile, entire, oblanceolate, mucronate at the apex, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, finely silky. Flowers 4-6 together, yellowish-red, in short-stalked heads from the axils of most of the leaves. Pod $\frac{1}{2}$ in. in diameter, the point nearly or quite curved round to the base.

Darfur: Jebel Marra, 6500-9400 ft.

30. **INDIGOFERA** L.

KEY TO GROUPS.

- A. Pod not prickly:
 - B. Pod globose or oblong-globose, 1-2-seeded GROUP 1.
 - BB. Pod linear to oblong:
 - C. Pod terete or subtetragonous, not flat:
 - D. Leaves all simple GROUP 2.
 - DD. Leaves (some of them) pinnate GROUP 3.
 - CC. Pod flat GROUP 4.
 - AA. Pod prickly GROUP 5.

GROUP 1.

- A. Bracts inconspicuous; flowers in 6-12-flowered racemes; leaves simple, linear, clothed with silvery-pubescence ... *I. linifolia*.
- AA. Bracts conspicuous, pinnate or subpinnate; flowers in heads or axillary clusters; leaves pinnate or rarely 1-foliolate:
- (a) Leaflets usually 3, occasionally 1 *I. lotononoides*.
- (aa) Leaflets 7-9 *I. capitata*.

GROUP 2.

- A. Flowers in dense clusters or heads:
- (a) Leaves ovate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; flowers in dense axillary clusters
I. cordifolia.
- (aa) Leaves linear to lanceolate, $1\frac{1}{4}$ -3 in. long, flowers in pedunculate heads *I. polysphaera*.
- AA. Flowers in racemes:
- B. Flowers in very short few-flowered axillary racemes:
- (b) Leaves linear to linear-lanceolate, about 1 in. long; pod 4-6-seeded *I. simplicifolia*.
- (bb) Leaves ovate or obovate, up to $\frac{3}{8}$ in. long; pod 6-8-seeded
I. arenaria.
- BB. Flowers in racemes 1-3 $\frac{1}{2}$ in. long:
- (c) Leaves linear, linear-oblong or oblong, acute and long-mucronate at the apex *I. achyranthoides*.
- (cc) Leaves obovate, lanceolate or oblanceolate:
- (d) Pod 6-7-seeded; leaves almost glabrous above, thinly appressed-grey-silky beneath; stems thinly appressed-grey-silky *I. bongensis*.
- (dd) Pod 8-10-seeded; leaves scabrous with appressed hairs on both surfaces; stems covered with appressed grey bristles *I. knoblochleri*.

GROUP 3.

- A. Leaves digitately 3-foliolate: plant appressed-white-pubescent ...
I. tritoides.
- AA. Leaves 2-more-foliolate, not digitate, with or without simple leaves:
- B. Leaflets usually 2, the terminal one large, the lateral one small:
- (a) Leaflets suborbicular or broadly ovate, densely clothed with a spreading silvery pubescence *I. diphylla*.
- (aa) Leaflets lanceolate or oblanceolate, nearly glabrous when mature *I. conjugata*.
- BB. Leaflets more than 2, with or without simple leaves:
- C. Shrubs or undershrubs armed with spines *I. spinosa*.
- CC. Unarmed plants:
- D. Bracts conspicuous, ovate or orbicular, usually concealing the flowers; flowers in dense axillary or terminal heads *I. strobilifera*.

DD. Bracts not as above:

- E. Flowers axillary, solitary or in pairs on slender peduncles; leaflets oblong or oblong-lanceolate
I. sparsa var. *bongensis*.

EE. Flowers in panicles, pseudopanicles or racemes:

F. Flowers in panicles or pseudopanicles:

- (b) Stems thinly pubescent; leaflets obovate to orbicular, $\frac{1}{2}$ in. long *I. bracteolata*.
 (bb) Stems grey-pubescent; leaflets oblanceolate, cuneate at the base, $\frac{3}{8}$ - $\frac{1}{2}$ in. long *I. pulchra*.

FF. Flowers in racemes:

- G. Racemes very lax, usually 2-6-flowered or rarely more-flowered or subdense:

H. Leaflets usually in not more than 5-6 pairs:

I. Annual or perennial herbs:

- (c) Leaflets 1-5:
 (d) Leaflets suborbicular, obovate or elliptic:
 (e) Leaflets $\frac{1}{2}$ in. or less long:
 (f) Leaflets about $\frac{3}{8}$ in. long, silvery
I. arenaria.

- (ff) Leaflets $\frac{1}{10}$ - $\frac{1}{2}$ in. long, glandular-strigose *I. mittuensis*.

- (ee) Leaflets more than $\frac{1}{2}$ in. long, densely clothed with appressed hairs; pod 10-12-seeded *I. pilosa*.

- (dd) Leaflets linear to linear-lanceolate; pod 12-15-seeded *I. welwitschii*.

- (cc) Leaflets more than 5, oblanceolate or obovate; pod glandular, 7-12-seeded *I. viscosa*.

II. Shrubs or undershrubs:

- (g) Leaflets 1-5 *I. suaveolens*.

- (gg) Leaflets more than 5 *I. zenkeri*.

HH. Leaflets usually in over 10 pairs; flowers rose; leaflets oblong to oblanceolate; pod 1-1 $\frac{1}{2}$ or more in. long *I. dendroides*.

GG. Racemes dense or cluster-like, few- to many-flowered:

J. Lateral leaflets alternate:

K. Annual or perennial herbs:

(h) Glabrous or pubescent, not silvery herbs:

- (i) Leaflets 3-5, obovate-oblong *I. oxalidea*.

- (ii) Leaflets 7-11, oblanceolate-oblong to obovate *I. hendecaphylla*.

(hh) Ashen-grey, hoary or silvery plants, prostrate or trailing:

(j) Leaflets 2-7:

- (k) Leaflets 2-5, elliptic-obovate; racemes 2 $\frac{1}{2}$ -4 in. long *I. insularis*.

- (kk) Leaflets 5-7, obovate-oblong; racemes under 1 in. long *I. parvula*.

81. PAPILIONACEAE

- (jj) Leaflets 7-11, obovate-oblong; racemes about 1 in. long *I. alternans*.
- KK. Shrubs or undershrubs:
- (l) Pod upcurved and torulose, about $\frac{3}{4}$ in. long; corolla scarlet *I. oblongifolia*.
- (ll) Pod straight, deflexed, 1 or more in. long; corolla purplish *I. schimperii*.
- JJ. Lateral leaflets opposite:
- L. Leaflets usually elliptic or obovate or oblong:
- M. Leaflets 3-7:
- N. Shrubs or undershrubs:
- (m) Leaflets 3 *I. pseudosubulata*.
- (mm) Leaflets usually more than 3:
- (n) Leaflets more than $\frac{1}{2}$ in. long:
- (o) Leaflets not scabrous, 4-6, lanceolate, oblanceolate or oblong
I. quartiniana.
- (oo) Leaflets scabrous particularly beneath, 3-9, elliptic to obovate ... *I. binderi*.
- (nn) Leaflets $\frac{1}{2}$ in. long, obovate, canescent ...
I. argentea.
- NN. Annual or perennial herbs:
- O. Pod 2-4-seeded; stems grey-hoary; leaflets usually 5 *I. semitrijuga*.
- OO. Pod 6-10-seeded:
- (p) Whole plant densely grey- or reddish-brown-hairy; pod densely hairy, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; leaflets usually 5-7
I. hirsuta.
- (pp) Plant not as above; pod appressed-pubescent to nearly glabrous, 1-2 in. long; leaflets usually 3 (rarely 5) ...
I. subulata.
- MM. Leaflets 7-25:
- P. Leaves turning dark-grey to blackish when dry:
- Q. Pod straight:
- (q) Racemes up to 1 in. long . *I. arrecta*.
- (qq) Racemes 2-3 in. long *I. tinctoria*.
- QQ. Pod falcate:
- (r) Pod 3-4-seeded *I. articulata*.
- (rr) Pod 6-8-seeded *I. suffruticosa*.
- PP. Leaves not turning blackish when dry:
- R. Shrubs or undershrubs:
- S. Stems not winged:
- (s) Pod hairy:
- (t) Pod setose; stems clothed with conspicuous long-spreading stiff hairs, often glandular
I. alboglandulosa.

- (tt) Pod canescent like the whole plant *I. argentea*.
- (ss) Pod nearly glabrous when mature; stems brown-pubescent
I. emarginella.
- SS. Stems winged; leaflets ovate or elliptic, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long *I. garckeana*.
- RR. Annual or perennial herbs:
- T. Pod 2-5-seeded:
- U. Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (u) Pod swollen, torulose, grey-pubescent *I. microcarpa*.
- (uu) Pod terete:
- (v) Leaflets 9-13 *I. secundiflora*.
- (vv) Leaflets about 20 *I. barteri*.
- UU. Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (w) Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, linear-oblong
I. rogersii.
- (ww) Pod $\frac{3}{4}$ - $\frac{1}{2}$ in. long, tetragonous
I. astragalina.
- TT. Pod more than 5-seeded:
- (x) Pod 6-8-seeded, densely pubescent; stems densely grey- or reddish-brown-pubescent *I. hirsuta*.
- (xx) Pod 15-20-seeded, pubescent; stems more or less grey-pubescent
I. parviflora.
- LL. Leaflets linear or narrowly oblong-elliptic.
- (y) Pod 1 $\frac{1}{2}$ -2 in. long, 10-15-seeded; keel of flower blunt *I. stenophylla*.
- (yy) Pod 1 in. long, 15-20-seeded; keel of flower beaked or subacuminate *I. costata*.

GROUP 4.

- A. Pod more or less curved, 5-12- (usually 6-8-) seeded, $\frac{1}{2}$ in. broad ...
I. hochstetteri.
- AA. Pod straight or nearly so, 10-12-seeded, about $\frac{1}{2}$ in. broad
I. aspera.

GROUP 5.

- Pod falcate with hooked prickles on the margin *I. echinata*.

Indigofera linifolia (L. f.) Retz.

Copiously branched annual herb 6-9 in. high; stems silky. Leaves sessile, linear, acute, at the apex, 1 $\frac{1}{2}$ -2 in. long, both surfaces, especially the lower one, more or less densely clothed with silky pubescence. Flowers white, in 6-12-flowered closed sessile axillary racemes $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Pod orbicular with an apiculus, silvery-white, 1-seeded.

North-eastern Sudan: 21° N. Kassala: Gallabat.

I. lotononoides Bak. f.

Shrub; stems woody, blackish; branchlets pale-brown. Leaves petiolate, usually 3-foliolate; leaflets oblong or obovate-oblong, under $\frac{3}{4}$ in. long, softly pubescent. Flowers in axillary clusters on slender white-pilose pedicels. Pod subglobose, laterally compressed, mucronate at the apex, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, 1-seeded, shortly white-pilose.

Equatoria: Dar Fertit.

I. capitata Kotschy.

Woody herb or undershrub 2 or more ft. high; branches stiff, slightly puberulous. Leaflets oblanceolate, mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, firm, appressed-pubescent, not at all silvery. Flowers red, small, in head-like clusters $\frac{1}{2}$ -1 in. broad. Pod chestnut-brown, oblong-globose, mucronate at the apex, $\frac{1}{2}$ in. long, 2-seeded, ultimately glabrous.

Central and Southern Sudan.

I. cordifolia Heyne ex Roth.

Bushy herb 6-12 in. high; branches slender, clothed with spreading cottony pubescence. Leaves obovate, cordate at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces more or less densely clothed with cottony pubescence. Flowers red, in 3-6-flowered dense sessile axillary clusters. Pod oblong, cuspidate, $\frac{1}{2}$ in. long, cottony, 1-2-seeded.

Northern and Central Sudan.

I. polysphaera Bak.

I. dewevrei M. Mich.

Erect branched undershrub 2-4 ft. high; branches angled, harshly pubescent. Leaves $1\frac{1}{2}$ -3 in. long, strigillose-scabrous. Flowers orange-red, very small, in rusty-brown heads. Pod very short, villous.

Equatoria.

I. simplicifolia Lam.

I. tetrasperma Vahl.

Erect stiffly branched undershrub 2-5 ft. high, softly grey-silky. Leaves linear or linear-lanceolate up to 4 in. long, appressed-strigose. Flowers pinkish. Pod linear, bluntly tetragonous with a mucro, less than 1 in. long, very minutely pubescent.

Equatoria.

I. arenaria A. Rich.

Erect dwarf densely branched herb; branches silky. Leaves simple and/or 3-5-foliolate, glaucous and more or less silvery on both surfaces. Flowers bright-purple, in subsessile axillary abbreviated racemes. Pod narrow-linear, spreading, mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, more or less silky, 6-8-seeded.

Northern Sudan.

I. achyranthoides Taub.

Appressed grey-pubescent herb; stems short from a woody rhizome. Leaves acutely mucronate at the apex, about $2\frac{1}{2}$ in. long, very closely appressed-puberulous. Racemes spike-like, axillary, up to $3\frac{1}{2}$ in. long; flowers at length reflexed.

Equatoria.

I. bongensis Kotschy & Peyr.

Slender procumbent appressed-silky herb. Leaves simple, nearly sessile, obovate, 1 in. long, green and almost glabrous above, thinly appressed-grey-silky beneath. Flowers rose-pink to purplish, in 20-30-flowered racemes $1\frac{1}{2}$ -2 in. long on firm slender axillary peduncles. Pod linear, straight, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, silky.

Equatoria.

I. knoblecheri Kotschy.

Shrubby herb with appressed-grey bristles. Leaves short-petiolate, simple, lanceolate or oblanceolate, acute at the apex, up to 2-3 in. long, both surfaces scabrous with appressed hairs. Flowers bright-red, in close 20-30-flowered racemes on peduncles exceeding the leaves. Pod slightly upcurved, 1 in. long, hispid.

Equatoria: banks of the White Nile near Gondokoro.

I. tritoides Bak.

Prostrate to procumbent herb. Leaflets oblanceolate to obovate, very acute at the apex, up to 1 in. long but usually less, densely appressed-pubescent. Racemes elongated, lax-flowered. Pod nearly straight, up to $1\frac{1}{2}$ in. long, shortly pubescent.

Red Sea Hills.

I. diphylla Vent.

Hoary erect undershrub 1-2 ft. high, or prostrate and spreading. Leaflets 2, very unequal-sized, the larger one about 1 or more in. long. Flowers red or bright-pink, in dense oblong-conical racemes. Pod curved, long-beaked, about $\frac{1}{2}$ in. long, densely silvery-tomentose.

Central Sudan.

I. conjugata Bak.

I. schweinfurthii Taub.

Shrubby herb; branches sub-tetragonous, thinly coated with white silvery hairs. Leaflets 2, the terminal one on a petiolule $\frac{1}{2}$ in. long, narrowed to both ends, $1\frac{1}{2}$ -3 in. long, the lateral one smaller, sessile, both surfaces grey-silky when young, becoming glabrous later. Flowers yellowish, in more than 20-flowered short-stalked axillary racemes 2-4 in. long. Pod deflexed, linear, compressed, mucronate at the apex, 1 in. long, slightly silky, many-seeded.

Equatoria.

I. spinosa Forsk.

Copiously branched stiff shrub; branches woody, with copious sharp rigid slender spines $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Leaflets 1-3, obovate, mucronate at the apex, up to $\frac{1}{2}$ in. long, both surfaces permanently silvery. Flowers reddish, silky on the outside, 1-6 on short slender pedicels from the spines. Pod linear, mucronate at the apex, up to $\frac{3}{4}$ in. long, silvery when young, subtorulose, 6-9-seeded.

Northern Sudan.

I. strobilifera (Hochst.) Hochst. ex Bak.

Low branched undershrub 1 or more ft. high, all parts covered with loose pale-brownish-silky pubescence. Leaflets 5-7, oblong or lanceolate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces permanently clothed with dense pale-brown loose silky pubescence. Flowers deep-red, small, in heads 1-2 in. long and more than $\frac{1}{2}$ in. broad. Pod oblong, mucronate at the apex, $\frac{1}{2}$ in. long, 2-4-seeded.

Central and Southern Sudan.

I. sparsa var. **bongensis** Bak. f.

Annual herb up to 9 in. high. Leaflets 3-7, oblong or oblong-lanceolate, up to $\frac{1}{2}$ in. long, glaucous and thinly appressed-silky beneath. Flowers red. Pod linear, glabrous.

Equatoria.

I. bracteolata DC.

Much-branched herb from a woody rhizome, 1-2 ft. high. Leaves of the main branches consisting of 1-4 pairs of obovate to nearly orbicular leaflets and a terminal one; leaves of the branchlets simple, both surfaces of leaves and leaflets grey-green, permanently clothed with appressed silky hairs. Flowers salmon or orange-red, small, few on branchlets with a leaf-like bract from the base of each. Pod elliptic, very short, pubescent, 1-2-seeded.

Central and Southern Sudan.

I. pulchra Willd.

Erect undershrub 2-5 ft. high; branches stiff, broom-like, striate, grey-pubescent. Leaflets 3-7, opposite, oblanceolate, $\frac{3}{8}$ - $\frac{1}{2}$ in. long, both surfaces and especially the under one, grey-green and finely pubescent. Flowers salmon or orange-red, small, in golden-tomentose clusters. Pod oblong, about $\frac{1}{2}$ in. long, finely villous, 2-seeded.

Central and Southern Sudan.

I. mittuensis Bak. f.

Erect bushy glandular herb; branchlets strigose, glandular. Leaves 3-5-foliolate or simple; leaflets obovate, rounded and mucronate at the apex, cuneate at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glandular-strigose. Flowers small in many-flowered racemes. Vexillum pubescent outside. Ovary subglabrous.

Equatoria.

***I. pilosa* Poir.**

Herb 1-2 ft. high, branched from the base; branches slender, angular, densely clothed with strong silky hairs. Central leaflet $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, both surfaces grey-green and densely clothed with strong appressed grey hairs, very pale beneath. Flowers pink or purplish, small, solitary on slender pedicels or in usually few-flowered racemes. Pod black when mature, $\frac{3}{4}$ -1 in. long, pilose, 10-12-seeded.

Central and Southern Sudan.

Var. ***multiflora* Bak. f.**

Racemes 8-20-flowered. Pod 7-9-seeded.

Equatoria.

***I. welwitschii* Bak.**

Diffuse copiously branched slender annual herb a few inches to 1 ft. high, sparsely pilose. Leaflets $\frac{1}{2}$ -1 in. long, pale-green, both surfaces with appressed grey bristles. Flowers salmon-red, very small, 4-9 in very lax racemes 1-4 in. long. Pod grey, $\frac{3}{4}$ in. long, much up-curved, becoming glabrous.

Equatoria.

***I. viscosa* Lam.**

Herb somewhat woody at the base, 1-4 ft. high; branches more or less densely coated with stalked glands. Leaflets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces glaucous, thinly silvery. Flowers red, in lax 4-6-flowered racemes on axillary peduncles $\frac{1}{2}$ -1 in. long. Pod linear, mucronate at the apex, $\frac{1}{2}$ -1 in. long, thinly silvery.

Central Sudan.

***I. suaveolens* Jaub. & Spach.**

Erect copiously branched undershrub 1 ft. high; branches coated with silvery pubescence. Leaflets obovate, $\frac{3}{8}$ in. long, both surfaces pale-green, scarcely at all silvery. Flowers solitary or in clusters of 2-4 together on peduncles about $\frac{1}{4}$ in. long. Pod linear, mucronate at the apex, 1 in. long, spreading, subtetragonous, thinly silky.

Central and Southern Sudan.

***I. zenkeri* Harms ex Bak. f.**

Undershrub; stems erect, glandular-pilose. Leaves imparipinnate; leaflets in 4-7 pairs, opposite, elliptic, oblong or obovate-oblong, midrib impressed above, about $\frac{1}{2}$ in. long, strigose-pubescent on both surfaces. Flowers pale-salmon-red, small, in lax-flowered racemes; peduncles $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Pod straight, terete, about $\frac{3}{8}$ in. long, 6-10-seeded, densely stipitate-glandular; seeds reddish-brown.

Equatoria.

I. dendroides Jacq.

Erect branched undershrub 2-3 ft. high; stems slender, wiry. Leaflets in 10-15 pairs, $\frac{1}{2}$ in. long, glaucous, appressed-pubescent. Flowers on long slender peduncles in very lax racemes of 8-20 flowers. Pod subtetragonous, almost glabrous, 10-12-seeded.

Equatoria.

I. oxalidea Welw. ex Bak.

Trailing perennial herb with branched stems, 1 or more ft. long. Leaflets $\frac{1}{2}$ - $\frac{1}{2}$ in. long, bright-green above, glaucous and inconspicuously grey-hispid beneath. Flowers purplish-red, in laxly 6-20-flowered racemes on peduncles $\frac{1}{2}$ - $\frac{1}{2}$ in. long finally 1-1 $\frac{1}{2}$ in. long. Pod deflexed, nearly straight, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, tipped with a persistent style, 3-4-seeded.

Central and Southern Sudan.

I. hendecaphylla Jacq.

Suberect or prostrate herb, woody at the base; stems appressed-grey-pubescent, becoming glabrous. Leaflets $\frac{1}{2}$ -1 in. long, sparsely pubescent above, appressed-pubescent beneath. Flowers reddish-purple in dense racemes 1-4 in. long. Pod deflexed, $\frac{3}{4}$ -1 in. long, almost glabrous when mature, 6-8-seeded.

Widespread.

I. insularis Chiov.

I. alternans var. *paucijuga* Schweinf. ex Broun & Massey.

Perennial herb; stems abundant, green-or grey-silky, more or less prostrate, 4-20 in. long. Leaves 2-5-foliolate; leaflets elliptic-obovate, rounded and mucronate at the apex, shortly cuneate or somewhat rounded at the base, the terminal ones $\frac{3}{4}$ - $\frac{1}{2}$ in. long, the lateral ones $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers in 30-35-flowered racemes 2 $\frac{1}{2}$ -4 in. long. Pod cylindrical, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, densely silky-villous when young, sparsely strigose when old, 1-8-seeded.

Northern Sudan: between Suakin and Berber.

I. parvula Del.

Trailing copiously branched herb; stems 6-9 in. long. Leaflets mucronate at the apex, about $\frac{1}{2}$ in. long, both surfaces thinly silky. Flowers pinkish-white, clustered in 2-4-flowered racemes. Pod spreading, linear, mucronate at the apex, $\frac{1}{2}$ in. long, thinly silky, 5-6 seeded.

Central and Southern Sudan.

I. alternans DC.

Prostrate silvery hairy herb; stems up to 1 ft. long. Leaflets $\frac{1}{2}$ - $\frac{1}{2}$ in. long, both surfaces persistently silvery-canescens, all distinctly petiolulate. Flowers bright-violet, in dense 12-20-flowered racemes about 1 in. long on peduncles often exceeding the leaves. Pod deflexed, $\frac{1}{2}$ in. long, persistently canescens, 5-6-seeded.

Darfur: foothills of Jebel Marra, 5000 ft.



Fig. 81—INDIGOFERA OBLONGIFOLIA Forsk.

I. oblongifolia Forsk.

Fig. 81.

I. paucifolia Del.

Stiff-branched undershrub or shrub sometimes several feet high, grey-glaucous or silvery. Leaflets 3-7, about 1 in. long, glaucous beneath, minutely pubescent and silvery on both surfaces particularly beneath. Flowers scarlet, in many-flowered dense axillary racemes. Pod about $\frac{3}{4}$ in. long, 6-8-seeded.

*Widespread.***I. schimperii** Jaub. & Spach.

Much-branched shrub reaching a height of 10 ft.; branches ascending, silvery, flexuose, woody. Leaflets 5-7, obovate, $\frac{1}{2}$ -1 in. long, both surfaces densely silvery. Flowers purplish, on rather close axillary racemes at first 1 in. long, finally 4-5 in. long. Pod straight, silky when young.

*Northern Sudan.***I. pseudosubulata** Bak. f.

Undershrub 2-3 ft. high; branchlets herbaceous, ascending. Leaflets 3, oblong to elliptic, strigose-pubescent. Flowers "white with red wings," in many-flowered racemes, the flowers crowded towards the top, more laxly arranged below; peduncle $3\frac{1}{4}$ -4 in. long, white-pubescent, usually longer than the leaves. Pod sometimes deflexed, straight or curved towards the top, about $\frac{3}{4}$ in. long, pubescent, 6-7-seeded.

*Equatoria.***I. quartiniana** A. Rich.

Woody erect undershrub 2-3 ft. high; branches ascending, slender, sulcate, thinly silky. Leaflets 1-1 $\frac{1}{2}$ or more in. long, both surfaces thinly pubescent. Flowers purplish, in racemes at first about 1 in. long on peduncles about the same length. Pod linear, tetragonous, spreading or slightly deflexed, mucronate at the apex, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, almost glabrous when mature, 6-10-seeded.

*Red Sea Hills: Soturba Mountains.***I. binderi** Kotschy.

Undershrub; stems angular, striate, scabrous with short stiff hairs. Leaflets 3-7, elliptic to obovate, mucronate and emarginate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces, especially the under one, scabrous. Flowers in fairly dense about 20-flowered racemes on axillary peduncles about 2 in. long. Pod glabrous, 8-9-seeded.

*Southern Sudan.***I. argentea** Burm. f.*I. semitrijuga* (non Forsk.) Broun & Massey.

Canescent undershrub 1 or more ft. high, copiously and diffusely branched. Leaves about $\frac{1}{2}$ in. long; leaflets 5-9, close, sessile, obovate, rounded and mucronate at the apex, about $\frac{1}{2}$ in. long, both surfaces silvery. Flowers small, in short-stalked 6-12-

flowered racemes exceeding the leaves. Pod spreading, linear, mucronate at the apex, $\frac{3}{4}$ in. long, silvery, 3-4-seeded.

Northern and Central Sudan.

1. semitrijuga Forsk.

I. arabica (non Jaub. & Spach) Broun & Massey.

Glaucous hoary silvery herb. Leaflets obovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces silvery. Flowers scarlet, in short axillary 6-12-flowered racemes. Pod linear, mucronate at the apex, about $\frac{3}{4}$ in. long, finely silky.

Northern and Central Sudan.

1. hirsuta L.

Erect or decumbent herb 2-3 ft. high; stems densely clothed with long fine spreading grey-or reddish-brown pubescence. Leaflets 5-7 (rarely 9), obovate, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, grey and thinly silky above, more densely silky beneath with a brown midrib. Flowers scarlet to pink, in moderately dense racemes 2-5 in. long, the inflorescences coloured from golden-brown to dark-blackish-brown. Pod straight, densely covered with grey or brown spreading pubescence, 6-8-seeded.

Central and Southern Sudan.

1. subulata Poir.

Annual or biennial herb 2-3 ft. high, copiously branched; branches thinly silky. Leaflets ovate-elliptic, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, bright-green, nearly glabrous above, appressed-pubescent to nearly glabrous beneath. Flowers salmon to lilac, in about 20-flowered racemes on axillary peduncles 1-2 in. long. Pod linear, deflexed, mucronate at the apex, somewhat torulose, 1-2 in. long, 8-10-seeded.

Northern and Central Sudan.

1. arrecta Hochst. ex A. Rich.

Fig. 82.

Erect branched undershrub; stems sulcate, shortly grey-pubescent. Leaflets in 5-8 pairs, oblanceolate, acute to obtuse and emarginate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces subglaucous, nearly glabrous above, shortly appressed-pubescent beneath. Flowers yellow, in 6-12-flowered racemes, sessile or nearly so. Pod chestnut-brown when mature, deflexed, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, polished, 6-8-seeded.

Central and Southern Sudan.

1. tinctoria L.

I. orthocarpa (DC.) Bak., non C. Presl.

Erect undershrub 2-4 or more ft. high. Leaflets in 4-6 pairs, oblong or obovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, subglaucous, nearly glabrous above, shortly appressed-pubescent beneath. Flowers yellowish or purplish, in lax axillary about 20-flowered racemes. Pod deflexed, 1-1 $\frac{1}{2}$ in. long, nearly glabrous when mature, 8-12-seeded.

Widespread.



Fig. 82—INDIGOFERA ARRECTA Hochst. ex A. Rich.

A, leaf-surface showing hairs. B, hair. C, inflorescence and leaf. D, flower. E, standard. F, wing-petal. G, keel. H, flower with corolla removed. I, anther. J, pistil in longitudinal section. K, fruiting branch. L, pod, showing seeds. M, seed.

I. articulata Gouan.

I. argentea L., non Burm. f.

Copiously branched silvery shrub up to 12 ft. high. Leaflets about 9, obovate, $\frac{3}{4}$ -1 in. long, both surfaces permanently silvery. Flowers yellow, in 12-20-flowered racemes 1-2 in. long. Pod deflexed, falcate, slightly torulose, $\frac{1}{2}$ in. long, nearly glabrous when mature, 3-4-seeded.

Widespread.

I. suffruticosa Mill.

Branched undershrub 3-5 ft. high. Leaflets in about 5-6 pairs, more or less oblanceolate, mucronate at the apex, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, nearly glabrous above, shortly appressed-pubescent beneath. Flowers pale-to deep-red, in axillary racemes 1-3 in. long. Pod deflexed, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, subtetragonous with thickened sutures, thinly pubescent, later nearly glabrous.

Blue Nile Province: Jebel Moya.

I. alboglandulosa Engler.

Erect undershrub about 20 in. high; branchlets glandular-pilose. Leaflets in 4-5 pairs, oblong, obtuse and mucronate at the apex, acute at the base, up to $\frac{1}{2}$ in. long, white strigose-pilose on both surfaces, with intermixed simple and divided hairs some glandular. Flowers red to purple, small, in racemes $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Pod 3-4-seeded.

Equatoria: Imatong Mountains, Loyaru, above Lomuleng, 6000-7000 ft.

I. emarginella Steud. ex A. Rich.

Woody erect undershrub, 3-4 ft. high; branches brown-pubescent, ribbed, not silky or silvery. Leaflets about 9, elliptic or obovate, mucronate at the apex, $\frac{1}{2}$ -1 in. long, minutely pubescent above and beneath. Flowers bright-yellow when fresh, brown when dried, in dense axillary sessile conical racemes 1-1 $\frac{1}{2}$ in. long. Pod linear, mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, nearly straight.

Equatoria.

I. garckeana Vatke.

Shrub with winged stems. Leaflets 7-11, ovate or elliptic, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, finely appressed-or crisped-pubescent beneath. Racemes dense with long linear bracts. Pod reflexed, 2 in. long, densely pubescent, about 15-seeded.

Equatoria.

I. microcarpa Desv.

Annual or biennial, sub-erect or prostrate, grey-pubescent herb. Leaflets 7-11, oblanceolate, both surfaces glaucous and thinly silky, the lower surface also dotted with black glands. Flowers red to pink, small, in dense nearly sessile axillary racemes 1 in. or more long. Pod torulose, 2-3-seeded.

North-eastern Sudan: 21° N.

I. secundiflora Poir.

Woody herb; stems more or less glandular with greyish or sometimes rich brownish-purple pubescence sometimes with an underlying shorter pubescence. Leaflets oblong or obovate, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, both surfaces densely grey-silky. Flowers salmon-red, in dense copious racemes 1 $\frac{1}{2}$ -4 in. long, the flowers tending to be on one side. Pod $\frac{1}{2}$ in. long, straight, horizontal, clothed with spreading grey or rusty often gland-bearing hairs, 2-4-seeded.

Central and Southern Sudan.

I. barteri Hutch. & Dalziel.

Small laxly-branched woody herb 1 or more ft. high; stems grey-appressed-pubescent. Leaflets oblong-obovate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, appressed-pubescent above, densely so beneath. Flowers blue, in several-to many-flowered racemes.

Equatoria.

***I. rogersii* R. E. Fr.**

Perennial herb from a thick rhizome; annual stems decumbent, up to 8 or more in. long, internodes more or less red-coloured and softly white-pilose. Leaflets in 3-5 pairs (rarely 2 pairs), the terminal ones elliptic, rounded and minutely apiculate at the apex, rounded or subcordate at the base, up to $\frac{1}{8}$ in. long, sparsely pilose to glabrous above, long-white-appressed pilose beneath. Flowers violet, small, in 10-15-flowered axillary racemes. Pod linear-oblong, more or less 4-seeded, shortly white-hirsute.

Equatoria.

***I. astragalina* DC.**

Erect hairy annual herb 1-2 ft. high; stems densely clothed with spreading greyish hairs. Leaflets 7-11 (very rarely 5), obovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces persistently clothed with spreading greyish soft hairs but more densely so beneath. Flowers usually deep-red, in dense greyish or light-golden villous racemes 1-2 in. finally 3-4 in. long. Pod deflexed, 2-5-seeded.

Central Sudan.

***I. parviflora* Heyne ex Wight & Arn.**

Erect herb 1-2 ft. high, diffusely branched from the base; branchlets angular, sulcate, more or less appressed-grey-pubescent. Leaflets narrowly oblanceolate to almost linear, rounded to truncate and mucronate at the apex, $\frac{1}{2}$ -1 in. long, thinly pubescent above, silvery appressed-pubescent beneath. Flowers pale-purplish, in sessile or subsessile abbreviated 6-12-flowered axillary racemes much shorter than the leaves. Pod linear, deflexed, slightly recurved towards the apex, 1-1 $\frac{1}{2}$ in. long, 15-20-seeded.

Widespread.

***I. stenophylla* Guillem. & Perrott.**

Erect sparingly-branched undershrub 1-3 ft. high. Leaflets mucronate at the apex, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. apart, both surfaces with short appressed grey hairs. Flowers light-pink, in nearly sessile axillary brownish-silky racemes 2-3 in. long. Pod linear, slightly upcurved and with sutures somewhat thickened, 1 $\frac{1}{2}$ -2 in. long, thinly silky, 10-15-seeded.

Central and Southern Sudan.

Var. *latifolia* A. Rich.

Leaflets oblanceolate. Racemes shorter and fewer-flowered.

Kassala: Gallabat.

***I. costata* Guillem. & Perrott.**

Erect scarcely branched herb up to 18 in. high; stems angular, scabrous, thinly appressed-pubescent. Leaflets elliptic-oblong, $\frac{3}{4}$ -1 in. long, both surfaces pale-green, thinly pubescent above, appressed-pubescent beneath. Flowers rose, in slender axillary racemes 2-3 in. long, as long as or longer than the leaves. Pod

linear, straight, subcompressed, deflexed, about 1 in. long, appressed-pilose, 15-20-seeded.

Darfur: Kulme, 3600 ft.

I. hochstetteri Bak.

I. anabaptista Steud. ex Bak.

Diffusely branched herb 1 or more ft. high; branchlets slender, angular, moderately silvery. Leaflets in 1-3 pairs, oblong-lanceolate, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, both surfaces glaucous and particularly the lower one thinly coated with strong appressed silvery hairs. Flowers pink, in close oblong about 12-flowered racemes not above $\frac{1}{2}$ in. long till fruit is produced. Pod linear, mucronate at the apex, deflexed, more or less curved, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{3}$ in. broad.

Northern and Central Sudan.

I. aspera Perrott. ex DC.

Diffuse herb similar to *I. hochstetteri*. Leaflets usually in 2 pairs, 1- $1\frac{1}{2}$ in. long, otherwise as *I. hochstetteri*. Flowers rose, on pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in. long in axillary 20-30-flowered racemes 2-4 in. long. Pod linear, deflexed, straight, 1- $1\frac{1}{2}$ in. long.

Central and Southern Sudan.

I. echinata Willd.

Copiously branched herb 1-2 ft. high; stems 2-edged, finely pubescent. Leaves simple, elliptic or obovate, mucronate at the apex, $1\frac{1}{2}$ -2 in. long, both surfaces finely pubescent. Flowers in lax axillary 6-10-flowered racemes 1 in. long. Pod oblong-falcate, cuspidate, triquetrous, $\frac{3}{8}$ in. long, 1-seeded, the upper edge entire, the two lower ones each with a double row of strong spreading prickles.

Kordofan: near Muglad.

31. **LABLAB** Adans.

Lablab niger Medic.

Dolichos lablab L.

Herbaceous perennial twiner; stems glabrous or pubescent. Leaflets 3, broadly ovate-rhomboid, acuminate at the apex, $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long, glabrous or nearly so beneath. Flowers white, red-tinged or purple, clustered on the peduncle in long stiff racemes. Pod broadly and slightly falcate, about $2\frac{1}{2}$ in. long, glabrous, beaked by the persistent style.

Widespread. Wild and cultivated.

32. **LATHYRUS** L.

Lathyrus hygrophilus Taub.

Slender herbaceous climber with tendrils. Leaflets 2, oblong or linear-oblong, up to $2\frac{1}{2}$ in. long, glabrous above, sparsely hairy beneath. Flowers light-blue-violet, pale-gold or pink, on usually 1-flowered axillary peduncles shorter than the leaves.

Equatoria: Imatong Mountains, Kippia grassland.



Fig. 83—*LONCHOCARPUS LAXIFLORUS* Guillem. & Perrott.

33. **LONCHOCARPUS** Kunth**Lonchocarpus laxiflorus** Guillem. & Perrott.

Fig. 83.

Deciduous savannah tree up to 40 ft. high; bark rough, light- or dark-grey; slash white or yellow-white exuding a blood-red resin. Leaves imparipinnate, about 1 ft. long; leaflets 5-7, opposite, elliptic, tapering at both ends, 2-6½ in. long, ¾-2 in. broad, decreasing in size from above downwards, grey-green. Flowers pinkish-lilac with a pale-yellow splash on the inside of the standard, in many-flowered panicles up to 2 ft. long, at first erect, later drooping. Calyx dark-purple. Pod pale-brown to straw-colour, 2-4 in. long, ¼-¾ in. broad, membranous, flat, thin.

Central and Southern Sudan.

34. **LOTONONIS** (DC.) Eckl. & Zeyh.**Lotononis platycarpa** (Viv.) P.-Sermolli.*L. leobordea* Benth.

Very variable procumbent, yellowish-silky pubescent herb. Leaflets 3, linear or oblanceolate, up to ¾ in. long. Flowers yellow, in 2-5-flowered sessile clusters. Pod linear-oblong, swollen, about equalling the calyx.

Red Sea Hills.

35. **LOTUS** L.**Lotus corniculatus** L.

Bird's-foot Trefoil.

Decumbent or ascending usually small perennial herb. Leaflets 5 of which the lower pair is close to the stem, obovate or lanceolate-ovate, ½-¾ in. long, glabrous. Flowers yellow or rarely white, in a 4-9-flowered umbel on a peduncle 1-2 in. long, with a 3-foliolate bract. Pod linear, straight, ¾-1 in. long.

Darfur: Jebel Marra.

L. montanus A. Rich.*L. nubicus* Hochst. ex Bak.

Grey-silky procumbent copiously branched perennial herb 3-6 in. high, with a thick rhizome. Leaflets 3-5, shortly petiolate, obovate, cuneate at the base, ¼-½ in. long, conspicuously grey-silky. Flowers reddish-yellow, on 1-4-flowered peduncles with a short-stalked simple bract like a leaflet at the base of the cluster. Pod linear-oblong, terete, ½-¾ in. long, 4-6-seeded.

Northern and Central Sudan.

L. glinoides Del.

Sparsely appressed-pilose decumbent annual herb 12 or more in. high. Leaflets 5, rather fleshy, obovate, cuneate at the base, ½-¾ in. long, glaucous, grey-silky. Flowers reddish, solitary, or in pairs on short axillary pedicels or in 3-4-flowered clusters as if terminal on short leafy branches; bracts 3-foliolate. Pod linear, ¾-¾ in. long, becoming glabrous, slightly torulose, 8-10-seeded.

Northern Sudan.

L. arabicus L.

Prostrate or ascending annual (rarely perennial) herb, woody at the base, 12 or more in. high. Stipules similar to but smaller than the leaflets; leaflets 5, all shortly petiolate, obovate, acute at the apex, cuneate at the base, entire, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous or thinly silky. Flowers reddish-yellow or salmon, usually 2-4 together or rarely solitary on axillary peduncles $\frac{1}{2}$ -1 in. long, with a stalked simple leaflet-like bract at the base of each cluster. Pod terete, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, glabrous, subtorulose, 10-12-seeded.

Widespread.

L. garcini DC.

Undershrub 12 or more in. high; branchlets diffusely branched, twiggly, appressed-grey-pubescent. Leaves scattered; leaflets 3, obovate, cuneate at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, grey-tomentose. Flowers reddish, copious, sessile, solitary, axillary; bracts absent. Pod straight, linear, $\frac{3}{4}$ in. long, glabrous, about 6-seeded.

Central Sudan.

36. MEDICAGO L.**Medicago minima (L.) Bartal.**

Bur Medick.

Annual diffuse downy herb up to 12 in. high. Leaflets 3, obovate, cuneate at the base, finely toothed. Flowers yellow, in short-stalked 2-6-flowered clusters. Pod globose with 2-5 spirals each edged with a double row of hooked prickles, $\frac{1}{2}$ in. broad without the prickles.

Red Sea Hills: Erkowit.

37. MILDBRAEIODENDRON Harms**Mildbraeiodendron excelsum Harms.**

Spreading deciduous forest tree up to 170 ft. high; bole thick and straight with little taper; buttresses small, rounded; bark grey-brown, with regular rectangular scales. Leaves drooping, pale-yellow-green when young; leaflets in 12-16 pairs, lanceolate to oblong (rarely ovate-oblong) 1-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous above, slightly pubescent beneath. Flowers in racemes or short panicles from the axils of the lower leaves. Stamens about 16 borne on the margin of the fleshy disk. Fruit yellow, about the size of a tennis ball, containing a soft yellow-brown pulp.

Equatoria: Azza and Lotti Forests.

38. MILLETTIA Wight & Arn.**Millettia barteri (Benth.) Dunn.**

Lofty woody climber; stems with pith, perhaps sometimes erect. Leaflets in 2-4 pairs, elliptic or obovate-elliptic, abruptly and obtusely acuminate at the apex, 3 $\frac{1}{2}$ -6 in. long, glabrous or nearly so beneath. Flowers pink or red turning purple, in terminal and axillary panicles. Pod oblong-oblancoate, curved, about 3 in. long, tomentose.

Equatoria.

39. **MUCUNA** Adans.**Mucuna pruriens** (L.) DC.

Lofty climber; stems more or less pubescent. Leaflets 3, very obliquely ovate, unequal-sided, acutely acuminate at the apex, up to 6 in. long, appressed-pilose beneath. Flowers dark-purple, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. long, in short-stalked racemes. Pod curved, about $3\frac{1}{2}$ in. long, faintly longitudinally ribbed, covered with orange-brown intensely irritant hairs; seeds small, broadly elliptic, with a short hilum on one side.

Central and Southern Sudan.

M. poggel Taub.

Lofty climber; branchlets striate and covered with a rusty indumentum. Leaflets 3, the terminal one broadly subrhomboid-ovate, the lateral ones very obliquely ovate, $3\frac{1}{2}$ -6 in. long, rusty-pubescent above, grey-silky and prominently nerved beneath. Flowers greenish-white, $3\frac{1}{2}$ in. long, in racemes 10-16 in. long; peduncles grey-silky-tomentose. Pod about 3 in. long, $1\frac{1}{2}$ in. broad, covered with rusty stinging hairs.

Equatoria.

40. **MUNDULEA** (DC.) Benth.**Mundulea sericea** (Willd.) A. Chev.

Fig. 84.

M. suberosa (DC.) Benth.

Shrub or tree up to 25 ft. high, usually with a straight stem and a bushy rounded crown; bark greenish-brown and smooth at first, becoming yellow and corky and fissured with age; branchlets softly tomentellous. Leaflets 12-20, oblong to oblong-lanceolate, $\frac{3}{4}$ -2 in. long and $\frac{1}{4}$ - $\frac{3}{4}$ in. broad, becoming glabrous above, appressed-pubescent beneath. Flowers purple-pink, about $\frac{3}{4}$ in. long, crowded into terminal leaf-opposed racemes up to 6 in. long. Pod pale-brown to yellow, $2\frac{3}{4}$ in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad, flat, indehiscent, finely tomentose, usually 6-8-seeded.

Darfur: Jebel Marra, 6500 ft. Nuba Mountains.

41. **NEORAUTANENIA** Schinz**Neorautanenia pseudopachyrhiza** (Harms) Milne-Redh.*Dolichos pseudopachyrhizus* Harms.

Strong climber with a tuberous root, attaining a length of 6-8 ft.; stems sometimes suberect, glabrous or pale silky-pubescent. Leaflets 3, very broadly and obliquely ovate or rhomboid, acute to obtuse at the apex, up to 6 in. long, thinly pubescent beneath, the terminal leaflet entire to deeply 3-lobed. Flowers bluish-purple to reddish, in axillary leafless long slender racemes. Style glabrous, sharply bent and thickened at the base. Pod $4\frac{1}{2}$ -6 in. long, velvety.

Central and Southern Sudan.



Fig. 84—*MUNDULEA SERICEA* (Willd.) A. Chev.
A, branchlet. B, flower. C, stamens. D, pistil. E, pod.

42. *ORMOCARPUM* Beauv.

Ormocarpum trichocarpum (Taub.) Harms ex Burt-Davy.

Deciduous tree or shrub usually 5-8 ft. high, occasionally attaining 20 ft.; branchlets grey or white, villous at first, becoming glabrous. Leaflets 11-21, oblong, up to $\frac{3}{4}$ in. long, pale-grey-green. Flowers blue-white, thickly mottled and streaked with purple, $\frac{3}{4}$ in. long, persistent, axillary, solitary or paired. Pod 1-2 in. long, densely bristly.

Equatoria: Torit.

43. *PHASEOLUS* L.

Phaseolus adenanthus G. F. W. Mey.

Wide-climbing nearly glabrous perennial herb with a tuberous root. Leaflets 3, broadly ovate, 2 $\frac{1}{4}$ -5 in. long, glabrous beneath except on the nerves, the lateral leaflets unequal-sided. Flowers pink and white turning yellow, glabrous, about 1 in. long, in rather stout 6-12-flowered axillary racemes. Pod linear, 4-5 $\frac{1}{2}$ in. long, nearly flat with thicker margins, 10-or more-seeded.

Central and Southern Sudan.

P. trinervius Heyne ex Wight & Arn.

Slender climber; stems clothed with deflexed grey or tawny hairs. Stipules ovate, striate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long; petiole 2-6 in. long, rusty-silky; leaflets 3, the central one broadly ovate or ovate-rhomboidal, 2-5 in. long, the lateral ones unequal-sided, almost glabrous above, hairy on the nerves beneath. Flowers rose-red, 3-6 close together on long or short slender flexuous peduncles. Pod nearly straight, linear, terete, 2-3 in. long, silky, 10-12-seeded.

Equatoria.

44. **PSEUDARTHRIA** Wight & Arn.**Pseudarthria confertiflora** (A. Rich.) Bak.

Undershrub 3 or more ft. high; branches grooved, yellowish-pubescent. Leaflets 3, elliptic-obovate, rounded to obtuse at the apex, the terminal one about $4\frac{1}{2}$ in. long, rather densely pubescent and strongly red-brown-nerved beneath. Flowers purple, small, arranged in short dense spike-like axillary and terminal racemes about 1 in. long. Pod linear, about $\frac{3}{4}$ in. long, densely pilose, several-seeded.

Equatoria.

P. hookeri Wight & Arn.

Erect stiff-branched undershrub 6-10 ft. high, grey-brown-downy all over. Leaflets 3, obovate to oblanceolate, very undulate on the margin, the terminal one $3\frac{1}{2}$ - $4\frac{1}{2}$ in. long, densely white-tomentose and strongly red-brown-nerved beneath. Flowers white, yellow or pink, small, in copious much-branched terminal panicles. Pod linear, $\frac{3}{4}$ -1 in. long, torulose, downy.

Equatoria.

45. **PSOPHOCARPUS** Neck.**Psopocarpus palmettorum** Guillem. & Perrott.

P. palustris (non Desv.) Broun & Massey.

Twiner with a tuberous root; stems softly tomentellous. Leaflets 3, entire or lobed, the terminal one rhomboidal, broadly rounded at the base, 1- $1\frac{1}{2}$ in. long, the lower surface softly tomentellous. Flowers blue, in moderately dense racemes about 6 in. long with softly tomentellous peduncles. Pod blackish when dry, 4-winged, 2-3 in. long, $\frac{1}{2}$ in. thick without the wings, glabrous, 4-seeded.

Southern Sudan.

46. **PSORALEA** L.**Psoralea plicata** Del.

Undershrub up to 4 ft. high; branches rigid, ribbed, weakly spiny. Leaflets 3, oblanceolate or oblong, about $\frac{1}{2}$ in. long, more or less crenate, closely and minutely glandular-pubescent. Flowers whitish, in stout axillary 6-14-flowered racemes. Pod ultimately black, ellipsoid, pubescent, 1-seeded.

Northern and Central Sudan.

47. **PTEROCARPUS** Jacq.**Pterocarpus lucens** Lepr. ex Guillem. & Perrott.

Deciduous tree up to 60 ft. high; bark smooth; slash yellow-white, exuding blood-red drops. Leaflets 3-11, oblong to elliptic, emarginate at the apex, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, up to $1\frac{1}{2}$ in. broad, shiny, glabrous. Flowers pale-yellow, $\frac{1}{2}$ in. long, in lax racemes up to 6 in. long, borne with or before the leaves. Pod straw-coloured, stipitate, broadly ovate to obovate, up to 2 in. long and 1 in. broad, 1-seeded.

Central and Southern Sudan.

48. **REQUIENIA** DC.**Requienia obcordata** (Lam.) DC.*Tephrosia obcordata* (Lam.) Bak.

Subwoody herb with rather long almost simple branches up to 2-3 ft. long, covered all over with appressed whitish hairs and often adorned with white feathery tassel-like galls. Leaves broadly obovate, sharply mucronate at the apex, cuneate, rounded or sub-cordate at the base, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, with 5-7 pairs of prominent looped lateral nerves. Flowers solitary or paired. Pod elliptic, about $\frac{1}{2}$ in. long, 1-seeded.

Central Sudan.

49. **RHYNCHOSIA** Lour.

- A. Robust subwoody climbers; calyx as long as the constricted pod:
- (a) Corolla red to white; seeds blue *R. albiflora*.
 - (aa) Corolla yellow; seeds not blue *R. resinosa*.
- AA. Twining or rarely suberect herbs or undershrubs; pod exerted and constricted:
- B. Terminal leaflet broad, ovate, rhomboid or ovate-lanceolate:
- C. Calyx subequal to the corolla, the tube short, the teeth long and narrow *R. schweinfurthii*.
- CC. Calyx usually shorter than the corolla, or only as long as it on the lowest tooth:
- D. Stipules minute, setaceous:
- (b) Corolla $\frac{1}{2}$ or more in. long:
 - (c) Leaves nearly glabrous *R. sennaarensis*.
 - (cc) Leaves tomentose *R. splendens*.
 - (bb) Corolla up to $\frac{1}{2}$ in. long but usually less:
 - (d) Leaflets slightly pubescent beneath:
 - (e) Leaflets usually more than 1 in. long; pod 1 in. long, much inflated *R. sublobata*.
 - (ee) Leaflets usually less than 1 in. long; pod $\frac{1}{2}$ - $\frac{2}{3}$ in. long, slightly inflated *R. minima*.
 - (dd) Leaflets densely grey-silky beneath; pod compressed ...
R. memnonia.

DD. Stipules ovate, about $\frac{1}{2}$ in. long:

(f) Pod densely clothed with glands and spreading hairs when young; terminal leaflet acute at the apex

R. viscosa.

(ff) Pod loosely covered with long weak spreading hairs, slightly covered with glands; terminal leaflet acuminate at the apex

R. orthobotrya.

BB. Terminal leaflet lanceolate or oblong-lanceolate, acute:

(g) Stems densely grey-tomentose

R. lynesii.

(gg) Stems pubescent

R. teramnoides.

AAA. Erect or rarely suberect herb; flowers yellow with purple streaks

R. nyasica.

Rhynchosia albiflora (Sims) Alston.

R. cyanosperma Benth. ex Bak.

Robust ornamental twiner. Leaflets obliquely ovate, acutely acuminate at the apex, $3\frac{1}{2}$ -5 in. long, densely and softly tomentose beneath. Flowers cream-coloured but varying from rich-red or violet to white, about $\frac{3}{4}$ in. long, in dense tomentose racemes up to 9 in. long; bracts suborbicular, $\frac{1}{2}$ in. long, densely grey-silky, deciduous. Pod about 1 in. long, grey-velvety.

Equatoria.

R. resinosa (Hochst.) Bak.

Climber; stems glandular-grey-pubescent. Leaflets ovate-rhomboid, acuminate at the apex, up to 3 in. long, shortly pubescent and glandular on the nerves beneath. Flowers yellow or reddish-tinged, in dense or moderately lax racemes 2-3 in. long on firm woody peduncles; bracts ovate, $\frac{1}{2}$ in. long, viscous. Calyx viscous. Pod about $\frac{3}{4}$ in. long, slightly pubescent.

Equatoria.

R. schweinfurthii Harms.

Somewhat pilose climber. Leaflets obovate-orbicular, shortly cuneate at the base, about $1\frac{1}{2}$ in. long, rather densely covered with golden glands beneath but not pubescent except on the principal nerves. Racemes about $1\frac{1}{2}$ in. long, axillary, few and dense-flowered.

Equatoria.

R. sennaarensis Hochst. ex Schweinf.

R. flavissima (Hochst.) Hochst. ex Bak.

Almost glabrous twiner. Central leaflet broad-ovate, 1- $1\frac{1}{2}$ in. long; lateral leaflets very unequal-sided, both surfaces glabrous, or the lower slightly grey-silky when young and golden-gland-dotted. Flowers yellow, $\frac{3}{4}$ in. long, in lax 6-12-flowered racemes 2-4 in. long on spreading peduncles. Pod gradually narrowed to the base, $\frac{3}{4}$ in. long, glabrous when mature.

Widespread.

R. splendens Schweinf.

Erect herb clothed with white tomentum. Leaflets obovate or elliptic, thinly white-silky above, densely clothed with white tomentum beneath. Flowers yellow, in 12-16-flowered racemes exceeding the leaves.

Kassala: Gallabat.

R. sublobata (Schumach.) Meikle.

R. caribaea (non DC.) Broun & Massey.

Twiner; stems more or less pubescent. Leaflets more or less rhomboid-ovate, obtuse to rounded at the apex, up to 2 in. long, more or less pubescent above and beneath. Flowers yellow, red-streaked, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, in lax unbranched racemes 2-6 in. long. Pod 1 in. long, much inflated, minutely puberulous.

Central and Southern Sudan.

R. minima (L.) DC.

Glabrous to slightly pubescent twiner or suberect herb. Leaflets orbicular or broad-ovate, $\frac{1}{2}$ -1 in. in diameter, both surfaces almost glabrous. Flowers yellow, $\frac{3}{8}$ in. long, in lax 6-12-flowered racemes 2-4 in. long. Pod about $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. broad, soon glabrous.

Widespread.

R. memnonia (Del.) DC.

Fig. 85.

R. ferruginea (non A. Rich.) Broun & Massey.

Hoary silky twiner or suberect herb. Leaflets about $\frac{3}{4}$ in. long and broad, appressed silky on both surfaces, and especially on the nerves. Flowers yellow, $\frac{3}{8}$ in. long, in short lax racemes about twice as long as the leaves. Pod curved, narrowed at the base, up to $\frac{3}{4}$ in. long, softly pubescent.

Widespread.

R. viscosa (Roth) DC.

Twiner; stems finely glandular and grey-pubescent. Leaflets sub-orbicular or broadly ovate-rhomboidal, acute at the apex, thinly pubescent beneath. Flowers yellow with or without purple streaks, in lax racemes up to 6 or more in. long on firm peduncles. Pod 1-1 $\frac{1}{2}$ in. long, $\frac{3}{8}$ - $\frac{1}{2}$ in. broad, densely covered when young with glands and spreading hairs.

Central and Southern Sudan.

R. orthobotrya Harms.

R. viscosa (non DC.) Broun & Massey p.p.

Twiner; stems glandular-pubescent. Stipules large and conspicuous, persistent, about $\frac{1}{2}$ in. long; leaflets 3, the central one suborbicular or broadly ovate-rhomboid. Flowers yellow, heavily streaked with deep purple, in slender pedunculate racemes. Pod reflexed, acuminate at the apex, about 1 $\frac{1}{2}$ in. long, loosely covered with long, weak, spreading hairs, viscous at the base.

Equatoria.



Fig. 85—*RHYNCHOSIA MEMNONIA* (Del.) DC.

A, flowers. B, standard, wing and keel. C, calyx and staminal tube. D, longitudinal section of flower. E, buds, and leaf with stipules. F, fruits. G, seeds.

R. lynesii Bak. & Martin.

Shrubby herb; stems half-climbing, grey-tomentose. Leaves 3-foliolate, alternate; leaflets prominently nerved and densely grey-tomentose on both surfaces, the terminal leaflet $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the lateral leaflets smaller. Flowers yellow, 1-3 on a peduncle shorter than the leaves. Pod somewhat mucronate at the apex, about $\frac{3}{4}$ in. long, more or less 2-seeded.

Darfur: Jebel Marra.

R. teramnoides Harms.

Slender twiner. Leaflets lanceolate, acute at the apex, 1-2 in. long, minutely pubescent beneath, strongly reticulate. Flowers in short several-flowered axillary racemes. Calyx silky-pubescent. Pod curved, $\frac{3}{4}$ in. long.

Equatoria.

R. nyasica Bak.

R. glutinosa Harms.

Erect to suberect herb; branches lax, pubescent, slightly viscid. Leaflets broadly ovate, shortly acuminate at the apex, rounded or cordate at the base, up to $1\frac{1}{2}$ in. long, pubescent above and beneath. Flowers yellow with purple streaks, few to several in slender racemes a little longer than the leaves. Pod $1\frac{1}{2}$ in. long, slightly pubescent.

Equatoria.

50. **ROTHIA** Pers.**Rothia hirsuta** (Guillem. & Perrott.) Bak.

Small branched annual herb about 6 in. high; branches long-silky pubescent. Leaflets 3, subsessile, oblanceolate, acute at the apex, about $\frac{3}{4}$ in. long, silky-pilose on both surfaces. Flowers pink or lilac, small, in 2-5-flowered axillary clusters. Pod sessile, about $\frac{3}{4}$ in. long, silky-pilose, several-seeded.

Central Sudan.

51. **SESBANIA** Scop.

A. Pod long-linear, without wings but margins usually thickened:

B. Plant glabrous or slightly pubescent only when young:

C. Herbs:

D. Plant usually unarmed:

(a) Leaflets $\frac{3}{4}$ - $1\frac{1}{4}$ in. long:

(b) Pod scarcely indented between the seeds, about $\frac{3}{8}$ in. broad, curved *S. pachycarpa.*

(bb) Pod strongly constricted between the seeds, up to $\frac{1}{2}$ in. broad, nearly straight *S. arabica.*

(aa) Leaflets up to $\frac{3}{4}$ in. long; standard yellow, mottled with numerous fine purple spots *S. microphylla.*

DD. Plant usually armed particularly on the leaf-rhachis

S. cannabina.

CC. Shrubs or small trees:

E. Stems and leaf-rhachis armed *S. macrantha*.

EE. Stems and leaf-rhachis not armed:

F. Pod twisted, distinctly torulose; inflorescences not branched *S. sesban*.

FF. Pod not twisted, not torulose when mature; inflorescences branched *S. punctata*.

BB. Plant pubescent or villous; pod 4-6½ in. long *S. pubescens*.

AA. Pod linear, broadly 4-winged *S. tetraptera*.

Sesbania pachycarpa DC.

Glabrous erect glaucous annual herb up to 3 ft. high; stems erect, soft, pithy, glabrous. Leaves several times longer than the inflorescence; leaflets linear-oblong, about ¾ in. long, minutely punctate with black spots. Flowers yellow densely mottled with dark spots, about ¼ in. long, in short few-flowered (sometimes only 2-3-flowered) inflorescences. Pod erect, curved, 6-12 in. long, ½ in. broad; seeds separated by partitions of the endocarp.

Central and Southern Sudan.

S. arabica Steud. & Hochst. ex Phillips & Hutch.

Tall herb; stems glabrous, sometimes very slender and decumbent. Leaflets linear-oblong, about ¾ in. long, glaucous-green. Flowers yellow finely mottled with purple, 2-3 in each inflorescence. Pod erect, nearly straight, up to 10 in. long, the margins much constricted between the seeds.

Central and Southern Sudan.

S. microphylla Harms ex Phillips & Hutch.

S. mossambicensis (non Klotzsch) Broun & Massey.

Erect branching herb up to 6 ft. high. Leaflets oblong or elliptic, obtuse and shortly mucronate at the apex, punctate above with minute black dots. Flowers in 2-8-flowered axillary racemes. Pod up to 9 in. long, linear, laterally compressed, eventually more or less moniliform.

Equatoria.

S. cannabina (Retz.) Pers.

S. aculeata Pers.; *S. punctata* (non DC.) Broun & Massey.

Herb often tall and occurring in swampy places; stems usually armed with prickles or rarely smooth, glabrous, erect, branched from the base, often thick and pithy and reaching 15 ft. high. Leaf-rhachis often armed; leaflets linear-oblong, about ¾ in. long. Flowers yellow, few to several in each inflorescence. Pod straight or slightly curved, 6-10 in. long, the margins only very slightly indented between the seeds.

Central and Southern Sudan.

S. macrantha Welw. ex Phillips & Hutch.

Shrub or tree up to 15 ft. high; stems, leaf-rhachis as well as the lower part of the inflorescence usually prickly. Stipules up to $\frac{1}{2}$ in. long; leaflets in 5-40 pairs, about $\frac{1}{2}$ in. long. Flowers yellow, in 6-20-flowered inflorescences up to 8 in. long. Pod up to 12 in. long, about $\frac{1}{2}$ in. broad, with thickened sutures.

Equatoria: *Imatong Mountains*.

S. sesban (L.) Merr.

S. aegyptiaca (Poir.) Pers.

Tall shrub or small tree, copiously branched. Leaflets oblong, up to $1\frac{1}{2}$ in. long but usually smaller. Flowers yellow. Pod long-acuminate at the apex, transversely divided, up to 6 in. long, glabrous, twisted, distinctly torulose.

Widespread.

Var. *bicolor* (Wight) F. W. Andr., comb. nov.

S. aegyptiaca var. *bicolor* Wight.

Flowers with the upper petal suffused with purple.

Widespread.

S. punctata DC.

Shrub or small tree up to 12 ft. high, copiously branched, more or less pale-glaucous. Leaflets oblong-linear, mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers yellow finely spotted with purple, in up to 20-flowered branched inflorescences. Pod slender, up to $9\frac{1}{2}$ in. long.

Equatoria.

S. pubescens DC.

Slender shrub often occurring in moist places; branches densely grey-silky. Leaflets in 12-30 pairs, elongate-oblong, up to $1\frac{1}{2}$ in. long, densely grey-silky. Flowers yellow, not spotted, in 6-12-flowered racemes on short silky peduncles. Pod slightly falcate, 4- $6\frac{1}{2}$ in. long, 20-30-seeded, glabrous.

Southern Sudan.

S. tetraptera Hochst. ex Bak.

Shrubby herb up to 4 ft. high. Leaf-rhachis, as well as the branches towards the base, often more or less densely prickly. Leaflets in 15-20 pairs, linear-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, both surfaces glabrous and glaucous. Flowers deep-yellow, in 2-7-flowered racemes. Pod 5-6 in. long, glabrous, broadly 4-winged.

Central Sudan.

52. SMITHIA Ait.

Smithia schweinfurthii Taub.

Erect shrubby herb; stems simple, the younger ones armed with almost prickly hairs above, long-pilose below, the adult stems almost glabrous. Leaves shortly-petiolate, the rachis armed as the young stems; leaflets in 9-13 pairs, obliquely linear-oblong and shortly falcate, acute and mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 3-nerved at the base, the midrib sparsely armed with stiff hairs and a few long ones otherwise glabrous on both surfaces. Flowers reflexed in short-peduncled densely bracteate axillary racemes; bracts ovate-orbicular, subamplexicaul, the margin hispid-ciliate.

Equatoria.

S. africana (Endl.) Taub.

S. kotschyi Benth.

Bush 6-12 ft. high, occasionally a tree up to 25 ft. often on damp sites; branchlets aromatic, densely clothed with weak yellow viscid bristles. Stipules persistent, ovate-lanceolate, up to $\frac{1}{2}$ in. long; leaflets in 15-25 pairs, falcate, linear to oblong, acute and mucronate at the apex, the largest one about $\frac{1}{2}$ in. long. Flowers orange, about $\frac{3}{4}$ in. long, in short axillary racemes; pedicels $\frac{1}{2}$ in. long with a pair of rigid persistent lanceolate bracteoles at the apex. Calyx $\frac{3}{4}$ in. long, bristly on the back. Pod glabrous, with 7-8 rounded articulations.

Blue Nile Province: Fazoghli; Sennar.

S. volkensis Taub.

Much-branched shrub or undershrub about 3 ft. high; branchlets hispid-viscous. Leaflets in 10-14 pairs, obliquely linear-oblong, subacute at the apex, hispid impressed-punctate beneath. Flowers lilac or white veined with purple, in terminal or lateral elongate heads on short golden-hispid peduncles.

Equatoria: Imatong Mountains, Ibahin.

53. SPHENOSTYLIS E. Mey.

Sphenostylis schweinfurthii Harms.

Erect undershrub 3-5 ft. high. Leaflets 3, lanceolate or linear-lanceolate, rounded and mucronate at the apex, up to $5\frac{1}{2}$ in. long, with a conspicuous cartilaginous margin. Flowers yellow, $\frac{3}{4}$ in. long, several on axillary peduncles. Pod linear, $4-4\frac{1}{2}$ in. long, slightly pubescent.

Equatoria.

S. stenocarpa (Hochst.) Harms.

Strong climber with a tuberous root. Leaflets 3, ovate, acuminate at the apex, up to $5\frac{1}{2}$ in. long. Flowers mauve-pink or purple, 1 in. long, few on stout axillary peduncles. Pod linear, flat, up

to 12 in. long, both margins raised, glabrous; seeds pale-coloured or marbled, ellipsoid, about $\frac{3}{4}$ in. long, smooth.

Kassala: Gallabat. Equatoria.

54. STYLOSANTHES Sw.

Stylosanthes flavicans Bak.

Copiously branched ascending undershrub or shrub; branches densely clothed with short yellowish pubescence. Leaflets oblanceolate, narrowed to both ends, long-mucronate at the apex, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, prominently nerved, both surfaces nearly glabrous. Flowers in dense oblong terminal heads. Pod with two articulations, about $\frac{1}{2}$ in. long, both faces and remains of style densely silky.

Kordofan. Equatoria: Wandi, River Yei,

55. TAVERNIERA DC.

Taverniera aegyptiaca Boiss.

Much-branched low shrub with slender twigs. Leaves simple, obovate, cuneate at the base, about $\frac{1}{2}$ in. long, nearly glabrous. Flowers red, on 1-2-flowered axillary more or less silky peduncles $\frac{1}{2}$ in. long. Pod shortly stipitate, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, with 2-3 joints, densely bristly on the faces.

Northern Sudan.

T. lappacea (Forsk.) DC.

Shrub; stems procumbent, branched, wide-spreading. Leaflets 3, fleshy, obcordate, about $\frac{1}{2}$ in. long, villous. Flowers yellowish, 1-2 together, axillary, shortly stalked. Joints of the pod covered with rigid bristles hooked at the apex.

Northern Sudan.

56. TEPHROSIA Pers.

A. Pod 2-many-seeded, oblong-linear or linear:

B. Calyx $\frac{1}{2}$ - $\frac{1}{3}$ in. long:

C. Leaves digitate; leaflets densely downy beneath; flowers in racemes *T. lupinifolia*.

CC. Leaves pinnate:

D. Leaves usually 3-foliolate, rarely some 1-foliolate or 5-foliolate, silvery-white beneath; flowers axillary; pod about $2\frac{1}{2}$ in. long, densely silky-villous ... *T. elegans*.

DD. Leaves 5- or more-foliolate:

E. Flowers axillary (rarely also in racemes); pod 1 or more in. long:

(a) Leaflets oblanceolate or narrow-oblanceolate:

(b) Pod 8-12-seeded:

(c) Pod densely clothed with light-grey pubescence; flowers white, often fading to pink

T. uniflora.

- (cc) Pod densely clothed with dark rusty-coloured pubescence; flowers yellow *T. emeroides*.
- (bb) Pod 6-8-seeded:
- (d) Pod 1-1½ in. long, pubescent; flowers purple
T. subtriflora.
- (dd) Pod 1½-2 in. long, densely appressed-grey-downy; flowers dull-pale-red *T. pentaphylla*.
- (aa) Leaflets obovate-oblong, the lower ones often as broad as long; flowers purplish *T. vicioides*.
- EE. Flowers in racemes:
- F. Flowers not more than ½ in. long:
- G. Racemes short, moderately dense, 6-12-flowered; leaflets in 4-6 pairs, 1-2½ in. long:
- (e) Pod at length slightly pubescent; herb or under-shrub *T. platycarpa*.
- (ee) Pod densely downy; herb *T. nana*.
- GG. Racemes lax:
- (f) Leaflets linear or linear-oblong:
- (g) Leaflets 3-9, thinly silky beneath; flowers 2-4 on thread-like peduncles; pod 5-8-seeded
T. gracilipes.
- (gg) Leaflets 5-17, conspicuously silvery-canescent beneath; racemes 4-8-flowered; pod 12-18-seeded *T. linearis*.
- (ggg) Leaflets 8-12, not silvery-canescent beneath but with tawny midribs; racemes 3-4-flowered ...
T. fulvinervis.
- (ff) Leaflets oblanceolate to obovate:
- (h) Leaflets 5-7 (rarely 9); racemes 6-16-flowered ...
T. apollinea.
- (hh) Leaflets 9 or more; racemes 6-20-flowered; pod 1½-2 in. long, more or less pubescent
T. purpurea.
- FF. Flowers ¼-½ in. long:
- H. Racemes much interrupted; leaflets 7-15; pod 9-10-seeded, densely brown-silky-pubescent with a dark margin *T. dichrocarpa*.
- HH. Racemes not interrupted, long, lax or somewhat dense:
- (j) Leaflets silvery-silky beneath, linear
T. pseudolongipes.
- (jj) Leaflets not silvery beneath:
- (k) Leaves nearly sessile; leaflets 2-3 in. long; pod 9-14-seeded *T. bracteolata*.
- (kk) Leaves petiolate, the petiole ¼-1 in. long; leaflets 1½-2½ in. long; pod 15-16-seeded
T. barbiger.
- BB. Calyx ½ or more in. long:
- (l) Flowers deep-mauve, in dense heads or short dense racemes; midrib of leaflets prolonged *T. atro-violacea*.

- (ll) Flowers in racemes; midrib of leaflets not prolonged:
 (m) Herb or undershrub; pod 2 in. long *T. ehrenbergiana*.
 (mm) Erect shrub; pod 4-5 in. long *T. vogelii*.
 AA. Pod 1-seeded, elliptic-oblong, covered with long white silky hairs *T. nubica*.

***Tephrosia lupinifolia* DC.**

Wide-trailing perennial herb; stems covered with soft spreading hairs. Leaflets 5-7, rarely 3, grey-green, narrow-oblongate, 1½-2 in. long, densely downy beneath. Flowers reddish, in lax terminal and axillary racemes about 12 in. long. Pod linear, sometimes oblong, 1-1½ in. long, downy, usually 5-6-seeded, but some may be shorter and only 1-2-seeded.

Central Sudan.

***T. elegans* Schumach.**

Undershrub up to 4-5 ft. high, densely silvery-hairy. Leaflets linear-oblongate, deeply emarginate or mucronate at the apex, up to 4½ in. long, with numerous ascending nerves nearly hidden beneath by the dense silky whitish hairs. Flowers pale-yellow, 2-3 together, ¾ in. long.

Equatoria.

***T. uniflora* Pers.**

Fig. 86.

T. lathyroides Guillem. & Perrott.; *T. anthylloides* Hochst. ex Bak.

Low herb to undershrub often much-branched from the base, often decumbent, grey-silky. Leaflets in 2-6 pairs, oblongate, ¾-1½ in. long, more or less villous beneath. Flowers usually axillary, 1-3 together. Pod 1½-2½ in. long.

Widespread.

***T. emeroides* A. Rich.**

Woody herb; stems angular, thinly grey-silky. Leaflets in 2-4 pairs, oblongate, ¾-1 in. long, glabrous above, appressed-grey-silky beneath. Flowers in 1-3-flowered axillary racemes. Pod 1½-2 in. long, 10-seeded.

Central Sudan.

***T. subtriflora* Hochst. ex Bak.**

Herbaceous perennial 1½-2 ft. high, dichotomously branched from the base; branches firm, densely clothed with short spreading grey-silky hairs. Leaflets in 2-3 pairs, narrowly oblongate, the terminal one 1-1½ in. long, the remainder smaller, glabrous above, appressed-grey-silky beneath. Flowers purple, 1-3 in the leaf-axils.

Northern and Central Sudan.



Fig. 86—*TEPHROSIA UNIFLORA* Pers.

A, flower. B, standard, wing and keel. C, staminal tube with upper stamen detached. D, complete staminal tube. E, longitudinal section of flower. F, pod dehiscing. G, seeds.

T. pentaphylla (Roxb.) Sweet ex Gamble.

Erect copiously-branched herb or undershrub, densely clothed with appressed-grey-silky hairs. Leaflets 5, oblanceolate or narrow-oblanceolate, cuneate at the base, emarginate at the apex, 1-2 in. long, glabrous and dark-green above, densely appressed-grey-silky beneath. Flowers dull-pale-red, 1-2 together, axillary.

Kassala: Ghadambaliya.

T. vicioides A. Rich.

Herbaceous perennial 1½-2 ft. long; branches finely grey-pubescent. Leaflets in 3-4 pairs, up to ½ in. long, deeply emarginate at the apex, both surfaces particularly the lower finely appressed-grey-silky. Flowers all axillary, 1-2 together. Pod 1 in. long, finely grey-downy, 6-9-seeded.

Northern and Central Sudan.

T. platycarpa Guillem. & Perrott.

T. humilis Guillem. & Perrott.

Herb or undershrub ½-1½ ft. high, woody at the base; stems annual, thinly villous. Leaflets broadly linear to oblong, truncate or emarginate at the apex, 1½-1¾ in. long, about ½ in. broad, thinly appressed-pilose beneath. Flowers pink or purple. Pod linear, 1½-2 in. long, with thickened margins.

Equatoria.

T. nana Kotschy.

Herb up to 12 in. high; stems slender, angular, moderately thickly clothed with spreading grey-to yellow-silky hairs. Leaflets in 4-6 pairs, oblanceolate to oblong, rounded and emarginate at the apex, 1-2 in. long, ½-¾ in. broad, glabrous to finely pubescent above, finely pubescent beneath. Flowers purple, less than ½ in. long, in 6-12-flowered dense racemes.

Kassala: Gallabat. Fung District: Fazoghli. Upper Nile: Meshra el Zeraf.

T. gracilipes Guillem. & Perrott.

Erect slender annual herb 1 or more ft. high, thinly appressed-grey-silky. Leaflets up to 1½ in. long, glabrous above. Flowers reddish-purple, small; peduncles ½-1 in. long. Pod ¾-1 in. long, finely downy.

Kassala: Gallabat. Nuba Mountains.

T. linearis (Willd.) Pers.

Erect copiously branched perennial herb 1-3 ft. high; branches slender, more or less grey-pubescent. Leaflets 1-1½ in. long, glabrous above. Flowers pink or orange-red in very lax racemes. Pod linear, 1½-2¼ in. long, finely downy.

Central and Southern Sudan.

T. fulvinervis Hochst. ex A. Rich.

Herb or undershrub 2-3 ft. high; stems terete, striated, tawny-silky. Leaflets $1\frac{1}{2}$ -2 in. long, nearly glabrous above, appressed-grey-silky with tawny midrib beneath. Flowers 3-5, distant, short-stalked; peduncle axillary, 3-4 in. long, more or less tawny-silky. Pod 2-2 $\frac{1}{2}$ in. long, appressed-silky.

Kordofan.

T. apollinea (Del.) DC.

Bushy plant 12-18 in. high, diffusely branched from the base. Leaflets $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, more or less pubescent above and beneath. Flowers red, in lax 6-16-flowered terminal or axillary racemes. Pod linear, $1\frac{1}{4}$ -1 $\frac{3}{4}$ in. long, glabrous or pubescent, 6-9-seeded.

Northern and Central Sudan.

T. purpurea (L.) Pers.

T. leptostachya DC.

Copiously branched herbaceous perennial 1-2 ft. high; stems firm, slender, glabrous or pubescent. Leaflets oblanceolate, $\frac{1}{2}$ -1 in. long, both surfaces grey-green, more or less glabrous above, more or less densely appressed-pubescent beneath. Flowers pink or purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in lax 6-20-flowered terminal and axillary racemes 3-6 in. long. Pod linear, glabrous or more or less pubescent, 5-12-seeded.

Central and Southern Sudan.

T. dichrocarpa Steud. ex A. Rich.

Much-branched shrub up to 10 ft. high; stems thinly appressed-grey-silky. Leaflets in 5-7 pairs, oblanceolate to narrowly oblong, long-mucronate at the apex, 1-1 $\frac{1}{2}$ in. long, glabrous above, more or less pubescent beneath. Flowers crimson, $\frac{3}{4}$ in. long, in terminal racemes, the flowers in distant clusters of 4-6 each. Pod 2 or more in. long, $\frac{1}{4}$ in. broad, densely and finely silky, 9-10-seeded.

Equatoria: Imatong Mountains, near Itobol camp, 6350 ft.

T. pseudolongipes Bak. f.

T. longipes (non Meisn.) Broun & Massey.

Erect herb. Leaflets in 4-5 pairs, linear, elongate, 2 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, glabrous above. Flowers purple, in 6-20-flowered elongated racemes. Calyx brown-tomentose. Pod narrow, 2-2 $\frac{1}{2}$ in. long, more or less pubescent.

Central Sudan.

T. bracteolata Guillem. & Perrott.*T. kotschyana* Hochst. ex Bak. f.

Erect branched undershrub 2-3 ft. high; branches appressed-brown-silky. Leaflets in 6-15 pairs, linear or oblanceolate, 2-3 in. long, glabrous above, slightly appressed-grey-silky beneath. Flowers pink to purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in lax terminal or leaf-opposed 6-20-flowered racemes 4-6 in. long. Pod 2-3 in. long, finely grey-silky.

*Central and Southern Sudan.***T. barbiger**a Welw. ex Bak.

Undershrub 2-4 ft. high; stems clothed with spreading tawny pubescence. Leaflets 11-15, narrowly oblanceolate, grey-green, becoming glabrous above, permanently grey-silky beneath, the midrib and sometimes the border tawny. Flowers purplish, in long-stalked usually terminal few-flowered racemes. Pod linear, about $2\frac{1}{2}$ in. long, finely grey-downy.

*Equatoria: Mount Nakbi between Yambio and Tembura.***T. atro-violacea** Bak. f.

Shrub 6 ft. high; stems as well as the leaf-rhaches yellow-brown-silky. Leaflets oblong or oblong-lanceolate, up to $1\frac{1}{2}$ in. long, nearly glabrous above, grey-pubescent beneath, the midrib rusty-pubescent and prolonged $\frac{1}{8}$ in. beyond the lamina, the margin sometimes rusty-pubescent. Flowers deep-mauve, in dense heads. Calyx densely yellow-brown tomentose. Pod about $2\frac{1}{2}$ in. long, dark-velvety, more or less 9-seeded.

*Equatoria: Imatong Mountains, above Kippia, 9000-10,000 ft.***T. ehrenbergiana** Schweinf.*T. incana* (non Grah.) Broun & Massey.

Herb or undershrub $1\frac{1}{2}$ -3 ft. high; stems densely clothed with woolly grey pubescence. Leaflets in 3-10 pairs, rounded and mucronate or emarginate at the apex, 1- $1\frac{1}{2}$ in. long, thinly grey-silky above, densely so beneath. Flowers reddish, about $\frac{1}{2}$ in. long, in terminal and axillary racemes 6-12 in. long, the lower flowers in clusters of 3-4 together an inch apart. Pod deflexed, 2 in. long, densely and permanently long-silky, 6-9-seeded.

*Central and Southern Sudan.***T. vogelli** Hook. f.

Erect shrub 6-10 ft. high, clothed with dense yellowish or rusty tomentum. Leaflets $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, almost glabrous above, densely appressed-grey-silky beneath, the midrib rust-coloured. Flowers red, white, or violet-purple, about 1 in. long, in 20-30-flowered dense stalked terminal racemes 4-6 in. long. Pod straight or slightly upcurved, 4-5 in. long, densely grey-or brown-velvety, 16-18-seeded.

Equatoria.

T. nubica (Boiss.) Bak.

Much-branched undershrub 12-18 in. high; branches densely white-silky-pubescent. Leaflets in 3-7 pairs, oblanceolate, 1-1½ in. long, both surfaces pale, and especially the lower one densely white-silky. Flowers purple or pinkish, in 6-20-flowered terminal or leaf-opposed racemes 3-6 in. long. Pod ½-¾ in. long.

Northern and Central Sudan.

57. **TERAMNUS** Browne**Teramnus labialis** (L.f.) Spreng.

Herbaceous twiner; stems softly pubescent or pilose. Leaflets 3, oblong or ovate to ovate-lanceolate, mucronate at the apex, 1½-3 in. long, appressed-pilose beneath. Flowers reddish, in axillary few-flowered racemes about as long as the leaves. Pod linear, flat, 1½-2½ in. long, usually sparingly pubescent, with a hook at the apex.

Widespread.

T. axilliflorus (Kotschy) Bak. f.

Herbaceous twiner; stems reddish-or grey-pubescent. Leaflets 3, linear-oblong, rounded or obtuse at the apex, up to 3½ in. long, ¼ in. broad, glabrous above, more or less pilose beneath. Racemes few-flowered. Pod more or less pilose, 8-12-seeded.

Upper Nile.

58. **TRIFOLIUM** L.

A. Petioles fused with the stipules almost throughout their length:

(a) Calyx-nerves 15-20; leaflets narrowly oblanceolate-linear
T. simense.

(aa) Calyx-nerves 10-12; leaflets broadly oblanceolate
T. polystachyum.

AA. Petioles largely free from the stipules (at least in the lower leaves):

B. Flowers 2-6, shortly pedicellate; calyx-nerves 15-20; pod up to 9-seeded *T. multinerve.*

BB. Flowers in heads of 10 or more; calyx-nerves 12 or fewer:

C. Fruiting calyx accrescent, about ⅜ in. in diameter, reticulately veined:

(b) Annual; fruiting calyx tomentose *T. tomentosum.*

(bb) Perennial; fruiting calyx almost glabrous ... *T. fragiferum.*

CC. Fruiting calyx not or hardly accrescent, not reticulately veined:

(c) Calyx densely silky-tomentose; teeth several times as long as the tube, greatly exceeding the corolla ... *T. arvense.*

(cc) Calyx glabrous or nearly so:

(d) Corolla yellow, the standard accrescent and becoming flat and membranous; terminal petiolule much longer than the lateral ones *T. campestre.*

(dd) Corolla purple, the standard not accrescent; petiolules of equal length *T. rueppellianum.*

Trifolium simense Fresen.

Herb 6-18 in. high, dichotomously branched from the base; stems glabrous or slightly pubescent. Leaflets linear-oblongate, sharply toothed, rigid, up to $1\frac{1}{2}$ in. long. Flowers red-mauve or purplish-violet, in heads about $\frac{1}{2}$ in. in diameter on rather short tomentose peduncles.

Equatoria: Imatong Mountains, Kippia, 8700 ft.

T. polystachyum Fresen.

Erect or procumbent annual herb; stems striate, becoming glabrous. Leaflets obtuse and mucronate at the apex, glabrous or slightly pubescent. Flowers pale-purple, in dense heads. Pod oblong-globose.

Equatoria: Imatong Mountains, Mount Kineti summit, 10,400 ft.

T. multinerve A. Rich.

Annual herb 6-12 in. high, glabrous, dichotomously and diffusely branched. Leaflets sessile, oblongate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the upper half sharply toothed. Flowers red-purple, up to $\frac{3}{8}$ in. long, on 1-6-flowered peduncles about $\frac{1}{2}$ in. long. Pod oblong, up to 9-seeded.

Equatoria: Imatong Mountains, Mount Kineti summit, 10,400 ft.

T. tomentosum L.

Annual erect herb up to 12 in. high, glabrous. Flowers pink, in heads. Calyx in fruit covered with a cloth-like dense woolly tomentum. Pod ovoid, compressed.

Red Sea Hills: Erkowit.

T. fragiferum L.

Strawberry-headed Trefoil.

Perennial herb; stems tufted, procumbent, rooting at the nodes. Leaflets almost sessile, oblong-obovate, up to $\frac{1}{2}$ in. long. Flowers pale-rose, in dense heads about $\frac{1}{2}$ in. broad. Pod ovoid, 1-2-seeded.

Red Sea Hills: Erkowit.

T. arvense L.

Hare's-foot Trefoil.

Copiously branched erect annual herb 6-12 in. high. Leaflets linear to obovate, about $\frac{1}{2}$ in. long. Flowers reddish, in dense stalked oblong heads. Calyx densely silky, the teeth densely ciliate with long silky hairs. Pod sessile.

Red Sea Hills: Erkowit.

T. campestre Schreb.

Hop Trefoil.

T. procumbens (non L.) Broun & Massey.

Annual herb 6-12 in. high. Leaflets obovate, cuneate at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers in dense round stalked heads.

Red Sea Hills: Erkowit.

T. rueppellianum Fresen.

Perennial herb 1-2 ft. long, diffusely branched, glabrous. Stipules about $\frac{3}{4}$ in. long, tailed-acuminate at the apex; leaflets obovate-elliptic, sharply serrulate, cuneate at the base, up to 1 in. long, glabrous, strongly nerved. Flowers purple, in pedunculate ovoid-globose heads about $\frac{1}{2}$ in. in diameter. Pod oblong, apiculate, 2-seeded.

Equatoria: Imatong Mountains, Atiaro.

59. **TRIGONELLA** L.**Trigonella hamosa** L.

Herbaceous annual herb 1 or more ft. high, diffusely branched; stems glabrous. Leaflets obovate, cuneate at the base, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, the upper half inciso-crenate, the terminal leaflet on a stalk about $\frac{1}{2}$ in. long. Flowers pale-yellow, in copious short axillary 6-12-flowered racemes. Pod linear, distinctly falcate, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, prominently reticulate-rugose, about 4-seeded.

Northern and Central Sudan.

T. occulta Del. ex DC.

Very diffuse pilose annual herb; stems under 6 in. long. Stipules deeply laciniate from the apex; leaflets oblanceolate, deeply serrate, up to $\frac{1}{2}$ in. long. Flowers yellow, in 2-4-flowered sessile axillary clusters. Pod elliptic, straight, scarcely exerted, up to $\frac{1}{2}$ in. long, glabrous, transversely reticulated with raised nerves, usually 2-seeded.

Northern and Central Sudan.

T. laciniata L.

Diffuse glabrous annual herb 12 or more in. high. Stipules lacinate from the apex; leaflets obovate, cuneate at the base, deeply serrate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers bright-yellow, in congested 6-12-flowered axillary racemes on peduncles $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Pod linear-oblong, straight, glabrous, transversely reticulated with raised lines, 5-6-seeded.

Northern Sudan.

60. **URARIA** Desv.**Uraria picta** (Jacq.) DC.

Woody herb 1-3 ft. high, sometimes taller; stems more or less grey-pubescent. Leaves pinnate, the lower ones sometimes entire; leaflets 5-9, linear-lanceolate to lanceolate, mucronate at the apex, rounded at the base, up to 8 in. long, subcoriaceous, finely pubescent and strongly reticulate with transverse tertiary nerves beneath; stipules large, ovate-lanceolate, acutely long-acuminate at the apex. Flowers pink or purplish, small, in dense villous spike-like racemes sometimes over 1 ft. long. Pod withdrawn within the calyx, glabrous, much articulated, the segments nearly separate, small and pearly-grey.

Southern Sudan.

61. **VIGNA** Savi

- A. Climbing or twining plants; leaves and flowers appearing together:
- B. Calyx-teeth shorter than or equal to the tube:
- C. Stipules not distinctly spurred:
- D. Leaflets not lobed:
- E. Leaflets narrow, linear to lanceolate:
- (a) Stems glabrous or sparingly pubescent:
- (b) Leaflets with very many lateral veins at right-angles to the midrib appearing prominently, finely reticulate above and beneath *V. multinervis*.
- (bb) Leaflets not as above:
- (c) Inflorescences 8-10-flowered; keel long and spirally twisted *V. macrorhyncha*.
- (cc) Inflorescences 2-4-flowered; keel short, not twisted *V. lancifolia*.
- (aa) Stems densely pubescent; flowers blue or violet
V. ambacensis.
- EE. Leaflets ovate, elliptic, elliptic-lanceolate or suborbicular:
- F. Pod more or less pubescent, 2-3 in. long ... *V. nilotica*.
- FF. Pod densely yellow-pubescent, up to 3½ in. long
V. schimperi.
- DD. Leaflets definitely lobed *V. fragrans*.
- CC. Stipules distinctly spurred at the base:
- (d) Leaflets not lobed, ovate, cuneate to rounded at the base, pubescent on both surfaces *V. occidentalis*.
- (dd) Leaflets shallowly 3-lobed and hastate towards the base, rhomboid, nearly glabrous:
- (e) Pod terete, linear, black, 3½ in. long; seeds very small
V. coerulea.
- (ee) Pod compressed, yellow-brown, 6-12 in. long, ¼-⅓ in. broad; seeds up to ¼ in. long *V. unguiculata*.
- BB. Calyx-teeth narrow and exceeding the tube:
- G. Keel obtuse or shortly beaked, the beak not sharply incurved:
- (f) Leaflets ovate-rhomboid, long-acuminate to acuminate at the apex, up to 3 in. long *V. membranacea*.
- (ff) Leaflets linear-lanceolate to ovate-lanceolate, acute and mucronate at the apex, up to 6½ in. long
V. reticulata.
- GG. Keel with a sharply incurved beak:
- (g) Leaflets ovate, elliptic or elliptic-lanceolate; stems covered with scattered long spreading hairs *V. vexillata*.
- (gg) Leaflets linear to linear-lanceolate; stems usually nearly glabrous *V. angustifolia*.
- AA. Erect or suberect herbs, rarely half-climbing, often without leaves when flowering; leaflets 3:
- (h) Plant densely white- or grey-pubescent *V. kotschyi*.
- (hh) Plant not as above *V. sudanica*.

Vigna multinervis Hutch. & Dalziel.*V. linearifolia* Hutch., non Hook. f.

Glabrous twiner with wiry stems. Stipules ovate-lanceolate, rounded at the base; leaflets linear, $2\frac{1}{2}$ -4 in. long, with very numerous lateral nerves at right-angles to the midrib, glabrous. Flowers blue or yellow, small, in short racemes. Pod about $2\frac{1}{2}$ in. long, glabrous.

*Equatoria.***V. macrorhyncha** (Harms) Milne-Redh.*Phaseolus stenocarpus* Harms.

Twiner; stems glabrous. Leaflets linear-lanceolate to oblong-lanceolate, 1-1 $\frac{1}{2}$ or more in. long, pubescent when young, becoming glabrous. Flowers 8-10 on peduncles up to 8 in. long. Pod 2-3 or more in. long.

*Darfur: Jebel Marra, 3000-5000 ft. Equatoria.***V. lancifolia** A. Rich.

Suberect herb, eventually twining, with a woody base; stems slender, striate, slightly pilose. Leaflets 3, narrowed gradually from near the base to the apex, 1-3 $\frac{1}{2}$ in. long, more or less appressed-grey-silky above and beneath. Flowers reddish, on slender flexuose peduncles 1-2 in. long. Pod linear, straight, about 2 in. long, densely rusty-bristly, 6-8-seeded.

*Kordofan.***V. ambacensis** Welw. ex Bak.

Twining plant; stems shortly grey-or yellowish-pubescent. Leaflets 3, the terminal one 2-3 in. long, blunt and mucronate at the apex, papery, with appressed hairs on both surfaces, the nerves raised beneath. Flowers violet-purple, in solitary or paired sessile or shortly peduncled axillary racemes and from the leafless upper part of the branches, with many lower nodes abortive, the 4-6 topmost flowers only being developed. Vexillum pubescent. Pod linear, about 1 $\frac{1}{2}$ in. long, densely hairy when young.

*Equatoria.***V. nilotica** (Del.) Hook. f.

Slender nearly glabrous twiner. Leaflets 3, the central one ovate-triangular or sometimes slightly hastate, acute at the apex, rounded at the base, 1-3 in. long. Flowers yellow-green or purplish, about 1 in. long, in 4-8-or more-flowered close racemes on more or less pubescent peduncles 3-5 in. long. Pod pendulous, linear, slightly torulose, 2-3 in. long, more or less pubescent, 6-8-seeded.

Widespread near rivers.

V. schimperi Bak.

Moderately stout twiner. Leaflets elliptic-lanceolate, usually acute at the apex, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, slightly pubescent on both surfaces. Flowers yellow, in about 6-flowered umbels on yellow-silky peduncles $\frac{1}{2}$ -5 in. long. Pod densely yellow-silky when young, 12-15-seeded.

Red Sea Hills: Erkowit. Equatoria: Imatong Mountains, Ras Logoforok, 8000 ft.

V. fragrans Bak. f.

Trailing herb from a large fibrous rhizome; stems grey-pubescent. Leaves petiolate; leaflets 3, the terminal one more or less trilobed, the middle lobe the largest, obtuse and mucronate at the apex, broadly cuneate at the base, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, pubescent, and sometimes densely so on both surfaces, the lateral leaflets smaller, unequal-sided, more or less trilobed, petiolulate or sessile. Flowers 1-3, blue with a white keel, or lilac with violet down the mid-keel and at the base of the standard, fragrant, at the apex of the $2\frac{1}{2}$ -5 in. long pubescent peduncle. Pod subtorulose, somewhat pilose outside, several-seeded.

Darfur: Jebel Marra, 5000 ft. Equatoria: Didinga Mountains, near Nagichot, about 6000 ft.

V. occidentalis Bak. f.

Slender climber. Petiole about $1\frac{1}{2}$ in. long; leaflets 3, pubescent above and beneath; terminal leaflet petiolulate, equal-sided, ovate or ovate-triangular, acute at the apex, up to 2 in. long, $1\frac{1}{2}$ in. broad; lateral leaflets unequal-sided up to $1\frac{1}{2}$ in. long, 1 in. broad. Flowers light-blue with a greenish standard, in few-flowered pedunculate racemes. Pod linear.

Equatoria: valley of River Yei near source.

V. coerulea Bak.

Herbaceous glabrous or nearly glabrous twiner. Stipules broad-lanceolate, striate; leaflets 3, 1 - $2\frac{1}{2}$ in. long. Flowers blue, in pairs on glabrous peduncles 4-6 in. long. Pod finally black, linear, terete, $3\frac{1}{2}$ in. long, $\frac{1}{2}$ in. thick, glabrous, 10-12-seeded.

Equatoria.

V. unguiculata (L.) Walp.

V. sinensis (L.) Savi ex Hassk.

Stout nearly glabrous herb, more or less twining. Leaflets 3, acute at the apex, 2-6 in. long, both surfaces glabrous or nearly so. Flowers white and mauve-tinged, or pink, reddish or yellow in 6-12-flowered racemes on glabrous to very sparsely pubescent peduncles 6-12 in. long. Pod pendulous, 6-12 in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad, glabrous, 10-15-seeded, slightly torulose when mature, with a thick decurved beak.

Widespread. Wild and cultivated.

V. membranacea A. Rich.

Slender wide-climbing, thinly grey-silky herb. Leaflets 3, membranous, $1\frac{1}{2}$ -3 in. long, both surfaces sparsely pubescent. Flowers rose-coloured, on 2-4-flowered very slender flexuose peduncles $\frac{3}{4}$ -2 in. long. Pod linear, straight, 2-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, finally glabrous or slightly pubescent, 10-12-seeded.

Northern Sudan: Nubia.

V. reticulata Hook. f.

Grey-or-yellowish-pilose twiner. Leaflets 3, variable, from linear to ovate-lanceolate, mucronate at the apex, up to 6 $\frac{1}{2}$ in. long, appressed-grey-pubescent on both surfaces. Flowers yellow or purplish, on closely 2-4-flowered peduncles 2-4 in. long. Calyx densely yellowish-pubescent. Pod black when mature, linear, straight, 2 $\frac{1}{2}$ -3 in. long, densely clothed with shining appressed dark-brown-velvety bristles when young, 10-12-seeded.

Equatoria.

V. vexillata (L.) Benth.

Fairly strong twiner usually with a fusiform tuberous root; stems usually clothed with spreading silky hairs. Leaflets 3, acute at the apex, obliquely and broadly cuneate to almost rounded at the base, the terminal one 3-6 in. long, all dark-green and with appressed strong silky hairs on both surfaces. Flowers pink or purplish turning yellow, 1 in. long, on 2-4-flowered peduncles 3-12 in. long; keel prolonged into an incurved beak. Pod recurved, linear, 3-4 in. long, silky.

Central Sudan.

V. angustifolia (Schumach.) Hook. f.

Slender nearly glabrous twiner with a thickened almost tuberous root. Leaflets 3, linear to linear-lanceolate, acute at the apex, rounded and unequal-sided at the base, up to 3 $\frac{1}{2}$ in. long, strongly reticulate. Flowers reddish-purple, on usually 2-flowered long peduncles. Pod 2 $\frac{3}{4}$ in. long, setulose.

Equatoria.

V. kotschyi Schweinf.

V. incana (non Taub.) Broun & Massey.

Densely grey-tomentose herb; stems somewhat twining. Flowers white or pinkish-lilac, on 2-3-flowered axillary peduncles from leafless branches. Pod up to 3 or more in. long, densely pubescent.

Central and Southern Sudan.

V. sudanica Bak. f.

Herb with several subrigid pilose stems arising from a thick rhizome 4-6 in. long. Flowers 2-5 at the apex of the stem. Standard suborbicular-obovate, emarginate at the apex, auriculate at the base, with claw $\frac{1}{2}$ in. long, about $\frac{3}{4}$ in. broad. Ovary velvety.

Equatoria: between Ibba and Yambio.

62. **VOANDZEIA** Thou.**Voandzela subterranea** (L.) DC.

Herb arising from a wide-creeping rhizome. Leaves on long slender petioles; leaflets 3, lanceolate to narrowly elliptic, emarginate at the apex, narrowed to the base, the terminal one $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, more or less 5-nerved at the base, glabrous. Flowers yellow, usually in pairs on hairy peduncles with swollen glandular apices which push into the soil drawing in the flowers. Pod ripening below the soil, orbicular to oblong, wrinkled when dry, about $\frac{3}{4}$ in. in diameter; seeds orbicular, smooth, hard, varying in size and colour, up to about $\frac{1}{2}$ in. in diameter.

Central and Southern Sudan.

63. **ZORNIA** J. F. Gmel.**Zornia glochidiata** Reichb. ex DC.

Z. diphylla (non Pers.) Broun & Massey p.p.

Glabrous or sparsely hairy loosely-branched annual herb up to 4 ft. high; stems wiry from a woody base. Stipules with a lanceolate spur at the base and a lanceolate lamina, leafy, about $\frac{2}{3}$ in. long; leaflets 2, linear-lanceolate to lanceolate, acute at the apex, up to $1\frac{1}{2}$ in. long, glabrous or slightly pubescent. Flowers reddish, small, in lax 6-8-flowered racemes, almost completely hidden by the subtending bract; bracts similar to the stipules but ciliate and broadly ovate and with a shorter spur. Pod 2-4-seeded, the segments covered with glochidiate bristles.

Central and Southern Sudan.

Z. durumuensis De Wild.

Erect perennial pubescent herb 6-12 in. high, arising from a woody base. Stipules narrowly lanceolate, spurred, about $\frac{1}{2}$ in. long; leaflets 2, narrowly lanceolate, acute at the apex, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. long, shortly pubescent. Flowers yellow, small, not hidden by the subtending bract; bracts broadly ovate-elliptic, about $\frac{2}{3}$ in. long, shortly pubescent. Pod up to $1\frac{1}{2}$ in. long, up to 5-seeded, the segments densely covered with slender puberulous bristles.

Equatoria

81A. HAMAMELIDACEAE¹

Trees or shrubs, often with stellate indumentum. Leaves alternate or rarely opposite, simple, the teeth sometimes glandular; stipules usually paired, often persistent, sometimes large. Flowers small, actinomorphic or zygomorphic, hermaphrodite or unisexual, often capitate. Calyx-tube more or less adnate to the ovary; lobes imbricate or valvate. Petals 4 or more or rarely absent, perigynous or epigynous, imbricate or valvate or rarely coiled. Stamens 4 or more, perigynous, in one row; filaments free; anthers oblong, 2-locular, opening lengthwise or by valves, the connective often produced. Disk absent or annular or of separate glands between the stamens and ovary. Ovary inferior or nearly so, or rarely superior, composed of 2 carpels often free at the apex, 2-locular; styles subulate, free, often recurved; ovules 1 or more in each loculus, pendulous from axile placentas. Fruit a woody capsule.

1. TRICHOCLADUS Pers.

Trichocladus malosanus Bak.

Shrub or small tree; branchlets covered with a dense whitish-or rusty-tomentum. Leaves alternate, shortly petiolate, entire, elliptic, acute to obtuse at the apex, more or less broadly cuneate at the base, 2½-4½ in. long, 1½-2 in. broad, glabrous above, densely whitish-stellate-tomentose beneath, the nerves often rusty-tomentose; petioles rusty-tomentose. Flowers yellowish-green, polygamous, in dense terminal and axillary heads. Corolla ½-¾ in. long.

Equatoria: Didinga Mountains, Naligede, Mount Lotuke, 5800-6800 ft.

82. SALICACEAE

Trees or shrubs. Leaves alternate, simple, deciduous; stipules free, small or foliaceous. Flowers unisexual, dioecious, densely arranged in erect or pendulous catkins often appearing before the leaves; bracts membranous, each subtending a flower. Calyx absent or represented by a cupular disk or 2 glandular scales. Petals absent. Male flowers: stamens 2 or more, filaments free or more or less united; anthers 2-locular, opening lengthwise. Female flowers: ovary sessile or shortly stipitate, 1-locular, with 2-4 parietal placentas; style short or long, 2-4-fid; ovules numerous. Fruit a 2-4-valved capsule; seeds small, with numerous fine hairs arising from the funicle and enveloping the seed.

¹A member of this family was discovered in the Sudan after the Key to the Families in Volume I had gone to press. The key towards the bottom of page lxxviii, Vol. I, should be amended as follows:—after ARALIACEAE. 107, insert

Shrubs or small trees; flowers in heads; fruit capsular; leaves simple ...
HAMAMELIDACEAE. 81A.

1. SALIX L.

Salix subserrata Willd.*S. safsaf* Trautv.

Shrub or tree up to 30 ft. high growing on the banks of streams or growing actually in water; stems usually procumbent; branchlets brown to red-brown, more or less glabrous, brittle. Leaves entire or serrulate, lanceolate, acute to long-acuminate at the apex, rounded to broadly cuneate at the base, 2-4 in. long, more or less glabrous on both surfaces the lower one blue-white with a red-brown midrib. Catkins 1½-2½ in. long, appearing with the leaves. Capsule ovoid, ½ in. long, glabrous.

*Northern and Central Sudan.***S. muriellii** Skan.

Riverside shrub; branchlets terete, the younger ones densely grey-villous, the older glabrous and brown. Leaves ovate-lanceolate to broadly lanceolate, entire, acute to acuminate at the apex, rounded to somewhat cuneate or sometimes slightly cordate at the base, 1½-5 in. long, densely grey-silky-villous on both surfaces when young, less densely villous when mature. Catkins 1-3 in. long, appearing with the leaves. Capsule broadly ovoid, about ½ in. long, glabrous, or sometimes rather densely villous.

*Northern and Central Sudan.***S. schweinfurthii** Skan.

Shrub; young branches at first densely grey-tomentose, finally brown and glabrous. Leaves oblong-lanceolate, serrulate, long-acuminate at the apex, rounded at the base, up to 5 in. long, 1-1½ in. broad, at first densely villous on both surfaces, later becoming glabrous; midrib conspicuous, flat above; prominent beneath. Catkins 1-2½ in. long. Capsule ovoid, contracted above the middle into a beak, about ½ in. long, glabrous.

Central Sudan.

83. ULMACEAE

Trees or shrubs. Leaves alternate, simple, often unequal-sided; stipules paired, falling early. Flowers in clusters arising from the 1 year-old branchlets, hermaphrodite or unisexual. Calyx-lobes imbricate or induplicate-valvate (i.e. valvate with the edges of the lobes folded in), persistent. Petals absent. Stamens inserted at the bottom of the calyx, erect in bud, opposite the calyx-lobes; filaments separate; anthers 2-locular, opening lengthwise. Ovary small, superior, composed of 2 united carpels, 1-2-locular; styles 2, divergent, stigmatose on their inner face; ovule solitary, pendulous from near the top. Fruit compressed, membranous, dry or thinly fleshy, often winged or appendiculate.

- A. Fruit a drupe; flowers axillary on the current year's shoots:
- B. Branchlets unarmed:
- C. Male calyx-lobes imbricate; cotyledons very broad
 CELTIS. 1.
- CC. Male calyx-lobes induplicate-valvate; cotyledons very narrow
 TREMA. 4.
- BB. Branchlets armed with axillary spines; leaves entire
 CHAETACME. 2.
- AA. Fruit a rounded flat stipitate samara with broad membranous wings; flowers in the axils of fallen leaves on previous season's growth
 HOLOPTELEA. 3.

1. CELTIS L.

Celtis integrifolia Lam.

Fig. 87.

Tree up to 60 ft. high, sometimes gregarious; crown spherical; limbs large and crooked; twigs slender, horizontal or drooping; bole slender, fairly straight, frequently bearing clusters of adventitious shoots; buttresses small, sharp; bark fairly smooth, pale-grey, with brown patches where the scales have dropped; slash hard, mottled dark-brown, crumbly. Leaves thinly coriaceous, entire on fertile shoots, sometimes serrate on adventitious twigs, 3-5-nerved from the base the nerves prominent beneath, acutely acuminate at the apex, obliquely and broadly rounded at the base, 1½-3 in. long, 1-2 in. broad, scabrous above, glabrous beneath except for tufts of hairs in the axils of the main nerves. Flowers yellow-green, in small axillary panicles. Drupe pale-brown, ovoid-ellipsoid, ½-¾ in. long.

Central and Southern Sudan.

C. zenkeri Engler.

Deciduous second-storey forest tree up to 100 ft. high; bole clean for 40-60 ft., usually 5-8 ft. in girth above buttresses; crown irregular, spreading; buttresses fairly wide and sharp; bark smooth, pale-brownish-yellow tinged with orange, lenticellate; slash yellow-white with brown lines and mottlings; young branchlets tomentose. Leaves 3-nerved at the base, pale-green, thinly coriaceous, entire (rarely inconspicuously toothed), shortly and acutely acuminate at the apex, unequal-cuneate to rounded at the base, 2½-6 in. long, 1½-2½ in. broad, more or less shortly rusty-pilose beneath. Flowers greenish-white, in short dense axillary paniced cymes, male towards the base of the branch, bisexual or female towards the upper part. Drupe red when ripe, downy, ovoid-globose, ridged, about ½ in. long.

Equatoria: Azza and Lotti Forests.

Celtis soyauxii Engler.

Evergreen second-storey forest tree 60-100 ft. high; bole exceptionally straight, slender and cylindrical, frequently clear of branches for 60-80 ft., usually measuring 4-6 ft. in girth above the



Fig. 87—*CELTIS INTEGRIFOLIA* Lam.
A, fruits. B, female flowers. C, male flower.

small sharp buttresses; crown small for the height of the tree; buttresses small, sharp; bark pale-brownish-white, smooth, scaling in small disks; slash white with concentric brown rings. Leaves dark-green, stiff, thinly coriaceous, entire or obscurely and obtusely toothed, obovate or obovate-oblong, 3-nerved from the base, obtusely acuminate at the apex, subequal, cuneate at the base, usually $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, glossy above, closely reticulate and glabrous beneath when mature. Flowers yellow-green, axillary. Fruit black when ripe, ellipsoid-globose, sharply 3-4-angled, about $\frac{1}{2}$ in. long.

Equatoria: Talanga Forest.

C. kraussiana Bernh.

Deciduous forest tree up to 80 ft. high; bole smooth, slender, grey; twigs reddish, rusty-pubescent when young; slash brown-spotted. Leaves 3-nerved from the base the nerves prominent beneath, ovate to elliptic-ovate or ovate-lanceolate, acuminate at the apex, unequal-rounded at the base, serrate, $1\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, rusty-pubescent when young, usually glabrous when mature (except on the nerves beneath), sometimes pubescent on both surfaces. Male flowers in subsessile or stalked clusters of 4-7 flowers from the lower leafless nodes of the branchlets; female flowers 1-2 at the upper nodes, usually in the axil of a young leaf. Drupe brown, subglobose, $\frac{1}{2}$ in. in diameter.

Equatoria: Didinga Mountains, 5300-6500 ft.

C. adolfi-friderici Engler.

Evergreen forest tree up to 150 ft. high somewhat resembling *Antiaris* in habit, with thick dark rounded or flattened crown and drooping branchlets; buttresses spreading, sharp; slash hard, granular, very crumbly, yellow-white with brown spots. Leaves coriaceous, 3-nerved at the base the nerves prominent on both surfaces, broadly elliptic to oblong-elliptic, acuminate at the apex, very unequal-sided at the base (more or less rounded on one side, more or less cuneate on the other), $5\frac{1}{2}$ - $6\frac{1}{2}$ in. long, 2-3 in. broad, glabrous beneath when mature. Flowers small, greenish, in axillary panicles up to $1\frac{1}{2}$ in. long. Drupe ovoid-globose, about $\frac{3}{4}$ in. long, and $\frac{1}{2}$ in. in diameter.

Equatoria: Azza Forest.

C. scotellioides A. Chev.

Small tree; bark smooth. Leaves coarsely toothed in the upper part, obovate-elliptic, up to 6 in. long, $2\frac{1}{2}$ in. broad, loosely reticulate beneath. Flowers white. Fruit small, ovoid, reticulate, on very short stout pedicels.

Equatoria: Khor Yubo, Bendere, gallery-forest.

2. CHAETACME Planch.

Chaetacme aristata Planch.

Fig. 88.

C. microcarpa Rendle.

Straggling thorny bush or much-branched spreading tree up to 30 ft. high; branchlets zig-zag, drooping; bark grey; slash brownish; spines solitary or paired, axillary, $\frac{1}{4}$ - $\frac{3}{4}$ in. long. Leaves entire, stiffly coriaceous, elliptic, mucronate and obtuse to acute at the apex, the midrib often well-prolonged beyond the lamina, unequal-rounded at the base, 2-4 in. long, 1-1 $\frac{1}{2}$ in. broad, glabrous. Flowers greenish or yellow-white, monoecious, in short dense axillary cymes. Drupe waxy-yellow, globose, $\frac{3}{4}$ - $\frac{1}{2}$ in. in diameter, tipped by the 2 style-arms.

Equatoria.

Fig. 88—CHAETACME ARISTATA Planch.

A, flowering branchlet. C, branchlet showing spines. D, upper portion of leaf showing prolonged midrib. E, flower-bud. G, flower. H, pistil. J, longitudinal section of fruit.

3. HOLOPTELEA Planch.

Holoptelea grandis (Hutch.) Mildbr.

Deciduous forest tree up to 120 ft. high; bole sinuous, up to 50 ft. long, 8-11 ft. in girth, buttressed with sharp flanges which do not spread laterally but may extend 15 ft. up the stem; crown irregular, open, with drooping branchlets; bark patchy, yellow to orange, scaly, covered with corky excrescences, often cracked longitudinally, brittle; slash pale-yellow-brown, hard. Leaves entire, thin, ovate to elliptic-oblong, shortly and broadly acuminate at the apex, rounded to shallowly cordate at the base, 2½-5 in. long, 1¼-2¼ in. broad, glabrous. Flowers in small branched axillary cymes ¼-1 in. long. Samara reminiscent of *Hymenocardia*, broadly obovate to suborbicular, rather deeply emarginate at the apex (with two tomentose styles projecting from the notch), cuneate at the base, 1¼-1½ in. long, about 1 in. in diameter, the wings puberulous to glabrous and striate with nerves which radiate from the oblique fruit-body.

Equatoria: Azza Forest.



Fig. 89—*TREMA GUINEENSE* (Schumacher) Ficalho.

A, portion of male inflorescence. B, branchlet with leaf, axillary shoot and female inflorescence. C, hermaphrodite flower. D, male flower. E, fruit.

4. TREMA Lour.

Trema guineense (Schumach.) Ficalho.

Fig. 89.

Fast-growing tree usually 20-40 ft. high, sometimes attaining 80 ft. high; crown spreading; bole straight, slender; slash white; bark thin, smooth, pale-grey, lenticellate, slightly fissured; branchlets densely pubescent. Leaves usually closely serrulate, unequal-sided, ovate to ovate-oblong, long-tailed at the apex, rounded to subtruncate or subcordate at the base, usually 3-4½ in. long, 1-1½ in. broad, scabrous above, softly and densely white-pubescent beneath. Flowers yellow-green, small, polygamous, in dense axillary clusters. Drupe black when ripe, subglobose, ½ in. in diameter, glabrous.

Equatoria.

84. MORACEAE

Trees or shrubs or rarely herbs, with milky juice. Leaves alternate or rarely opposite, simple, penninerved or palmnerved; stipules 2, often falling early and leaving a scar. Flowers much reduced, unisexual, monoecious or dioecious, actinomorphic, often in heads or on disks or hollow receptacles. Calyx-lobes usually 4, sometimes reduced or absent, imbricate or valvate. Petals absent. Male flowers: stamens usually equal in number and opposite to the sepals when present, filaments inflexed or erect in bud; rudimentary ovary present or absent. Female flowers with superior to inferior ovary of 2 united carpels, one often abortive, usually 1-locular; style simple or 2-branched, throat-like; ovule solitary, usually pendulous. Fruit a small achene or nut or drupe.

The following members of this family are cultivated in the Sudan: *Morus alba* L., Mulberry; *Ficus carica* L., Fig.

- A. Stamens reflexed in bud with reversed anthers; flowers not in a nearly closed receptacle:
- B. Flowers in dense spicate or capitate inflorescences, the male often catkin-like:
- (a) Style divided from the base into 2 branches, terminal; leaves 3-nerved from the base MORUS. 5.
- (aa) Style simple, thread-like, sometimes with a very short second branch, slightly lateral on the ovary; leaves pinnately nerved CHLOROPHORA. 2.
- BB. Flowers (at least the male) densely crowded on a flattened or concave but open receptacle usually having several spreading linear lobes on the margin; female flowers amongst the males; usually herbs DORSTENIA. 3.
- AA. Stamens not reflexed in bud nor with reversed anthers:
- C. Ovule pendulous from the apex of the ovary-loculus:
- (b) Flowers arranged on the inside of a hollow nearly closed receptacle (fig) with a small ostiole (mouth) at the apex; peduncle with a whorl of 2-3 bracts at the top, or rarely these scattered on the outside of the receptacle; stipules leaving a circular scar on the shoot FICUS. 4.

- (bb) Flowers not arranged on the inside of a nearly closed receptacle:
- (c) Flowers arranged inside an open receptacle and often exerted from it; receptacles unisexual; male flowers capitate, the female ones solitary *ANTIARIS*. 1.
- (cc) Flowers arranged on the outside of a fleshy globose or ellipsoid receptacle; floral bracts often peltate at the apex; fruits buried in the fleshy part of the receptacle and forming a compound fruit (syncarp) ... *TRECVLIA*. 7.
- CC. Ovule erect from the base of the ovary-loculus; leaves digitately 5-7-foliolate or digitately lobed *MYRIANTHUS*. 6.

1. *ANTIARIS* Lesch.

Antiaris africana Engler.

Straight-boled deciduous tree up to 150 ft. high; crown rounded to flat-topped; branchlets frequently pendulous; buttresses small to medium-sized; bark pale-grey, smooth; slash brown to yellow-white, exuding a latex the colour of milky tea; branchlets longitudinally wrinkled, densely rusty-tomentose. Leaves on flowering shoots entire, obovate to obovate-elliptic, obtuse to rounded at the apex, unequal-rounded at the base, 2½-6 in. long, 1-3 in. broad, usually scabrous above, scabrous and pubescent particularly on the nerves beneath; leaves on saplings and coppice-shoots denticulate, elliptic to obovate-elliptic, acutely acuminate at the apex, unequal-subcordate at the base, 4-9 in. long, 1½-3½ in. broad, setose-scabrous above, setose-pilose beneath. Flowers dioecious or submonoecious, appearing before the leaves; male receptacles yellow-green, flattened, ¼-½ in. in diameter; styles of female flowers with 2 almost thread-like lobes. Fruit drupaceous, scarlet and velvety when ripe, ellipsoid, ½-¾ in. long, single-seeded.

Equatoria.

2. *CHLOROPHORA* Gaudich.

Chlorophora excelsa (Welw.) Benth.

Fig. 90.

Large deciduous tree frequently in forest attaining 160 ft. in height with a straight cylindrical bole 50-60 ft. long, while in savannah it rarely exceeds 100 ft. usually branching within 40 ft. of the ground; crown large, composed of a few stout widely spreading limbs; ultimate branchlets often pendulous, especially in male trees; buttresses small or absent; surface roots usually well-developed, red-brown with yellow lenticels; bark thick, pale-ash-grey to dark-brown or almost black, scaling slightly at the base; slash yellow with red-brown spots, a white latex exuding. Leaves very variable, those on flowering shoots entire, oblong-elliptic, very shortly acuminate at the apex, 5-6 in. long, 3-4 in. broad, with scattered stiffish hairs above and more or less densely tomentose beneath, or both surfaces becoming glabrous; those on young trees and coppice-shoots, serrate, long-acuminate at the apex, much

larger. Flowers green, unisexual, the sexes borne on separate trees; male spikes usually pendulous, slender, up to 6 in. long; female spikes usually erect, stout, closely packed, rarely more than 2 in. long, the fertilised inflorescence developing into a green mulberry-like head of which the individual fruits are small achenes.

Equatoria.



Fig. 90—*CHLOROPHORA EXCELSA* (Welw.) Benth.

A, male inflorescences. B, male flower. C, branchlet with female inflorescences. D, female flower. E, longitudinal section through a female flower. F, fruit. G, longitudinal section through fruit and seed. H, branchlet with young leaf and stipules.

3. *DORSTENIA* L.

Dorstenia bicornis Schweinf.

Herb 1 ft. high; stems pubescent, 2 or 3 arising from a creeping cylindric much-branched fleshy rhizome, the leaves crowded towards the upper part of the stem. Lower leaves elliptic to obovate, acute to acuminate at the apex, narrowed below

to a somewhat obtuse or acute base, rarely entire, usually undulate or more or less grossly dentate to deeply cut in the upper part, 4-5 in. long, 1½-2½ in. wide, becoming glabrous or with scattered appressed hairs on the upper surface; petiole 1-1½ in. long, but usually less than ½ in. long in the upper leaves. Receptacle half-moon shaped. Styles dividing into 2 longer or shorter arms. Flowers as in *D. psilurus*.

Equatoria.

D. psilurus Welw.

Herb 1-2½ ft. high, persisting by a cylindric rhizome. Leaves very variable in shape and dissection, 4-6 in. long, 1½-3 in. wide, with a few scattered appressed hairs on the upper surface, paler and minutely hirsute along the nerves beneath; petiole 2 in. long in the lower leaves, becoming shorter above. Inflorescence solitary, long-stalked, vertical; receptacle green, linear-lanceolate not half-moon shaped, up to 1½ in. long, passing above into a long erect linear tapering appendage 2-3½ in. long which passes into a short upwardly curving appendage ½ or less in. long; male flowers with 1 stamen; female flowers fewer, inserted in a row on either side of the middle line; style dividing into 2 linear spreading stigmas. Fruit globose, about ⅙ in. in diameter.

Equatoria.

D. walleri Hemsl.

Fleshy herb 8-16 in. high; stems simple, succulent, erect, very shortly pubescent, arising from a depressed almost disc-like tuber about 1½ in. in diameter. Leaves collected in the upper part of the stem, entire, elliptic, obtuse at the apex, unequal-cuneate at the base passing into the petiole, 2½-5½ in. long, 1-2 in. broad, usually glabrous but sometimes puberulous on the midrib beneath; petioles of lower leaves ½-¾ in. long, of the upper ones shorter. Inflorescence solitary, stalk up to 2 in. long; receptacle stellate, 4-7-rayed, the longest diameter up to 2 in. long, curved, with minute white hairs, passing at each ray into a bract-arm which is narrowly triangular below becoming thread-like above, ¾-3 in. long; male flowers with 3 stamens; female flowers numerous and distributed, the style undivided.

Equatoria.

D. barnimiana Schweinf.

Stemless herb; leaves and peduncles arising from a depressed globose tuber 1½-2 in. in diameter and about 1 in. thick, bearing numerous fibrous roots on its surface. Leaves somewhat fleshy, ovate to suborbicular, cordate at the base, 2-3 in. long, 2-2½ in. wide, finally glabrous, the ultimate leaf sometimes dissected; petiole stout, up to 6 or more in. in length. Peduncles as long as or longer than the petiole; receptacle green, vertical, attached just above the base, oblong or narrowly oblong, sometimes linear

with a narrow margin passing into terminal and lateral linear-tapering bracts; male flowers with 2 stamens with an indistinctly 2-lobed calyx; female flowers distributed throughout the disc, the style unbranched.

Kassala: Gallabat. Fung District. Equatoria: near Azza Forest.

Var. *tropaeolifolia* (Schweinf.) Rendl.

Tuber small, roundish, $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter. Leaf solitary, sub-orbicular, peltate, 1-1 $\frac{1}{2}$ in. in greatest diameter; petiole $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Peduncle 2-4 $\frac{1}{2}$ in. long: bracts $\frac{1}{2}$ - $\frac{3}{4}$ in. long, usually acute at the apex.

Kassala: Gallabat.

Var. *ophioglossoides* (Hochst.) Engler.

Smaller than *D. barnimiana*; leaves ovate, cordate or peltate at the base, about 1 in. long and wide; petioles $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Peduncles 2-2 $\frac{1}{2}$ in. long: bracts linear-tapering, acute at the apex, about $\frac{1}{2}$ in. long.

Kassala: Gallabat.

D. palmata Engler.

Stemless herb; tuber roundish when young, becoming broadly conical, sometimes with a stout cylindrical neck, reaching 1-1 $\frac{1}{2}$ in. in diameter and bearing fibrous roots. Leaves thinly papery when dry, either variously dissected or simple and ovate, obtuse at the apex, cordate at the base, 3-4 in. long, about 3 in. broad, entire or dentate, glabrous; petiole 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long. Peduncle 2-4 $\frac{1}{2}$ in. long; receptacle erect, narrowly elongate-triangular, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad with an apical bract $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{4}$ or less in. in breadth, and usually one or two pairs of shorter bracts spreading from the corners of the base; male flowers with 2 stamens; female flowers distributed; style undivided projecting from the narrow tubular calyx.

Equatoria.

D. foetida var. *obovata* (Hochst.) Engler.

Fig. 91.

Herb; tuber thick and fleshy bearing several diverging short fleshy stems $\frac{1}{2}$ -2 in. high. Leaves borne at the apex of the stem and short branches, deciduous, entire, elliptic or ovate or obovate, rounded and sometimes emarginate at the apex, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. wide; petioles slender, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long; receptacle roundish, up to $\frac{1}{2}$ in. diameter with 8-10 linear unequal bract-arms $\frac{1}{2}$ or less in. in length; male flowers with 2-3 stamens; female flowers generally distributed; style undivided.

Rea Sea Hills: Karoru Hills, Kutai Geraita.



Fig. 91—DORSTENIA FOETIDA var. OBOVATA Engler.

A, seeds.

4. FIGUS L.

- A. Ostiole (mouth) of the receptacle (fig) with bracts visible from outside and spreading transversely across the orifice:
- B. Basal bracts of receptacles arranged in a single whorl at the apex of the peduncle, none either on the peduncle or over the surface of the receptacle:
- C. Male flowers with more than 1 stamen:
- D. Male flowers with 3-6 stamens; leaves toothed or lobed, scabrous *F. palmata*.
- DD. Male flowers usually with 2 stamens; leaves often toothed and scabrous and hairy:
- (a) Receptacles borne in panicles on the main stem or on the principal branches, rarely also a few of them in the axils of the leaves:
- (b) Mature receptacles tomentose; leaves suborbicular or elliptic-orbicular, entire *F. sycomorus*.
- (bb) Mature receptacles glabrous or scaly-puberulous; leaves ovate or ovate-elliptic or oblong-elliptic, usually repand-dentate *F. capensis*.
- (aa) Receptacles axillary, solitary, sometimes borne towards the base of the young shoots:

- (c) Leaves very broadly ovate or more or less rhomboid, usually coarsely repand-dentate; receptacles puberulous *F. vallis-choudae*.
- (cc) Leaves orbicular or ovate, mostly subentire or obtusely serrate; receptacles densely tomentose
F. gnaphalocarpa.
- CC. Male flowers with a single stamen; leaves always entire and nearly always smooth, rarely hairy and scabrous:
- E. Receptacles glabrous or very slightly and finely puberulous when mature:
 - (d) Leaves scabrous on the upper surface, elliptic or oblong-elliptic, long-tailed at the apex *F. dicranostyla*.
 - (dd) Leaves not scabrous on the upper surface:
 - (e) Leaves lanceolate or oblong-lanceolate, long-tailed at the apex; petiole up to 2½ in. long *F. salicifolia*.
 - (ee) Leaves ovate to oblong-ovate, obtuse or slightly acuminate at the apex; petiole up to 1½ in. long
F. ingens.
- EE. Receptacles softly and densely tomentose when mature
F. ingentoides.
- BB. Basal bracts scattered on the peduncle and over the surface of the receptacle, sometimes very small:
 - F. Leaves (at least some of them) opposite, often with 3-dentate tips; usually a riverside shrub *F. capreifolia*.
- FF. Leaves always alternate, entire or variously toothed or lobed, but never only 3-dentate at the apex:
 - G. Leaves usually very asymmetrical, the midrib dividing the lamina into two unequal halves:
 - (f) Leaves long-tailed at the apex *F. urceolaris*.
 - (ff) Leaves rounded or shortly acuminate at the apex
F. exasperata.
- GG. Leaves symmetrical, the midrib dividing the blade into approximately equal halves *F. sciarophylla*.
- AA. Ostiole of the receptacle pore-like and more or less 2-lipped, with all the bracts descending abruptly into the receptacle and not visible from outside:
 - H. Receptacles borne on short leafless arrested branchlets or in clusters on the main trunk or branches remote from the leaves *F. polita*.
- HH. Receptacles often paired, borne in the axils of the leaves of the young shoots, rarely some extending to the two-year-old wood:
 - I. Receptacles sessile or subsessile:
 - J. Receptacles more or less completely invested until nearly mature by large and often cap-like persistent basal bracts *F. ovata*.
 - JJ. Receptacles not invested by the basal bracts, the latter usually small and often deciduous or falling early:

- (g) Leaves pubescent above and tomentose beneath when quite young, soon becoming glabrous above but permanently shortly pubescent beneath (except in var. *glaberrima*) *F. glumosa*.
- (gg) Leaves quite glabrous on both surfaces ... *F. thonningii*.
- II. Receptacles pedunculate:
- K. Leaves more or less cordate or broadly cuneate to rounded at the base:
- L. Leaves broadly ovate or suborbicular:
- M. Leaves rather long-tailed at the apex ... *F. populifolia*.
- MM. Leaves rounded or obtusely pointed or shortly and obtusely acuminate at the apex:
- (h) Peduncle under $\frac{1}{2}$ in. long *F. vasta*.
- (hh) Peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (i) Leaves rounded or shortly and obtusely cuspidate at the apex, suborbicular, deeply cordate at the base *F. abutilifolia*.
- (ii) Leaves obtusely pointed at the apex, broadly ovate, rounded to slightly cordate at the base
F. congensis.
- LL. Leaves broadly oblong-elliptic to broadly obovate; peduncle $\frac{1}{2}$ - $1\frac{1}{2}$ in. long *F. platyphylla*.
- KK. Leaves narrowed to the base, not cordate, oblanceolate:
- (j) Receptacles glabrous *F. dekdekena*.
- (jj) Receptacles pubescent to tomentose *F. iteophylla*.

Ficus palmata Forsk.

Bush or small tree; branches and branchlets purplish when dry. Leaves variable, subobtusely dentate, 5-7-nerved at the base, the undivided ones ovate, acuminate at the apex, when divided then more or less ovate-orbicular in outline, truncate or rounded at the base or rarely slightly cordate, 3-lobed with sometimes 2 obscure side-lobes at the base, $2\frac{1}{2}$ -8 in. long, $1\frac{1}{2}$ -5 in. broad, scabrous on both surfaces. Receptacles axillary or from the axils of fallen leaves on shoots of 2 season's growth, solitary, subglobose or pyriform with a boss at the apex, stipitate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, puberulous or slightly scabrous.

Darfur: Jebel Marra.

F. sycomorus L.

Fig. 92.

Spreading savannah tree up to 80 ft. high, often found near streams; bark yellow-grey; young branchlets glabrous or almost so, except for a ring of long hairs just below each node. Leaves drying pale, rounded to obtuse at the apex, rounded to cordate at the base, 2-5 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, very rarely larger, glabrous on both surfaces or minutely puberulous beneath or sometimes somewhat scabrous; petiole $\frac{1}{2}$ -1 in. long. Receptacles obovoid to obovoid-globose, $\frac{3}{4}$ -1 in. in diameter, sometimes stipitate at the base; peduncle $\frac{1}{2}$ - $1\frac{1}{2}$ in. long.

Widespread.

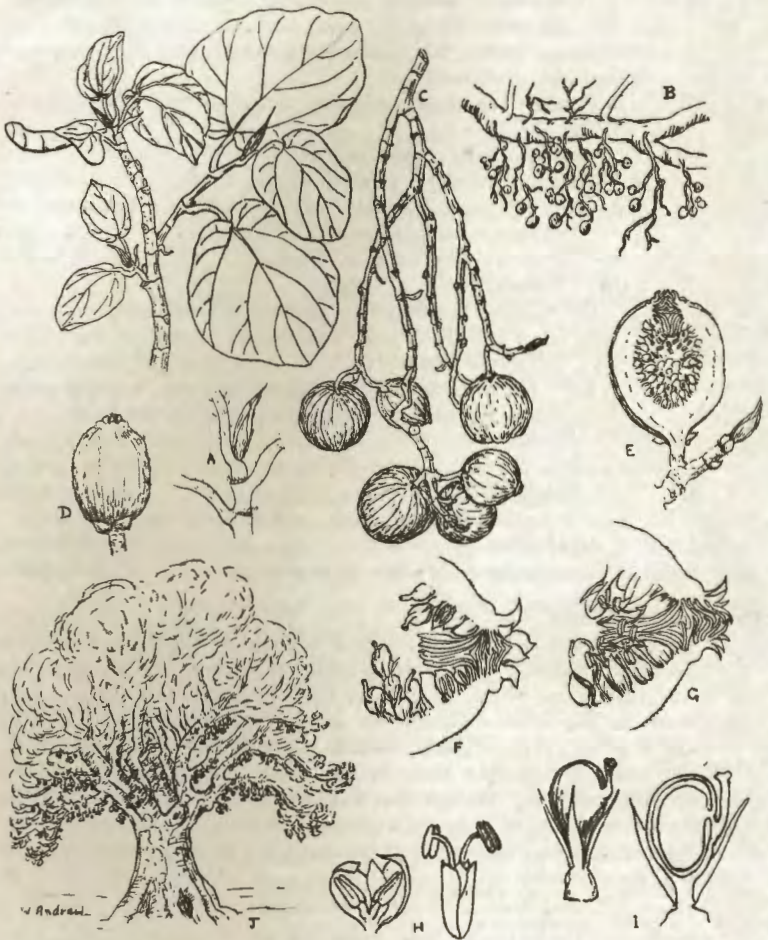


Fig. 92—FICUS SYCOMOROS L.

A, bud enclosed in stipules which later fall. B, figs on leafless branches on older wood. C, collection of figs. D, fig. E, longitudinal section through fig. F, longitudinal section through ostiole end of young fig showing bracts, male flowers still enclosed in perianth and female flowers already mature. G, longitudinal section through ostiole end of older fig showing male flowers now open. H, male flowers. I, female flower with longitudinal section of same. J, tree showing figs on older branches.

F. capensis Thunb.

Savannah or forest tree, usually about 30 ft. high, sometimes attaining 60 ft.; bark pale-brown with small grey scales; slash pale-red; sap watery-viscid. Leaves entire to repand-dentate, obtuse to shortly acuminate at the apex, shortly cuneate to rounded or subcordate at the base, 3-6 in. long, 1-3 in. broad, glabrous to slightly pubescent; petiole $\frac{1}{2}$ -2 in. long. Panicles clustered, up to 1½ ft. long; receptacles yellow-red, obovoid, $\frac{3}{4}$ -1½ in. long, edible but rather watery and tasteless; peduncles $\frac{1}{2}$ -¾ in. long.

Equatoria.

F. vallis-choudae Del.

Spreading tree up to 60 ft. high, often occurring on the edge of forest in damp situations, but also on the banks of streams in savannah; bark grey or pale-brown, rough. Leaves obtuse at the apex, 5-8 in. long, 4-7 in. broad, glabrous on both surfaces or rarely shortly pubescent beneath; petiole 1½-2½ in. long. Receptacles solitary, succulent, pear-shaped or subglobose, 1½-2½ in. long, edible; peduncle stout, woody, $\frac{1}{2}$ -¾ in. long.

Central and Southern Sudan.

F. gnaphalocarpa (Miq.) Steud. ex A. Rich.

Savannah tree up to 60 ft. high; branchlets pilose when young; bark on young stems pale-green with a soft powdery covering; bark on older stems grey-green, fairly smooth, with scattered grey scales and pale-brown patches where the scales have fallen; slash pale-pink. Leaves obtuse to rounded at the apex, 2-5 in. long, 1½-4 in. broad; petiole usually $\frac{1}{2}$ -¾ in. long. Receptacles yellow-red to reddish-purple, pear-shaped to globose, 1½-2 in. long, borne directly behind the leaves; peduncle $\frac{1}{2}$ -¾ in. long.

Central and Southern Sudan.

F. dicanostyla Mildbr.

Savannah tree up to 60 ft. high; branchlets densely tomentose at first, becoming puberulous or glabrous. Leaves 2½-4½ in. long, 1½-2½ in. broad; petiole $\frac{1}{2}$ -1½ in. long. Receptacles yellowish-pink, axillary, solitary, subglobose, about 1½ in. in diameter with a smooth shiny patch surrounding the ostiole; peduncle about ½ in. long.

Equatoria.

F. salicifolia Vahl.

Fig. 93.

Tree, sometimes somewhat climbing; branches covered with light-brown bark. Leaves entire, sometimes purplish, usually obtuse at the apex, rounded or slightly cordate at the base, 1-6 in. long (rarely up to 9 in.), $\frac{1}{2}$ -2 in. broad, glabrous and usually shining on the upper surface, conspicuously warty beneath, sometimes glaucous-green when dry. Receptacles usually crowded, axillary, usually in pairs, globose, about ½ in. in diameter; peduncle $\frac{1}{4}$ -½ in. long, rather slender, densely tomentose.

Central Sudan: usually on hillsides.



Fig. 93—*FICUS SALICIFOLIA* Vahl.

Fig. 94—*FICUS CAPREIFOLIA* Del.

A, branchlet. B, inflorescence. C, male flower. D, E, stamen. F, short-styled female flower. G, long-styled female flower. H, fig. J, fruit. K, portion of upper surface of leaf enlarged.

F. ingens (Miq.) Miq.

Spreading savannah tree up to 40 ft. high; bark grey. Leaves pinkish-mauve when young, entire, 3-9 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, deeply cordate or rounded-truncate often unequal-sided at the base. Receptacles axillary, usually paired, sessile or shortly pedunculate, glabrous or puberulous, wrinkled when dry; peduncle up to $\frac{1}{2}$ in. long.

Central and Southern Sudan.

F. ingentoides Hutch.

Shrub or small tree; young branchlets softly tomentose, leafy. Leaves entire, oblong-lanceolate or ovate-oblong, shortly and obtusely acuminate at the apex, rounded or slightly cordate at the base, $2\frac{1}{2}$ -5 in. long, 1- $2\frac{1}{2}$ in. broad, glabrous and dull on both surfaces or slightly shining above; petiole $\frac{1}{2}$ - $1\frac{1}{4}$ in. long. Receptacles in the axils of fallen leaves on branchlets 2-seasons old, shortly pedunculate, globose or slightly obovoid-globose, about $\frac{1}{2}$ in. in diameter.

Darfur: Jebel Marra.

F. capreifolia Del.

Fig. 94.

Willow-like shrub or tree up to 20 ft. high lining the banks of rivers; bark pale-grey. Leaves lanceolate to oblong-lanceolate, obtuse or acute or 3-fid at the apex, obtuse at the base, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, scabrous; petiole up to $\frac{1}{2}$ in. long. Receptacles solitary, subglobose, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, scabrous, edible; peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Widespread.

F. urceolaris Welw. ex Hiern.

F. storthophylla Warb.

Shrub or tree up to 15 ft. high, often on the edge of forest; branchlets usually scabrous. Leaves obliquely elliptic to obliquely obovate-oblong, cuneate to obtusely rounded at the base, 3-7 in. long, 1-2 in. broad. Receptacles orange-red, axillary, solitary or 2-3 together, subsessile, globose, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter, minutely scabrous to densely setose, edible.

Equatoria.

F. exasperata Vahl.

Fig. 95.

Forest tree usually about 30 ft. high, but sometimes attaining 80 ft.; bark reddish, smooth; sap watery, viscid. Leaves elliptic to obovate-elliptic, usually 3-lobed on coppice shoots and on lower branches, finely denticulate, rounded to cuneate at the base, $2\frac{1}{2}$ -5 in. long, $1\frac{1}{2}$ -2 in. broad, very scabrous on both surfaces; petiole usually 1- $1\frac{1}{2}$ in. long, very scabrous. Receptacles red when ripe, axillary, solitary or paired, obovoid to subglobose, up to $\frac{1}{2}$ in. in diameter, not edible.

Equatoria: Lotti Forest; Yambio.

Fig. 95—*FICUS EXASPERATA* Vahl.

A, leaf-surface showing hairs. B, single hair. C, fig. D, longitudinal section through fig.

F. sclarophylla Warb.

Shrub or tree up to 30 ft. high with a trunk up to 4 ft. in girth; bark reddish. Leaves sometimes entire, sometimes pinnatifid or pinnatilobed (lobes usually entire), elliptic or oblong to oblong-elliptic, long-tailed at the apex and lobes, very shortly cordate at the base, 6-13 in. long, $2\frac{1}{2}$ -7 in. broad, usually scabrous on both surfaces, usually with only a few scattered setose hairs on the upper surface, but pilose or villous on the midrib and lateral nerves beneath (occasionally villous or pilose on both surfaces); petiole $1-1\frac{1}{2}$ in. long.

Equatoria.

F. polita Vahl.

Forest tree up to 120 ft. high, often epiphytic at first. Leaves ovate or ovate-oblong, acuminate to long-tailed at the apex, slightly cordate or rounded at the base, 3-6 in. long, $2-4\frac{1}{2}$ in. broad. Receptacles purple-green, depressed-globose, very numerous, borne on thick woody outgrowths from the old wood, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. in diameter, wrinkled when dry; peduncle $\frac{1}{2}$ - $\frac{2}{3}$ in. long.

Equatoria.

F. ovata Vahl.

Large tree with a very broad crown, often epiphytic at first; young branchlets purplish, very stout, leafy, ribbed. Leaves entire, oblong-elliptic or elongate-ovate, obtusely acuminate at the apex, rounded or cordate at the base, 7-14 in. long, up to 9½ in. broad, glabrous and dull on both surfaces, or finely puberulous beneath; petiole up to 5 in. long. Receptacles in axillary pairs, sessile or subsessile, subglobose or ellipsoid, 1-2 in. in diameter:

Equatoria.

F. glumosa Del.

Savannah tree up to 30 ft. high. Leaves entire, oblong or ovate-oblong, rounded or obtusely and shortly acuminate at the apex, cordate at the base, 1-4 in. long, ¾-2¼ in. broad; petiole usually ¾-1½ in. long. Receptacles red, axillary, paired, globose, about ½ in. in diameter, sweet and fairly succulent.

Widespread.

Var. **glaberrima** Martelli.

Bark-cloth Tree.

Leaves glabrous beneath.

Widespread.

F. thonningii Bl.

Forest or savannah tree up to 40 ft. high, usually epiphytic at first, usually low-branched; the tree is often fluted or multi-stemmed owing to the rooting of the aerial roots which form thick masses on the upper stem and dangle from the base of the branches; bark grey, smooth. Leaves dark-green, entire, obovate to oblong-elliptic, acute to obtuse at the apex, 2-8 in. long, 1-2½ in. broad, glabrous; petiole ¾-2¼ in. long. Receptacles usually paired, globose to ovoid-globose, ¼-½ in. (rarely ¾ in.) in diameter, puberulous or glabrous.

Central and Southern Sudan.

F. populifolia Vahl.

Fig. 96.

Tree up to 60 ft. high, sometimes epiphytic at first; branchlets pendulous; bark grey or yellow, smooth. Leaves yellow-green when dry, entire, broadly ovate, acutely long-acuminate at the apex, widely cordate at the base, 2-6 in. long, up to 6 in. broad; petiole slender, up to 4½ in. long. Receptacles yellow-brown when dry, 2-4 together, axillary or from the axils of fallen leaves, globose, ½ in. in diameter, glabrous or puberulous, usually ribbed or reticulate, edible; peduncle up to ¾ in. long.

Central and Southern Sudan.

Fig. 96—*FICUS POPULIFOLIA* Vahl.

A, flowering branchlet. B, flower-bud. C, D, stamen. E, long-styled female flower. F, G, short-styled female flower. H, fig. J, longitudinal section of fruit.

F. vasta Forsk.

Spreading savannah tree up to 50 ft. high with rounded crown; young branches thick, softly and densely tomentose. Leaves entire, very broadly ovate to suborbicular, obtuse to rounded at the apex, deeply cordate at the base, 5-10 in. long, 5-8 in. broad, softly pubescent beneath; petiole $1\frac{1}{2}$ - $4\frac{1}{4}$ in. long. Receptacles 2-3 together, subglobose, pubescent, edible.

Widespread.

F. abutilifolia (Miq.) Miq.

F. mittuensis Warb.; *F. discifera* Warb.

Tree; branchlets covered with light-red bark. Leaves entire, broadly ovate-orbicular, rounded or shortly and obtusely acuminate at the apex, deeply cordate at the base the basal lobes sometimes overlapping, $3\frac{1}{2}$ - $8\frac{1}{2}$ in. long, 3-8 in. broad, dull on both surfaces, glabrous above, softly tomentose beneath when young, becoming pubescent to glabrous when mature; petiole 2- $4\frac{1}{2}$ in. long. Receptacles pedunculate, axillary, solitary or in clusters, obovoid or ellipsoid, about $\frac{1}{2}$ in. long; peduncle about $\frac{1}{2}$ in. long.

Central and Southern Sudan.

F. congensis Engler.

Gregarious spreading tree up to 50 ft. high, usually in or at the edge of swamps; branchlets drooping. Leaves entire, broadly ovate to ovate-elliptic, rounded to slightly cordate at the base, 3- $8\frac{1}{2}$ in. long, $2\frac{1}{2}$ -6 in. broad, glabrous on the upper surface, pubescent to glabrous beneath; petiole 1- $3\frac{1}{2}$ in. long. Receptacles paired, reddish, globose, up to 1 in. in diameter, glabrous to pubescent

Equatoria.

F. platyphylla Del.

Savannah tree up to 60 ft. high, often epiphytic at first; crown large, spreading; bark rusty-orange with large grey-brown patches where scales have dropped; slash pink; surface roots often prominent; branchlets very stout, bearing prominent horse-shoe-like leaf-scars. Leaves entire, broadly oblong-elliptic to somewhat narrowed in the middle, deeply cordate at the base, 6-12 in. long, 3-8 in. broad, glabrous above, minutely puberulous beneath; lateral nerves red when young, prominent; petiole up to 5 in. long. Receptacles reddish, numerous, in clusters of 2-5 together towards the tips of the branchlets, subglobose, $\frac{1}{2}$ -1 in. in diameter, pilose to glabrous, often warted.

Widespread.

F. dekdekana (Miq.) A. Rich.

Savannah or forest tree up to 30 ft. high, usually epiphytic at first. Leaves entire, oblanceolate, rounded to very shortly and obtusely acuminate, narrowed at the base, 2-6 in. long, 1- $1\frac{1}{2}$ in. broad; petiole $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Receptacles pale-yellow, paired or crowded, globose, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, glabrous; peduncle up to $\frac{1}{2}$ in. long.

Central and Southern Sudan.

F. iteophylla Miq.

Similar to *F. dekdekana* but the receptacles pubescent to densely tomentose.

Central and Southern Sudan.

5. MORUS L.

Morus mesozygia Stapf.

Small to tall tree; branchlets reddish-brown, glabrous. Leaves prominently 3-nerved from the base, broadly or obovately elliptic, narrowly long-acuminate at the apex, rounded or shallowly cordate at the base, more or less crenate-serrate, 2-5 in. long, 1½-2½ in. broad, glabrous or sometimes shortly pubescent on the nerves beneath. Female inflorescence solitary or two or three together on arrested shoots, globose, the peduncle grey-puberulous ½-¾ in. long. Syncarp about ¼ in. in diameter, scarcely succulent.

Equatoria: *Aloma Plateau, Khor Aba gallery-forest; Boma Plateau, 3700 ft.*

6. MYRIANTHUS Beauv.

Myrianthus arboreus Beauv.

Deciduous understorey tree up to 30 ft. high; bole short, dividing close to the ground into several steeply-ascending limbs; the tree is often carried on stout stilt roots a foot or more in length; bark brown. Leaves red when young, digitate or deeply digitately lobed; leaflets 5-7, obovate-elliptic, sessile, the median segment usually about 10 in. long, 3½ in. broad (sometimes up to 30 in. long, 9 in. broad), the outer segments about half as long as the median, upper surface smooth, lower surface densely grey-puberulous between the brown pubescent raised veins; petiole usually shorter than the lamina. Inflorescences usually paired; male inflorescences a paniculate cyme; female inflorescence yellow, globose, about ¾ in. in diameter, shortly pedunculate. Compound fruit bright-yellow when ripe, cone-like, spherical, hard, rough, 1½-3 in. in diameter; seeds surrounded by a slightly acid edible pulp.

Equatoria: *depression- and gallery-forests.*

7. TRECULIA Decne.

Treculia africana Decne.

African Bread-fruit. Fig. 97.

Forest tree up to 80 ft. high; bole cylindric, fluted at the base; bark smooth, pale-grey; slash exuding copious white latex; branchlets grey-purple, pithed. Leaf-buds long, sharp-pointed; leaves simple, alternate, elliptic to ovate-elliptic, shortly and obtusely pointed at the apex, unequal-rounded at the base, usually 8-10 in. long, 3-5 in. broad (sometimes as much as 18 in. long, 8 in. broad), glabrous, shiny above; petiole very short. Flowers dioecious; male flower-heads yellowish-brown, highly scented, globose, the size of a tennis-ball, very shortly pedunculate. Syncarp spherical, up to 18 in. in diameter and 35 lbs. in weight, subsessile on the trunk and main limbs, covered with coarse spine-like tubercles; seeds very numerous, smooth, ellipsoid, buried in spongy pulp.

Equatoria: *gallery-forests; Azza Forest.*

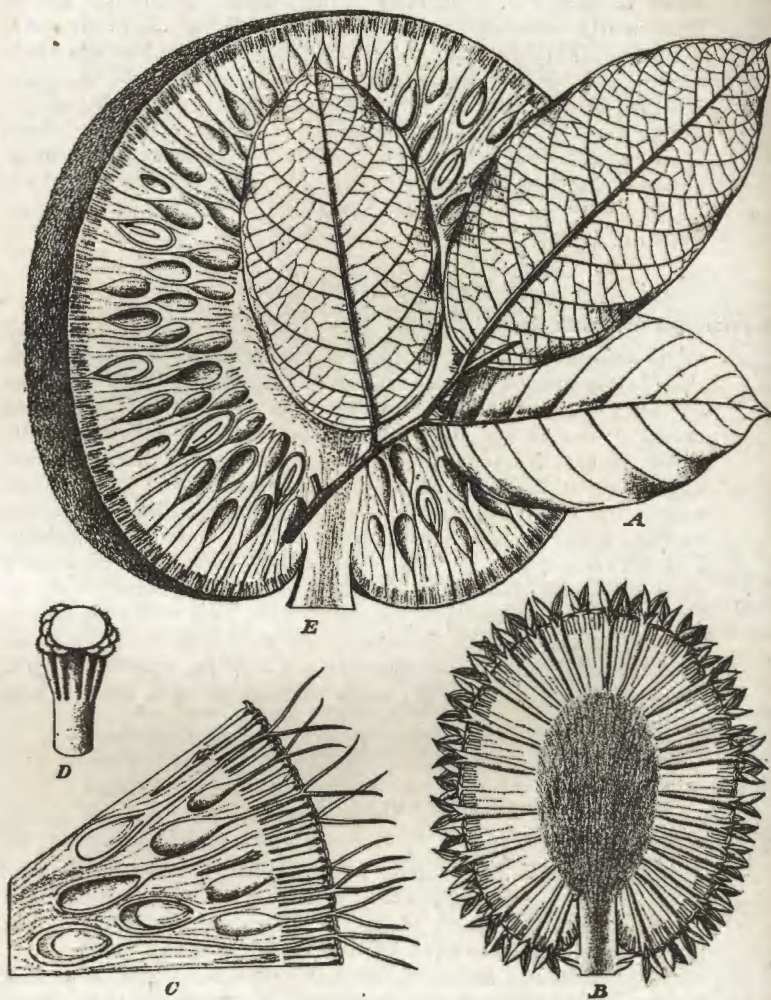


Fig. 97—TRECULIA AFRICANA Decne.

A, branchlet with leaves. B, male inflorescence in longitudinal section. C, portion of female inflorescence. D, bract from female inflorescence. E, longitudinal section through the compound fruit (syncarp).

85. URTICACEAE

Herbs, undershrubs, or rarely soft-wooded trees, rarely climbing, often armed with stinging hairs; epidermal cells usually with prominent cystoliths; stems often fibrous. Leaves with or without stipules, alternate or opposite, simple. Flowers very small, unisexual, usually cymose, sometimes crowded on a common enlarged receptacle. Male flowers: calyx 4-5-lobed, lobes imbricate or valvate; petals absent; stamens as many as and opposite the calyx-lobes; filaments inflexed in bud; rudimentary ovary usually present. Female flowers: calyx like the male or rarely absent, and often enlarged in fruit; petals absent; staminodes scale-like or absent; ovary free or adnate to the calyx, 1-locular; style simple; ovule solitary and erect. Fruit a dry achene or fleshy drupe.

- A. Leaves alternate:
 - B. Leaves with stipules:
 - C. Leaves petiolate, usually more or less equal-sided:
 - D. Cystoliths linear:
 - E. Perennial herbs or shrubs; leaves grossly serrate or lobed to below the middle GIRARDINIA. 6.
 - EE. Annual herbs; leaves not lobed FLEURYA. 4.
 - DD. Cystoliths dot-like:
 - (a) Flowers enclosed in a cup-like involucre of bracts and generally surrounded by woolly hairs FORSSKALEA. 5.
 - (aa) Flowers not enclosed in a cup-like involucre of bracts nor surrounded by woolly hairs POUZOLZIA. 9.
 - CC. Leaves sessile or subsessile, oblique and very unequal-sided at the base ELATOSTEMA. 3.
 - BB. Leaves without stipules; cystoliths dot-like PARIETARIA. 7.
- AA. Leaves opposite, sometimes unequal-sized in each pair, petiolate:
 - (b) Cystoliths dot-like; stipules free or connate only at the base:
 - (c) Flowers in clusters spaced on a rhachis usually exceeding the leaves BOEHMERIA. 1.
 - (cc) Flowers in clusters in the axils DROGUETIA. 2.
 - (bb) Cystoliths linear; stipules wholly connate PILEA. 8.

1. BOEHMERIA Jacq.

Boehmeria platyphylla D. Don.

Shrub 3-15 or more ft. high; branches soft-wooded, glabrous or slightly strigose-pubescent. Leaves thin, very broadly ovate or ovate-rhomboid, rather abruptly acuminate at the apex, 3-nerved and rounded to broadly cuneate at the base, very coarsely triangular-dentate to serrate-dentate throughout or sometimes entire at the base, 2½-8 in. long, up to 7½ in. broad, cystoliths inconspicuous. Spikes very slender, sometimes clustered, the flower-clusters widely separated on the rhachis. Fruit broadly ellipsoid, ½ in. long, puberulous.

Equatoria: gallery-forests.

2. **DROGUETIA** Gaudich.**Droguetia iners** (Forsk.) Schweinf.

Perennial herb or shrub from a slender woody rhizome; stems slender, erect or ascending from a rooting prostrate base, 2-5 ft. high, more or less pubescent becoming almost glabrous below, the internodes elongated. Leaves opposite, 3-nerved, the margin above the base crenate-dentate, ovate to elliptic, acuminate at the apex, rounded to obtuse at the base, 1-2½ in. long and ¾-1½ in. broad on the main stem but smaller on the branches, dotted with cystoliths and with a few appressed rather stiff hairs above, pubescent on the nerves beneath; petiole slender, ½-¾ as long as the lamina. Flowers green, subsessile in the axils. Achene shiny-black, compressed, ovate, about 1/24 in. long.

Equatoria: Imatong Mountains, River Ngairigi, 5000 ft.

3. **ELATOSTEMA** J. R. & G. Forst.**Elatostema orientale** Engler.

Perennial herb; stems numerous, succulent, arising from a rhizome-like base, more or less densely and shortly pubescent. Leaves obliquely oblanceolate, acuminate at the apex, more or less deeply serrate above the base, 1-3 in. long, ¾-1 in. broad, glabrous or with a few scattered stiff hairs above, hispidulous on the nerves beneath; cystoliths linear short numerous. Female inflorescence sessile or subsessile, ¾-¾ in. broad, forming when mature a dense hemispherical or rounded hairy cushion.

Equatoria: Imatong Mountains, near River Kineti, 6000-7000 ft.



Fig. 98—**FLEURYA AESTUANS** (L.) Miq.

A, part of inflorescence. B, male flower. C, female flower. D, fruit.

4. **FLEURYA** Gaudich.**Fleurya aastuans** (L.) Mig.

Fig. 98.

Herb resembling a nettle, up to 4 or more ft. high; stems more or less pilose. Leaves membranous, long-petiolate, very coarsely serrate, broadly ovate, acuminate at the apex, rounded or subcordate at the base, up to 6 in. long and broad, with stiffish appressed hairs on both surfaces. Flowers green or greenish-red, small, in paniculate large many-flowered bisexual inflorescences longer than the leaves. Fruit brown, very small, ovoid, nearly smooth.

*Equatoria.***F. ovalifolia** (Schumach.) Dandy, comb. nov.*Haynea ovalifolia* Schumach.; *F. podocarpa* Wedd.

Creeping sometimes half-shrubby herb 1-5 ft. high, arising from a creeping stolon; stem as well as the petioles and peduncles glabrous or more or less covered with whitish spreading or appressed stinging hairs. Leaves membranous, ovate to deltoid-ovate, acuminate at the apex, subtruncate to bluntly cuneate at the base, coarsely dentate, up to about 4 in. long, 3½ in. broad, more or less covered with rather stiff hairs. Inflorescences unisexual; the male greenish-white, spike-like or catkin-like, unbranched, the flowers in dense clusters on long naked peduncles often arising directly from the underground stem; female cymes inconspicuous, loosely few-flowered in the lower-leaf-axils or on the stolons. Fruits often produced underground, compressed-ovate, about ½ in. long, enveloped at the base by the persistent calyx.

*Equatoria.***F. Interrupta** (L.) Wight.

Erect herb; stems 8-36 in. high, slender, scarcely branched, almost glabrous or with a few stinging hairs. Leaves membranous, broadly crenate-serrate, ovate, acuminate at the apex, broadly obtuse to somewhat truncate at the base, 1½-3½ in. long, 1-2 in. broad, with a few stiffish hairs on both surfaces. Inflorescences bisexual, narrow, spike-like, bearing sessile clusters at intervals on the long slender stalk or its few short branches, the male flowers few and soon falling. Fruit pale-brown, ovate, narrowly winged, less than ⅓ in. long.

*Equatoria.*5. **FORSSKALEA** L.**Forsskalea tenacissima** L.

Herb becoming woody below or shrubby with a stout perennial root, from a few inches to 2 ft. high, diffusely branched from the base; branches often reddish, hispid with spreading spiny and hooked hairs and shortly tomentose between, leafy with short internodes. Leaves orbicular, obovate or rhomboid, obtuse at the apex, cuneate and entire at the base, crenate-serrate above the base, usually ½-1 in. or sometimes up to 2 in. long, ½-1½ in. broad.

dark-green when dry and hispid and more or less tomentose above, white-tomentose beneath. Flower-heads sessile, 2 or more at each node, sometimes crowded on undeveloped lateral branchlets the number of flowers in each head varying greatly; male-flowers absent from the 2-leaved involucre, otherwise up to 8 or 12; female-flowers solitary (in the 2-leaved involucre) or up to 6 densely embedded in whitish wool. Fruit reddish-brown, ovoid-elliptic, apiculate.

Northern Sudan. Khartoum.

F. viridis Ehrenb. ex Webb.

Annual herb a few inches to 3 ft. high, often becoming woody below; branches slender, minutely hirsute, later becoming glabrous. Leaves ovate to lanceolate, somewhat coarsely-serrate above the base, $\frac{1}{2}$ -4 in. long, $\frac{1}{3}$ -2 in. broad, sparsely and minutely hispid above, more or less glabrous-pubescent on the nerves beneath and sometimes with a scanty whitish tomentum between the nerves. Flower-heads more or less as in *F. tenacissima*, the flowers embedded in whitish or sometimes pale-rusty coloured wool. Fruit ellipsoid, apiculate.

Northern Sudan. Khartoum.

6. **GIRARDINIA** Gaudich.

Girardinia condensata (Hochst.) Wedd.

Erect monoecious or dioecious herb $1\frac{1}{2}$ -6 ft. high; stems half-succulent and as well as the leaves and inflorescences bristly with stiff stinging hairs. Leaves simple and grossly serrate and acuminate at the apex, or pinnately or subdigitately lobed to below the middle, up to 8 in. long and broad, more or less spreadingly pilose and setose above and beneath, the lobes very coarsely serrate and acuminate at the apex. Inflorescences unisexual, usually solitary in the leaf-axils with a short peduncle, sometimes a second one of alternative sex present; male inflorescences simple or forked or with a few lax branches, the flowers densely arranged along the axis; female cymes densely crowded on the axis or its short branches, densely beset with spreading stinging hairs. Fruit broadly ovate or somewhat cordate, nearly $\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, Kimisu forest.

7. **PARIETARIA** L.

Parietaria debilis Forst. f.

Slender more or less decumbent branched herb up to 12 in. high; stems very thin. Leaves very thin and flaccid, broadly ovate, at most obtusely pointed at the apex, rounded to broadly cuneate at the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long and up to $\frac{3}{4}$ in. broad. Flowers few in sessile axillary clusters. Fruit included in the calyx, polished-dark-brown or greenish-brown, ellipsoid, not apiculate, about $\frac{1}{24}$ in. long.

Red Sea Hills. Darfur: Jebel Marra, 9700 ft.

8. **PILEA** Lindl.**Pilea tetraphylla** (Steud.) Bl.

Slender erect glabrous succulent herb, dioecious or rarely monoecious, 1-6 in. high, sometimes arising from a creeping rhizome. Leaves forming a pseudo-whorl at the apex of the stem and branches by approximation to two pairs, ovate, obtuse or acute at the apex, broadly cuneate at the base, somewhat coarsely crenate-serrate above the base, rarely almost entire, upper leaves usually $\frac{1}{2}$ -1 in. long, lower leaves usually smaller, with a few appressed hairs on the upper surface and on the nerves beneath; stipules suborbicular, persistent. Flowers in a flat terminal sessile corymb surrounded by the four uppermost leaves.

Equatoria: Imatong Mountains, Itobol.

P. ceratomera Wedd.

Dioecious or sometimes monoecious fleshy herb with creeping stem rooting at the nodes; branches erect, smooth, 6-24 in. high, glabrous. Leaves opposite, broadly ovate, acuminate at the apex, crenate-serrate above the base, 1-3 in. long, $1\frac{1}{2}$ -2 in. broad, glabrous or with scattered appressed hairs on the veins beneath; stipules broadly oblong, about $\frac{1}{2}$ in. long, soon falling. Inflorescences forming dense sessile heads at the upper nodes. the pair at each node becoming confluent, unisexual, or the upper bisexual.

Equatoria: Imatong Mountains, Itobol, 6400 ft.

P. Johnstoni Oliv.

Nettle-like erect glabrous herb 1-3 ft. high. Leaves long-petiolate, grossly serrate, ovate to broadly ovate, acuminate but blunt at the apex, 3-nerved and rounded to obtuse at the base, $1\frac{1}{2}$ -4 in. long, 1-3 in. broad; with scattered white pointed hairs above, more numerous beneath; stipules broadly ovate or orbicular, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, persistent. Flowers crowded in small subglobose axillary heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, the heads solitary or in pairs at the end of peduncles 1- $1\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, Mount Kineti, 10,000 ft.

9. **POUZOLZIA** Gaudich.**Pouzolzia mixta** Solms.

Monoecious shrub; branches woody, somewhat angled, bearing remains of past inflorescences, young branches clothed with spreading soft white hairs. Leaves entire, ovate, acuminate at the apex, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad, densely covered with short hairs above, more or less white-tomentose beneath especially when young; stipules glumaceous and red-brown, lanceolate from an ovate base, acute at the apex, up to $\frac{1}{2}$ in. long. Flowers crowded, axillary, the male flowers numerous, the female solitary among the males.

Fung District: Fazoghli.

86. CANNABACEAE¹

Erect or climbing herbs. Leaves with stipules, alternate or opposite, simple, entire or divided. Flowers dioecious, apetalous, axillary, the male ones paniculate, the female sessile, crowded or strobilate, with large persistent bracts. Male flower: calyx 5-partite, segments imbricate, stamens 5, erect in bud. Female flower: calyx entire closely enveloping the ovary, ovary sessile, 1-locular, style 2-partite, ovule solitary, pendulous. Fruit an achene, covered by the persistent calyx.

1. CANNABIS L.

Cannabis sativa L.

Indian Hemp.

Annual herb 3-10 or more ft. high, densely leafed; stems minutely puberulous and glandular. Leaves sparsely gland-dotted, alternate or the lower opposite, palmately divided usually to the base into 5 or more linear-lanceolate toothed acuminate segments reduced to 3 in the upper leaves, sharply serrate, 3-6 in. long, somewhat scabrous and dark-green above, pale and finely pubescent beneath. Male flowers yellowish; female flower sheathed by a hirsute bract from which protrude the long threadlike stigmas. Fruit pale-greyish-brown, smooth, about $\frac{1}{4}$ in. long.

Southern Sudan. A native of Asia widely cultivated in Africa; source of a powerful narcotic known as hashish or bhang; cultivation prohibited in the Sudan.

87. CELASTRACEAE

Erect trees or shrubs, or climbers, sometimes spiny. Leaves alternate or opposite, simple; stipules inconspicuous or absent. Flowers mostly cymose or clustered, usually hermaphrodite, actinomorphic, small. Calyx 4-5-lobed, the lobes imbricate or rarely valvate. Petals 5, imbricate or valvate. Stamens 4-5, rarely more, alternate with the petals, inserted on or below the margin of the disk. Disk usually present, often fleshy and flat. Ovary superior, 1-5-locular; style short, more or less 2-3-lobed; ovules usually 2, from the inner angle of the loculi. Fruit various, small.

- A. Fruit capsular; seeds arillate; leaves alternate MAYTENUS. 2.
 AA. Fruit drupaceous; seeds not arillate:
 Leaves alternate MYSTROXYLON. 3.
 Leaves opposite ELAEODENDRON. 1.

1. ELAEODENDRON Jacq.

Elaeodendron buchananii (Loes.) Loes.

Tree up to 50 ft. high with a spreading crown; bark black-brown. Leaves crenulate, obovate-oblong, rounded to acute (often

¹Spelt *Cannabinaceae* in the key to families, Vol. I, p. lxxv.

emarginate) at the apex, cuneate at the base, up to 8 in. long, $3\frac{1}{2}$ in. broad (usually less than 5 in. long and less than 2 in. broad); petiole $\frac{1}{4}$ - $\frac{1}{3}$ in. long. Flowers yellow-green, fragrant, in axillary cymes with 2-3 whorls of branches. Fruit brown, woody, ellipsoid, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, sharp-pointed.

Equatoria: about 6 miles N.W. of Nyanga village, N.W. of Said Bundas.

2. MAYTENUS Molina.

Maytenus senegalensis (Lam.) Exell.

Fig. 99.

Gymnosporia senegalensis (Lam.) Loes.

Savannah tree or shrub up to 25 ft. high; bark grey; slash red; branchlets with or without spines; spines very variable, short and slender or long and stout, frequently bearing leaves and flowers. Leaves pale-green or glaucous, serrulate, very variable in shape and size, usually obovate to obovate-elliptic, rounded or emarginate (occasionally subacute) at the apex, long-cuneate at the base, usually 2- $3\frac{1}{2}$ in. long, $\frac{1}{4}$ - $1\frac{1}{2}$ in. broad (up to 5 in. long, $3\frac{1}{2}$ in. broad); petioles often red. Flowers white in single or clustered axillary cymes, the peduncles forked. Capsule red, up to $\frac{1}{2}$ in. in diameter, 2-3 locular, 6-seeded.

Widespread.

M. cymosa (Soland.) Exell.

Savannah shrub or tree up to 20 ft.; spines (when present) straight, up to $1\frac{1}{2}$ in. long, bearing flowers and fruits. Leaves crenate, elliptic-oblong to obovate, obtuse to rounded at the apex, long-attenuate to the base, generally $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, occasionally up to 3 in. long, 1 in. broad. Flowers greenish-white, on forked peduncles.

Equatoria: River Yei just below Yei, gallery-forest; Didinga Mountains, Nagichot, 6500 ft.

M. gracillipes (Welw.) Exell.

Glabrous shrub or small tree; branchlets red-purplish, often armed with red slender straight leafless spines up to 3 in. long. Leaves oblong-elliptic to elliptic, acute to shortly acuminate at the apex, narrowed to each end, crenulate to serrulate, 3-6 in. long, 1-3 in. broad, glabrous. Flowers white, small, in clusters on very slender peduncles $1\frac{1}{2}$ -3 in. long which usually fork above the middle a few times. Fruit red, $\frac{1}{2}$ -1 in. in diameter after dehiscence.

Equatoria: Imatong Mountains, Mount Agnagi, 6000-7000 ft.

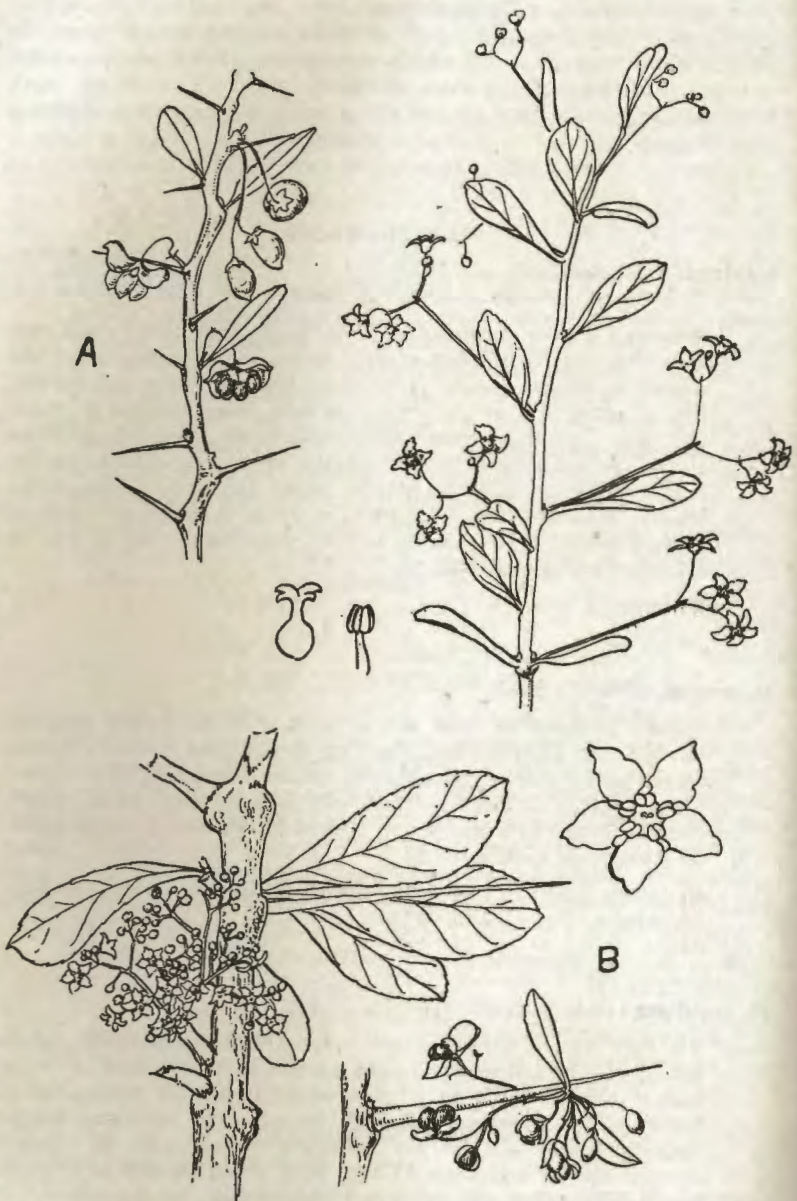


Fig. 99—MAYTENUS SENEGALENSIS (Lam.) Exell.
 A, Erkowitz form, spines slender. B, Blue Nile form, spines stout.

M. luteola (Del.) F. W. Andr., comb. nov.*Celastrus luteola* Del.; *Gymnosporia luteola* (Del.) Szyszyl.

Unarmed tree up to 40 ft. high. Leaves pale-green or glaucous, thick and leathery, usually coarsely dentate, ovate-oblong, acute to obtuse at the apex, 1½-4 in. long, ¾-1½ in. broad, coated on the under surface with a white wax. Flowers in 2-8-flowered axillary clusters, the peduncles simple. Capsule the size of a pea.

Red Sea Hills: Erkowit.

M. lancifolia (Thonn.) Loes.

Unarmed shrub or tree up to 30 ft. high. Leaves serrulate, elliptic to ovate-elliptic, acute or shortly acuminate at the apex, cuneate at the base, up to 4½ in. long, 1½ in. broad. Flowers white, small, in axillary clusters; pedicels up to ¼ in. long. Capsule purple-red, 3-valved; seeds orange.

Equatoria: Imatong Mountains, Mount Kineti ravine forest.



FIG. 100—MYSTROXYLON AETHIOPICUM (Thunb.) Loes.

A, flowering branchlet. B, flower. C, longitudinal section through the pistil and disk. D, fruit. E, seed.

3. MYSTROXYLON Eckl. & Zeyh.

Mystroxylon aethiopicum (Thunb.) Loes.

Fig. 100.

Elaeodendron aethiopicum (Thunb.) Oliv.

Savannah bush or tree attaining 50 ft. high, but usually much smaller; bole short; crown narrow; branchlets pendulous. Leaves more or less shining, undulate or entire, elliptic to ovate, usually rounded or emarginate at the apex, 1-4 in. long, $\frac{1}{2}$ -2 in. broad, usually glabrous above, paler and glabrous or softly and minutely pubescent beneath. Flowers greenish-yellow, inconspicuous, in subsessile or shortly pedunculate axillary clusters. Fruit red, ovoid, apiculate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 1-seeded, edible.

Equatoria.

88. HIPPOCRATEACEAE

Erect trees or shrubs, or climbers, usually glabrous. Leaves usually opposite, simple; stipules small or absent. Flowers cymose or in clusters, hermaphrodite, actinomorphic, usually small. Calyx small, 5-partite, lobes imbricate. Petals 5, imbricate or valvate. Disk present, conical, cupular or expanded. Stamens usually 3 or rarely 2-5, inserted on the disk, alternate with the petals; anther-loculi distinct or confluent. Ovary superior or more or less confluent with the disk, 3-locular; style subulate or short, usually 3-fid; ovules 2-10 in each loculus, axile, 1-2-seriate. Fruit capsular and compressed or baccate; seeds compressed and often winged or angular; cotyledons large, thick, connate.

- A. Fruit dehiscent, flat; inflorescence pedunculate; seeds compressed, usually winged at one end ... HIPPOCRATEA. 1.
 AA. Fruit indehiscent, baccate; inflorescence not pedunculate or rarely so; seeds not winged SALACIA. 2.

1. HIPPOCRATEA L.

Hippocratea velutina Afz.

Climbing shrub; branchlets rusty-tomentose. Leaves entire, broadly elliptic, abruptly and shortly acuminate at the apex, rounded to subcordate at the base, 2-4 in. long, $1\frac{1}{2}$ -2 in. broad, glabrous above except on the rusty-hispid midrib, often with sub-stellate scabrous hairs on the principal veins beneath. Inflorescences rusty-pubescent, loosely paniculate; flowers about $\frac{1}{2}$ in. in diameter. Petals spatulate-obovate, fringed. Fruit deeply divided into 2 or 3 oblong-lanceolate velvety carpels about 2 in. long.

Equatoria: Azza Forest.



Fig. 101—HIPPOCRATEA RICHARDIANA Cambess.

A, flower. B, C, stamen, front and back. D, cross-section of ovary. E, dehiscent fruit. F, seed.

H. richardiana Cambess.

Fig. 101.

H. cymosa var. *schweinfurthiana* (Loes.) Loes.; *H. obtusifolia* (non Roxb.) Broun & Massey.

Glabrous climber. Leaves coriaceous, crenate or almost entire, elliptic, rounded or very shortly acuminate at the apex, usually obtuse or rounded or broadly cuneate at the base, 1½-4 in. long, ¾-2 in. broad; petiole ¼-½ in. long. Flowers greenish-red, fragrant, in loose many- or few-flowered axillary cymes, or sometimes on pendent somewhat tendril-like branches forming a loose panicle interrupted by long internodes and reduced leaves. Fruit obovate, flat, about 2 in. long.

Central and Southern Sudan.

2. SALACIA L.***Salacia duclis-wuerttembergiae* Hochst.**

Shrub; branches subterete; bark ashen. Leaves coriaceous, obtusely serrate, obovate, narrowed at the base into a short petiole, glabrous, copiously reticulate especially beneath. Panicles axillary, dichotomous, six times shorter than the leaves.

Blue Nile Province.

S. pyriformis (Sabine) Steud.

Shrub or tree up to 25 ft. high. Leaves usually entire or undulate, oblong, rather abruptly acuminate at the apex, shortly cuneate at the base, 3-8 in. long, 1½-4½ in. broad, midrib depressed above, very prominent beneath, glabrous. Flowers in axillary, several to many-flowered sessile clusters. Fruit pear-shaped.

Equatoria: near west bank of probably River Ndango in valley 10 miles south of Jebel Marra.

89. ICACINACEAE

Erect trees or shrubs, or rarely climbers. Leaves without stipules, alternate or rarely opposite, simple. Flowers hermaphrodite or rarely unisexual by abortion, actinomorphic. Calyx small, 4-5-lobed; lobes imbricate or valvate, rarely enlarging and enveloping the fruit. Petals 4-5 or rarely absent, free or united, valvate. Stamens the same number as and alternate with the petals; anthers 2-locular, sometimes deeply 4-lobed; filaments free, often hairy below the anthers. Disk rarely present. Ovary superior, 1-locular, or rarely 3-5-locular; ovules usually 2, pendulous from the top of the ovary. Fruit drupaceous, 1-locular, 1-seeded, rarely winged.

1. ICACINA A. Juss.

icacina senegalensis A. Juss.

Undershrub throwing out glabrous or pubescent leafy shoots 2-3 ft. high from an enormous underground fleshy rhizome. Leaves ovate to obovate, obtusely acuminate to rounded and emarginate at the apex, 2-4½ in. long, 1½-2½ in. broad, conspicuously reticulate and glabrous or nearly so beneath. Flowers whitish, in lax terminal corymbose cymes. Petals shortly hairy outside. Fruit reddish, obovoid, about 1½ in. long, tomentellous.

Equatoria: Wau-Tembura road at crossing of Bo river and at Mabou.

90. SALVADORACEAE

Trees or shrubs, sometimes with axillary spines. Leaves often with rudimentary stipules, opposite, simple. Flowers in dense axillary clusters or panicles, hermaphrodite or dioecious, actinomorphic. Calyx 3-4-toothed. Petals 4, free or partially connate, imbricate. Stamens 4, inserted on or near the base of the petals and alternate with them. Disk absent or of separate glands between the filaments. Ovary superior, 1-2-locular; ovules 1-2, erect. Fruit a berry or drupe; seed erect; cotyledons thick, cordate.

- A. Petals free DOBERA. 1.
 AA. Petals united into a short tube SALVADORA. 2.

1. **DOBERA** Juss.**Dobera glabra** (Forsk.) R. Br.

Fig. 102.

D. roxburghii Planch.

Large tree; branchlets more or less finely pubescent upwards. Leaves coriaceous, very variable in shape, ovate or obovate, acute or obtuse at the apex, 2-3 in. long, glabrous above when mature, usually thinly clothed with a fine whitish pubescence beneath. Flowers polygamous, in erect panicles, the rhachis more or less white-tomentose. Drupe ellipsoid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Widespread.

Fig. 102—DOBERA GLABRA (Forsk.) R.Br.

2 **SALVADORA** L.**Salvadora persica** L.

Fig. 103.

Much-branched usually glabrous shrub or small tree; branchlets white, terete. Leaves pale-green, coriaceous, oblong or rarely ovate or suborbicular, 2-3 in. long. Flowers greenish-white, in panicles copiously produced from the end of the branchlets and axils of the upper leaves. Drupe the size of a pea.

Widespread.



Fig. 103—SALVADORA PERSICA L.
A, flower.



Fig. 104—XIMENIA AMERICANA L.

91. OLACACEAE

Erect trees or shrubs, or climbers. Leaves without stipules, alternate, simple. Flowers actinomorphic, usually hermaphrodite, small. Calyx-lobes imbricate or open in bud. Petals free or variously connate, valvate. Disk often present, usually annular. Stamens free or rarely united into a column, as many as or fewer or more numerous than and opposite the petals, some often without anthers. Ovary superior or slightly immersed in the disk, 1-3-locular; style 1 with a 2-5-lobed stigma; ovules 1-5 from the apex of a central placenta in the 1-locular ovaries, or pendulous from the inner angle of the 2-or more-locular ovaries. Fruit drupaceous, sometimes inferior by fusion with the calyx.

1. XIMENIA L.

Ximenia americana L.

Fig. 104.

Scrubby deciduous spiny savannah bush or tree up to 20 ft. high; bark dark-brown to black, with small rectangular scales; slash crimson, fibrous; spines straight, sharp, slender, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Leaves tending to fold up along the midrib, narrowly elliptic, emarginate or obtuse at the apex, $1\frac{1}{2}$ -3 in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad; petiole short. Flowers white, fragrant, about $\frac{1}{2}$ in. in diameter, in umbellate racemes. Petals densely bearded inside. Style sharp, persisting as a pointed tip to the fruit. Fruit yellow, thin-skinned, plum-like, about 1 in. in diameter, edible, containing a single large stone.

Widespread.

92. OPILIACEAE

Erect trees or shrubs, or woody climbers. Leaves without stipules, alternate, simple. Flowers usually hermaphrodite. Calyx minute. Petals 4-5, conspicuous in bud, free or more or less united, valvate. Stamens as many as and opposite to the petals, free or united to the base of the petals. Disk glands alternating with the stamens. Ovary superior or semi-inferior, 1-locular; stigma sessile or style slender; ovule solitary. Fruit drupaceous, often fleshy.

1. OPILIA Roxb.

Opilia celtidifolia (Guillem. & Perrott.) Endl. ex Walp.

O. amentacea (non Roxb.) Broun & Massey.

Woody climber, sometimes suberect with straight branches; branchlets green, glabrous. Leaves oblong to obovate-oblongate, acutely to obtusely acuminate at the apex, cuneate at the base, $2\frac{1}{4}$ - $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ -2 in. broad, glabrous. Flowers yellowish-green, fragrant, small, in racemes at first covered with broad imbricate bracts and shortly catkin-like, at length slender and up to $1\frac{1}{2}$ in. long. Fruit ellipsoid, about 1 in. long, puberulous.

Central and Southern Sudan.

93. LORANTHACEAE

Shrubs parasitic on trees or very rarely erect terrestrial trees or shrubs. Leaves without stipules, usually opposite or whorled, entire, simple, sometimes reduced to scales. Flowers often brightly coloured, actinomorphic, hermaphrodite or unisexual. Calyx small or rudimentary, adnate to the ovary. Petals valvate, free or united high up into a tube which is often split down one side. Stamens as many as the petals and inserted on them or at their base; anthers 2-locular or rarely 1-locular, sometimes divided into numerous smaller loculi. Disk present or absent. Rudimentary ovary often present in the male flower, staminodes in the female. Ovary inferior, usually without a distinct placenta and ovule. Fruit a berry or drupe; seed solitary without a distinct testa.

1. LORANTHUS L.

- A. Corolla polypetalous *L. curviflorus*.
- AA. Corolla gamopetalous:
 - B. Corolla-lobes with several oblique folds arising from the adnate part of the filament *L. acaciae*.
 - BB. Corolla-lobes without folds on the inner surface:
 - C. Filaments without a tooth or ledge in front of the anther:
 - D. Anthers transversely septate *L. usuiense*.
 - DD. Anthers not transversely septate:
 - E. Corolla-lobes cohering, their edges rolled in at the apex; corolla split unilaterally *L. hildebrandtii*.
 - EE. Corolla-lobes with edges neither rolled in nor back:
 - F. Corolla-tube not split unilaterally; receptacle densely villous at the base or all over
L. dregei var. *kerenicus*.
 - FF. Corolla-tube split unilaterally:
 - (a) Corolla-lobes shorter than the tube *L. djurensis*.
 - (aa) Corolla-lobes longer than the tube ... *L. platyphyllus*.
 - CC. Filaments produced above into a tooth or forming a ledge in front of the anther:
 - (b) Calyx tubular, enclosing the basal swelling of the corolla-tube *L. dodoneifolius*.
 - (bb) Calyx neither tubular nor enclosing the basal swelling of the corolla-tube:
 - (c) Corolla-lobes reflexed:
 - (d) Leaves elliptic-oblong to oblanceolate, cuneate or obtuse at the base *L. globiferus*.
 - (dd) Leaves ovate to broadly lanceolate, rounded to truncate at the base *L. verrucosus*.
 - (cc) Corolla-lobes erect:
 - (e) Corolla puberulous or pubescent outside
L. schweinfurthii.
 - (ee) Corolla villous-tomentose outside ... *L. heteromorphus*.

Loranthus curviflorus Benth. ex Oliv.

Branchlets slender, glabrous. Leaves opposite, subopposite or alternate, rigidly coriaceous, linear, oblanceolate-linear or oblanceolate (more rarely obovate-oblong), obtuse or round at the apex, cuneate at the base, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long, glabrous. Flowers in 4-6-flowered solitary umbels; peduncle $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Petals $1\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, reflexed above the middle, with 4-8 (usually 5) pairs of oblique folds arising from the adnate part of the filament.

Rea Sea District: between sea-level and 4000 ft.

L. acaciae Zucc.

Young branchlets brownish, slender, smooth, glabrous. Leaves opposite or subopposite, straight or slightly curved, rigidly coriaceous, oblong or elliptic-oblong or lanceolate-oblong, obtuse or rounded at the apex, cuneate or obtuse at the base, $1\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, $\frac{3}{8}$ -1 $\frac{1}{2}$ in. broad, glabrous. Flowers in 2-flowered, axillary, solitary or clustered umbels; peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Petals about $1\frac{1}{2}$ in. long.

Widespread. Parasitic on *Cordia gharaf*, *Acacia seyal*, *Sesbania sesban*, *Tamarix orientalis*, *Acacia campylacantha*, *Ziziphus mucronata*.

L. usuiensis Oliv.

Young branchlets rusty-tomentose with branched hairs, soon becoming glabrous. Leaves ovate-oblong or oblong, obtuse or rounded at the apex, subequal and obtuse or rounded or more rarely subcordate at the base, $1\frac{3}{4}$ -4 $\frac{1}{2}$ in. long, 1-2 in. broad, stellate-pubescent when young, soon glabrous; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers in many-flowered clusters. Corolla $1\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, straight, more or less densely rusty-tomentose outside.

Equatoria: *Imatong Mountains*, *Mount Baghanj*, 6000-7000 ft.

L. hildebrandtii Engler.

Young branchlets coarsely pubescent, later glabrous. Leaves thinly coriaceous, opposite or subopposite, lanceolate, acute at the apex, cuneate at the base, or more rarely ovate, $1\frac{1}{2}$ -2 in. long, $\frac{3}{8}$ -1 $\frac{1}{4}$ in. broad, sparingly pubescent on both surfaces, later glabrous. Flowers in about 18-flowered umbels. Corolla about $\frac{3}{4}$ in. long, pilose outside.

Equatoria.

L. dregei var. **kerenicus** Sprague.

Young parts rusty-tomentellous with verticillate-branched hairs, adult branches glabrous. Leaves coriaceous, ovate-oblong or ovate, more rarely suborbicular, rounded or obtuse at the apex, rounded or cordate at the base, $1\frac{1}{2}$ -3 in. long, 1-2 $\frac{1}{2}$ in. broad, coarsely pubescent on both surfaces when young, upper surface glabrous and the lower puberulous when mature. Heads 2-4-flowered; peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Corolla about 2 in. long, very densely villous.

Kassala: *Gallabat*. Parasitic on *Combretum hartmannianum*.

L. djurensis Engler.

Branchlets brownish, slender, glabrous. Leaves opposite or alternate, thinly coriaceous, dull, ovate or lanceolate, gradually narrowed to the rounded or acute apex, rather abruptly narrowed to the acute base, 2-4 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, more or less prominently 3-nerved, glabrous. Umbels 3-5-flowered; peduncle 1/24- $\frac{1}{2}$ in. long. Corolla 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, glabrous outside.
Equatoria.

L. platyphyllus Hochst. ex A. Rich.

Young branchlets smooth, subglaucous, older ones rough, glabrous. Leaves ternate, subopposite or alternate, coriaceous, lanceolate or ovate-oblong or elliptic-oblong (the lowermost ones of each branchlet elliptic or obovate, smaller than the others), subacute, obtuse or rounded at the apex, cuneate to almost rounded at the base, 2-4 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{3}{4}$ in. broad, glabrous. Umbels 5-8-flowered, axillary, solitary; peduncle $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Corolla 1 $\frac{1}{2}$ -2 in. long.
Central and Southern Sudan.

L. dodoneifolius DC.

Branchlets rather slender, pallid, glabrous. Leaves opposite or alternate or ternate, straight or subfalcate; linear-lanceolate, obtuse or rounded at the apex, narrowly cuneate at the base, 2-4 in. long, $\frac{1}{2}$ -1 in. broad, glabrous. Heads 2-3-flowered, axillary, solitary or in pairs; peduncle $\frac{1}{2}$ in. long. Corolla 2 in. long.
Darfur. Equatoria.

L. globiferus A. Rich.

Fig. 105.

L. globiferus var. *verrucosus* Sprague p.p.

Branchlets smooth, glabrous. Leaves opposite or subopposite, elliptic-oblong to oblanceolate and usually broader above the middle, rounded to obtuse at the apex, 1-3 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 in. broad, glabrous. Flowers in 3-6-flowered, axillary, clustered umbels. Corolla 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, glabrous.
Widespread.

L. verrucosus Engler.

L. globiferus var. *verrucosus* (Engler) Sprague p.p.

Similar to *L. globiferus* but the leaves are broadly lanceolate to ovate, more or less tapering to the obtuse or acute apex, 1-3 $\frac{1}{2}$ in. long, 1-2 in. broad.
Equatoria.

L. schweinfurthii Engler.

Branchlets pallid, shortly pubescent, later glabrous. Leaves coriaceous, opposite or subopposite, broadly ovate, obtuse or rounded at the apex, subcuneate or rounded or cordate at the base, 2 $\frac{1}{2}$ -3 in. long, 1 $\frac{1}{4}$ -2 $\frac{3}{4}$ in. broad, glabrous. Umbels 9-10-flowered, axillary, solitary; peduncle $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Corolla under 1 $\frac{1}{2}$ in. long, pubescent outside.

Equatoria. Parasitic on *Ficus platyphylla*.



Fig. 105—LORANTHUS GLOBIFERUS A. Rich.

A, flowers. B, corolla-lobe with stamen. C, flower with corolla-tube and stamens removed. D, fruits. E, transverse section of fruit.

L. heteromorphus A. Rich.

Branchlets short, spreading, yellow-or rusty-tomentose when young, later pubescent. Leaves coriaceous, opposite, ovate, ovate-oblong, elliptic-oblong or lanceolate, acute, obtuse or rounded at the apex, obtuse at the base, $1\frac{1}{2}$ - $5\frac{1}{2}$ in. long, $\frac{1}{4}$ - $1\frac{1}{4}$ in. broad, tomentose or tomentellous when young, coarsely pubescent or finally becoming glabrous. Umbels 2-9-flowered, axillary, solitary; peduncle $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Corolla $1\frac{1}{4}$ -2 in. long, villous-tomentose outside with red multicellular more or less branched hairs.

Fung District: Fazoghli.

94. **SANTALACEAE**

Trees or shrubs or herbs, sometimes parasitic on trees or roots. Leaves without stipules, alternate or opposite, entire, sometimes reduced to scales. Flowers often greenish, hermaphrodite or unisexual, actinomorphic. Calyx green or petaloid, often fleshy, adnate to the ovary; lobes 3-6, valvate or slightly imbricate. Petals absent. Stamens the same number as and opposite to the calyx-lobes. Disk present and epigynous. Ovary inferior or half-inferior, 1-locular; style simple; ovules 1-3. Fruit nut-like or drupaceous; seed without a testa.

A Flowers hermaphrodite **THESIUM**. 2.
AA. Flowers unisexual **OSYRIS**. 1.

1. **OSYRIS** L.**Osyris compressa** (Berg.) A. DC.

Much-branched shrub 6-8 ft. high, wholly glabrous. Leaves rigidly coriaceous, shortly petiolate, oblong, mucronate at the apex, narrowed to the base, glaucous, the lateral veins hardly visible. Male flowers in shortly peduncled axillary umbellate cymes. Female flowers usually solitary. Berry scarlet, oblong, the size of a small pea.

Equatoria: Yirrol; Mount Tomadur summit, Abyssinian border.

2. **THESIUM** L.**Thesium schweinfurthii** Engler.

Perennial herb about 9 in. high with numerous erect much-branched spreading stems. Leaves linear, acute or acuminate and colourless at the apex, $\frac{1}{2}$ -1 in. long. Inflorescences short with a terminal flower, the lateral flowers in the axil of a leafy bract. Calyx minute. Fruit globose or globose-ovoid, about $\frac{1}{2}$ - $\frac{3}{8}$ in. in diameter.

Equatoria.

Fig. 106—*THESIUM VIRIDE* A. W. HILL.

A, flowering branch. B, flower with bracteoles. C, flower in vertical section with calyx spread out. D, young fruits showing calyx adnate to the ovary. E, mature fruit. F, portion of calyx in fruiting stage.

***T. viride* A. W. Hill.**

Fig. 106.

Perennial undershrub up to 15 in. high from a woody rootstock; stems greyish-green, grooved, glabrous or scabrous. Leaves subulate, acute at the apex, about $\frac{1}{4}$ in. long, ciliate or subglabrous beneath. Inflorescence in irregularly branched axillary cymes, usually borne on a long peduncle. Calyx about $\frac{1}{4}$ in. long. Fruit globose-ovoid, about $\frac{1}{4}$ in. long.

Equatoria: between *Jebel Manda* and *Jebel Yukanga* near *River Boro*.

95. *BALANOPHORACEAE*

Fleshy annual or perennial herbs parasitic on roots, without chlorophyll or stomata. Leaves reduced to scales or absent. Flowers unisexual, or very rarely hermaphrodite, densely crowded into inflorescences with unisexual or mixed male and female flowers. Male flowers with or without a valvate 3-8-lobed calyx. Petals absent. Stamens 1-2 in the flowers without a calyx, often as many as and opposite to the lobes in flowers with a calyx; filaments free or connate; anthers 2-many-locular, free or connate. Ovary 1-3-locular, adnate to the perianth when present; styles 1-2, terminal or rarely the stigma sessile and discoid; ovule solitary in each loculus, usually pendulous, nude or with a single integument. Fruit small, nut-like, 1-locular, 1-seeded.



W.E.T.

Fig. 107—THONNINGIA SANGUINEA Vahl.
A, plant with several flower-heads. B, male flower.

1. THONNINGIA Vahl

Thonningia sanguinea Vahl.

Fig. 107.

Herb, tuberous at the point of attachment. Peduncles arising from a densely villous branched rhizome, up to 3 in. long; scales of the peduncle thick, keeled, serrulate, ovate-lanceolate, acute to acuminate at the apex, gradually increasing in size upwards, up to $\frac{3}{4}$ in. long, glabrous outside, pubescent inside at the base. Flower-heads crimson turning brown, subglobose, unisexual, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. in diameter; involucre scales similar to peduncle scales but larger.

Equatoria.

96. RHAMNACEAE

Trees or shrubs or very rarely herbs, sometimes climbing. Leaves usually with stipules, alternate or opposite, simple. Flowers usually cymose or clustered, small, hermaphrodite or rarely polygamous. Calyx tubular, 4-5-lobed, lobes valvate. Petals small, 4 or 5, or absent. Stamens 4-5, opposite to and often embraced by the petals. Disk usually present, perigynous, sometimes lining the calyx-tube. Ovary sessile, free or sunk in the disk, 2-4-locular; ovules solitary, rarely paired, erect from the base. Fruit various, often drupaceous.

- A. Leaves alternate, or if subopposite then stipules extra-petiolar:
 B. Fruit not winged; branches without tendrils:
 (a) Leaves 3-5-nerved from the base; fruit drupaceous; stipular spines present or rarely absent ZIZIPHUS. 6.
 (aa) Leaves pinnately nerved; stipular spines absent:
 (b) Fruit 1-locular; tall forest trees MAESOPSIS. 4.
 (bb) Fruit more than 1-locular; shrubs or small trees:
 (c) Fruit 2-locular; ovary immersed in the disk
 BERCHEMIA. 1.
 (cc) Fruit 3-4-locular; ovary seated on the thin disk
 RHAMNUS. 5.
 BB. Fruit with 3 lateral wings; branches with tendrils
 GOUANIA. 2.
 AA. Leaves opposite; stipules interpetiolar; no tendrils; flowers in lax cymes LASIODISCUS. 3.

1. BERCHEMIA DC.

Berchemia discolor (Klotzsch) Hemsl.

Shrub or small tree. Leaves entire or obscurely crenate, alternate or subopposite, petiolate, ovate or ovate-elliptic or lanceolate, rounded to acute at the apex, round to broadly cuneate and sometimes unequal at the base, 1-2 $\frac{1}{2}$ in. long, shiny above, dull and glaucous and sometimes pubescent beneath. Flowers greenish, in axillary sessile or shortly pedunculate cymes. Drupe yellow, fleshy, edible, oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, 2-seeded.

Equatoria.

2. **GOUANIA** Jacq.**Gouania longispicata** Engler.

Climbing shrub; stems with tendrils and as well as the petioles more or less densely brown-tomentose particularly when young. Leaves alternate, serrate, oblong-ovate, subacuminate at the apex, subcordate at the base, up to $3\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. broad, grey-tomentose with the nerves rusty-pilose and prominent beneath. Flowers in clusters on terminal spikes.

Equatoria: *Imatong Mountains, Ibahin, very common climber over Acacia trees.*

3. **LASIODISCUS** Hook. f.**Lasiodiscus mildbraedii** Engler.

Forest shrub or tree up to 30 ft. high. Leaves crenulate, pinnately nerved, oblanceolate-elliptic to elliptic, obtuse to obtusely acuminate at the apex, unequal-sided at the base, $3\frac{1}{2}$ - $7\frac{1}{2}$ in. long, 1-3 in. broad; petioles up to $\frac{1}{2}$ in. long. Flowers densely brown-tomentose in axillary cymes usually with two main branches; peduncles up to $1\frac{3}{4}$ in. long. Fruit velvety-brown.

Equatoria: *Imatong Mountains.*

4. **MAESOPSIS** Engler**Maesopsis eminii** Engler.

Fast-growing deciduous tree usually 50-90 ft. high, sometimes attaining 140 ft.; bole shortly and bluntly buttressed, cylindrical, straight, free from branches for 30-70 ft.; bark thick, pale-grey to almost white, deeply fissured; slash pale-red merging to yellow-white; crown rounded when mature, usually flattened in young trees. Leaves glossy, remotely but prominently toothed, lanceolate to broadly oblong-lanceolate, gradually acuminate at the apex, rounded at the base, 3-6 in. long, 1-2 in. broad. Flowers green, small, in rusty-pubescent axillary cymes $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Drupe yellow turning black on falling, oblong, about 1 in. long.

Equatoria: *Talanga Forest.*

5. **RHAMNUS** L.**Rhamnus prinoides** L'Hérit.

Shrub or tree usually less than 15 ft. but occasionally attaining 25 ft. high, sometimes straggling; branchlets more or less pubescent when young, becoming glabrous when mature; bark grey-brown, lenticellate. Leaves dark-green, serrate, lanceolate-oblong to elliptic, acutely acuminate at the apex, obtusely rounded to cuneate at the base, up to 4 in. long, $1\frac{1}{2}$ in. broad, shiny above; petiole up to $\frac{1}{2}$ in. long. Flowers yellow-green, 2-10 together in the leaf-axils; pedicels up to $\frac{1}{2}$ in. long. Fruit red, globose, up to $\frac{1}{2}$ in. in diameter, shiny.

Equatoria: *Imatong Mountains, 6000-7000 ft.*

6. ZIZIPHUS Mill.

Ziziphus mauritiana Lam.*Z. orthacantha* DC.

Armed savannah shrub or tree, sometimes erect and attaining 25 ft. in height, more frequently scrambling and forming impenetrable thickets; branchlets as well as the lower leaf-surfaces and inflorescences densely white to ochry-tomentose; bark grey-brown, fissured and scaly; slash pink; spines paired, brown, one of each pair straight and directed forward and up to $\frac{1}{2}$ in. long, the other shorter and sharply recurved. Leaves very variable in size and shape, serrulate, elliptic to ovate-suborbicular, usually obtuse to acute at the apex, very slightly asymmetrical or subequal at the base, usually $\frac{3}{4}$ -4 in. long, $\frac{1}{2}$ -2 in. broad, dark-green and glabrous to shortly pubescent above, softly grey- or buff-tomentose beneath; petiole up to $\frac{1}{2}$ in. long. Flowers yellow-white, fragrant, in 10-30-flowered sessile or subsessile cymes. Sepals tomentose outside. Fruit red-brown, smooth, shiny, spherical, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, edible, with a sweet but rather dry pulp surrounding the large stone.

Central and Southern Sudan.

Z. abyssinica Hochst. ex A. Rich.

Similar to *Z. mauritiana* but the leaves are very asymmetrical at the base and more or less densely grey-or rusty-tomentose beneath, and the cymes distinctly but shortly pedunculate.

Central and Southern Sudan.

Z. mucronata Willd.

Buffalo Thorn.

Spiny shrub or tree up to 30 ft. high, frequently straggling or half-climbing; branchlets brown or dark-brown, zig-zag and as well as the petioles and inflorescences rusty-puberulous to almost glabrous; spines stout, similar to *Z. mauritiana*. Leaves thin, pale-green, crenate-serrate, broadly ovate, usually broadly acuminate at the apex, unequal-sided and sometimes cordate at the base, usually 2-4 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, glabrous or pubescent only on the nerves beneath; petiole up to $\frac{1}{2}$ in. long. Flowers yellow-green in 10-20-flowered sessile or subsessile axillary cymes. Sepals more or less pubescent outside. Fruit dark-red-brown, smooth, spherical, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, rather acrid and bitter, scarcely edible.

Widespread.

Z. spina-christi (L.) Willd.

Fig. 108.

Spiny shrub or tree up to 30 ft. high; branchlets pale or nearly white, glabrous; spines similar to *Z. mauritiana*. Leaves pale, crenulate and sometimes thickened on the margin, ovate-lanceolate or broadly elliptic, at most rounded at the base, 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 in. broad, glabrous, or pubescent sometimes only on the

nerves beneath. Flowers greenish-yellow in subsessile sometimes dense cymes. Fruit fleshy, subglobose, about $\frac{3}{4}$ in. in diameter when ripe, edible.

Northern and Central Sudan.



Fig. 108—ZIZIPHUS SPINA-CHRISTI (L.) Willd.

A, leaf-margin. B, flowers. C, longitudinal section of flower. D, fruit.

Z. pubescens Oliv.

Usually unarmed tree up to 50 or more ft. high; bole dark-grey, fissured, sometimes armed with blackish spines up to 2 in. long; branchlets grey or grey-brown, rusty-pubescent when young, zig-zag with very short internodes but not prominently so. Leaves crenulate, elliptic, acute to acuminate at the apex, obtuse and often slightly unequal-sided at the base, 1-2½ in. long, ½-1 in. broad, glabrous or slightly pubescent above, puberulous to pubescent (especially on the nerves) beneath; petiole less than ½ in. long. Flowers yellow-green, in sessile or subsessile axillary cymes exceeding the petiole in length. Fruit ellipsoid, ½ in. in diameter, edible.

Equatoria.

97. AMPELIDACEAE

Climbing shrubs or small trees or herbs from a perennial rootstock; stems nodose or jointed, often with watery juice. Leaves usually with stipules, alternate or the lower sometimes opposite, simple or digitately compound or bipinnate, often pellucid-punctate. Flowers hermaphrodite or unisexual, actinomorphic, small, in leaf-opposed spikes or racemes or cymes or panicles; peduncles often with tendrils. Calyx small, entire or 4-5-toothed or lobed. Petals 4-5, free or united, valvate, falling early. Disk present, intrastaminal, usually very distinct. Stamens 4-5, opposite the petals, inserted at the base of the disk; anthers free or connate, 2-locular. Ovary 2-6-locular, loculi 1-2 ovuled; style short; stigma capitate or discoid. Fruit a berry, often watery, 1-6-locular.

The Grape Vine (*Vitis vinifera* L.) is cultivated in the Sudan.

- A. Leaves simple or digitately compound; stamens free from each other; ovary 2-locular, loculi 2-ovuled:
 - B. Tendrils when present leaf-opposed, never borne on the inflorescence CISSUS. 2.
 - BB. Tendrils always present and borne on the inflorescence AMPELOCISSUS. 1.
- AA. Leaves bipinnate; stamens united into a tube adnate to the base of the petals; ovary 3-6-locular, loculi 1-ovuled ... LEEA. 3.

1. AMPELOCISSUS Planch.

- A. Leaves simple:
 - B. Leaves not or only shallowly lobed:
 - (a) Leaves more or less tomentose beneath:
 - (b) Leaves when mature thinly matted with greyish or salmon-coloured cottony web-like tomentum beneath *A. schimperiana.*
 - (bb) Leaves when mature densely bright-cinnamon-red-tomentose beneath *A. cinnamochroa.*
 - (aa) Leaves when mature glabrous or slightly pubescent often only on the nerves beneath:
 - (c) Flowers in small few-flowered cymes *A. asurifolia.*

- (cc) Flowers in copious thyrsoid panicles *A. abyssinica*.
- BB. Leaves deeply lobed:
- C. Leaves when mature densely matted or pubescent beneath:
- (d) Leaves with scattered brown web-like pubescence beneath ...
A. bombycina.
- (dd) Leaves densely bright-red-cinnamon-tomentose beneath: ...
A. cinnamochroa.
- CC. Leaves glabrous or nearly so:
- (e) Stems thick, firm, but compressible and hollow in the
centre *A. cavicaulis*.
- (ee) Stems slender, firm, woody *A. asarifolia*.
- AA. Leaves compound:
- (f) Leaves almost glabrous beneath *A. multistriata*.
- (ff) Leaves rusty-tomentose beneath *A. sarcocephala*.

***Ampelocissus schimperiana* (Hochst.) Planch.**

Climber; stems woody, strong, matted with cottony tomentum when young, glabrous when mature. Leaves shallowly serrate, orbicular, cordate at the base, up to 12 or 15 in. broad; basal lobes broadly rounded, sometimes 2 in. deep, the upper part with 3 shallow triangular lobes; petioles 2-6 in. long, matted and sometimes with purple gland-tipped hairs. Flowers bright-red, in short-stalked, dense, cymose or thyrsoid clusters. Fruit oblong, $\frac{3}{4}$ -1 in. long, watery, edible.

Central and Southern Sudan.

***A. cinnamochroa* Planch.**

Extensive climber; stems rather stout, half-woody, and as well as the petioles densely covered with a mat of woolly bright-cinnamon-red hairs. Leaves broadly ovate-orbicular, sometimes shortly trilobed, about 6 in. broad. Flowers blackish-purple, small, in densely crowded lateral clusters 2-4 in. broad. Fruit red, subglobose, $\frac{3}{8}$ in. in diameter.

Equatoria.

***A. asarifolia* (Bak.) Planch.**

A. grantii (Bak.) Planch.

Strong climber with a thickened half-succulent root; stems often slightly woolly when quite young, soon glabrous. Leaves slightly to deeply 5-lobed, denticulate, orbicular, cordate at the base, subacute at the apex, 2-5 in. broad, glabrous above. Flowers often red-tinged, in small and rather few-flowered cymes. Fruit blackish, about $\frac{1}{2}$ in. long.

Central and Southern Sudan.

A. abyssinica (Hochst.) Planch.

Wide-spreading glabrous or slightly pubescent climber; stems woody. Leaves thin, orbicular, shallowly 3-lobed in the upper part, denticulate, cordate at the base, 6-9 in. broad; petioles 3-4 in. long. Flowers green, in copious thyrsoid panicles on short firm peduncles.

Central and Southern Sudan.

A. bombycina (Bak.) Planch.

Extensive climber; stems more or less brown-woolly, half-woody. Leaves orbicular, denticulate, deeply 3-5-lobed, cordate at the base, 2-6 in. broad, glabrous above when mature; petiole 1-3 in. long. Flowers deep-red, small, in dense clusters; peduncles spreading, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, densely pilose. Fruit small, rounded.

Equatoria.

A. cavicaulis (Bak.) Planch.

Wide climber; stems up to $\frac{1}{2}$ in. thick, striated. Leaves membranous, orbicular, broadly dentate, 5-lobed, the central lobe spatulate, the others unequal-sided and again deeply lobed, up to 12 in. broad. Flowers deep-red, small, in a thyrsoid panicle, the ultimate branches racemose.

Equatoria.

A. multistriata (Bak.) Planch.

A. pentaphylla Gilg & Brandt.

Wide climber; stems more or less woody, finely striate, glabrous. Leaves digitately 5-foliolate; leaflets distantly serrate-dentate, obovate-oblancoelate, acute to acuminate at the apex, cuneate at the base into a short petiolule, 3-4 $\frac{1}{2}$ in. long, up to 2 $\frac{1}{2}$ in. broad. Flowers reddish, in copiously compound short-stalked lateral thyrsoid panicles. Fruit smooth, about $\frac{1}{2}$ in. long.

Equatoria.

A. sarcocephala Planch.

Climber; stems striate, sparsely lanate, finally becoming glabrous. Leaves digitately 5-7-foliolate; leaflets elliptic-or oblancoelate-oblong, acuminate at the apex, dentate-serrate, 3-6 in. long. 1-2 in. broad, glabrous above. Flowers in dense heads $\frac{3}{4}$ -1 in. in diameter. Fruit ellipsoid, $\frac{1}{2}$ in. long, 1-2-seeded.

Equatoria.

2. **CISSUS** L.

A. Leaves simple, usually toothed, rarely divided below the middle:

B. Leaves not lobed or only slightly so:

C. Cymes pedunculate, the peduncle usually fairly long:

D. Leaves more or less cordate or very broadly rounded at the base, usually broadly-ovate or ovate-orbicular:

- E. Leaves very jagged-toothed; stems and young leaves densely rusty-tomentose *C. rubiginosa*.
- EE. Leaves subentire or shortly toothed:
- (a) Petiole at least as long as the lamina *C. petiolata*.
- (aa) Petiole shorter than the lamina:
- (b) Stems when old with broad corky wings
C. bignonioides.
- (bb) Stems without broad corky wings:
- (c) Climbers or trailing herbs:
- (d) Leaves subentire or obscurely toothed
C. populnea.
- (dd) Leaves distinctly toothed:
- (e) Leaves with few (about 8-12) teeth on each margin *C. quadrangularis*.
- (ee) Leaves with numerous teeth on each margin ...
C. rufescens.
- (cc) Erect herb up to 6 ft. high *C. alnifolia*.
- DD. Leaves cuneate to narrowly rounded at the base, elliptic to oblong-elliptic; erect herb from a woody rootstock
C. cornifolia.
- CC. Cymes subsessile or with a peduncle up to $\frac{1}{2}$ in. long; leaves distantly denticulate *C. afzelii*.
- BB. Leaves digitately lobed nearly to the base; petals 4; style subulate *C. palmatifida*.
- AA. Leaves 3-7-foliolate:
- F. Leaves sessile or subsessile:
- G. Leaflets not glabrous beneath:
- H. Erect herbs:
- (f) Stems and pedicels glandular-brown-tomentose
C. crotalarioides.
- (ff) Stems and pedicels not glandular, rusty-tomentose
C. triumfettioides.
- HH. Climber *C. schweinfurthii*.
- GG. Leaflets glabrous beneath:
- (g) Erect herb; leaflets oblong-lanceolate *C. juncea*.
- (gg) Climber; leaflets ovate to elliptic *C. ternata*.
- FF. Leaves petiolate:
- I. Leaflets entire or very minutely or obscurely or distantly denticulate *C. aralioides*.
- II. Leaflets very distinctly toothed with usually numerous teeth or very undulate-toothed on the margin:
- J. Leaflets linear to narrowly oblanceolate, rather long-attenuated to the base:
- (h) Extensive climber; leaflets rounded or subobtusate at the apex, not acuminate *C. serpens*.
- (hh) Erect herb; leaflets acute to acuminate at the apex
C. crinita.
- JJ. Leaflets broadly lanceolate to orbicular, usually abruptly contracted into the petiolulate or sessile base:
- K. Leaflets sessile *C. adenocephala*.

KK. Leaflets petiolulate :

L. Leaflets 3 :

- (i) Leaflets glabrous beneath *C. ibuensis*.
 (ii) Leaflets tomentose beneath *C. cyphopetala*.

LL. Leaflets more than 3 :

- M. Leaflets sessile or subsessile; petiole pubescent
C. adenantha.

MM. Leaflets petiolulate :

- (j) Leaves pedate, i.e. the secondary petioles forked :
 (k) Unexpanded corolla globose; style very short
C. gracilis.
 (kk) Unexpanded corolla cylindrical, much longer than
 broad; style subulate *C. adenocaulis*.
 (jj) Leaves not pedate, rather fleshy ... *C. cyphopetala*.

***Cissus rubiginosa* (Welw.) Planch.**

Undershrub; stems wide-climbing, densely rusty-tomentose. Leaves quadrate-orbicular, broadly truncate or widely cordate at the base, about 2½-3½ in. long, densely rusty-pilose beneath. Flowers small in compound cymes; inflorescences rusty-tomentose. Fruit pointed, ½ in. long.

Equatoria.

***C. petiolata* Hook. f.**

Glabrous woody climber; stems tetragonal, becoming corky with age. Leaves ovate-pentagonal, widely cordate at the base, minutely toothed, 3½-4 in. long. Flowers in cymes of about 6 flowers each. Fruit reddish when ripe, ½ in. long.

Equatoria.

***C. bignonioides* Schweinf. ex Planch.**

Wide-climber; stems when young finely striated, subquadrangular. Leaves orbicular, acuminate at the apex, cordate at the base, irregularly serrate-dentate, 3-4½ in. broad, glabrous. Flowers in copiously compound irregular 6-12-flowered cymes, on peduncles 2-4 in. long.

Equatoria.

***C. populnea* Guillem. & Perrott.**

C. pallida (non Steud.) Broun & Massey.

Lofty climber; stems green, turning whitish with age, stout, glabrous, softly woody. Leaves subentire or obscurely toothed, broadly ovate-pentagonal, shortly triangular-acuminate at the apex, widely cordate at the base, 3½-7½ in. broad, glabrous, the main nerves usually radiating from the base. Flowers few in lax cymes. Fruit with a bloom and turning blackish-purple when ripe, nearly 1 in. long.

Central and Southern Sudan.



Fig. 109—CISSUS QUADRANGULARIS L.

C. quadrangularis L.

Fig. 109.

Glabrous lofty climber; stems stout, succulent, quadrangular, almost winged, constricted at the nodes, leafy only on the young shoots. Leaves thin, ovate-triangular to 3-lobed, truncate or subcordate at the base, $2\frac{1}{2}$ -4 in. broad, glabrous. Flowers greenish, few in short cymes. Fruit red when ripe, subglobose, about $\frac{1}{2}$ in. in diameter, 1-seeded.

Widespread.

C. rufescens Guillem. & Perrott.

Climbing or ground-trailing herb; stems glabrous to shortly pubescent. Leaves denticulate, the teeth very small and numerous, broadly ovate to orbicular, rounded to obtuse at the apex, more or less cordate at the base, $2\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, usually sparsely pubescent to glabrous above, very sparsely puberulous to glabrous on the lamina beneath when mature with the nerves more or less crisped-pubescent. Flowers umbellulate in cymes. Fruit black when ripe, pear-shaped, $\frac{1}{2}$ in. long.

Equatoria.

C. alnifolia Schweinf. ex Planch.

Erect herb; tendrils absent; stems covered with short glandular hairs. Leaves sessile, denticulate, ovate or subrhomboid-elliptic to almost orbicular, rounded at the apex, broadly subcordate or subtruncate at the base, 4-5 in. broad, puberulous or pubescent on both surfaces, the hairs mixed with orange glands. Flowers in terminal cymes; pedicels densely glandular-pilose. Fruit glandular-pilose, 1-seeded.

Equatoria.

C. cornifolia (Bak.) Planch.

Erect herb about 3 ft. high; stems brown-tomentose, stout, often arising after bush fires. Leaves distantly denticulate, elliptic to oblong-elliptic, acute at the apex, cuneate at the base, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 in. broad, densely brown-tomentose beneath when young, later glabrous or nearly so. Flowers often appearing before the leaves, in lateral compound cymes or terminal panicles with cymose branches. Fruit black-purple, obovoid, about $\frac{1}{2}$ in. long, pointed, edible.

Central and Southern Sudan.

C. afzeli (Bak.) Gilg & Brandt.

Glabrous climber. Leaves shortly petiolate, distantly denticulate, ovate or ovate-oblong, shortly acuminate and mucronate at the apex, rounded to truncate at the base, 1-4 $\frac{1}{2}$ in. long, $1\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad. Flowers small, in leaf-opposed few-flowered cymes. Fruit ovoid.

Equatoria.



Fig. 110—*CISSUS PALMATIFIDA* (Bak.) Planch.

A, flowering shoot. B, flower. C, longitudinal section of flower. D, cross-section of ovary. E, fruit. F, tendril

***C. palmatifida* (Bak.) Planch.**

Fig. 110.

Herb; stems often red-purple-tinged, suberect at first, then trailing or climbing, finely striate, villous when young. Leaves dentate, digitately lobed, lobes often deeply lobed again, truncate or slightly cordate at the base, 2-5 in. broad, finely pubescent above, more or less densely matted with fine grey pubescence and with the nerves rust-coloured beneath. Flowers in 6-12-flowered lateral cymes. Fruit black, subglobose, $\frac{1}{4}$ in. in diameter.

Equatoria.

***C. rotularioides* Planch.**

Erect herb 3-4 ft. high; stems brown-glandular-tomentose particularly when young, from a thickened rootstock. Leaves 3-foliolate; leaflets doubly serrate, oblanceolate, acute at the apex, cuneate at the base, up to 6 in. long, $1\frac{1}{2}$ in. broad, softly pubescent beneath. Flowers in many-flowered short dense cymes. Fruit subglobose, brown-tomentose.

Equatoria.

***C. triumfettioides* Gilg & Brandt.**

Perennial erect herb from a woody tuberous root; stems rusty-tomentose. Leaves 3-5-foliolate; leaflets serrate, obovate or obovate-oblong, acute at the apex, narrowly cuneate at the base, 4-7 $\frac{1}{2}$ in. long, shortly pubescent above, densely rusty-tomentose

beneath. Flowers in di- or trichotomous many-flowered dense cymes. Calyx densely rusty-tomentose. Fruit subglobose, rusty-tomentose.

Equatoria.

C. schweinfurthii Planch.

Climber; stems more or less reddish-grey-glandular-pilose. Leaves 3-foliolate; leaflets membranous, repand-dentate, oblong to rather narrowly elliptic, acute to obtuse at the apex, cuneate at the base, up to 5 in. long, 1½ in. broad. Flowers in many-branched cymes.

Equatoria.

C. juncea Webb.

Erect herb with a scaly tuberous root; stems striated, glabrous, leafless below. Leaves 3-foliolate; leaflets inciso-dentate, oblong-lanceolate, 6-8 in. long; about 1 in. broad at flowering time. Flowers green, in lax long-pedunculate terminal cymes 2-4 in. broad.

Central and Southern Sudan.

C. ternata (Forsk.) J. F. Gmel.

Stems climbing, terete, striate, glabrous; tendrils bifid. Leaves sessile or subsessile, thick, deeply and irregularly serrate, ovate to elliptic, acute at the apex, rounded to subcordate at the base, 2-3 in. long, glabrous. Flowers shortly pedicellate, in leaf-opposed dichotomous cymes.

Kassala: between Suakin and Kassala.

C. aralioides (Welw.) Planch.

Lofty glabrous climber, woody at the base; stems stout, succulent, terete. Leaves sometimes subsucculent; leaflets oblong-obovate, rounded or shortly acuminate at the apex, cuneate at the base, 2½-5½ in. long, ¾-2 in. broad, glabrous. Flowers whitish, in stalked thyrsoid compound panicles, the ultimate clusters 6-12-flowered. Fruit reddish, turning blue-purple, ¾-1 in. long.

Equatoria.

C. serpens Hochst. ex A. Rich.

Extensive climber; stems finely grooved, grey-glandular-pubescent. Leaves 5-7-foliolate; leaflets serrate-dentate, oblanceolate to obovate, 3¼-5 in. long, 1-1½ in. broad, shortly pubescent sometimes only on the nerves beneath. Flowers in compound cymes 3-4 in. broad on stout herbaceous sometimes setose-glandular and tomentose peduncles 3-4 in. long. Fruit oblong-turbinate, about ½ in. long, puberulous.

Darfur. Kordofan.

C. crinita Planch.

Erect herb; stems bristly-glandular, herbaceous from a half-succulent woody base. Leaves 3-7-foliolate; leaflets coarsely toothed, oblanceolate, acute to acuminate at the apex, up to 12 in. long, 3 in. broad, slightly pubescent particularly on the nerves beneath. Flowers in deeply red-tinged many-flowered cymes shorter than the leaves. Fruit black.

Equatoria.

C. adenocephala Gilg & Brandt.

Perennial climber; stems sulcate, more or less pilose. Leaves 3-5-foliolate; leaflets prominently serrate, ovate, acute at the apex, broadly cuneate or rounded at the base, up to 8 in. long, 3 in. broad, glabrous above, usually sparsely pilose on the nerves beneath. Flowers in dense many-flowered compound cymes on pilose peduncles $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long. Fruit ovoid, about $\frac{1}{2}$ in. long, somewhat densely grey-pilose, with glandular hairs intermixed.

Red Sea Hills: Karora Hills.

C. ibuensis Hook. f.

C. intricata (Bak.) Broun & Massey.

Wide climber; stems often rather deeply striate, slightly pubescent to glabrous; branches as well as the leaves sometimes slightly succulent. Leaves 3-foliolate; leaflets oblong-elliptic to ovate, acute at the apex, rounded at the base, $1\frac{1}{2}$ -3 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, glabrous on both surfaces when mature except sometimes on the nerves beneath. Flowers greenish, in copiously compound cymes $1\frac{1}{2}$ -2 in. broad on peduncles 4-6 in. long. Fruit about $\frac{1}{2}$ in. in diameter, glabrous.

Widespread, particularly near water.

C. cyphopetala Fresen.

Herbaceous climber; stems finely grey-downy, finely striated. Leaves 3-5-foliolate; leaflets broadly crenate, obovate-oblong, rounded at the base, 2-3 in. long, 1- $1\frac{1}{2}$ in. broad, more or less grey-downy beneath. Flowers in copiously compound cymes 3-5 in. broad on pubescent peduncles 2-3 in. long.

Widespread.

C. adenantha Fresen.

C. figariana Webb; *C. serpens* (non Hochst.) Broun & Massey p.p. Herb; stems striate, glabrous to shortly pubescent; tendrils absent. Leaves digitately 5-7-foliolate; leaflets sessile or subsessile, deeply and irregularly serrate, oblong-lanceolate, acuminate at the apex, cuneate at the base, glabrous when mature except on the nerves beneath; petiole pubescent. Flowers in large terminal corymbose cymes on 2-5-chotomous glandular peduncles.

Widespread.

C. gracilis Guillem. & Perrott.

Slender climber; stems angular, grooved, glabrous. Leaves 5-foliolate; leaflets irregularly serrate, petiolulate, ovate-oblong, acute to acuminate at the apex, rounded or cordate at the base, 3-5 in. long, 1½-2 in. broad. Flowers very small, in glabrous cymes on peduncles 1-4 in. long. Fruit black, globose, ¼-⅜ in. in diameter, glabrous.

Kassala: Gallabat. Equatoria.

C. adenocaulis Steud. ex A. Rich.

Nearly glabrous climber; stems deeply striate, and as well as the leaves half-succulent. Leaves 5-7-foliolate; leaflets dentate, ovate-oblong, acute to acuminate at the apex, rounded or cordate at the base, 2-3 in. long, 1-1½ in. broad, glabrous or slightly pubescent on both surfaces. Flowers reddish in bud, in copiously branched cymes 1-3 in. broad on peduncles 1-3 in. long. Fruit black, globose, ½ in. in diameter.

Kassala: Gallabat. Equatoria.

3. **LEEA** L.**Leea guineensis** Don.

Fig. 111.

Erect or suberect soft-wooded shrub up to 8 ft. high; tendrils absent. Leaves bipinnate; pinnae imparipinnate; leaflets petiolulate, crenate-serrate, opposite, oblong-elliptic, abruptly acuminate at the apex, rounded or slightly narrowed at the base, up to 7½ in. long, 3¼ in. broad, glabrous. Flowers orange and white, in leaf-opposed large spreading cymes. Fruit depressed, shallowly 5-8-lobed, nearly ⅜ in. in diameter, glabrous.

Equatoria.



Fig. 111—**LEEA GUINEENSIS** Don.

A, inflorescence and leaf. B, flower-bud. C, flower opened. D, longitudinal section of flower. E, staminal tube. F, stamen from the front and from the side. G, cross-section through ovary. H, berry.

98. RUTACEAE

Shrubs or trees or rarely herbs. Leaves without stipules, alternate or opposite, simple or compound, gland-dotted. Flowers hermaphrodite or rarely unisexual, usually actinomorphic. Sepals 4-5, imbricate, free or connate. Petals imbricate or rarely valvate, usually free. Stamens as many as or twice as many as the petals, or rarely numerous, free or rarely united; anthers 2-locular, introrse, the connective often glandular at the apex. Disk usually present within the stamens. Ovary superior, syncarpous and often 4-5-locular, or the carpels free (secondary apocarp); styles free or connate; ovules often 2, superposed. Fruit baccate, drupaceous or coriaceous, or rarely a capsule.

The following introduced plants of this family are cultivated in the Sudan: *Citrus aurantifolia* (Christm.) Swingle (*C. medica* subvar. *acris* Broun & Massey), Lime; *C. aurantium* L. (*C. aurantium* var. *amara* L. ex Broun & Massey), Bitter Orange; *C. limonia* Osb. (*C. medica* subvar. *limetta* Risso ex Broun & Massey), Lemon; *C. maxima* (Burm.) Merr. (*C. decumana* (L.) L.), Pummelo; *C. paradisi* Macf., Grape-fruit; *C. reticulata* Blanco (*C. nobilis* (non Lour.) Broun & Massey), Mandarin Orange, Tangerine; *C. sinensis* (L.) Osb. (*C. aurantium* var. *sinensis* L.), Sweet Orange.

- A. Herbaceous plants; flowers hermaphrodite; leaves alternate RUTA. 6.
- AA. Shrubs or trees:
- B. Leaves compound:
- C. Leaves more than 5-foliolate:
- D. Flowers hermaphrodite; unarmed shrubs or small trees CLAUSENA. 3.
- DD. Flowers unisexual:
- (a) Trees with prickle-bearing outgrowths on the stems and/or branchlets FAGARA. 4.
- (aa) Trees without prickle-bearing outgrowths FAGAROPSIS. 5.
- CC. Leaves 3-5-foliolate:
- E. Leaf-rhachis or petiole not winged or only very slightly so:
- (b) Armed shrubs or small trees; flowers unisexual TODDALIA. 8.
- (bb) Unarmed large shrubs or small trees; flowers polygamous TECLEA. 7.
- EE. Leaf-rhachis with a broad leafy wing between the leaflets ... CITROPSIS. 2.
- BB. Leaves simple; spiny shrubs or trees AEGLOPSIS. 1.

1. AEGLOPSIS Swingle

Aeglopsis eggellingii M. R. F. Tayl.

Deciduous spiny bush or tree up to 20 ft. high on forest edges; spines strong, straight, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Leaves crenulate, elliptic to obovate-elliptic, acuminate at the apex, cuneate at the base, 3-9 $\frac{1}{2}$ in. long, 1 $\frac{1}{4}$ -3 $\frac{1}{4}$ in. broad, densely and minutely glandular-punctate; petiole $\frac{3}{4}$ -1 in. long. Flowers greenish-white, in very

short axillary panicles. Fruit yellow-green, woody, pear-shaped, up to 3 in. in diameter; seeds surrounded by a strongly aromatic balsamic resin.

Equatoria.

2. **CITROPSIS** (Engler) Swingle & Kellerm.

Citropsis schweinfurthii (Engler) Swingle & Kellerm.

Spiny shrub or small tree; spines axillary, usually in pairs. Leaves 3-5-foliolate; leaflets serrate, broadly lanceolate, acuminate or acute to subacute at the apex, narrowed from the middle to the long-cuneate base, 2½-5 in. long, ¾-2½ in. broad; petiole broadly winged. Flowers white, axillary, in clusters of 4-10. Fruit light-yellow, the size of an orange.

Equatoria.

3. **CLAUSENA** Burm. f.

Clausena anisata (Willd.) Hook. f.

Fig. 112.

Unarmed shrub or tree usually 6-10 ft., occasionally attaining 30 ft., high; bark grey-green. Leaves strongly aromatic, up to 12 in. long; leaflets 11-37, alternate, entire or crenulate, obliquely ovate to ovate-lanceolate, obtusely acuminate at the apex, cuneate at the base, very variable in size, 1-4 in. long, ¼-1½ in. broad, glandular-punctate, more or less pubescent especially on the nerves beneath; petioles very short. Flowers creamy-white, in lax axillary panicles 3-14 in. long. Drupe shining, red-purple to blue-black, ellipsoid, about ½ in. long.

Equatoria.



Fig. 112—**CLAUSENA ANISATA** (Willd.) Hook. f.

A, inflorescence and leaf. B, flower-bud. C, open flower. D, flower in vertical section. E, F, stamen, front and side view. G, pistil. H, cross-section of ovary. I, fruits.

4. **FAGARA L.****Fagara angolensis** Engler.

Deciduous forest tree usually about 40 ft. high, sometimes attaining 80 ft.; stem armed with conical woody prickle-bearing outgrowths; branchlets strongly armed with short strong prickles; prickles brown with darker tips, straight or directed forwards or backwards. Leaves usually 8-18 in. long, the rhachis armed with recurved prickles; leaflets 11-15 (usually 13 or 15), entire or minutely crenulate, oblong-elliptic, attenuate-long-acuminate at the apex, cuneate at the base, 2½-4 in. long, ¾-1½ in. broad, prominently punctate; petiolules very short. Flowers creamy-white, in axillary panicles up to 12 or more in. long. Fruit reddish, globose, about ¾ in. in diameter; seeds black.

Equatoria: Azza Forest.

F. macrophylla (Oliv.) Engler.

Deciduous forest tree up to 100 ft. high; stem usually with conical woody prickle-bearing outgrowths; bark grey, smooth; slash yellow, fragrant; branchlets and leaf-rhachis armed with short sharp straight prickles up to ½ in. long. Leaves up to 3½ or more ft. long; leaflets 13-27, entire, elongate-oblong, rounded on one side and cuneate on the other at the base, the lamina unequally divided by the midrib, usually 4-9 in. long, 1½-2½ in. broad, prominently punctate; petiolules up to ½ in. long. Flowers creamy-white, sessile on the branches of the larger panicles. Fruit reddish, subglobose, ½ in. in diameter; seeds black.

Equatoria: Source Yubo.

5. **FAGAROPSIS** Mildbr.**Fagaropsis angolensis** (Engler) H. M. Gardn.

Deciduous tree up to 40 ft. high on the edge of forests; branchlets purple-brown, dotted with pale elliptic lenticels. Leaflets 5-11, usually 7 or 9, variable in shape, ovate-lanceolate to oblong-elliptic, acuminate at the apex, unequal-sided at the base, 1½-4 in. long, 1-1½ in. broad. Flowers yellow-white, appearing before the leaves, in terminal panicles usually with two whorls of branches. Fruit globose, ¾-1 in. in diameter.

Equatoria: Imatong Mountains.

6. **RUTA L.****Ruta tuberculata** Forsk.

Fig. 113.

Perennial herb about 12 in. high, with tubercled glands; stems ascending, much forked. Lower leaves and those of sterile branches more or less crenate, obovate or oblong-spathulate, tapering into a petiole, up to 2 in. long, but usually smaller; upper ones spathulate-linear, obtuse at the apex, ½-1 in. long. Flowers yellowish, clustered in forked cymes.

Northern and Central Sudan.



Fig. 113—*RUTA TUBERCULATA* Forsk.
A, fruit. B, flower.

7. **TECLEA** Del.**Teclea nobilis** Del.

Fig. 114.

Evergreen under-storey shrub or tree up to 40 ft. high; bark grey; slash yellow rapidly turning to brown. Leaves dark-green, usually 3-foliolate; petiole $\frac{3}{4}$ -2 in. long; leaflets narrow-lanceolate to elliptic or narrowly oblong-elliptic, acute to subacuminate at the apex, cuneate at the base, usually 2-6 in. long, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. broad; petiolules up to $\frac{1}{2}$ in. long. Flowers yellow-green, polygamous, in stout erect strongly branched panicles 2-7 (usually 2-4) in. long. Fruit red, ovoid, up to $\frac{1}{2}$ in. long, 1-seeded.

Red Sea Hills: Erkowit. Central and Southern Sudan.



Fig. 114—TECLEA NOBILIS Del.

A, inflorescence and leaf. B, flower-bud. C, male flower after removal of calyx and corolla. D, vertical section through ovary of female flower.

8. **TODDALIA** Juss.**Toddalia asiatica** (L.) Lam.*T. aculeata* Pers.

Scrambling prickly shrub or small tree. Leaflets sessile, coriaceous, narrowly elliptic to oblong, narrowed at both ends, 1-3 in. long, $\frac{1}{2}$ -1 in. broad, glabrous. Flowers white to yellow, in compressed axillary cymes. Fruit orange-coloured, globose, 3-5-grooved, about $\frac{1}{2}$ in. in diameter; seeds solitary in each loculus.

Equatoria.

99. *SIMAROUBACEAE*

Trees or shrubs sometimes with a bitter bark, rarely spiny. Leaves alternate or rarely opposite, pinnate or rarely simple and very rarely gland-dotted; stipules absent or rarely present and then often very long. Flowers small, unisexual or polygamous or rarely hermaphrodite, actinomorphic. Calyx-lobes 3-5. Petals 3-5 or rarely absent, imbricate or valvate, or united into a tube. Disk present. Stamens inserted at the base of the disk, as many as or twice as many as the petals or rarely numerous, free, sometimes with a scale at the base. Ovary usually 2-5-lobed, 1-5-locular, or the carpels quite separate; styles 1-5; ovules usually solitary or rarely 2 or more, axile. Fruit usually indehiscent, sometimes winged.

A. Leaves simple:

- (a) Ovary 5-6-locular; fruit depressed, 4-6-angled; stipules 2-4 or more in. long **KLAINEDOXA**. 6.
 (aa) Ovary 2-locular; fruit more or less ellipsoid; stipules up to 1 in. long **IRVINGIA**. 5.

AA. Leaves compound:

- B. Leaves 2-foliolate; flowers few in supra-axillary clusters or umbels; branchlets usually armed with supra-axillary spines ...
BALANITES. 1.

BB. Leaves pinnate:

- C. Flowers hermaphrodite; leaf-rhachis narrowly winged
HARRISONIA. 4.

CC. Flowers unisexual; leaf-rhachis not narrowly winged:

- (b) Stamens twice as many as the petals; calyx closed in bud, rupturing into unequal segments; fruit not reticulate **HANNOA**. 3.
 (bb) Stamens as many as the petals; calyx open in bud; fruit reticulate **BRUCEA**. 2.

1. **BALANITES** Del.**Balanites aegyptiaca** (L.) Del.

Fig. 115.

Savannah tree usually 15-20 ft. high, sometimes attaining 35 ft.; bark grey to dark-brown with thick ragged scales and long vertical fissures in which the yellow of the new bark can be seen; slash pale-yellow; branchlets green, smooth, armed with green straight forward-directed supra-axillary spines up to $3\frac{1}{2}$ in. long. Leaves grey-green; leaflets obovate to orbicular-rhomboid, usually 1-2 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad (exceptionally up to 3 in. long, 2 $\frac{1}{2}$ in. broad). Flowers yellow-green, about $\frac{1}{2}$ in. in diameter, in supra-axillary clusters or rarely subracemose. Fruit green at first, turning yellow, broadly oblong-ellipsoid, with a large hard pointed stone surrounded by a yellow-brown sticky edible flesh.

Widespread.



Fig. 115—BALANITES AEGYPTIACA (L.) Del.

2. BRUCEA J. F. Mill.

Brucea antidysenterica Lam.

Shrub or tree up to 20 ft. high. Leaves pinnate, 9-24 in. long; petiole reddish-pubescent; leaflets 7-13, opposite or subopposite, narrowly ovate to oblong, obtuse or shortly apiculate at the apex, rounded and usually unequal-sided at the base, 1½-5 in. long, 1-2¼ in. broad, more or less reddish-pubescent beneath. Flowers yellow-green, small, subsessile, clustered at intervals on the axis of pilose-tomentose spikes 4-10 in. long. Fruit bright-red, ellipsoid, ¾-1 in. long.

Equatoria: Didinga Mountains, Podocarpus forest at summit of Jebel Lotuka, 8500 ft.

3. **HANNOA** Planch.**Hannoa schweinfurthii** Oliv.

Glabrous shrub or small tree. Leaves 3-7-foliolate, $\frac{1}{2}$ -1 ft. long; leaflets coriaceous, narrowly oblong-oblongate, obtuse or subacute at the base, 3-6 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, glabrous. Flowers yellow, 1-3 on erect axillary or terminal peduncles 1-6 in. long. Fruit $\frac{3}{4}$ -1 in. long.

Equatoria.

4. **HARRISONIA** R. Br. ex A. Juss.**Harrisonia abyssinica** Oliv.

Shrub usually armed, sometimes straggling; prickles very short, more or less hooked. Leaves 1 $\frac{1}{2}$ -3 in. long; rhachis more or less winged between the pairs of leaflets; leaflets in usually 2-5 pairs, remotely dentate-serrate or occasionally lobed, obovate-elliptic or elliptic, obtuse at the apex, cuneate and oblique at the base in the sessile lateral leaflets, usually narrowed into a more or less winged petiolule in the terminal one, $\frac{1}{2}$ -1 in. long, usually glabrous except on the midrib beneath. Flowers in racemose axillary cymes.

Central and Southern Sudan.

5. **IRVINGIA** Hook. f.**Irvingia smithii** Hook. f.

Glabrous tree usually 30-40 ft. high but sometimes much taller. Leaves more or less broadly ovate, gradually and broadly acuminate at the apex, shortly cuneate or rounded at the base, 2 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, 2-2 $\frac{1}{2}$ in. broad, glabrous, with numerous spreading lateral nerves, finely reticulate on both surfaces; petiole about $\frac{3}{4}$ in. long; stipules up to 1 in. long, deciduous. Flowers yellowish, fragrant, small, in glabrous paniculate racemes up to 4 in. long. Fruit scarlet, oblong-ellipsoid, 1 $\frac{1}{2}$ -2 in. long.

Central and Southern Sudan: on river banks and in gallery-forests.

1. **barteri** Hook. f.

Large forest tree; stems grey; branchlets ending in a narrow curved stipular sheath covering the leaf-bud. Leaves shining, elliptic or obovate-elliptic, shortly and broadly acuminate at the apex, more or less cuneate or narrowly rounded at the base, 2 $\frac{1}{2}$ -6 in. long, 1 $\frac{1}{2}$ -3 in. broad, with about 8 pairs of lateral nerves, reticulate; petiole about $\frac{3}{4}$ in. long; stipules up to $\frac{3}{4}$ in. long, very acute at the apex, deciduous and leaving a scar. Flowers in short clustered racemes, sometimes subumbellate. Fruit yellow, broadly ellipsoid, resembling a mango, about 2-2 $\frac{1}{2}$ in. in diameter.

Equatoria: gallery-forests.

6. **KLAINEDOXA** Pierre ex Engler**Klainedoxa gabonensis** Pierre ex Engler.*K. oblongifolia* (Engler) Stapf.

Evergreen forest tree up to 150 ft. high; crown very thick, often umbrella-shaped in old trees; buttresses prominent, sharp, spreading, sometimes plank-like; bark grey, somewhat fissured. Leaves coriaceous, glossy, ovate to broadly elliptic or oblong-lanceolate, shortly acuminate at the apex, shortly cuneate at the base, usually 3-6 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, but sometimes up to 15 in. long and 5 in. broad, glabrous; stipules deciduous, linear, sharp-pointed, usually 2-4 in. long but sometimes longer, glabrous, enclosing the buds. Flowers reddish, small, in glabrous paniculate racemes about 6 in. long. Fruit hard, depressed-globose, about 2 in. long, $2\frac{1}{2}$ in. in diameter, obscurely 5-ribbed, resembling a small green apple.

Equatoria: gallery-forests.100. **BURSERACEAE**

Trees or shrubs secreting resin or oil. Leaves without stipules, alternate or rarely opposite, pinnate or rarely simple, usually not punctate. Flowers small, hermaphrodite or rarely unisexual. Sepals 3-5, imbricate or valvate. Petals 3-5 or rarely absent, free or rarely connate, imbricate or valvate. Disk present. Stamens as many as or twice as many as the petals; filaments free. Ovary superior, 2-8-locular; ovules 1 or 2 in each loculus, axile. Fruit a drupe or rarely a capsule.

- A. Fruit a capsule; leaflets serrate; flowers in clustered racemes or panicles at the end of the shoots **BOSWELLIA**. 1.
 AA. Fruit a drupe:
 B. Fruit fairly large and smooth; leaflets entire; tall forest trees ... **CANARIUM**. 2.
 BB. Fruit small, reticulate; leaflets usually toothed; shrubs or small savannah trees **COMMIPHORA**. 3.

1. **BOSWELLIA** Roxb.**Boswellia papyrifera** (Del.) Hochst. Frankincense Tree. Fig. 116.

Deciduous savannah tree up to 30 ft. high; bark pale-yellow-brown, papery, peeling in wide strips; slash reddish, exuding a fragrant resin. Leaflets 13-19, sessile, opposite to subopposite, crenate, oblong-lanceolate, up to 5 in. long, $1\frac{1}{2}$ in. broad, softly pubescent on both surfaces when young, ultimately glabrous above. Flowers white, tinged with pink, appearing before the leaves, pedicellate, sweet-scented, $\frac{1}{2}$ in. in diameter, in panicles up to 18 in. long, clustered at the ends of the thick branchlets; peduncles red. Fruit red, 3-(rarely 4-)sided, pear-shaped, about 1 in. long.

Central and Southern Sudan.



Fig. 116—*BOSWELLIA PAPYRIFERA* (Del.) Hochst.

2. **CANARIUM** L.**Canarium schweinfurthii** Engler.

Incense Tree.

Deciduous forest tree up to 120 ft. high; buttresses slight or absent; bark grey, rough, fissured; slash pale-brown to flesh-colour, exuding a fragrant resin usable as incense; branchlets densely rusty-pubescent. Leaves up to 2½ ft. long, tufted at the ends of the branches; leaflets in usually 6-10 pairs, sometimes up to 15 pairs, opposite or subopposite, oblong to oblong-lanceolate, abruptly acuminate at the apex, cordate to rounded at the base, 3-8 in. long, 1-2 in. broad, pubescent beneath. Flowers yellow-green to creamy-yellow, about ½ in. long, in axillary panicles up to 8 or more in. long. Fruit purple, like a date, 1-1½ in. long, cupped by the persistent calyx; pulp edible; seeds edible only when cooked.

Equatoria: gallery- and depression-forests.

3. **COMMIPHORA** Jacq.**Commiphora habessinica** (O. Berg) Engler.

Small savannah tree; bark on bole black, corrugated, cracking into squares; bark on branchlets purple-brown, peeling in papery strips. Leaves simple or very rarely 3-foliolate, subsessile, clustered, obovate, obtuse or rounded at the apex, cuneate at the base, ¾-1½ in. long, ¾-¾ in. broad, glabrous. Flowers pink, subsessile, about ½ in. long, clustered on very short cushion-like side-branches. Fruit ovoid, about ½ in. long, beaked.

Northern and Central Sudan.

C. africana (A. Rich.) Engler.

Fig. 117.

Shrub or tree up to 20 ft. high, usually spiny; bark green and shining, resin-scented, flaking in papery scales. Leaves usually 3-foliolate; leaflets coarsely crenate-serrate, obovate, obtuse or broadly acute at the apex, the central leaflet usually cuneate at the base and ½-1½ in. long, ½-1 in. broad, pubescent on both surfaces. Flowers with red petals with spreading green tips, ½ in. long, in axillary clusters. Fruit grey-green with a purple bloom, drupaceous, elliptic, ½-¾ in. long.

Central Sudan.

C. pedunculata (Kotschy & Peyr.) Engler.

Small tree; branchlets yellow-pubescent, the lateral ones occasionally hardening into spines. Leaves pinnate, usually crowded at the ends of the branchlets; leaflets in 3-4 pairs, subsessile, serrate-dentate, oblong, rounded at the apex, ¾-2¾ in. long, ¾-¾ in. broad, more or less softly pubescent on both surfaces. Flowers whitish, few on densely pubescent axillary peduncles up to 2 in. long. Fruit ellipsoid, about ¾ in. long, softly pubescent.

Central and Southern Sudan.



Fig. 117—COMMIPHORA AFRICANA (A. Rich.) Engler.

C. opobalsamum (L.) Engler.

Mecca Balsam; Balm of Gilead. Fig. 118.

Unarmed shrub or tree, wholly glabrous or extremities as well as the leaves occasionally finely pubescent. Leaves 3-5-foliolate or rarely simple, scattered or in clusters of 2-3 or more from short lateral branchlets often less than 1 in. long; leaflets entire or obscurely undulate, obovate or oblanceolate, obtuse or broadly acute at the apex, up to $\frac{3}{4}$ in. long. Flowers small, in clusters. Fruit ovoid or ellipsoid, smooth, glabrous, apiculate.

Red Sea District.



Fig. 118—COMMIPHORA OBOVALSAMUM (L.) Engler.

A, habit. B, flowering branchlet. C, male flower. D, branchlet with fruits. E, longitudinal section of fruit showing folded embryo. F, cross-section of fruit.

C. quadrinecta Schweinf. ex Engler.

Armed tree 10-15 ft. high; branchlets grey, glabrous, the lateral ones often hardening into spines. Leaves simple or 3-foliolate, orbicular or obovate or ovate or elliptic, acute at the apex, rounded at the base, about 1 in. long, glabrous on both surfaces. Flowers rose, clustered. Fruit oblong-ovoid, glabrous, the inner hard woody portion having a wing at each corner.

Kassala: Jebel Erimbat at Goz Regeb.

C. erythraea (Ehrenb.) Engler.

Small tree; branches short without spines. Leaflets 3 or rarely 5, sessile or subsessile, entire or obscurely crenate, obovate to ovate, the lateral leaflets $\frac{3}{4}$ -2 in. long, $\frac{1}{4}$ -1 $\frac{1}{2}$ in. broad, the terminal leaflet 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, grey-tomentose. Flowers cymose; peduncles about 1 in. long. Drupe ovoid, about $\frac{3}{8}$ in. in diameter, shortly pubescent.

Red Sea District.

101. MELIACEAE

Trees or shrubs usually with hard scented wood, very rarely sub-herbaceous. Leaves without stipules, alternate, usually pinnate. Flowers actinomorphic, usually hermaphrodite. Calyx often small, imbricate or rarely valvate. Petals free or partially connate, contorted or imbricate, or adnate to the staminal tube and valvate. Stamens usually 8 or 10 or rarely numerous, usually with connate filaments and the anthers often sessile in the tube. Disk present and various. Ovary superior, often 3-5-locular; stigma often disciform or capitate; ovules usually 2 or rarely 1 or more. Fruit baccate or capsular or rarely a drupe, often with a large central axis; seeds sometimes winged.

The following introduced plants of this family are cultivated in the Sudan: *Azadirachta indica* A. Juss., Neem; *Melia azedarach* L., Persian Lilac.

- A. Leaves pinnate or 3-foliolate:
- B. Fruit capsular:
- (a) Seeds not winged, small, thick TRICHILIA. 5.
- (aa) Seeds winged:
- (b) Fruit globose, large and woody; seeds flat, winged all round KHAYA. 3.
- (bb) Fruit oblong or elongated; seeds with a long terminal wing; flowers in wide cymose panicles:
- (c) Leaflets undulately toothed PSEUDOCEDRELA. 4.
- (cc) Leaflets entire ENTANDROPHRAGMA. 2.
- BB. Fruit drupaceous; flowers in slender panicles; leaflets entire; seeds not winged EKEBERGIA. 1.
- AA. Leaves simple or 1-foliolate; flowers subsolitary or subumbellate; fruit a fleshy capsule TURRAEA. 6.

1. EKEBERGIA Sparrm.

Ekebergia rueppelliana (Fresen.) A. Rich.

Fig. 119.

Forest tree up to 80 or more ft. high; bark grey; branchlets glabrous or nearly so, drying purplish, dotted with small pale-brown lenticels. Leaves imparipinnate, grouped chiefly near the ends of the branches, 6-12 in. long; rhachis reddish, more or less pubescent, compressed, sharp-edged; leaflets 5-11, coriaceous to firmly membranous, elliptic to ovate-lanceolate, acute or acuminate at the apex, shortly cuneate at the base, 2-5 in. long, 1-1½ in. broad, at first pubescent above and tomentose beneath, later glabrous, pale beneath; petiolule of lateral leaflets up to ½ in. long, of terminal leaflet up to 1 in. long. Flowers white, sometimes faintly tinged with pink, fragrant, in axillary panicles. Ovary 2-locular. Fruit fleshy, globose, about 1 in. in diameter.

Fung District. Equatoria.



Fig. 119—EKEBERGIA RUEPPELLIANA (Fresen.) A. Rich.

A, flower. C, staminal tube and pistil in vertical section. D, pistil. E, cross-section through ovary. F, fruit in vertical section. H, flowering branchlet.

E. senegalensis A. Juss.

Tree about 30 ft. high; bark grey, smooth, becoming rough and scaly. Leaves rather pale, pinnate, crowded at the ends of the branchlets; rhachis glabrous, sharp-edged; leaflets oblong or elliptic, shortly acuminate at the apex, unequal-sided and shortly cuneate at the base, 2-4 in. long, 1-1½ in. broad, glaucescent and glabrous and finely reticulate beneath. Flowers in axillary puberulous panicles. Fruit brownish, drupaceous, 5-locular, 5-lobed, globose in outline, ¾-1 in. long, glabrous, containing 2-4 bright-red seeds with a yellow aril.

Equatoria: Nyin Akok.

2. ENTANDROPHRAGMA C. DC.

Entandrophragma angolense (Welw.) C. DC.

Deciduous forest tree up to 160 ft. high with clean bole up to 80 ft. long; branches usually few, frequently steep-ascending; buttresses usually only moderately strong, but sometimes prominent and extending as much as 20 ft. up the stem; bark smooth, pale-grey-brown with pinkish or rusty-orange patches, scaling in large or small irregular flakes which leave concave scars; slash red. Leaves

usually 10-14 in. long, sometimes much larger; leaflets 10-16 (usually 12), oblong or broadly oblong-lanceolate, about twice (never more than 3 times) as long as broad, the central leaflet 2½-6 in. long, 1½-2½ in. broad. Flowers white, in stiff panicles up to 12 in. long. Capsule woody; thickest towards the apex and tapered towards the base, the valves falling together in the form of a cap, 5-6 in. long; seeds 3-4 in. long including the wing.

Equatoria: Azza Forest; Imatong Mountains, forest near Issore, 4400 ft.



W Andrae.

Fig. 120—*KHAYA SENEGALENSIS* (Desr.) A. Juss.

A. portion of inflorescence. B, flower. C, longitudinal section of flower. D, pistil with fleshy disk. E, showing attachment of anther to staminal tube. F, half staminal tube with anthers. G, fruits and winged seeds.

3. *KHAYA* A. Juss.

Khaya senegalensis (Desr.) A. Juss. Senegal Mahogany. Fig. 120.

Deciduous tree 60-90 ft. high, occurring in savannah and gallery-forests; bole clean, 30-50 ft. long; buttresses slight or absent; bark dark-grey, with small thin scales; slash bright-crimson, a red sap exuding. Leaves pale-green, 6-14 in. long; leaflets 6-16, oblong to narrowly oblong-elliptic, 2-5 in. long, 1-1½ in. broad. Flowers white with an orange-red disk around the ovary, in lax axillary panicles up to 8 in. long. Capsule 4-5-valved, about 2½ in. in diameter; seeds flat, 1¼-1½ in. long, ¾-1 in. broad including the wing.

Darfur. Equatoria.

K. grandifoliola C. DC.

African Mahogany. Fig. 121.

K. dawei Stapf.

Medium-sized to large deciduous tree occurring in gallery-forests and on the edge of streams in savannah; stem usually crooked; bark pale-grey, fairly smooth towards the top of the bole, cracking into irregular scales towards the base; slash dark-red with lighter streaks. Leaves shiny, up to 20 in. long; leaflets 6-10, broadly elliptic to ovate-elliptic, shortly and abruptly acuminate at the apex, 5-7½ in. long, 2-4 in. broad, with about 12 pairs of lateral nerves. Flowers white with an orange-red disk around the ovary, parts usually in 5's, in stiff axillary panicles up to 1 ft. long. Capsule 5-valved, about 2½ in. in diameter; seeds 1¼-1½ in. long, ¾-1 in. broad including the wing.

Equatoria.

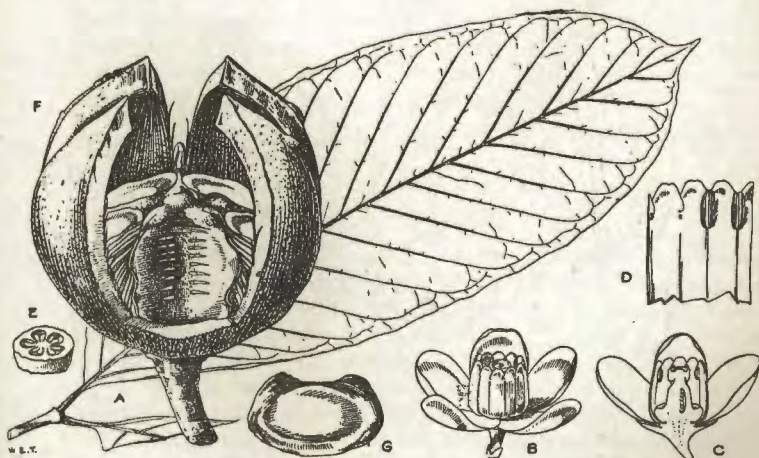


FIG. 121—*KHAYA GRANDIFOLIOLA* C. DC.

A, leaflet. B, flower. C, flower in vertical section. D, staminal tube from inside. E, cross-section of ovary. F, fruit with one valve removed. G, winged seed.



Fig. 122—*PSEUDOCEDRELA KOTSCHYI* (Schweinf.) Harms.
 A, fruit open. B, flowers and parts of same. C, winged seeds.

4. **PSEUDOCEDRELA** Harms**Pseudocedrela kotschyi** (Schweinf.) Harms.

Fig. 122.

Savannah tree up to 40 ft. high; crown oblong or pyramidal; branches steeply ascending; bark silver-grey to blackish, thin, fairly regularly fissured; slash bright-crimson. Leaves reddish when young, 12-16 in. long, tufted towards the ends of the branches; leaflets usually 2-5 in. long, 1-1½ in. broad, but much larger on coppiced branches, more or less softly pubescent. Flowers white (orange at the base of the staminal tube), fragrant, in panicles 6-8 in. long. Capsule 4-6 in. long; valves 5, dehiscing from the apex almost to the base, but remaining connected by a fibrous network; seeds pendulous, 5 in each loculus, about 2 in. long including the wing.

Central and Southern Sudan.

5. **TRICHILIA** Browne**Trichilia emetica** Vahl.

Fig. 123.

Tree usually 15-40 ft. high, occasionally attaining 90 ft.; young parts densely yellow-pubescent; bark grey, scaly. Leaves up to 18 in. long, in terminal clusters; leaflets 7-11, subsessile, oblong to oblong-elliptic, the basal pair sometimes nearly rounded, the terminal leaflet often obovate, rounded and emarginate at the apex, 1½-7 in. long, ¾-2½ in. broad, increasing in size from below upwards, pubescent beneath; midrib sometimes prolonged beyond and below the cleft tip. Flowers yellow-white, pedicellate, ¼-½ in. long, in racemes up to 4 in. long. Stamens joined for about half their length, the filaments 2-fid at the apex (a lateral tooth on each side of the anther). Capsule crimson when ripe, 4-valved, globose, about 1 in. in diameter; seeds brown with a scarlet or orange-red aril.

Central and Southern Sudan.

T. prleureana A. Juss.

Tree up to 80 ft. high, gregarious in forest, solitary in savannah; bark pale-brown, stringy, scarcely scaling; bole deeply fluted; slash dark-yellow. Leaves up to 10 in. long; leaflets 5-9 (rarely 11), elliptic to oblong or oblanceolate, shortly and obtusely acuminate at the apex, rounded to cuneate at the base, 2¼-5 in. long, 1½-2½ in. broad, glabrous or pubescent only on the nerves beneath. Flowers greenish-white tinged with pinkish-purple outside, creamy inside, very fragrant, in axillary racemes up to about 4 in. long. Filaments united throughout their length. Fruit globose; seeds black with a white aril.

Equatoria: Imatong Mountains.



Fig. 123—TRICHILIA EMETICA Vahl.

T. retusa Oliv.

Glabrous tree 40 ft. high, often occurring in gallery-forests or on river-banks. Leaflets 3-5, oblanceolate, narrowed to the base, widely bilobed-emarginate at the apex, 2½-5 in. long, 1-2 in. broad, finally glabrous beneath. Flowers white, fragrant, about ¾ in. long, tomentellous. Fruit broadly obovoid, usually 2-valved, about 1½ in. long; valves mucronate, finely tomentellous; seeds oblong, ¾ in. long.

Equatoria.

T. volkensii Gürke.

Under-storey shrub or tree up to 35 ft. high; young parts pinkish-pubescent. Leaves 3-15 in. long; leaflets 5-11, elliptic to oblong-lanceolate or oblanceolate, acuminate at the apex, obliquely attenuate to rounded at the base, 2-8 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, more or less covered with pinkish stellate hairs beneath. Flowers yellow-white, subsessile in racemes usually 5-10 in. long. Fruit ovoid.

Equatoria: Imatong Mountains, Mount Baghanj, 6000-7000 ft.

6. **TURRAEA** L.**Turraea vogellii** Hook. f.

Climbing shrub or under-storey tree up to 20 ft. high. Leaves ovate-elliptic, acuminate at the apex, rounded to subcuneate at the base, up to 5 in. long, $2\frac{1}{2}$ in. broad, glabrous or pubescent only on the nerves beneath; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers white, on pedicels $\frac{1}{2}$ -1 in. long; peduncle up to 2 in. long. Staminal-tube about $\frac{2}{3}$ as long as the petals, the filamentous teeth about as long as the anthers. Fruit globose, $\frac{3}{4}$ in. in diameter, splitting into 10 recurving valves; seeds black with an orange aril.

Equatoria: Khor Aba, Aloma Plateau.

T. nilotica Kotschy & Peyr.

Small shrub or tree up to 20 ft. high. Leaves entire or undulate, obovate or obovate-elliptic, obtuse, retuse or scarcely acute at the apex, narrowed at the base, 2-5 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, softly pubescent becoming glabrous above, tomentose and paler beneath. Flowers about $\frac{1}{2}$ in. long, in umbellate sessile axillary or sub-terminal clusters or terminating short lateral branches. Fruit orange, globose.

Central and Southern Sudan.

T. holstii Gürke.

Shrub or small tree; branchlets glabrous. Leaves shortly petiolate, oblong to ovate, acuminate at the apex, narrowed at the base into the petiole, 2- $3\frac{1}{2}$ in. long, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, glabrous, shiny above. Cymes 2-4-flowered, long-pedunculate, axillary.

Equatoria: Imatong Mountains, in ravines near Mount Garia, 6000-7000 ft.

102. **SAPINDACEAE**

Trees or shrubs or climbers. Leaves alternate or rarely opposite, simple or compound; stipules rarely present. Flowers actinomorphic or zygomorphic, sometimes very small, usually unisexual, variously arranged. Sepals imbricate or rarely valvate. Petals 3-5 or rarely more or absent, imbricate. Disk usually present, sometimes unilateral. Stamens hypogynous, often 8, inserted within the disk or unilateral;

filaments free, often hairy. Ovary superior, entire or vertically lobed to the base, 1-4- (often 3-) locular; style terminal or gynobasic, rarely 2-4, simple or divided; ovules 1-2 or rarely many in each loculus, axile. Fruit capsular or indehiscent, rarely winged; seeds often conspicuously arillate.

- A. Leaves pinnate with an odd terminal leaflet or 3-foliolate or simple:
- B. Climbing shrubs or herbs, the peduncle bearing coiled tendrils:
- (a) Woody plants; fruit firm, not bladder-like, turbinate, slightly 3-lobed at the top PAULLINIA. 14.
- (aa) Herbaceous plants; fruit bladder-like and membranous CARDIOSPERMUM. 5.
- BB. Shrubs or trees without tendrils:
- (b) Leaves (at least some of them) 3-foliolate; flowers in slender often pendulous racemes or panicles of racemes; fruit not winged ALLOPHYLUS. 1.
- (bb) Leaves simple:
- (c) Fruit flat, broadly winged; branches and leaves viscid DODONAEA. 7.
- (cc) Fruit neither flat nor winged; branches and leaves not viscid PAPPEA. 13.
- AA. Leaves pinnate without an odd terminal leaflet; tendrils absent:
- C. Fruit dehiscent; petals present or rarely absent:
- D. Calyx deeply lobed; seeds with a fleshy covering up to the middle APORRHIZA. 3.
- DD. Calyx toothed, small, soon open in bud:
- (d) Petals with scales at the base:
- (e) Petals with free entire scales; disk free ERIOCOELUM. 8.
- (ee) Petals funnel-shaped through the fusion of the scales; disk united with the ribs of the calyx BLIGHIA. 4.
- (dd) Petals (when present) without scales at the base; capsule thin and bladderly, 2-lobed and 2-locular MAJIDEA. 11.
- CC. Fruit indehiscent:
- E. Fruit vertically lobed to the base, sometimes with only 1 lobe fertile, with a style basal from between the lobes:
- (l) Ovary lobed but not deeply; stamens 5-8; leaflets in 1-2 pairs APHANIA. 2.
- (ff) Ovary deeply lobed; stamens 12-30; leaflets in 8 pairs DEINBOLLIA. 6.
- EE. Fruit laterally lobed or entire, with a terminal style; petals absent:
- F. Stamens more numerous than the calyx-lobes:
- (g) Sepals united high up; stamens 8-13:
- (h) Aril absent; stamens 8 PLACODISCUS. 15.
- (hh) Aril present; stamens usually more than 8 LECANIODISCUS. 10.

(gg) Sepals united only at the base; aril absent
MELANODISCUS. 12.

FF. Stamens as many as the calyx-lobes; fruit a berry:

- (i) Flowers in head-like cymes at the ends of the branch-
lets ZANHA. 16.
- (ii) Flowers in dense axillary clusters
HAPLOCOELUM. 9.

1. ALLOPHYLUS L.

Allophylus africanus Beauv.

Schmidelia africana (Beauv.) DC.; *S. schweinfurthii* (Gilg) Broun & Massey.

Shrub or tree up to 30 ft. high. Petiole 1-4 in. long, shortly pubescent; leaflets 3, sessile or shortly petiolulate, subentire to distantly crenate or serrate, oblong-obovate or elliptic, subacute to rounded at the apex, cuneate at the base, 4-6 in. long, 2-3 in. broad, glabrous except for occasional tufts of hairs in the nerve-axils and on the nerves beneath. Flowers creamy-white, fragrant, in usually unbranched axillary and terminal racemes up to 8 in. long. Fruit glabrous, ellipsoid, up to $\frac{1}{2}$ in. long.

Equatoria.

A. rubifolius (Hochst.) Engler.

Schmidelia rubifolia Hochst. ex A. Rich.

Shrub or small tree; branchlets slender, finely grey-downy. Petiole 1- $\frac{1}{2}$ in. long, downy; leaflets 3, irregularly serrate-crenate, obovate, subacute to acute or shortly acuminate at the apex, cuneate at the base, 2-3 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 in. broad, deep-green and sparsely puberulous above, pale-green and more or less finely grey-downy beneath. Flowers in simple or slightly branched racemes 2-3 $\frac{1}{2}$ in. long on downy axillary peduncles. Fruit black, 1-2-coccos, turbinate, coriaceous, $\frac{1}{2}$ in. long, glabrous when mature.

Central and Southern Sudan.

A. welwitschii Gilg.

Shrub or small tree. Leaves 3-foliolate; leaflets irregularly and rather distantly serrate, oblong or laterally oblique-ovate-oblong, long-acuminate at the apex, obtuse to narrowly cuneate or with one side cuneate and the other rounded at the base, 4-6 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, glabrous on both surfaces except on the nerves; petiole 2-3 $\frac{1}{2}$ in. long. Flowers greenish, shortly pedicellate, in 3-8-flowered cymes forming a pseudo-raceme 2 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long.

Equatoria: gallery-forest within 5 miles of Iwatoka.

2. **APHANIA** Bl.**Aphania senegalensis** (Juss.) Radlk.

Under-storey tree usually 30-40 ft. high, occasionally attaining 70 ft., somewhat resembling *Khaya* in appearance; bark pale-brown. Leaf-rhachis 1½-6 in. long; leaflets 2-6 (usually 4), entire, coriaceous, opposite or subopposite, broadly oblanceolate to elliptic or obovate-elliptic, obtuse at the apex, cuneate at the base, 3-7 in. long, 1-2½ in. broad; petiolules swollen, grooved above, very short. Flowers polygamous, creamy-white, in rather lax terminal panicles up to 10 in. long. Drupe red, ellipsoid-globose, ½-¾ in. long, fleshy, edible, with the basal style and abortive carpels persisting at the bottom; seeds bitter.

Equatoria.

3. **APORRHIZA** Radlk.**Aporrhiza panioulata** Radlk.

Tree; branchlets puberulous when young, becoming glabrous. Leaves pinnate; leaflets in 3-4 pairs, oblong-lanceolate, shortly and obtusely acuminate at the apex, up to 7 in. long, 2½ in. broad, shining. Flowers small in terminal panicles. Sepals densely tomentose. Petals 7. Capsule shortly stipitate, densely grey-velvety.

Equatoria.

4. **BLIGHIA** Konig**Blighia unijugata** Bak.

Under-storey tree usually 20-50 ft. high, or occasionally an upper-storey tree attaining 100 ft. in height; crown dense; bark grey to dark-green, thin, brittle, fairly smooth, horizontally ridged; slash mottled brown with crumbly fracture. Leaves paripinnate; leaflets 2-6, opposite to subopposite, elliptic to oblanceolate or obovate-elliptic, shortly and broadly acuminate at the apex, cuneate at the base, the lower pair or pairs smaller than the uppermost pair, the uppermost pair 2-8 in. long, ¾-4 in. broad (usually 2-5 in. long, 1-1½ in. broad), dark-green and glossy above, glabrous except for tufts of hairs in the axils of the nerves beneath. Flowers white, very fragrant, in axillary racemes up to 6 in. long. Petals downy, funnel-shaped through the growing together of the basal scales. Stamens grey-villous. Capsule red, turbinate, about 1½ in. long, slightly 3-lobed, the lobes narrowly winged; valves after dehiscence recurving and becoming woody; seeds shining, dark-brown to black, with a small yellow cupular basal aril.

Equatoria: Bendere, Zande district, in Anogeissus-Khaya grandifoliola wood; Khor Ini, near Yei.



Fig. 124—*CARDIOSPERMUM GRANDIFLORUM* Sw.
 A, inflorescence and leaf. B, fruits. C, flower. D, stamens. E, petal with adnate scale.

5. **CARDIOSPERMUM L.****Cardiospermum grandiflorum Sw.**

Fig. 124.

Herbaceous climber; stems usually pilose with long weak spreading hairs. Leaves biternate; leaflets coarsely toothed or almost lobed, more or less ovate, acute or broadly acuminate at the apex, pilose especially on the midrib and in the axils of the nerves beneath. Flowers cream-white, fragrant, nearly $\frac{3}{4}$ in. long, in umbellate inflorescences with a pair of tendrils at the apex of the peduncle. Fruit more or less 3-angled, bladdery, shortly cuneate at the base, about 2 in. long, glabrous except sometimes on the main nerves, reticulate.

Equatoria.Fig. 125—**CARDIOSPERMUM HALICACABUM L.**

A, seed.

C. halicacabum L.

Fig. 125.

Slender climber; stems annual, deeply sulcate, glabrous or finely grey-downy. Leaves bright-green, biternate with deeply inciso-pinnatifid ovate segments, glabrous or puberulous on the nerves and margin. Flowers about $\frac{1}{2}$ in. long, in axillary 3-fid umbels on slender peduncles 2-3 in. long with a pair of tendrils from near the apex. Fruit more or less 3-winged, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long, bladderly, pubescent all over; seeds black with a white aril.

Widespread.

C. corindum L.

Slender climber; stems deeply sulcate, pubescent to pilose. Leaves biternate, the segments ovate, deeply inciso-pinnatifid, pubescent. Flowers white, $\frac{1}{2}$ in. long on peduncles 3-4 in. long with a pair of opposite spirally coiled tendrils near the apex. Fruit stipitate, 1 - $1\frac{1}{2}$ in. in diameter, pubescent.

Red Sea District.

C. microcarpum Kunth.

C. halicacabum var. *microcarpum* (Kunth) Bl.

Similar to *C. halicacabum* but capsule more or less distinctly triangular and not more than $\frac{3}{8}$ in. each way.

Central and Southern Sudan.

6. **DEINBOLLIA** Schumach.**Deinbollia grandifolia** Hook. f.

Tall tree. Leaflets alternate, oblong-elliptic or broadly elliptic, obtusely acuminate at the apex, rather rounded at the base, up to $10\frac{1}{2}$ in. long, 4 in. broad, glabrous and closely reticulate beneath. Flowers yellow-white, in clusters forming large nearly glabrous pyramidal panicles up to 12 in. long.

Equatoria: gallery-forest within 5 miles of Iwataka.

7. **DODONAEA** Mill.**Dodonaea viscosa** Jacq.

Fig. 126.

Shrub or tree usually 6-12 ft. high, occasionally attaining 25 ft.; branchlets sometimes red-brown, angular, viscid, glabrous. Leaves subsessile, thin, viscid, oblanceolate, obtusely apiculate at the apex, long-attenuate at the base, 2-4 in. long, $\frac{1}{2}$ -1 in. broad, glabrous. Flowers yellow-green or creamy-white, unisexual or polygamous, in short terminal panicles or subracemose. Petals absent. Fruit pale-brown, flat, suborbicular to obcordate, deeply emarginate, broadly 2- or more-winged, up to $\frac{3}{4}$ in. in diameter including the membranous wings.

Red Sea District.



Fig. 126—DODONAEA VISCOSA Jacq.

A, cross-section of fruit. B, male flower. C, female flower.

8. ERIOCOELUM Hook. f.

Eriocoelum kerstingii Gilg ex Engler.

Tall tree; young branchlets and inflorescences densely yellow- or rusty-tomentose. Leaves sessile; leaflets in 2-3 pairs, oblong to oblong-elliptic, subacute at the apex, broadly cuneate at the sometimes unequal-sided base, $3\frac{1}{2}$ - $6\frac{1}{2}$ in. long or rarely longer, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, glabrous above, more or less pubescent on the nerves beneath. Flowers white, in dense-flowered panicles at the apex of the branchlets. Capsule depressed-globose, about $\frac{3}{4}$ in. in diameter.

Equatoria: Khor Ini, Yei.

9. **HAPLOCOELUM** Radlk.**Haplocoelum foliolosum** (Hiern) Bullock.

Deciduous shrub or tree up to 25 ft. high; bark grey. Leaves paripinnate, 1-3½ in. long, yellow or pink when young; leaflets 6-14, subequal or the terminal pair the largest, sessile or subsessile, broadly elliptic to obovate-elliptic, emarginate at the apex, unequal-cuneate at the base, ½-1 in. long, ¼-½ in. broad. Flowers often appearing before the leaves, yellow, fragrant, pedicellate, very numerous in dense axillary clusters (much-contracted panicles). Fruit ellipsoid, ½-¾ in. long.

Equatoria: slopes of Jebel Yukanga, N.W. of Jebel Manda in middle of headwaters, valley of R. Boro, 3800 ft.

10. **LECANIODISCUS** Planch. ex Benth.**Lecaniodiscus cupanifolides** Planch. ex Benth.

Spreading under-storey shrub or tree up to 40 ft. high; branchlets ridged, shortly pubescent. Leaves paripinnate; rachis slender, woody towards the base; leaflets 8-12, opposite or subopposite, oblong to obovate-elliptic, usually broadly long-tailed at the apex, cuneate at the base, usually 3-6 in. long, 1¼-1¾ in. broad, glabrous; petiolules usually swollen, very short. Flowers dull-yellow, very fragrant, polygamous or dioecious, more or less clustered in puberulous axillary racemes much shorter than the leaves. Fruit velvety-yellow-tomentose, broadly ovoid to globose, about ¾ in. long, shortly beaked by the terminal style; seeds brown to black, embedded in a sweet edible gelatinous pulp.

Equatoria: in edge of gallery-forest, Khor Aba, Aloma Plateau.

11. **MAJIDEA** Kirk ex Oliv.**Majidea fosteri** (Sprague) Radlk.

Harpullia fosteri Sprague.

Deciduous forest tree up to 100 ft. high; bole clean to 40 ft.; girth 6 ft. at breast height; buttresses usually well developed; bark yellowish, especially towards the base, covered with projecting lenticels. Leaves pinnate, up to 18 in. long; leaflets usually 8-24, opposite or subopposite or alternate, sessile or subsessile, crenulate, oblong to oblong-elliptic, obtusely acuminate at the apex, unequal-sided (more or less rounded on the upper side, cuneate on the lower) at the base, 2-5 in. long, ¾-1½ in. broad, glabrous. Flowers often appearing before the leaves, greenish-brown, tinged with pink or purple, in short dense panicles. Petals present or absent. Disk shining-red, conspicuous. Fruit yellow-green to red-green outside, scarlet inside, turbinate, clustered, bladdery, membranous, about 1½ in. long, 2 in. broad, 3-lobed, 3-locular, dehiscing loculicidally; seeds oblong, ½ in. long, densely covered when young by a greenish tomentum.

Equatoria: Azza and Lotti Forests.

12. **MELANODISCUS** Radlk.**Melanodiscus** sp.

Medium lower-storey tree; bark transversely corrugated. Leaf-rhachis pubescent; leaflets in 2-4 pairs, oblanceolate to obovate, the lower pairs smaller, glabrous except for tufts in the nerve-axils and on the nerves beneath; petiolules densely pubescent.

Equatoria: Lotti Forest.

13. **PAPPEA** Eckl. & Zeyh.**Pappea** sp.

Tree up to 25 ft. high; branchlets grey to dark-grey. Leaves crowded at the ends of the branchlets, oblong to oblong-elliptic, rounded to emarginate at the apex, unequal-sided and rounded to subcordate at the base, up to 3 in. long, 1½ in. broad, sparsely puberulous above and beneath particularly on the nerves.

Equatoria: on upper face of escarpment, Botichabi Pools, Abyssinian border.



Fig. 127—**PAULLINIA PINNATA** L.

A, inflorescence and leaf. B, flower. C, flower in vertical section. D, disk-glands. E, stamen. F, ovary in cross-section. G, H, fruits.

14. PAULLINIA L.

Paullinia pinnata L.

Fig. 127.

Woody climber; branchlets softly pubescent to nearly glabrous, ribbed. Leaves imparipinnate; rhachis conspicuously winged, the wings leafy; leaflets in 2 pairs, opposite, rather coarsely and remotely toothed, oblong to obovate, 2½-6 in. long, 1-3 in. broad, glabrous to pubescent with hairy pits in the axils beneath. Flowers white, small, on axillary peduncles with 1 or 2 spirally coiled tendrils at the apex and with a short raceme of clustered flowers beyond. Fruit scarlet, woody, turbinate, slightly 3-lobed and shortly beaked at the apex, about 1½ in. long.

Fung District. Equatoria.

15. PLACODISCUS Radlk.

Placodiscus sp.

Tall tree at least 100 ft. high. Leaflets 5-7, narrowly elliptic to oblong-elliptic, obtusely acuminate at the apex, cuneate at the base, 3½-6½ in. long, 1½-2 in. broad, glabrous on both surfaces.

Equatoria: Azza Forest.

16. ZANHA Hiern

Zanha golungensis Hiern.

Deciduous spreading forest tree up to 60 ft. high; branchlets red-grey, scaly when young. Leaves paripinnate, 4-9 in. long; leaflets 6-8 or rarely more, entire or occasionally crenate, ovate to oblong (rarely lanceolate), obtusely acuminate at the apex, cuneate and often unequal-sided at the base, 2-4 in. long, 1-1½ in. broad, glabrous. Flowers appearing before the leaves, olive-green, small, in dense head-like cymes 2-5 in. long at the ends of the branchlets. Fruit olive-like, ripening from green through rosy-pink to straw-yellow, ellipsoid, ¾ in. long, apiculate, edible; seeds black with an orange aril.

Equatoria: Khor Mamenze, Tembura; Wau, garden of civil rest-house.

103. MELIANTHACEAE

Shrubs or small trees. Leaves alternate, pinnate; stipules present, intrapetiolar, often large. Flowers hermaphrodite or rarely unisexual, racemose, zygomorphic. Calyx of 5 unequal segments, imbricate. Petals 5, free, subperigynous, clawed, unequal. Disk unilateral or annular, lining the inside of the calyx. Stamens 4-6, inserted within the disk, free or variously connate, often bent downwards or forwards. Ovary 4-5-locular, superior; style central, dentate or truncate; ovules 1-4 in each loculus, axile. Fruit a papery or woody capsule, loculicidally 4-5-valved or opening only at the apex.

1. BERSAMA Fresen.

Bersama abyssinica Fresen.

Tree; young branchlets grey-downy. Leaves usually 9-13-foliolate, the rachis sometimes winged; leaflets shortly petiolulate, more or less distantly serrate towards the apex, oblong-lanceolate, acute or acuminate at the apex, rounded to cuneate at the sometimes unequal-sided base, 2-4½ in. long, ¾-1½ in. broad, glabrous above, glabrous or sparsely pubescent beneath. Flowers in dense axillary racemes 4-8 in. long, 1 in. broad when expanded. Capsule subglobose, bony, 4-5-angular, ½-¾ in. long, densely brown-tomentose.

Equatoria.

104. ANACARDIACEAE

Trees or shrubs, often with resinous bark. Leaves alternate or very rarely opposite, simple or compound; stipules absent or very rarely present but obscure. Flowers hermaphrodite or unisexual, usually actinomorphic. Calyx variously divided, sometimes semi-superior in fruit. Petals 3-7 or absent, free or rarely connate and adnate to the torus. Disk present. Stamens often twice as many as or rarely equal to the petals or numerous. Ovary superior, 1-locular, or rarely 2-5-locular or very rarely the carpels free; styles 1-5, often widely separated; ovule solitary, pendulous from the apex or adnate to the ovary wall or pendulous from a basal funicle. Fruit usually drupaceous.

The Mango, *Mangifera indica* L., is planted in the Sudan for its fruit and as a shade tree.

A. Leaves compound:

B. Leaves 5- or more-foliolate:

C. Petals absent; flowers hermaphrodite PISTACIA. 4.

CC. Petals present, imbricate; flowers polygamous or dioecious:

D. Style 1, terminal; only one ovary-loculus fertile
SORINDEIA. 8.

DD. Styles more than 1:

(a) Sepals free:

(b) Anthers much longer than broad; leaflets opposite or subopposite; fruit obovoid; male flowers spicate ...
SCLEROCARYA. 7.

(bb) Anthers orbicular; leaflets subopposite or alternate; fruit broadly ellipsoid; flowers in lax panicles
PSEUDOSPONDIA. 5.

(aa) Sepals more or less united at the base:

(c) Petals 4; leaflets opposite LANNEA. 3.

(cc) Petals 3; leaflets alternate ... HAEMATOSTAPHIS. 1.

BB. Leaves always 3-foliolate; flowers polygamous or dioecious
RHUS. 6.

AA. Leaves simple; flowers polygamous or dioecious ... HEERIA. 2.

1. HAEMATOSTAPHIS Hook. f.

Haematostaphis barteri Hook. f.

Small tree; branchlets purplish-glaucous. Leaves pinnate; leaflets about 9-12 on each side, oblong or oblong-elliptic, slightly emarginate at the apex, rounded or slightly cuneate at the base, 2-3½ in. long, ¼-1¼ in. broad, glabrous, rather glaucous. Flowers dioecious, creamy, in slender lax pendulous panicles clustered at the ends of the branchlets. Fruit deep-red, drupaceous, smooth, broadly ellipsoid, about ¼ in. long, edible.

Equatoria.

2. HEERIA Meisn.

Heeria insignis (Del.) Kuntze.

Fig. 128.

Rhus insignis (Del.) Oliv.

Shrub or small spreading tree 15 ft. high. Leaves lanceolate to oblong-lanceolate, acute and mucronate at the apex, up to 8 in. long and 2 in. broad but usually smaller, closely silvery-silky-tomentellous and glaucous beneath, with very numerous spreading parallel lateral nerves. Flowers in terminal narrowly pyramidal panicles. Fruit black, sometimes deeply 2-lobed, about ½ in. broad.

Widespread.

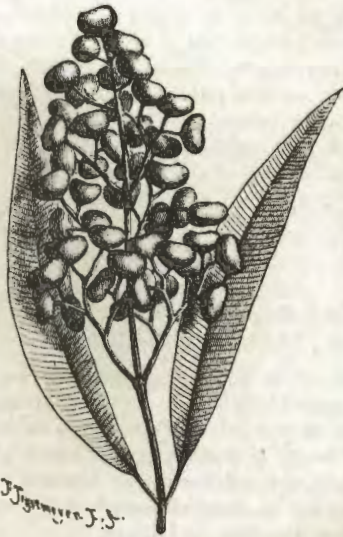


Fig. 128—HEERIA INSIGNIS (Del.) Kuntze.

H. pulcherrima (Schweinf.) Kuntze.*Rhus pulcherrima* (Schweinf.) Oliv.

Shrub or small tree with a milky juice; branchlets softly pubescent. Leaves obovate-elliptic or broadly elliptic, sometimes mucronate and subtruncate or emarginate at the apex, cuneate at the base, up to 8½ in. long, 5 in. broad, greenish and softly tomentose beneath, with numerous parallel lateral nerves. Flowers whitish or reddish, small, in lax oblong panicles. Fruit as in *H. insignis*.

*Central and Southern Sudan.***H. reticulata** (Bak. f.) Engler.

Savannah tree up to 30 ft. high; bark grey. Leaves often verticillate, entire, elliptic to lanceolate or oblong-lanceolate, mucronate and acute to obtuse at the apex, 4-8 in. long, 1-3 in. broad, silvery-tomentose beneath, with numerous parallel lateral nerves; petiole ¾-1 in. long. Flowers white or pinkish-white, small, in erect terminal panicles. Fruit purple-black, persisting.

*Equatoria.*3. **LANNEA** A. Rich.**Lannea fruticosa** (Hochst.) Engler.*Odina fruticosa* Hochst. ex A. Rich.

Savannah tree up to 25 ft. high; branchlets rough, thickly lenticellate. Leaves 9-18 in. long, tufted at the branch-ends; leaflets 11-15, sessile, lanceolate, obtuse at the apex, 1½-3½ in. long, ¾-1 in. broad, minutely stellate-pubescent at first, later glabrous. Flowers yellowish-white, in racemes on stout axillary peduncles; peduncle simple or branched once near the base, 2½-5 in. long, reddish-pubescent with stellate hairs. Fruit ¾-1 in. long, with 4 raised marks near the apex.

*Widespread.***L. schimperl** (Hochst.) Engler.

Fig. 129.

Odina schimperl Hochst. ex A. Rich.

Savannah tree up to 35 ft. high; bark dark-grey to almost black, rough. Leaves reddish-tomentose when young; leaflets 5-11, subsessile, elliptic to ovate-lanceolate, more or less acuminate at the apex, 2-5 in. long, 1½-2 in. broad, almost glabrous above when mature, densely matted-tomentose beneath. Flowers yellow, in simple racemes 2-5 in. long clustered at the ends of the twigs and appearing when the tree is leafless.

Widespread.



Fig. 129—LANNEA SCHIMPERI (Hochst.) Engler.
A, vertical section of fruit. B, flower.

L. schweinfurthii (Engler) Engler.

Usually fairly straight tree 20 ft. high, but sometimes much larger; slash dark-crimson. Leaflets 7-9, sessile, oblong-lanceolate to elliptic, long-acuminate at the apex, rounded to acute at the base, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, glabrous on both surfaces when mature, the nerves particularly the midrib prominent beneath. Flowers in branched spikes.

Darfur. Southern Sudan.

L. kerstingii Engler & Krause.

Odina barteri Oliv. p.p.

Savannah tree 30-40 ft. (rarely 60 ft.) high; bole light-grey, smooth, often with a spiral twist; slash salmon-pink with paler streaks. Leaflets 5-11, subsessile, ovate to ovate-elliptic, more or less acuminate at the apex, $3\frac{1}{2}$ -6 in. long, $1\frac{1}{2}$ -3 in. broad; tawny stellate hairs few and inconspicuous on both surfaces, the lower surface pubescent with erect spreading hairs when mature. Flowers yellow; male flowers scented, in spikes usually 5-6 in. long (rarely up to 15 in. long); female flowers not scented, in shorter spikes. Fruit reddish-purple, oblong, $\frac{1}{2}$ in. long.

Central and Southern Sudan.

L. humilis (Oliv.) Engler.

Odina humilis Oliv.

Deciduous savannah tree or shrub up to 15 ft. high. Leaves tufted at the ends of the branchlets; leaflets 13-19, oblong, rounded at both ends, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, dark-green and sparsely pubescent above, densely white- or tawny-stellate-tomentose beneath. Flower-spikes unbranched, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Fruit white-tomentose, about $\frac{1}{2}$ in. long.

Central and Southern Sudan.

4. **PISTACIA** L.**Pistacla falcata** Becc. ex Martelli.

Shrub or tree. Leaves imparipinnate, 6-8 in. long, clustered at the ends of the branchlets; leaflets in 5-7 pairs, subcoriaceous, alternate or opposite, subsessile, subfalcate, unequal-sided, narrowly lanceolate, long-acuminate at the apex, attenuate at the base, glabrous, paler beneath. Flower-spikes clustered at the ends of the branchlets.

Red Sea Hills: Dris Pass.

5. **PSEUDOSPONDIAS** Engler**Pseudospondias microcarpa** (A. Rich.) Engler.

Forest tree 30-60 ft. high or occasionally up to 80 ft. high; bole short, usually gnarled and twisted, heavily buttressed; bark pale-yellow-grey, flaking in large sheets; slash white. Leaves pinnate, up to 2 ft. long; leaflets in 2-6 pairs, subopposite or alternate,

unequally divided by the midrib, oblong to elliptic, broadly and obtusely acuminate at the apex, unequal-cuneate to rounded at the base, up to 8 in. long, $3\frac{1}{2}$ in. broad. Flowers dioecious, white, very small, in lax axillary panicles up to as long as the leaves. Fruit blue-black when ripe, broadly ellipsoid, about $\frac{1}{2}$ in. long, edible.

Equatoria.

6. RHUS L.

Rhus abyssinica Hochst. ex Oliv.

Fig. 130.

Shrub or tree up to 20 ft. high. Petiole up to 3 in. long, pubescent; leaflets sessile, crenate towards the apex (sometimes entire on flowering shoots), more or less pubescent above, pubescent or tomentose beneath, the central leaflet ovate or lanceolate to obovate or oblanceolate, usually 3-8 in. long but sometimes up to 12 in. long, $1\frac{1}{2}$ -4 in. broad, the lateral leaflets usually elliptic. Flowers brownish-white, in axillary and terminal panicles up to 8 in. long. Fruit brown, small.

Red Sea Hills. Equatoria.

R. oxyacantha Schousb. ex Cav.

R. dioica Brouss. ex Willd.

Shrub; branches twisted, spiny. Leaflets sessile, obtusely few-lobed, dentate from the middle to the apex, obovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, ciliate to glabrous. Flowers dioecious, very small, in short terminal panicles. Fruit shining, globose, $\frac{1}{2}$ in. in diameter, glabrous.

Red Sea Hills.

R. natalensis Bernh.

R. glaucescens A. Rich.

Bush or occasionally tree up to 20 ft. high; branchlets grey-brown. Petiole $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; leaflets pale-green, entire or crenulate, obovate to oblanceolate or oblong-lanceolate, obtuse to subacute (sometimes mucronate or emarginate) at the apex, cuneate at the base, central leaflet $1\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, paler and glabrous or becoming so beneath. Flowers greenish-yellow, very small, in slender panicles up to 6 in. long. Fruit globose, about $\frac{1}{2}$ in. in diameter.

Central and Southern Sudan.

R. vulgaris Meikle.

R. villosa (non L. f.) Broun & Massey.

Much-branched shrub or small tree up to 30 ft. high; branchlets softly brown- or rusty-villous. Leaflets often undulate-crenate or rarely entire or grossly serrate, obovate or orbicular, mucronate and obtuse or very rarely emarginate at the apex, cuneate towards the base, usually $1\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, densely villous on both surfaces. Inflorescences terminal or subterminal, pyramidal,

many-branched, up to 8 in. long or longer, the rhachis and branches densely pubescent; male flowers in dense subsessile clusters; female flowers in lax panicles. Fruit globose, about $\frac{1}{8}$ in. in diameter.

Central and Southern Sudan.



Fig. 130—RHUS ABYSSINICA Hochst. ex Oliv.

A, flower. B, vertical section of fruit.

R. retinorrhæa Steud. ex Oliv.

Glabrous shrub or tree; stem grey, smooth. Petiole $1\frac{1}{2}$ -2 in. long; leaflets entire or obscurely denticulate, elliptic or linear-lanceolate, more or less (often finely) acuminate at the apex, narrowed at the base, central leaflet 2-6 in. long, $\frac{1}{2}$ -1 in. broad, glabrous above, glabrous to slightly pubescent and paler beneath. Flowers pedicellate, in axillary or terminal moderately lax many-flowered panicles usually shorter than the leaves. Fruit shining, about $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter.

Red Sea Hills: Dris Pass.

R. flexicaulis Bak.

Shrub; branchlets densely pilose. Leaflets 3, oblanceolate-oblong to obovate, obtuse to emarginate at the apex, cuneate at the base, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, densely pilose and dull-green on both surfaces. Flowers in ample lax terminal panicles, the branches pubescent.

Red Sea Hills: Erkowit.

7. **SCLEROCARYA** Hochst.**Sclerocarya birrea** (A. Rich.) Hochst.

Fig. 131.

Savannah tree up to 40 ft. high; bark pale-grey, flaking in small or large scales; slash orange-pink with green edges. Leaves 6-12 in. long, tufted at the ends of the branchlets; leaflets glaucous, in 5-9 pairs, opposite, entire or toothed, obovate to elliptic, usually very acute at the apex, shortly cuneate at the base, $\frac{3}{4}$ -2 in. long, $\frac{1}{2}$ -1 in. broad. Flowers appearing before the leaves, dioecious, each in the axil of a small red bract; male flowers in erect terminal spikes 2-3 in. long; female flowers 2-3 together at the twig-ends on stout pedicels $\frac{1}{2}$ -1 in. long. Sepals purple-red, free. Petals recurved, green with purple-red tips. Stamens yellow. Fruit pale-yellow, plum-like, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. in diameter, with a tough skin and juicy mucilaginous flesh.

Central and Southern Sudan.

8. **SORINDEIA** Thou.**Sorindeia schweinfurthii** Engler.

Tree; branchlets shortly pilose. Leaves subcoriaceous, about 8 in. long, shiny above; leaflets in 2-3 pairs, subsessile, oblong, shortly and obtusely acuminate at the apex, obtuse at the base, $2\frac{1}{2}$ -4 in. long, $1\frac{1}{2}$ in. broad; petiole shortly pilose. Flowers in glabrous few-branched panicles about 12 in. long. Calyx deeply 5-lobed, the lobes ovate. Petals ovate, 4 times as long as the calyx-lobes. Stamens 15, the filament half as long as the anther.

Equatoria: Dar Fertit.



Fig. 131—*SCLEROCARYA BIRREA* (A. Rich.) Hochst.
A, flowers. B, fruit.

105. CONNARACEAE

Erect trees or shrubs, or climbers. Leaves without stipules, alternate, compound, imparipinnate or 1-3-foliolate. Flowers hermaphrodite or rarely unisexual, actinomorphic or slightly zygomorphic. Calyx imbricate or valvate. Petals 5, free or sometimes slightly connate, imbricate or rarely valvate. Stamens 5 or 10, hypogynous to perigynous, often curved downwards or forwards; filaments often united at the base. Disk thin or absent. Carpels 1-5, free, 1-locular; ovules 2, collateral, erect, attached near the base or the middle of the ventral suture, both or only 1 ripening in the fruit. Fruiting-carpels often splitting down one side exposing the seed; seeds usually 1, often arillate.

- A. Inflorescences terminal or nearly terminal, never on the old wood :
 B. Petals about $\frac{1}{2}$ as long as the sepals CNESTIS. 2.
 BB. Petals as long as or longer than the sepals :
 (a) Leaves 3-foliolate; hairs stellate AGELAEA. 1.
 (aa) Leaves pinnate; hairs simple JAUNDEA. 3.
 AA. Inflorescences axillary or clustered on the old wood :
 C. Sepals glabrous or nearly so, imbricate; inflorescences not clustered SANTALOIDES. 4.
 CC. Sepals tomentose, nearly valvate; inflorescences often clustered on the older branches CNESTIS. 2.

1. AGELAEA Soland. ex Planch.

Agelaea ugandensis Schellenb.

Erect or climbing shrub; stems slightly appressed-pubescent, later glabrous. Leaflets 3-nerved almost from the base; terminal leaflet elliptic, shortly and broadly acuminate at the apex, rounded to broadly cuneate at the base, $1\frac{1}{2}$ - $5\frac{1}{2}$ in. long, $\frac{3}{4}$ - $2\frac{1}{2}$ in. broad, lateral leaflets more or less unequally divided by the midrib, glabrous above and beneath when mature. Flowers in terminal or sub-terminal panicles on rusty-stellate-pubescent peduncles. Calyx densely rusty-silky-tomentose. Fruit oblique-obovoid, about $\frac{3}{4}$ in. long, densely rusty-velvety; seeds shiny-black.

Equatoria: gallery-forests.

2. CNESTIS Juss.

Cnestis ferruginea DC.

Fig. 132.

Densely-brown pubescent shrub. Leaflets numerous, oblong, obtusely pointed at the apex, rounded at the base, 2- $3\frac{1}{2}$ in. long, 1 in. broad, softly pubescent beneath when mature. Flowers white, small, in inflorescences shorter than the leaves and clustered at the ends of the branchlets. Fruit red, velvety pear-shaped, about $1\frac{1}{2}$ in. long, bluntly beaked, hairy inside.

Equatoria.



Fig. 132—CNESTIS FERRUGINEA DC.

A, flower after removal of calyx. B, branchlet with fruits. C, seed with aril. D, seed in longitudinal section.

3. JAUNDEA Gilg

Jaundea pinnata (Beauv.) Schellenb.

Byrsocarpus pseudobaccatus (Gilg) Schellenb.

Strong woody climber or sometimes an erect shrub. Leaflets usually 5 (more rarely 7), ovate or oblong-ovovate, obtusely pointed and mucronate at the apex, up to $4\frac{1}{2}$ in. long, 2 in. broad, laxly veined and glabrous beneath except sometimes on the midrib. Flowers white or pink-tinged, fragrant, in short and clustered panicles. Fruit scarlet, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long; seeds black.

Equatoria.

J. monticola (Gilg) Schellenb.

Rambling shrub or lofty woody climber; stems glabrous. Leaflets usually 7 (or rarely 5), oblong or oblong-elliptic, abruptly and shortly acuminate at the apex, rounded at the base, $2\frac{3}{4}$ -4 in. long, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. broad, glabrous, prominently reticulate beneath. Flowers greenish-white, in solitary or clustered axillary many-flowered panicles up to $3\frac{1}{2}$ in. long; peduncle shortly pubescent. Fruit scarlet, about $\frac{3}{4}$ in. long.

Equatoria: gallery- and depression-forests.

4. **SANTALOIDES** Schellenb.**Santaloides gudjuanum** (Gilg) Schellenb.*Rourea gudjuana* Gilg.

Erect or climbing glabrous shrub or small tree. Leaflets ovate, shortly and broadly acuminate, up to 3½ in. long, 2 in. broad, usually smaller. Flowers white or pink-tinged, in very slender glabrous cymes much shorter than the leaves. Fruit red, ovoid, shortly tapering to the apex, very closely striate, ¾-1 in. long, smooth, glabrous, not splitting down one side.

*Equatoria.*106. **ALANGIACEAE**

Trees or shrubs, sometimes spiny. Leaves without stipules, alternate, simple. Flowers hermaphrodite, in axillary cymes; pedicels articulated. Calyx truncate or with 4-10 teeth. Petals 4-10, usually linear, valvate, at length recurved, sometimes coherent at the base. Stamens as many as and alternate with the petals or 2-4 times as many, free or slightly connate at the base, more or less villous inside. Disk cushion-like. Ovary inferior, 1-2-locular; style simple, club-shaped or 2-3-lobed; ovule solitary, pendulous. Fruit a drupe crowned by the sepals and disk, 1-seeded.

1. **ALANGIUM** Lam.**Alangium chinense** (Lour.) Rehd.

Fast-growing deciduous tree up to 50 ft. high; bark pinkish-grey. Leaves ovate to broadly elliptic, acuminate at the apex, 3-5-nerved from the very oblique base, 3-6 in. long, 1½-3½ in. broad; petiole up to 1 in. long. Flowers creamy-white, fragrant, in small axillary cymes 1-1½ in. long. Calyx minute, toothed. Petals puberulous, strap-shaped, about ½ in. long. Fruit ellipsoid, about ½ in. long and ¼ in. broad.

*Equatoria: Imatong Mountains.*107. **ARALIACEAE**

Usually woody plants, sometimes climbing by means of aerial roots. Leaves alternate or rarely opposite, simple or compound, often with stellate indumentum; stipules often adnate to and scarcely distinguishable from the base of the petiole or intrapetiolar or rarely absent. Flowers hermaphrodite, polygamous or dioecious, actinomorphic, spicate, racemose, umbellate, or capitate. Calyx small, entire or toothed, adnate to the ovary. Petals 3 or more, often 5, valvate or slightly imbricate, free or united. Stamens free, alternate with and usually as many as the petals. Disk on top of the ovary, often confluent with the style in the middle. Ovary inferior, 1- or more-locular; styles free or connate; ovules solitary in each loculus, pendulous from the inner angle. Fruit a berry or a drupe.

- A. Leaves pinnate; leaflets softly tomentose with stellate hairs
POLYSCIAS. 2.
- AA. Leaves digitate or digitately lobed:
B. Flowers spicate or racemose; ovary 2-locular ... CUSSONIA. 1.
BB. Flowers umbellate or capitate; ovary 5- or more-locular
SCHEFFLERA. 3.

1. CUSSONIA Thunb.

Cussonia arborea Hochst. ex A. Rich.

Savannah tree up to 20 ft. high, occasionally attaining 40 ft.; young parts stellate-tomentose; bark grey-brown, corky, deeply furrowed. Leaves digitate or very deeply digitately lobed, crowded at the ends of the thick branchlets; petiole 6-18 in. long; leaflets 5-7, serrulate, more or less broadly elliptic, occasionally with 1 or 2 deep notches or lobes near the apex, obtuse to acuminate at the apex, cuneate at the base, up to 9 in. long, 3½ in. broad, puberulous above, flannelly beneath when young. Flowers yellow, appearing before the leaves, about ¼ in. in diameter, in sessile spikes up to 14 in. long and about ½ in. thick. Fruit ovoid, fleshy, ¼ in. long.

Nuba Mountains. Equatoria.

C. hamata Harms.

Tree. Leaves palmately 5-7-lobed to about half-way down, remotely serrate, broadly ovate or obovate, acuminate at the apex, scabrous with scattered rigid hooked hairs above and with scattered hairs on the nerves beneath; otherwise similar to *C. arborea*.
Equatoria.

C. laciniata Harms.

Tree. Leaves deeply divided into 6-7 deeply lobed segments, the latter oblong or ovate-oblong, obtuse or acute at the apex; lobes remotely serrate, oblong or ovate, acute or obtuse at the apex, scabrous with rigid hooked hairs above, more or less pubescent particularly on the nerves beneath; petiole deeply sulcate; otherwise similar to *C. arborea*.
Equatoria.

2. POLYSCIAS J. R. & G. Forst.

Polyscias fulva (Hiern) Harms.

Deciduous flat-topped tree up to 40 ft. high; bole straight, cylindrical, unbuttressed; bark grey-yellow; crown obconical, composed of a whorl of limbs each of which bears whorls of branches; young parts densely stellate-pubescent. Leaves up to 4 ft. long; leaflets rather thin, 13-29, oblong to ovate-elliptic, shortly acuminate at the apex, rounded to truncate at the base, 3-7 in. long, 1½-3 in. broad, puberulous on the midrib above, softly tomentose beneath. Flowers yellowish, shortly pedicellate, in erect tomentellous panicles 1½-3 ft. long with lateral branchlets 1-4 in. long. Fruit ellipsoid, ribbed, about ¼ in. long.

Equatoria: Imatong Mountains.

P. ferruginea (Hiern) Harms.

Tree 20 or more ft. high; young parts brownish-stellate-tomentose. Leaflets leathery, oblong to ovate, shortly acuminate at the apex, cordate to truncate at the base, up to 8 in. long, 4 in. broad, densely tomentose beneath. Flowers sessile or subsessile, in softly tomentose panicles up to 20 in. long with lateral branchlets about $4\frac{1}{2}$ in. long. Fruit ellipsoid, ribbed, $\frac{1}{2}$ in. long, glabrous or nearly so.

Equatoria: Imatong and Didinga Mountains.

3. **SCHEFFLERA** J. R. & G. Forst.**Schefflera abyssinica** (Hochst.) Harms.

Spreading tree up to 60 ft. high; bark grey-black, corky. Leaves digitate, clustered at the ends of the branches; petiole up to 12 in. long; leaflets thinly coriaceous, usually 5 or 6, crenate-serrate, ovate, more or less long-acuminate at the apex, usually 5-6 in. long, 2 $\frac{1}{2}$ -4 in. broad, the petiolule $1\frac{1}{2}$ in. long. Flowers polygamous, in umbellulose racemes 4-12 in. long and clustered below the terminal leaf-tuft; peduncle of umbellules $\frac{1}{2}$ - $\frac{3}{4}$ in. long; pedicels $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Styles 3 in male flowers, 5 or 6 in female flowers, recurved in fruit. Fruit red, $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Equatoria: Imatong and Didinga Mountains.

108. **UMBELLIFERAE**

Herbaceous plants or rarely somewhat woody; stems furrowed; pith broad, soft. Leaves alternate, usually much divided or rarely peltate, sheathing at the base. Flowers hermaphrodite or rarely unisexual, in simple or compound umbels or rarely capitate. Calyx 5-lobed, adnate to the ovary. Petals 5, free, valvate or slightly imbricate, epigynous. Stamens 5, free, alternate with the petals; filaments in bud bent in. Ovary inferior, 2-locular; styles 2; ovules pendulous, solitary in each loculus. Fruit dry, 2-locular, dividing into two 1-seeded portions; carpels usually ribbed and often with parallel resinous canals (vittae).

The following introduced plants of this family are cultivated in the Sudan: *Daucus carota* L., Carrot; *Anethum graveolens* L. (*Peucedanum graveolens* (L.) Hiern, non S. Wats.), Dill; *Petroselinum crispum* (Mill.) Airy-Shaw, Parsley; *Cuminum cyminum* L., Cummin.

A. Umbels simple, capitate or irregularly compound:

B. Calyx-lobes rudimentary or absent; usually prostrate or creeping herbs:

(a) Petals valvate in bud; fruit without secondary ridges

HYDROCOTYLE. 13.

(aa) Petals imbricate in bud; fruit with more or less prominent secondary ridges

CENTELLA. 5.

BB. Calyx-lobes prominent; erect herbs:

(b) Flowers sessile in globose capitula

ALEPIDEA. 2.

(bb) Flowers in irregularly compound umbels; fruit covered with glochidiate bristles

SANICULA. 16.

AA. Umbels regularly compound:

C. Trees:

(c) Leaflets ovate, irregularly serrate-setose
STEGANOTAENIA. 17.

(cc) Leaflets or leaves lanceolate, entire
HETEROMORPHA. 12.

CC. Shrubs or herbs:

D. Shrubs; fruit laterally compressed ... HETEROMORPHA. 12.

DD. Herbs:

E. Fruit winged, much compressed dorsally:

(d) Leaves bi- or multi-pinnate PEUCEDANUM. 14.

(dd) Leaves lobed or simply pinnate:

(e) Glabrous herbs FERULA. 9.

(ee) Pubescent or setose herbs HERACLEUM. 11.

EE. Fruit not winged:

F. Fruit distinctly laterally compressed:

(f) Bracts of involucre numerous BERULA. 3.

(ff) Bracts of involucre few or absent; leaves pinnate:

(g) Pinnae not sharply toothed on the margins, ovate or
orbicular or deeply multifid
PIMPINELLA. 15.

(gg) Pinnae sharply toothed on the margins, lanceolate or
bi- or tri-fid AFROSISON. 1.

FF. Fruit oblong, subterete:

G. Fruit glabrous or papillose-hispidulous:

(h) Flowers yellow FOENICULUM. 10.

(hh) Flowers white CORIANDRUM. 6.

GG. Fruit hirsute or covered with glochidiate bristles:

H. Fruit hirsute; involucre of many bracts
DIPLOLOPHIUM. 8.

HH. Fruit covered with glochidiate bristles:

(i) Bristles ending in a two-way hook like an arrow-
head CAUCALIS. 4.

(ii) Bristles not ending as above:

(j) Ribs of ripe fruit not prominent; bristles of fruit
slender, scattered, not in well-defined rows ...
TORILIS. 18.

(jj) Ribs of ripe fruit prominent; bristles of fruit
stout, in well-defined rows ... DAUCUS. 7.

1. AFROSISON Wolff

Afrosison schweinfurthii Wolff.

Glabrous perennial herb up to 5 ft. high; stems thick, angular, sulcate, hollow. Stem-leaves broadly triangular, bipinnate; pinnae in 2-4 pairs, distant; leaflets variable in shape, obovate or oblong or elliptic-oblong, obtuse or shortly acuminate at the apex, narrowed to the base, denticulate or serrate. Inflorescence much elongated; umbels long-pedunculate, of 6-8 rays; involucre absent. Fruit ovoid-globose, laterally compressed.

Equatoria.

A. djurense Wolff.

Perennial glabrous herb about 3 ft. high, with a thickened root; stems erect, terete, finely striate. Leaves divided ternately or biternately or pinnately into 3 pairs of pinnae; leaflets serrately sharp-toothed, ovate, obovate or lanceolate, acute or acuminate at the apex. Inflorescence as in *A. schweinfurthii*, of 6-10 rays. Fruit ovoid-globose or ovoid.

Equatoria.

A. gallabatense Wolff.

Perennial glabrous herb, with a thickened root; stems erect, hollow. Leaves more or less broadly triangular, 4-6 in. long; lower ones divided into 3-4 pairs of bipinnatisect linear-lanceolate segments, long-acuminate at the apex, narrowed to the base; stem-leaves subternate or pinnate in 3 pairs, the pinnae trisect. Inflorescence forming an elongate panicle up to 16 in. long; umbels small, of 4-6 rays; involucre absent. Young fruit obconical.

Kassala: Gallabat.

2. **ALEPIDEA** Delaroché**Alepidea** sp.

Erect herb; bracts of the involucre first white, then crimson.

Equatoria: Imatong Mountains, Mount Kineti, grassland.

3. **BERULA** Koch**Berula erecta** (Huds.) Coville.

Water-parsnip.

Sium angustifolium L.; *S. thunbergii* DC.

Perennial stoloniferous glabrous herb 2-3 ft. high, growing in marshy places. Radical leaves pinnate, 6-12 in. long; petiole about 5 in. long, dilated and sheathing at the base, the sheath usually auricled or appendaged at the apex, 2 in. long; leaflets variable in shape, 1½-3 in. long; stem-leaves similar but smaller. Flowers in peduncled umbels of many slender primary rays 1-2 in. long in fruit, secondary rays numerous; involucre bracts numerous. Fruit glabrous, ½ in. long.

Darfur: Jebel Marra, Niurnya, 6500 ft.

4. **CAUCALIS** L.**Caucalis incognita** Norman.

Erect herb; stems slightly hirsute. Leaves bipinnately divided into numerous small leaflets, the petiole and petiolules hirsute as well as the leaf-nerve beneath. Flowers white, in simple shortly pedicellate or sessile umbels. Fruit when mature densely covered with glochidiate purple-brown bristles.

Equatoria: Imatong Mountains.

C. pedunculata Bak. f.

Erect herb; stems striate, sparsely pilose. Leaves bipinnately divided, almost glabrous. Flowers in terminal compound umbels, the secondary umbels on peduncles about $\frac{1}{2}$ in. long. Fruit about $\frac{3}{8}$ in. long, covered with reddish-brown glochidiate bristles when mature.

Equatoria: Didinga Mountains, Char, Mount Lotuke, 6000 ft.

5. CENTELLA L.**Centella asiatica** (L.) Urb.

Hydrocotyle asiatica L.

Perennial herb, often near water; stems long, creeping, often rooting at the nodes, usually glabrous. Leaves equally crenate, crenulate or without obtuse teeth, reniform, deeply cordate at the base, 1-2 in. broad, glabrous or pubescent; petioles usually 2 or more together, glabrous or pubescent. Flowers pink, often monoecious, in about 4-flowered umbels on glabrous or pubescent clustered peduncles of variable length; involucre of 2 or 3 broad pubescent bracts with some linear ones inside. Fruit $\frac{1}{2}$ in. broad, slightly pubescent or glabrous, with primary ridges and weaker secondary ones.

Equatoria.

6. CORIANDRUM L.**Coriandrum sativum** L.

Coriander.

Erect glabrous annual or biennial herb 1-1 $\frac{1}{2}$ ft. high, emitting a very disagreeable smell when rubbed. Lower leaves pinnate or bipinnate with broadly-ovate or cuneate deeply cut segments, the other leaves more divided with linear segments which are few and slender in the uppermost leaves. Flowers white, in terminal rather small umbels of 5-8 rays without a general involucre.

Darfur: *Jebel Marra*, *Niurnya*, 6500 ft. Also cultivated.

7. DAUCUS L.**Daucus** sp.

Low herb among rocks. Leaves radical, pinnately compound, sparsely hispid. Flowers red, in regularly compound few-flowered umbels on peduncles up to 6 in. long; involucre of dissected or linear bracts.

Red Sea Hills: *Erkowit*.

8. **DIPLOLOPHIUM** Turcz.**Diplolophium africanum** Turcz.

Fig. 133

D. abyssinicum (Hochst.) Benth.

Stout perennial herb 2-5 ft. high, with a turpentine-smell when bruised; stems glaucescent, sometimes flushed with purple. Leaves 2-12 in. long, with very numerous spreading thread-like acute segments; petiole 1-5 in. long, $\frac{1}{3}$ - $\frac{2}{3}$ in. wide. Flowers rather large, in umbels with many stout pubescent primary rays 1-1 $\frac{1}{2}$ in. long, and many secondary rays; involucrel bracts 1 in. or more long. Fruit $\frac{1}{2}$ in. long, with long styles.

Central and Southern Sudan.



Fig. 133—DIPLOLOPHIUM AFRICANUM Turcz.

A, umbel in fruit. B, umbellule. C, flower and petal, tip inflexed. D, longitudinal section of flower. E, immature fruits, whole and split into two. F, mature fruits. G, transverse section of immature fruit showing vittae.

9. FERULA L.

Ferula sp.

Tall glabrous herb. Petioles of the upper leaves sheathing. Flowers yellow, in terminal and lateral regularly compound umbels.

Red Sea Hills: Erkowit.

10. FOENICULUM Mill.

Foeniculum vulgare Mill.

Fennel. Fig. 134.

Erect perennial herb up to 3 ft. high. Leaves 3 or 4 times dissected; segments very narrow, linear or subulate, rather stiff in dry situations, very slender when cultivated. Flowers yellow, in rather large umbels of 15 or more rays, more or less glaucous, without involucre. Fruit elliptic, about $\frac{1}{2}$ in. long, the vittae very conspicuous.

Darfur: Jebel Marra, 5000-9000 ft. Also cultivated.



Fig. 134—FOENICULUM VULGARE Mill.

A, flower. B, fruit. C, transverse section of half-fruit showing vittae.

11. HERACLEUM L.

Heracleum elgonense (Wolff) Bullock.

Pubescent or hirsute sometimes stout herb; stems branched, sulcate-angular, hollow. Leaves pinnate with inciso-dentate sessile pinnae up to $1\frac{1}{2}$ in. long, sparsely hirsute above, more or less densely and softly grey-hirsute beneath. Flowers white or cream, in terminal or lateral regularly compound umbels; involucre bracts small, narrow, acute at the apex. Fruit glabrous when mature.

Equatoria: Imatong Mountains, Mount Kineti, 10,300 ft.

12. **HETEROMORPHA** Cham. & Schlecht.**Heteromorpha arborescens** (Spreng.) Cham. & Schlecht.

Glabrous shrub or small tree; branchlets reddish, terete. Leaves simple or 3-5-foliolate; leaflets lanceolate, acute or blunt at the apex, narrowed to the base, 1-2½ in. long; petiole 1-1½ in. long, amplexicaul at the base. Umbels terminal and subterminal; rays 1-1½ in. long; involucre of many unequal leaf-like simple bracts which fall early. Fruit ½ in. long.

Equatoria: Imatong Mountains, Lomaru, rocky ground.

13. **HYDROCOTYLE** L.**Hydrocotyle natans** Cyr.

Robust creeping perennial herb, rooting at the nodes. Leaves suborbicular or subreniform, distinctly lobed and slit at the base up to the central insertion of the long petiole, 1-2½ in. in diameter; petiole thick, erect, sometimes about 1 ft. long, pilose when young. Flowers in about 7-flowered umbels on peduncles up to 3 in. long. Fruit ½ in. broad, with weak primary ridges.

Southern Sudan: floating herb in the Sudd.

14. **PEUCEDANUM** L.**Peucedanum grantii** Kingston ex Oliv.

Glabrous shining herb up to 7 ft. high; stems striate, forming thick branches above. Lower leaves bipinnate on long petioles dilated and clasping at the base; upper leaves usually 3-foliolate on petioles more or less wholly dilated. Flowers in pedunculate paniculate umbels, primary rays ½-¾ in. long; involucral bracts absent or 1, small. Fruit obovate-oblong, much compressed dorsally with 3 rounded ridges on the base, ½ in. long, winged on the margins.

Equatoria.

15. **PIMPINELLA** L.**Pimpinella oreophila** Hook. f.

Perennial more or less pubescent herb up to 15 in. high; stems erect or ascending. Leaves pinnate, the lower ones 1½-6 in. long, on slender petioles much dilated and sheathing at the base; leaflets sessile or subsessile, crenate or dentate, usually suborbicular and ¼-¾ in. in diameter, the lateral leaflets often oblique at the base, the terminal one usually cordate. Flowers white, in terminal pedunculate umbels with 6-11 primary and secondary rays each. Fruit ovate-oblong, not winged, up to ⅞ in. long, glabrous.

Equatoria: Imatong Mountains, Mount Kineti, rocky summit.

P. peregrina L.

Pubescent or nearly glabrous biennial herb up to 3½ ft. high; stems erect, glaucescent, usually purplish towards the base. Radical leaves pinnate, about 6 in. long, the leaflets suborbicular, crenate, the terminal one cordate at the base; stem-leaves pinnate or pinnatisect, the segments ovate or lanceolate, serrate or lacinate; petiole long, sheathing. Flowers white, in terminal pedunculate umbels with 9-13 primary rays. Fruit ovoid, hairy when young, later hispid, the hairs without hooks.

Equatoria: spur of Mountain Bira, near Laboni.

P. etbaica Schweinf.

Herb 2-12 in. high; stems erect, finely striate, glabrous or thinly pubescent. Radical leaves pinnately tripartite on long petioles; lower stem-leaves 5-pinnatipartite; upper stem-leaves tripartite, shortly stalked; petiole sheathing at the base; sheath whitish, narrowed, membranous, slightly webbed-ciliate. Flowers white or violet-purplish, in short or long-stalked umbels of 3-7 primary rays ¼-½ in. long with 7-12 secondary rays. Fruit ovate, ⅛ in. long, densely covered with hooked hairs.

Red Sea Hills.

P. camptotricha Penzig.

Herb about 12 in. high, the lower parts softly pilose; stems erect, striate. Radical leaves pinnate; pinnae rather irregularly crenate, ovate to orbicular, about 1 in. long, the lateral leaflets usually oblique at the base, more or less puberulous above, pubescent beneath. Flowers in short or long-stalked umbels of 4-8 primary rays up to ½ in. long. Fruit covered with hooked hairs.

Red Sea Hills: Erkowit.

16. **SANICULA** L.**Sanicula europaea** L.

Wood Sanicle.

Glabrous shining herb 1-3 ft. high. Radical leaves long-petiolate, palmately divided nearly to the base into 5 obovate-crenate lobes 1-2 in. long; cauline leaves becoming smaller. Flowers pale-pink, in few-flowered small umbels; primary bracts 2, usually with 2 acute small lobes near the base.

Equatoria: Imatong Mountains near Itobol, 6900 ft.; Dongotona Mountains near Aripawa, 6800 ft.



Fig. 135—*STEGANOTAENIA* ARALIACEA Hochst.

A, flowers. B, C, fruits.

17. **STEGANOEA** Hochst.**Steganotaenia araliacea** Hochst.

Fig. 135.

Peucedanum fraxinifolium Hiern ex Oliv.

Deciduous savannah tree usually 10-15 ft. high, sometimes attaining 25 ft.; crown shapeless, low-branched; bark grey-brown, thick and corky, horizontally fissured. Leaves pinnate, crowded near the ends of the branches, 5-15 in. long; petiole sheathing at the base; leaflets 5-9, irregularly serrate-setose, broadly ovate to elliptic (lateral leaflets oblique), acutely-acuminate at the apex, rounded to subcordate at the base, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, glabrous. Flowers white, usually appearing well before the leaves, in compound umbels clustered 6-8 together at the ends of the stout twigs; peduncle 4-8 in. long with a bract-bearing node (from which sometimes springs a whorl of compound umbels) 1-2 in. from the apex; primary rays 1- $2\frac{1}{2}$ in. long. Fruit obovate-oblong, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, winged, 3-ribbed.

*Central and Southern Sudan.*18. **TORILIS** Adans.**Torilis arvensis** (Huds.) Link.

Field Hedge-parsley.

Annual or biennial herb $\frac{1}{2}$ -3 ft. high. Leaves pinnate or bipinnate with stalked lanceolate pinnatifid acute segments, on dilated petioles clasping at the base. Flowers white, in terminal stalked erect umbels usually of 3 primary rays each with about 5 secondary rays, on leaf-opposed peduncles. Fruit ovoid, $\frac{1}{2}$ in. long, covered with spreading glochidiate prickles.

*Red Sea Hills: Erkwit.*109. **ERICACEAE**

Shrubs or undershrubs or rarely trees. Leaves without stipules, usually alternate or whorled, simple, usually evergreen. Flowers hermaphrodite, actinomorphic or slightly zygomorphic. Calyx persistent, deeply divided. Corolla usually gamopetalous, inserted below a fleshy disk, lobes contorted or imbricate. Stamens usually twice as many as the corolla-lobes or rarely as many as and alternate with them, inserted on the disk; filaments free or rarely somewhat connate; anthers often with tails. Ovary superior, several-locular; ovules numerous on axile placentas which often intrude into the loculi, or rarely solitary; style simple. Fruit a capsule, berry or drupe; seeds sometimes winged.

- A. Stamens 4-5; low wiry undershrubs covered with bristly sometimes gland-tipped hairs **BLAERIA**. 1.
 AA. Stamens 8; erect shrubs or small trees, not glandular
ERICA. 2.

1. **BLAERIA** L.**Blaeria spicata** Hochst. ex A. Rich.

Undershrub 6-12 in. high; stems more or less densely hirsute with gland-tipped hairs. Leaves in whorls of 3 or alternate, linear or

linear-lanceolate, the margins rolled back, $\frac{1}{11}$ - $\frac{1}{2}$ in. long, sparsely hirsute with gland-tipped hairs. Flowers reddish-purple, axillary, forming leafy often congested racemes. Corolla tubular, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Anthers 2-lobed, each loculus with a short dorsal subulate basal appendage.

Darfur: Jebel Marra, 8500-10,000 ft.

B. breviflora Engler.

Undershrub up to 18 in. high; stems more or less densely pubescent with branched non-gland-tipped hairs. Leaves in whorls of 3, linear to sublanceolate, about $\frac{1}{8}$ in. long, minutely pubescent and with longer simple or branched hairs on the margin. Flowers reddish, axillary, forming leafy often congested racemes. Corolla shortly and broadly campanulate, about $\frac{1}{8}$ in. long. Anther-loculi with or without a very short basal appendage.

Equatoria: Imatong Mountains, Mount Kineti summit, 10,400 ft.

2. **ERICA** L.

Erica arborea L.

Shrub or tree up to 25 ft. high. Leaves sessile or shortly petio- late, acicular, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers white, in terminal or subterminal clusters on short lateral branches, often so abundant as to appear racemose. Anthers and stigmas red.

Equatoria: Imatong Mountains, Mount Kineti, 8700-10,400 ft.

110. **EBENACEAE**

Trees or shrubs, often with hard and black wood. Leaves without stipules, alternate or subopposite, entire. Flowers usually unisexual, often dioecious, the male flower with a rudimentary ovary, the female usually solitary and with imperfect or no stamens. Calyx 3-6-lobed, persistent, often accrescent in fruit. Corolla 3-7-lobed; lobes imbricate. Stamens hypogynous or inserted near the bottom of the corolla, 2-4 times as many as the corolla-lobes, or rarely as many as and alternate with them; filaments free or united in pairs; anthers intorse. Ovary superior, 3- or more-locular; style often divided; ovules pendulous from the inner angle, 1-2 in each loculus. Fruit a more or less succulent berry.

A. Calyx not enlarged in fruit EUCLEA. 2.

AA. Calyx enlarged in fruit:

B. Ovary 4- or 8-locular; flower parts in 4-5's ... DIOSPYROS. 1.

BB. Ovary 3- or 6-locular; flower parts in 3's MABA. 3.

1. **DIOSPYROS** L.

Diospyros mespiliformis Hochst. ex A. DC.

Fig. 136.

Tree up to 50 ft. high; bark black, with small regular scales; slash salmon-pink; young shoots and inflorescences silvery-tomentose. Leaves shiny, oblong or elliptic, obtuse to acute at the apex, cuneate at the base, 3-6 in. long, 1-2 in. broad, the midrib impressed

above and prominent beneath. Flowers white, dioecious; male flowers clustered, stamens 10-16; female flowers solitary, stamínodes 6-8. Fruit yellow, subglobose, 1 in. in diameter, with sweet edible pulp; seeds 4-6, dark-brown.

Widespread.

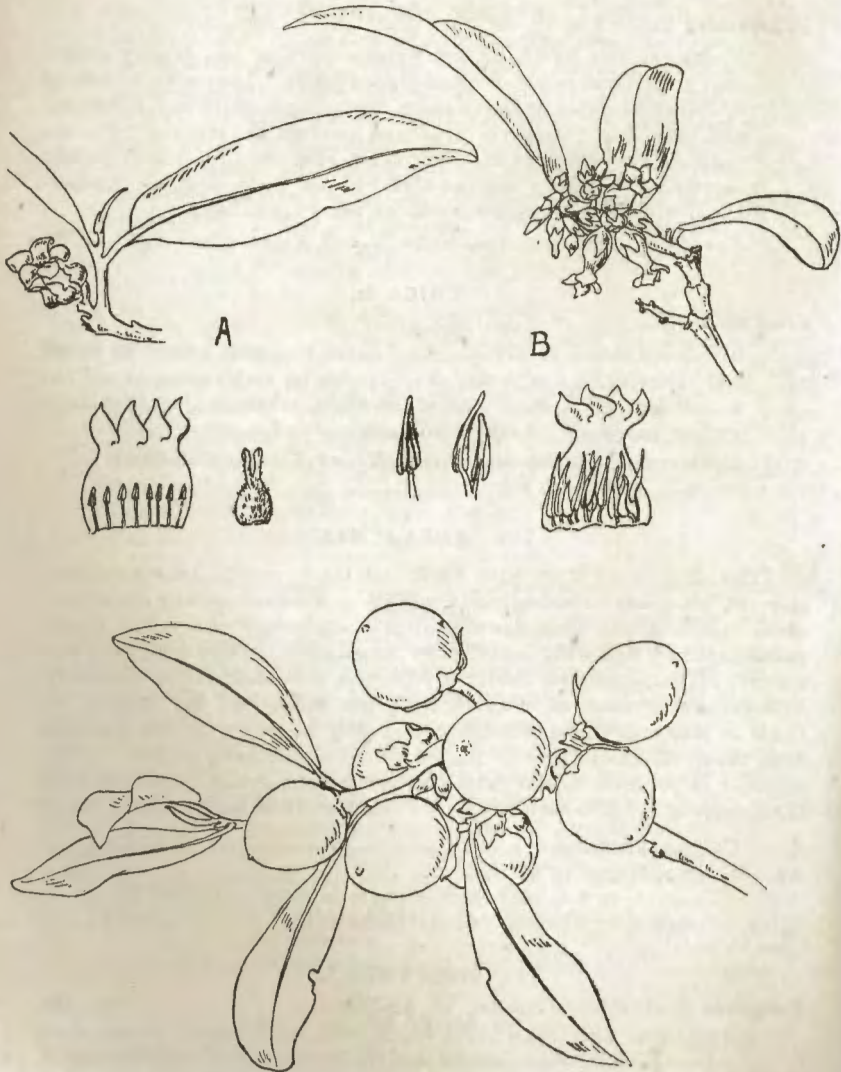


Fig. 136—DIOSPYROS MESPIIFORMIS Hochst. ex A.DC.

A, female flowers. B, male flowers.



Fig. 137—*EUCLEA SCHIMPERI* (A.DC.) Dandy.

A. A. male flowers. B, B, female flowers.

2. **EUCLEA** Murr.**Euclea schimperi** (A. DC.) Dandy, comb. nov.

Fig. 137.

Kellaua schimperi A. DC.; *E. kellau* Hochst.

Glabrous shrub or small tree. Leaves subopposite, flat or wavy, obovate or oblanceolate, rounded at the apex, cuneate at the base, 1-2 in. long, $\frac{1}{2}$ -1 in. broad, glossy above, paler beneath; petiole $\frac{1}{10}$ - $\frac{1}{8}$ in. long. Flowers in 9-11-flowered racemes, those of male flowers lax and $\frac{3}{4}$ -1 in. long, those of female flowers $\frac{3}{4}$ - $\frac{1}{2}$ in. long. Fruit globose, $\frac{1}{2}$ in. in diameter, edible.

*Red Sea Hills: Erkowit; Has Has.***E. divinorum** Hiern.

Shrub or tree attaining 40 ft. high. Leaves elliptic to lanceolate, obtuse at the apex, cuneate at the base, 2-4 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, glabrous above and beneath. Flowers fragrant, yellowish-white; male racemes lax, up to 1 $\frac{1}{2}$ in. long; female racemes stouter, up to $\frac{3}{4}$ in. long. Fruit globose, $\frac{1}{2}$ in. in diameter, edible.

*Equatoria: Didinga Mountains, Nagichot, 6600 ft.*3. **MABA** J. R. & G. Forst.**Maba abyssinica** Hiern.

Straight-boled forest tree up to 80 ft. high; bark dark-grey to black-brown, shaggy, scaling in strips. Leaves lanceolate to oblong-lanceolate, obtuse to subacuminate at the apex, 2-5 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, the midrib impressed above. Flowers white, fragrant, subsessile in axillary clusters, the male flowers in groups, the female ones in pairs or singly. Fruit red, becoming black, spherical, about $\frac{1}{2}$ in. in diameter.

*Central and Southern Sudan.***M. lancea** Hiern.

Much-branched shrub up to 12 ft. high, the young parts as well as the inflorescences densely yellowish-pubescent. Leaves oblong-lanceolate, gradually acuminate at the apex, 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, sparsely pilose on the midrib beneath; petiole pubescent. Flowers axillary, solitary, all arranged on one side. Fruit oblong-ellipsoid, curved, $\frac{3}{4}$ in. long, becoming glabrous, girt by the cupular persistent calyx.

Equatoria: about 6 miles N.W. of Uyanga village, N.W. of Said Bundas.

111. SAPOTACEAE

Trees or shrubs or rarely climbers, with milky juice. Leaves without stipules, simple, alternate, entire, leathery. Flowers hermaphrodite, actinomorphic, usually small, often produced on old stems. Calyx 4-8-lobed. Corolla 4-8-lobed; lobes in 1-2 rows, imbricate, sometimes with petaloid external appendages. Stamens inserted on the corolla, the fertile ones equal to and opposite the corolla-lobes, or more numerous and in 2 or more rows; staminodes sometimes present. Ovary several-locular, superior; style simple; ovules ascending from the inner angle, solitary in each loculus. Fruit often a rather hard berry or rarely a capsule, 1-many-locular; seeds with a bony often shining testa and a large broad hilum.

- A. Corolla-lobes without external appendages:
 B. Leaves and flowers densely clustered at the tops of the shoots; ovary 8-10-locular; petals usually 8 BUTYROSPERMUM. 2.
 BB. Leaves usually not clustered at the tops of the shoots; ovary rarely more than 5-locular; petals 4-6:
 C. Hairs on the leaves simple (not medifixed) or absent:
 (a) Staminodes absent or very small:
 (b) Seeds with endosperm CHRYSOPHYLLUM. 3.
 (bb) Seeds without endosperm PACHYSTELA. 7.
 (aa) Staminodes present, usually more or less petaloid ANINGERIA. 1.
 CC. Hairs on the leaves T-shaped MALACANTHA. 4.
 AA. Corolla-lobes with petaloid external appendages (these often appearing to be 3 series of petals):
 (c) Sepals 4 + 4 MIMUSOPS. 6.
 (cc) Sepals 3 + 3 MANILKARA. 5.

1. ANINGERIA Aubrév. & Pellegr.

Aningeria altissima (A. Chev.) Aubrév. & Pellegr.

Hormogyne altissima A. Chev.; *Sideroxylon altissimum* (A. Chev.) Hutch. & Dalziel.

Upper-storey forest tree up to 170 ft. high; bole clean, cylindrical, up to 90 ft. long; mid-girth 12 ft.; buttresses medium-sized; bark grey, smooth; slash exuding a latex the colour of milky tea. Leaves entire, elliptic to obovate-elliptic, obtuse to almost rounded at the apex, rounded to broadly cuneate at the base, 2-5 in. long, 1-2½ in. broad, glabrous or at most hairy on the midrib; lateral nerves 9-24 pairs, prominent beneath; petiole ¼-½ in. long, often twisted, tomentellous. Flowers creamy-white, in axillary clusters; pedicels tomentellous, up to ¼ in. long in flower, attaining ¾ in. in fruit. Calyx pale-brown, softly pubescent outside. Fruit obovoid-globose, ¾ in. long; seeds glossy-dark-brown, ovoid, ½ in. long, with a pale elliptic scar running nearly the whole length of the seed.

Equatoria: Azza and Laboni Forests.



Fig. 138—*BUTYROSPERMUM NILOTICUM* Kotschy.

A, corolla opened. B, stamen and staminodes. C, calyx. D, vertical section of ovary. E, transverse section of ovary. F, stamen. G, fruit. H, seed.

2. **BUTYROSPERMUM** Kotschy**Butyrospermum niloticum** Kotschy. Shea-butter Tree. Fig. 138.*B. parkii* var. *niloticum* (Kotschy) Pierre ex Engler.

Gregarious savannah tree 20-40 ft. high; bole stout, usually about 12 ft. long, 4-5 in. in girth, branching into a number of large gnarled wide-spreading limbs, which form a dense crown, the lower branches frequently drooping to the ground; bark dark-grey to almost black, deeply fissured and cross-cut to form very thick square or rectangular scales $1\frac{1}{2}$ - $2\frac{1}{2}$ in. wide; slash crimson, exuding a white latex; branchlets stout. Leaves reddish when young, clustered towards the top of the branchlets, slightly sinuate, oblong to obovate-oblong, rounded to subacute at the apex, rounded or subcordate to broadly cuneate at the base, up to 11 in. long, $4\frac{1}{2}$ in. broad (usually 5-8 in. long, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. broad), pubescent at first, glabrous or puberulous later; lateral nerves almost at right-angles, conspicuous, parallel, numerous (usually 20-30 pairs); petiole $1\frac{1}{4}$ -4 in. long (usually 2 - $2\frac{1}{2}$ in. long). Flowers creamy-white, fragrant, in dense clusters at the tips of the branchlets above the leaves of the previous year. Sepals in two sizes, oblong-lanceolate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, the outer row softly rusty-brown-tomentose outside, the inner row pubescent and greenish (often with a pink tinge). Staminodes petaloid. Fruit ellipsoid, 2 - $2\frac{1}{2}$ in. long, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. in diameter; seeds 1-3 (usually 1), shining-dark-brown with a large white scar running down one side, about 2 in. long, 1 in. in diameter.

Southern Sudan.Fig. 139—**CHRYSOPHYLLUM ALBIDUM** Don.

A, flowering shoot. B, open flower. C, stamen. D, longitudinal section of ovary. E, fruit. F, interior of fruit with seed. G, seeds.

3. CHRYSOPHYLLUM L.

Chrysophyllum albidum Don.

Fig. 139.

Forest tree up to 120 ft. high; crown thick; bole fluted, frequently free of branches up to 70 ft.; bark pale-brownish-green; slash exuding a white latex. Leaves oblong-elliptic to elongate-obovate-elliptic, shortly acuminate at the apex, cuneate at the base, 5-12 in. long, 1½-4 in. broad, dark-green above, pale-tawny beneath when young, later silvery-white; primary lateral nerves wide-spaced, 9-16 on each side of the midrib. Flowers creamy-white, in dense axillary clusters or from above the scars of fallen leaves. Calyx rusty-pubescent outside. Fruit yellow or yellow-brown when ripe, depressed-globose but with a sharp point, 1-2 in. in diameter, containing a pleasantly acid edible pulp; seeds shiny-brown, bean-like, oblong, compressed, about 1 in. long.

Equatoria: gallery- and depression-forests.

G. fulvum S. Moore.

Forest tree up to 90 ft. high, with fluted bole up to 50 ft. long. Leaves elongate-obovate-elliptic, shortly and obtusely acuminate at the apex, cuneate at the base, 3-9 in. (usually 4-6 in.) long, 1-2½ in. broad, glossy-dark-green above, fawn-puberulous to tawny-pubescent beneath when mature; petiole ½-¾ in. long. Flowers shortly pedicellate in dense axillary clusters. Sepals rusty-red. Corolla yellow-white. Fruit ovoid-globose, 1½ in. long, with a mealy covering.

Equatoria: Imatong Mountains.

4. MALACANTHA Pierre

Malacantha sp.

Lower-storey tree; bole fluted; bark scaly; slash white with a white latex; young branchlets densely rusty-tomentose. Leaves obovate, rounded to obtuse and mucronate at the apex, broadly cuneate at the base, up to 11 in. long, 6½ in. broad, sparsely pilose on the lamina but more densely so on the midrib above, pilose beneath with numerous prominent lateral nerves, the midrib densely rusty-tomentose; petiole up to 1 in. long, densely rusty-tomentose.

Equatoria: Khor Yubo near Bendere, gallery-forest.

5. MANILKARA Adans.

Manilkara schweinfurthii (Engler) Dubard.

Mimusops schweinfurthii Engler.

Thick-crowned tree up to 50 ft. high; bark black. Leaves tough and leathery, ovate or obovate or oblong-elliptic, obtuse or rounded or emarginate at the apex, rounded or obtusely cuneate at the base, 3-7 in. long, 1-3½ in. broad (usually 4-5 in. long, 1½-2½ in. broad), dark-green above, silvery-grey-white beneath, the midrib deeply impressed above; petiole ¾-1½ in. long. Flowers creamy,

fragrant, abundant, in dense axillary clusters. Calyx cinnamon-brown-pubescent.

Equatoria: on ironstone.

6. MIMUSOPS L.

Mimusops djurensis Engler.

M. kummel (non Hochst.) Broun & Massey.

Tree; branches slender, shortly rusty-pilose when young, later brown, lenticellate. Leaves elliptic or oblong-elliptic, shortly and obtusely acuminate at the apex, acute at the base, 2-3½ in. long, 1-1½ in. broad. Flowers axillary, 2-3 together on pedicels about 1 in. long; corolla-tube as long as the filaments.

Equatoria.

M. ugandensis Stapf.

Forest tree up to 130 ft. high; bole thick, cylindrical; bark dark-brown, deeply channelled and crosscut into small rectangles; slash dark-red, exuding a white latex. Leaves oblong to obovate-oblong, shortly acuminate to long-cuspidate-acuminate at the apex, broadly cuneate at the base, 3-4½ in. long, 1½-1¾ in. broad, glabrous; petiole ½-¾ in. long. Flowers yellow-white, pendulous, numerous, in axillary clusters; pedicels ¾-1 in. long. Calyx pubescent. Fruit yellow, ovoid, 1 in. long, flannelly when young, glabrous when mature.

Equatoria: Azza Forest.

M. fragrans (Bak.) Engler.

Spreading tree up to 40 ft. high; branchlets slender, densely rusty-tomentose. Leaves elliptic to obovate-elliptic, obtuse or obscurely cuspidate at the apex, broadly cuneate at the base, 3-4 in. long, 1½-2 in. broad, glabrous when mature except sometimes on the midrib beneath. Flowers creamy-white, fragrant, erect or drooping, 2-4 together in the axils of the upper leaves; pedicels 1-1½ in. long, densely rusty-tomentose. Fruit ellipsoid, about ¾ in. long; seeds with a basal scar.

Equatoria: Didinga Mountains, Char, Mount Lotuke, edge of valley forest, 6000 ft.

7. PACHYSTELA Pierre ex Engler

Pachystela brevipes (Bak.) Engler.

Fig. 140.

Forest tree up to 60 ft. high; bole deeply fluted. Leaves obovate, bluntly acuminate at the apex, very narrowly cuneate at the base, 3½-7½ in. long, 1½-2½ in. broad, glabrous on both surfaces; petiole ½-¾ in. long. Flowers yellow-white, fragrant, crowded in dense clusters on small cushions in the axils of the lowest leaves or on the bare branchlets. Calyx-lobes appressed-grey-tomentose. Fruit yellow, oblong-ellipsoid, ¾-1 in. long, prominently beaked, containing a milky juice and a white mucilaginous acid-sweet edible pulp.

Equatoria: Azza Forest.



S.R.C.

Fig. 140—*PACHYSTELA BREVIPES* (Bak.) Engler.
 A, flower. B, longitudinal section of flower. C, part of corolla laid open. D,
 stamen. E, stigma. F, fruits.

112. MYRSINACEAE

Trees or shrubs or rarely woody herbs. Leaves alternate or rarely subopposite, simple, gland-dotted or with resinous lines. Flowers small, hermaphrodite or rarely dioecious, in clusters or racemes or panicles. Sepals free or connate, often gland-dotted, valvate or imbricate or contorted, persistent. Corolla gamopetalous or rarely the petals free; lobes contorted or imbricate or rarely valvate. Stamens as many as and opposite to the petals, the filaments more or less adnate to the corolla; anthers introrse. Ovary superior to half-inferior, 1-locular; style simple, sometimes capitate; ovules numerous on a free-basal placenta. Fruit a berry or drupe, or rarely irregularly dehiscent.

- A. Calyx free from the ovary; fruit 1-seeded RAPANEA. 2.
 AA. Calyx-tube adnate to the ovary; fruit many-seeded ... MAESA. 1.

1. MAESA Forsk.

Maesa lanceolata Forsk.

Fig. 141.

Shrub or tree up to 30 ft. high; bark red-brown. Leaves crenate to serrate, ovate-elliptic to lanceolate-elliptic, acute at the apex, rounded to cuneate at the base, 3-8 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, the nerves exuding a dark-brown resin when the leaves are broken across. Flowers yellow-white, small, numerous in shortly pedunculate axillary panicles. Fruit in pendent bunches, yellow, globose, up to $\frac{1}{2}$ in. in diameter.

Darfur: Jebel Marra. Equatoria: Imatong Mountains.

M. schweinfurthii Mez.

Shrub or small tree. Leaves crenate, ovate or obovate, more or less rounded at the apex, cuneate at the base, about $4\frac{1}{2}$ in. long, $2\frac{1}{2}$ in. broad, glabrous when mature. Flowers white, in several-flowered axillary racemes or panicles.

Equatoria.

2. RAPANEA Aubl.

Rapanea neurophylla (Gilg) Mez.

Shrub or tree up to 40 ft. high; branchlets purple-red, glabrous. Leaves glabrous, clustered at the ends of the branches, obovate-oblongate, obtuse or acute at the apex, gradually acuminate at the base, 3-9 in. long, $1\frac{1}{2}$ -3 in. broad, the midrib red. Flowers very small, in clusters of 4-6 in the axils of or below the leaves. Corolla-lobes with black longitudinal markings. Fruit purple, globose, up to $\frac{1}{2}$ in. in diameter.

Equatoria: Imatong Mountains.



Fig. 141—*MAESA LANCEOLATA* Forsk.

A, flower. B, corolla-lobe and stamen from within. C, stamen. D, fruit. E, cross-section of fruit.

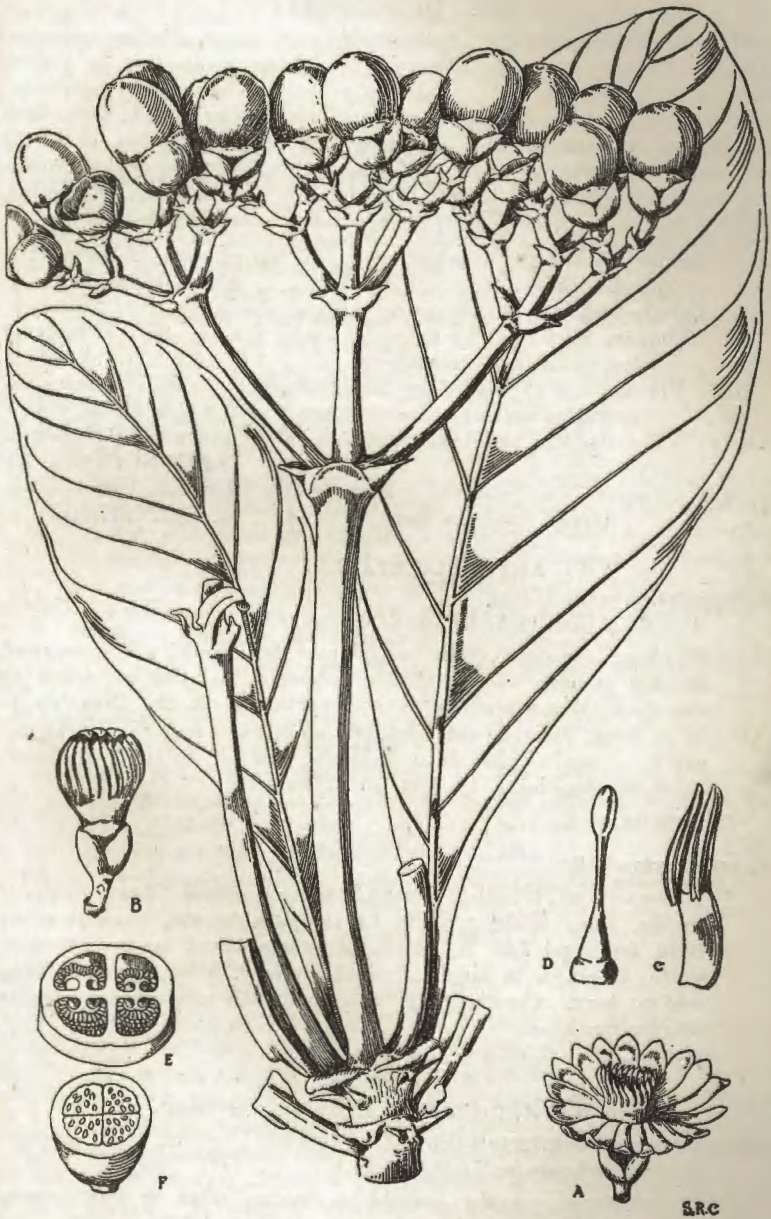


Fig. 142—ANTHOCLEISTA VOGELII Planch.

A, flower. B, flower-bud. C, two stamens. D, pistil. E, cross-section of ovary.
F, cross-section of fruit.

113. LOGANIACEAE

Usually trees or shrubs. Leaves with or without stipules, opposite, simple. Flowers hermaphrodite, actinomorphic, paniculate or corymbose or in globose heads. Calyx-lobes valvate or rarely imbricate. Corolla tubular; lobes 4-18, contorted or imbricate or valvate. Stamens epipetalous, as many as and alternate with the corolla-lobes, or rarely reduced to 1. Ovary superior, 2-4-locular; style simple; ovules numerous or rarely solitary, axile or ascending from the base of each loculus. Fruit a capsule or berry or drupe; seeds sometimes winged.

- A. Corolla-lobes 6-18, much contorted; stamens as many as the corolla-lobes ANTHOCLEISTA. 1.
 AA. Corolla-lobes 4-5, imbricate or valvate; stamens 4-5:
 B. Flowers subtended by large foliaceous bracts; stamens inserted low down in the corolla-tube COINOCHELAMYS. 2.
 BB. Flowers not subtended by large foliaceous bracts; stamens inserted at or just below the throat of the corolla:
 (a) Corolla-lobes imbricate; anther-loculi confluent at the apex ... LACHNOPYLIS. 3.
 (aa) Corolla-lobes valvate; anther-loculi distinct; leaves 3-5-nerved from the base STRYCHNOS. 4

1. ANTHOCLEISTA Afz. ex R. Br.

Anthocleista vogelii Planch.

Fig. 142.

A. nobilis (non Don) Broun & Massey.

Shrub or tree up to 60 ft. high; branchlets armed with persistent axillary spines. Leaves elongate-obovate, rounded to obtuse at the apex, long-attenuate to and auriculate at the base, up to 18 in. long, 8½ in. broad, glabrous. Flowers cream, in compound cymes. Corolla-tube about the same length as the 6-18 lobes. Fruit ovoid-globose, 1½-1¾ in. in diameter.

Equatoria.

A. *pulcherrima* Gilg.

Tree up to 40 ft. high; branchlets without spines. Leaves usually sessile, elongate-oblong to elongate-obovate, usually about 18 in. long and 7 in. broad but sometimes much larger. Flowers white, fragrant, in large terminal cymes, the inflorescence being 9-15 in. long. Corolla up to 2 in. long, the tube up to twice as long as the lobes.

Equatoria: Imatong Mountains.

2. COINOCHELAMYS T. Anders. ex Benth.

Coinochlamys schweinfurthii Gilg.

Mostuea schweinfurthii (Gilg) Bak.

Much-branched shrub; branchlets slender, more or less densely pubescent. Leaves subsessile, oblong, narrowed to an obtuse or subacute apex, more or less rounded and unequal-sided at the base, 1-2 in. long, glabrous; stipules brown, oblong, scarious.

Flowers white with yellow streaks in the tube, $\frac{1}{2}$ in. long, in few-flowered terminal cymes enclosed in a pair of orbicular cuspidate membranous bracts about $\frac{1}{2}$ in. long.

Equatoria.

3. LACHNOPYLIS Hochst.

Lachnopylis congesta (R. Br.) C. A. Sm.

Tree usually 15-35 ft. high, sometimes attaining 70 ft.; bark rough, blackish; branchlets 3-6-sided. Leaves entire or slightly wavy, elliptic to oblanceolate-oblong, obtuse at the apex, cuneate at the base, 3-5 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, glabrous; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers white, fragrant, in dense terminal panicles of cymes; pedicels absent or very short.

Equatoria: Imatong Mountains, Loyaru, also Itobol-Kippia track, about 8500 ft.

L. compacta C. A. Sm.

Shrub or tree up to 40 ft. high; branchlets angular, densely tomentose and leafy towards the apex. Leaves verticillate, ternate, entire, elliptic or oblong-elliptic, acute or subacute at the apex, narrowed to the base into the densely pubescent petiole, 4 in. long, 1 in. broad, green and glabrous above, paler and stellate-pubescent beneath. Flowers subsessile, forming many-flowered compact heads up to 2 $\frac{1}{2}$ in. broad.

Equatoria: Imatong Mountains, above Kippia, 8000-10,000 ft.

L. oppositifolia Hochst.

Nuxia dentata R.Br. ex Benth.

Small to tall tree; branchlets slender, glabrous. Leaves opposite, usually distinctly toothed, lanceolate, 2-4 in. long, $\frac{1}{2}$ -1 in. broad, shiny above, glabrous. Flowers greenish-white, small, in corymbose cymes; pedicels about $\frac{1}{2}$ in. long.

Red Sea Hills: below Erkowit, in rocky gullies near water.

4. STRYCHNOS L.

Strychnos innocua Del.

S. xerophila Bak.; *S. penduliflora* Bak.

Shrub or tree usually less than 20 ft. high but sometimes attaining 40 ft.; branchlets powdery pale-grey-green or stone-grey to almost straw-colour. Leaves 3-nerved from the base, broadly elliptic to oblong or obovate-oblong, rounded at the apex, 2 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, 1-3 in. broad, usually glabrous or only slightly pubescent beneath (occasionally rather densely pubescent beneath, especially when young). Flowers pale-green with a ring of hairs in the throat, $\frac{1}{2}$ in. long, in short few-flowered cymes. Fruit blue-green at first, ripening to orange, globose, woody, 1 $\frac{1}{2}$ -2 in. in diameter; pulp edible.

Widespread.



Fig. 143—*STRYCHNOS SPINOSA* Lam.

A, leafy shoot. B, flowering shoot. C, flower. D, longitudinal section of flower. E, stamen. F, cross-section of ovary. G, fruit. H, cross-section of fruit.

S. spinosa Lam.

Fig. 143.

Savannah shrub or tree usually 15-20 ft. high, occasionally attaining 30 ft.; bark pale-brown, smooth; branchlets usually armed with axillary spines; spines pale with black tips, paired, widely spaced. Leaves 3-nerved from the base, broadly obovate to suborbicular, obtuse or subacute at the apex, cuneate to rounded at the base, 1½-3 in. long, ¾-2¼ in. broad, glabrous. Flowers greenish-white with a ring of white hairs in the throat, ¼ in. long, in short dense compound cymes. Fruit green at first, yellow-orange when ripe, globose, woody, 4-5 in. in diameter; seeds numerous, flat, round, ¼-½ in. in diameter, poisonous; pulp yellow-brown, edible.

Central and Southern Sudan.

Var. pubescens Bak.

Leaves more or less pubescent on both surfaces.

Darfur: Kulme, 3800 ft. Equatoria: Imatong Mountains, Lorima, 3600 ft.

S. gracillima Gilg.

Erect shrub; branchlets slender, with copious hooked spines from the nodes. Leaves 3-nerved from the base, ovate or oblong, acute at the apex, cuneate at the base, 1 in. long, glabrous. Flowers in dense compressed terminal cymes. Fruit globose, 2 in. in diameter.

Central and Southern Sudan.

S. emarginata Bak.

Erect shrub; branchlets very slender, pubescent, with hooked spines from the nodes. Leaves 3-nerved from the base, glossy, obovate, emarginate and mucronate at the apex, 1-2 in. long, glabrous. Flowers in dense terminal very compound cymes. Fruit globose, 2 in. in diameter.

Equatoria.

S. holstii Gilg.

Forest shrub or tree up to 30 ft. high; branchlets whitish. Leaves opposite and decussate, shortly petiolate, more or less coriaceous, elliptic, acute at the apex and the base, 1¼-1½ in. long, glabrous, 3-nerved. Flowers in short forked 3-5-flowered axillary cymes. Berry globose, 1-seeded, about ¼ in. in diameter.

Equatoria: Imatong Mountains, Lorienton, 3500-5500 ft.

114. OLEACEAE

Trees or erect shrubs or climbers. Leaves without stipules, opposite or very rarely alternate, simple or compound. Flowers hermaphrodite or rarely unisexual, actinomorphic. Calyx lobed or dentate, rarely absent. Petals present or absent, free or connate, often 4, imbricate or valvate with the edges turned in. Stamens hypogynous or epipetalous, usually 2 or rarely 4; anthers apiculate, the loculi back to back. Ovary superior, 2-locular; style simple with a capitate or bifid stigma; ovules usually 2 in each loculus, axile or pendulous or ascending. Fruit capsular or baccate or drupaceous; seeds sometimes winged.

- A. Petals free or nearly so; leaves simple LINOCIERA. 2.
- AA. Petals united into a short or long tube:
 - B. Corolla-tube very short; leaves simple:
 - (a) Corolla-lobes in bud valvate with the edges turned in OLEA. 3.
 - (aa) Corolla-lobes in bud imbricate STEGANTHUS. 5.
 - BB. Corolla-tube medium to quite long; lobes imbricate:
 - C. Fruit hard and woody, 2-valved; seeds winged; leaves simple SCHREBERA. 4.
 - CC. Fruit a berry; seeds not winged; leaves simple or compound ... JASMINUM. 1.

1. JASMINUM L.

***Jasminum dschurlicum* Gilg.**

J. schweinfurthii (non Gilg) Broun & Massey.

Low undershrub; branchlets slender, densely yellowish-pubescent when young. Leaves subsessile, ovate to elliptic, acute to acuminate at the apex, narrowed to the base, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, rather sparsely pubescent above, more or less densely yellowish-pubescent beneath. Flowers white, about 1 in. long, 1-3 together in terminal and axillary inflorescences. Calyx pubescent, the lobes 2 $\frac{1}{4}$ -4 times as long as the tube.

Equatoria.

***J. schweinfurthii* Gilg.**

Climbing shrub; branchlets slender, yellowish-pubescent. Leaves oblong to elliptic, acute to acuminate at the apex, rounded at the base, 1 $\frac{1}{4}$ -2 $\frac{1}{2}$ in. long, glabrous above and beneath except for the midrib; petioles $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers 1-3 in terminal and axillary inflorescences. Calyx-tube sparsely pubescent, the lobes 1 $\frac{1}{2}$ as long as the tube.

Equatoria.

***J. abyssinicum* Hochst. ex DC.**

Climbing shrub; branchlets almost glabrous. Leaves 3-foliolate; leaflets ovate, acute to acuminate at the apex, 1 $\frac{1}{2}$ -2 in. long, the terminal one long-petiolulate, the lateral ones smaller and short-petiolulate; petiole about $\frac{1}{2}$ in. long. Flowers white, in many-

flowered terminal and axillary cymes. Calyx glabrous or sparsely pubescent, the teeth very much shorter than the tube.

Equatoria: Imatong Mountains, Atiara, in *Acacia xiphocarpa* low forest.

J. dichotomum Vahl.

J. ternifolium Bak.

Climbing shrub; branchlets glabrous. Leaves usually in whorls of 3, oblong or ovate-oblong, 2-3 in. long, glabrous; petiole about $\frac{1}{2}$ in. long. Flowers white, about 1 in. long, in compound terminal and axillary cymes. Berry oblong, $\frac{1}{2}$ in. long.

Equatoria.

J. floribundum R. Br.

J. officinale (non L.) Broun & Massey.

Climbing shrub; branchlets glabrous. Leaflets 3-7, ovate to elliptic, glabrous, the terminal one petiolulate, 1-1 $\frac{1}{2}$ in. long, the lateral ones smaller and sessile. Flowers white, fragrant, 1-1 $\frac{1}{2}$ in. long, in few-flowered terminal and axillary cymes.

Red Sea Hills: Karora Hills. *Fung District*: Fazoghli.

Var. *steudneri* (Schweinf.) Gilg & Schellenb.

Fig. 144.

J. steudneri Schweinf. ex Bak.

Branchlets and leaves more or less densely pubescent.

Red Sea Hills: Erkowit.

2. **LINOCIERA** Sw.

Linociera nilotica Oliv.

Shrub or tree up to 60 ft. high; bark grey-black; branchlets glabrous. Leaves oblong, gradually and broadly acuminate at the apex, cuneate at the base, 4-7 in. long, 1-2 $\frac{1}{2}$ in. broad, dark above, paler beneath and with the lateral nerves having a conspicuous gaping pit in the axils. Flowers creamy-white, fragrant, in short axillary panicles up to 1 $\frac{1}{2}$ in. long, frequently from leafless nodes. Fruit ellipsoid, $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad.

Equatoria.

3. **OLEA** L.

Olea chrysophylla Lam.

Brown Olive.

O. europaea var. *nubica* Schweinf. ex Bak.

Much-branched spreading tree usually 20-30 ft. high, but sometimes attaining 50 ft.; bole fluted; bark dark-brown, rough; slash white. Leaves narrow-lanceolate or elliptic-lanceolate to ovate, gradually narrowed and frequently mucronate at the apex, gradually narrowed to or at the base, 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, scaly with silvery-white or golden glandular scales beneath; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers white, small, numerous, in lateral scale-covered axillary panicles 1-2 $\frac{1}{2}$ in. long. Drupe purple, subglobose, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, edible and sweet.

Red Sea Hills. *Darfur*: *Jebel Marra*, 8000-10,000 ft.



Fig. 144—*JASMINUM FLORIBUNDUM* var. *STEUDNERI* (Schweinf.) Gilg & Schellenb.

A, stamen and pistil. B, fruit.

***O. hochstetteri* Bak.**

East African Olive.

Tree up to 20-30 ft. high; crown dense, composed of steeply-ascending branches; bark grey-white, smooth. Leaves elliptic-lanceolate, acuminate at the apex, cuneate at the base, 3-4½ in. long, 1-1½ in. broad, olive-green above, paler below. Flowers white, small, in panicles 2-4½ in. long. Filaments as long as the anthers. Drupe ellipsoid, about ½ in. long.

Equatoria: Imatong Mountains, 6700-8700 ft.; Didinga Mountains, Mount Lotuke, 6800 ft.

4. **SCHREBERA** Roxb.**Schrebera macrantha** Gilg & Schellenb.

Slender-boled deciduous forest tree up to 90 ft. high; bark pale-yellow-brown, smooth, thin; slash yellow-brown. Leaves broadly elliptic to obovate-elliptic, rounded and shortly acuminate at the apex, unequal-rounded to cuneate at the base, $2\frac{1}{2}$ -5 in. long, $1\frac{1}{2}$ -3 in. broad; petiole $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Flowers white (chocolate-purple in the throat of the tube), fragrant, in lax cymes about $2\frac{1}{2}$ in. long. Capsule dark-purple-brown with scattered pale-brown lenticles, pear-shaped, 2 - $2\frac{1}{2}$ in. long; seeds winged.

Equatoria: Azza Forest.

5. **STEGANTHUS** Knobl.**Steganthus welwitschii** (Knobl.) Knobl.

Olea welwitschii (Knobl.) Gilg & Schellenb.

Forest tree up to 90 ft. high; crown small; bole straight, cylindrical or slightly tapered; bark pale-grey to nearly white, vertically channelled. Leaves lanceolate-oblong, long-acuminate at the apex, cuneate at the base, 3-6 in. long, $1\frac{1}{2}$ -2 in. broad; petiole $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Flowers white, very numerous in lateral and terminal panicles $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long. Filaments much shorter than the anthers. Drupe ellipsoid.

Equatoria: Dongotona Mountains.

115. **APOCYNACEAE**

Trees, erect shrubs or climbers or rarely perennial herbs, often with a milky juice. Leaves without stipules, opposite or verticillate or rarely alternate, simple, entire. Flowers hermaphrodite, actinomorphic. Calyx often glandular inside; lobes 5 or rarely 4, imbricate. Corolla tubular, variously shaped; lobes contorted-imbricate, very rarely valvate. Stamens 5 or rarely 4, inserted in the corolla-tube; filaments free or rarely united; anthers often sagittate, free or connivent round the stigma or rarely adherent to the latter, the connective often produced at the apex; pollen granular. Disk usually present, annular or cupular or of separate glands. Ovary superior, 1-locular with 2 parietal placentas or 2-locular with the placentas adnate to the septum, or carpels 2 and connate only at the apex and base with a ventral placenta in each carpel; style 1, split at the base or entire, thickened and stigmatose below the apex; ovules 2 or more in each carpel. Fruit entire and indehiscent or of 2 separate carpels, baccate, drupaceous or follicular; seeds often winged or appendaged with long silky hairs.

- A. Leaves spirally arranged; stem succulent, stout, unarmed
ADENIUM. 2.
- AA. Leaves opposite or whorled:
- B. Branchlets armed with axillary spines CARISSA. 4.
- BB. Branchlets without spines:
- C. Corolla-lobes overlapping to the left (viewed from outside):
- D. Ovary syncarpous:
- (a) Inflorescences terminal LANDOLPHIA. 10.
- (aa) Inflorescences axillary:
- (b) Ovary 1-locular; climbers CLITANDRA. 5.
- (bb) Ovary 2-locular; erect shrubs ... ACOKANTHERA. 1.
- DD. Ovary apocarpous or almost so:
- E. Fruit composed of follicles ALSTONIA. 3.
- EE. Fruit baccate or drupaceous:
- (c) Inflorescences axillary; disk absent
PLEIOCARPA. 11.
- (cc) Inflorescences terminal:
- (d) Sepals free to the base or nearly so:
- (e) Corolla-tube at least 4 times as long as the lobes;
disk present; ovules 2 in each loculus; anthers
not sagittate RAUVOLFIA. 12.
- (ee) Corolla-tube not more than twice as long as the
lobes; disk absent; ovules numerous; anthers
sagittate CONOPHARYNGIA. 6.
- (dd) Sepals united into a tubular or subcampanulate
calyx circumscissile at the base or splitting longi-
tudinally; disk present VOACANGA. 13.
- CC. Corolla-lobes overlapping to the right:
- (f) Anther-loculi not sagittate:
- (g) Stamens inserted above the middle of the corolla-tube ...
ALSTONIA. 3.
- (gg) Stamens inserted near the base of the corolla-tube
HOLARRHENA. 9.
- (ff) Anther-loculi sagittate:
- (h) Ovary syncarpous HOLALAFIA. 8.
- (hh) Ovary apocarpous FUNTUMIA. 7.

1. ACOKANTHERA Don

Acokanthera schimperii (A. DC.) Oliv.

Glabrous shrub. Leaves somewhat coriaceous, elliptic to obovate, mucronate and obtuse to rounded at the apex, more or less acute at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad, often shiny above. Flowers white or tinged with pink, usually fragrant, in few- to many-flowered glabrous or rarely scantily puberulous corymbs or clusters. Berry black, globose or subellipsoid, 1 in. in diameter.

Equatoria: *Didinga Mountains, Naligede*, 5800 ft.

2. **ADENIUM** Roem. & Schult.**Adenium honghel** A. DC.

Fig. 145.

A. obesum (non Roem. & Schult.) Broun & Massey.

Shrub or small tree 6-10 ft. high; stem stout, smooth; branches half-succulent, leafless when in flower. Leaves spirally arranged, sessile, obovate-oblong, mucronate and obtuse to rounded at the apex, gradually narrowed to the base, $2\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad, glabrous. Flowers red or pink, $1\frac{1}{2}$ -2 in. long, in short 2-10-flowered subsessile cymes. Follicles 4-6 in. long.

Darfur: Jebel Marra. Nuba Mountains.



Fig. 145—ADENIUM HONGHEL A. DC.

A, small tree in flower. B, leafy shoot. C, longitudinal section of flower. D, stamen. E, transverse section of ovary. F, fruit. G, seed.

A. coetatum Stapf.

Shrub 1-3 ft. high, with a very short fleshy trunk and succulent branches tapering from a thick base about 6 in. in diameter to less than 1 in. in diameter. Leaves succulent, stiff, obovate, rounded or slightly retuse and usually minutely cuspidate at the apex, cuneate at the base, 1½-4 in. long, ¾-1½ in. broad, more or less tomentose when young, soon becoming glabrous. Cymes 2-flowered, sessile, terminal from a bunch of leaves. Corolla pink or crimson, more or less pubescent outside.

Equatoria.

A. speciosum Fenzl.

Shrub 4 or more ft. high; trunk 2-3 ft. thick at the base, scantily branched at the top, the flowers and leaves appearing together. Leaves spirally arranged, oblanceolate or linear-oblong, mucronate and rounded or slightly retuse at the apex, abruptly or (rarely) gradually narrowed at the base, 2-4 in. long, ¾-1 in. broad, softly tomentose on both surfaces or rarely glabrous. Flowers red or pink, in few- or many-flowered forked racemose inflorescences. Follicles linear-spindle-shaped, tomentose, reflexed, 5-7 in. long.

Central and Southern Sudan.

3. ALSTONIA R. Br.***Alstonia boonel*** De Wild.

A. congensis (non Engler) Broun & Massey.

Deciduous forest tree to 130 ft., with deeply fluted bole; bark grey-brown, wrinkled with conspicuous lenticels; slash yellow with darker pinkish spots, a chalk-white latex exuding. Leaves obovate, rounded to shortly acuminate at the apex, narrowed to the base, 5-8 in. long, 1½-3½ in. broad, dark above, pale beneath, the lateral nerves numerous and parallel. Flowers white, in lax terminal cymes. Follicles slender, elongate, 8-16 in. long, pendulous; seeds with a tuft of fluffy white hairs at each end.

Equatoria: gallery- and depression-forests.

4. CARISSA L.***Carissa edulis*** (Forsk.) Vahl.

Fig. 146.

Much-branched shrub; branchlets glabrous or thinly and softly pubescent, armed with axillary spines. Leaves ovate, acute at the apex, rounded or broadly cuneate at the base, 1½-3½ in. long, 1-2 in. broad, glabrous or thinly pubescent on the midrib beneath. Flowers white and wine-red, fragrant, in shortly pedunculate cymes. Fruit purple to black, globose, about ¾ in. long, glabrous, edible.

Widespread.



Fig. 146—*CARISSA EDULIS* (Forsk.) Vahl.

5. **GLITANDRA** Benth.**Glitandra schweinfurthii** Stapf.

Climbing shrub; young branches pale-greyish-brown, dotted with reddish spots lower down. Leaves shortly petiolate, elliptic to oblong-elliptic, abruptly acuminate at the apex, cuneate at the base, $2\frac{1}{2}$ -3 in. long, $1\frac{1}{2}$ - $1\frac{1}{4}$ in. broad, slightly glossy above, opaque and glaucous beneath. Flowers with a yellow tube and white lobes, about 1 in. long, in few-flowered axillary cymes. Fruit reddish-brown, globose, 2 in. in diameter.

Equatoria.

6. **CONOPHARYNGIA** Don**Conopharyngia holstii** (K. Schum.) Stapf.

Fig. 147.

Heavily foliated under-storey shrub or tree up to 20 ft. high. Leaves broadly elliptic, usually 7-12 in. long, 3-5 $\frac{1}{2}$ in. broad, but sometimes much larger. Flowers wax-white, yellow in the throat, fragrant, about $1\frac{1}{2}$ in. in diameter; corolla-tube stout, up to $\frac{3}{4}$ in. in diameter, densely tomentose within except for the filamental ridges. Berries green, spherical, about 4 in. in diameter.

Equatoria.

7. **FUNTUMIA** Stapf**Funtumia elastica** (Preuss) Stapf.

Lagos Rubber Tree.

Second-storey forest tree up to 80 ft. high; bole straight, cylindrical, unbuttressed; slash yellow-white with copious white latex which coagulates at once on the finger-tips and comes away cleanly from the skin. Leaves oblong-elliptic, more or less sinuate at the margin, 4-10 in. long, $1\frac{1}{2}$ -4 in. broad, the lateral nerves with pits in the axils beneath. Flowers yellow-white, fragrant, in short dense axillary cymes. Fruit the shape of an aeroplane-propeller, up to 12 in. long; seeds with a tuft of long silky hairs at one end.

Equatoria: Azza Forest.

8. **HOLALAFIA** Stapf**Holalafia multiflora** Stapf.

Glabrous lofty climber. Leaves subcoriaceous, elliptic or oblong or rarely obovate, very obtuse to shortly acuminate at the apex, rounded to subcordate at the base, 4-6 in. long, 2 $\frac{1}{2}$ -2 $\frac{3}{4}$ in. broad, shiny above, the secondary nerves finely channelled above and prominent beneath; petiole about $\frac{1}{2}$ in. long. Flowers white with a central red spot, in corymbs up to 3 in. in diameter on a stout peduncle up to $\frac{1}{2}$ in. long. Corolla-tube and lobes each about $\frac{1}{2}$ in. long. Fruit linear, cylindrical, up to 3 ft. long, $\frac{3}{4}$ in. in diameter, pendent, dehiscent.

Equatoria.



Fig 147—*CONOPHARYNGIA HOLSTII* (K. Schum.) Stapf.

A, flowering branchlet. B, flower in vertical section. C, sepal. D, E, stamen, front and back. F, stigma. G, H, ovary in vertical and transverse section. J, K, L, fruit. M, N, O, seed.

9. **HOLARRHENA** R. Br.**Holarrhena wulfsbergii** Stapf.

Tree up to about 50 ft. high. Leaves elliptic to lanceolate-elliptic, acutely acuminate at the apex, shortly cuneate to rounded at the base, 3½-6 in. long, up to 3½ in. broad, shining and glabrous above, glabrous beneath except in some of the nerve-axils. Flowers white, in dense axillary or terminal subsessile corymbs 1½-2½ in. in diameter; peduncle and pedicels puberulous, the latter slender and up to ½ in. long. Calyx more or less densely minutely tomentose. Corolla glabrous, about ⅓ in. long. Follicles linear, up to 12 or more in. long.

Equatoria: *Mount Otogo summit*, 3650 ft.

10. **LANDOLPHIA** Beauv.**Landolphia comorensis** (Boj.) K. Schum.

L. florida var. *leiantha* Oliv.

Tall powerful woody glabrous climber; tendrils long, branched, pseudo-axillary or distinctly terminal; young branches dark-red or black-brown, dotted with numerous small lenticels. Leaves very variable, coriaceous, usually elliptic to elliptic-oblong, or ovate or oblong, obtuse or rarely shortly acuminate at the apex, rounded at the base, 3-7 in. long, 2½-3½ in. broad, glossy and dark-green above, paler beneath. Flowers yellow near the mouth but otherwise white, fragrant, in terminal shortly peduncled many-flowered dense glabrous corymbs, very rarely in elongate panicles; corolla-tube usually ¾-1 in. long. Fruit yellow, more or less globose, up to 4 in. in diameter; pulp yellow, edible.

Kassala. Equatoria.

Var. *florida* (Benth.) K. Schum.

L. florida Benth.

Inflorescences tomentose or pubescent.

Central and Southern Sudan.

L. petersiana (Klotzsch) Dyer.

Climbing shrub, the sensitive inflorescences often acting as tendrils; young branches minutely rusty-pubescent or tomentose, becoming glabrous. Leaves coriaceous, elliptic or elliptic-oblong, subacute or obtuse at both ends, 3-4½ in. long, 1½-2 in. broad, loosely pubescent on both surfaces when young, soon glabrous. Flowers white, fragrant, in short or elongate peduncled panicles bearing clusters of many sessile flowers at the ends of short branches. Fruit globose, up to 2½ in. in diameter, finely velvety.

Equatoria: *Ngwolima, confluence of Halima stream with River Busseri S.W. of Wau.*

Var. *schweinfurthiana* (Hallier f.) Stapf.

Young branches and inflorescences densely rusty-velvety. Leaves shortly acuminate at the apex, rounded or subacute at the base, 2-3 in. long, about 1 in. broad, more or less pubescent on both surfaces. Corolla-tube up to $\frac{1}{2}$ in. long.

Equatoria.

L. *ugandensis* Stapf.

Woody climber; tendrils branched, arising from the branch-forks. Leaves oblong to oblong-elliptic, shortly and obtusely acuminate at the apex, broadly cuneate to rounded at the base, $2\frac{1}{2}$ -4 in. long, 1-1 $\frac{1}{2}$ in. broad, glabrous. Flowers white, in 12-16-flowered dense corymbs finally lengthening out into short racemes. Fruit globose, with light-brown lenticels.

Equatoria: Imatong Mountains, Mount Itobol forest

L. *senegalensis* var. *glabriflora* Hua.

Dense shrub up to 2 ft. high or more usually a strong climber, wholly glabrous; tendrils long, branched. Leaves thinly coriaceous, oblong, shortly and rather abruptly acuminate at the apex, subacute or rather obtuse at the base, $2\frac{1}{4}$ -4 in. long, $1\frac{1}{2}$ -1 $\frac{3}{4}$ in. broad, glossy and dark above, much paler beneath. Flowers fragrant, in terminal shortly peduncled many-flowered rather dense glabrous corymbs or short semi-globose panicles. Corolla-tube yellowish, $\frac{1}{2}$ in. long; corolla-lobes pure white with a yellow base, $\frac{3}{4}$ in. long. Fruit orange-coloured with grey patches, ovoid to globose, $2\frac{1}{2}$ -4 in. long.

Equatoria: ironstone escarpment above River Jur and near leper colony north of Wau.

L. *owariensis* var. *tomentella* Stapf.

Fig. 148.

More or less climbing shrub or tree, often very large, with long hook-branched tendrils; young branches and tendrils densely tawny-tomentose. Leaves oblong to elliptic, obtuse or obtusely subacuminate at the apex, $2-3\frac{1}{2}$ in. long, 1-1 $\frac{1}{2}$ in. broad, quite glabrous above (except sometimes on the midrib), softly pubescent beneath when young, soon becoming glabrous. Flowers white, soon turning brownish, in shortly peduncled many-flowered finely tawny-tomentose pyramidal or ovoid panicles (rarely elongate with distinct spreading or recurved branches, the lower acting as tendrils); corolla-tube $\frac{1}{2}$ in. long. Fruit yellow, mottled with red, globose, $1\frac{1}{2}$ in. in diameter, smooth, dotted with numerous lenticels, sweet, edible.

Equatoria. Yields the best Sudan *Landolphia* rubber.



Fig. 148—*LANDOLPHIA OWARIENSIS* var. *TOMENTELLA* Stapf.
A, flower. B, flower with corolla opened. C, stamens. D, fruit.

11. *PLEIOCARPA* Benth.

Pleiocarpa tubiclna Stapf.

Shrub; branches greyish-brown. Leaves opposite or in whorls of three, coriaceous, oblong, shortly and obtusely acuminate at the apex, cuneate at the base, $3\frac{1}{2}$ - $5\frac{1}{2}$ in. long, 1-2 in. broad, glabrous on both surfaces, glossy above. Flowers white, about $\frac{1}{2}$ in. long, sessile, in 12-30-flowered compact axillary clusters, often in the axils of fallen leaves.

Equatoria: Azza Forest.

12. *RAUVOLFIA* L.

Rauvolfia vomitoria Afz.

Shrub or small tree up to 15 ft. high (rarely 30 ft. high); young branches 4-sided, slender. Leaves in whorls of 3-4, very variable in shape, lanceolate to elliptic, acuminate at the apex, $2\frac{1}{2}$ -6 in. long, 1-3 in. broad. Flowers white, small, distinctly pedicellate in repeatedly dichotomous puberulous cymes arranged in umbels. Drupes red when ripe, ovoid, $\frac{1}{2}$ in. in diameter.

Equatoria.

R. oxyphylla Stapf.

Tree up to 80 ft. high, with spreading umbrella-shaped crown; young branches stout. Leaves whorled, crowded, dark-green, obovate to oblanceolate, acute or shortly acuminate at the apex, up to 12 in. long, 3 in. broad; midrib straw-coloured, drying to

brown, conspicuous. Flowers white, subsessile, in large glabrous umbels up to 8 in. in diameter. Drupes subglobose, asymmetrical.
Equatoria.

13. VOACANGA Thou.

Voacanga africana Stapf.

Low-branched spreading shrub or tree up to 20 ft. high. Leaves lanceolate or ovate or elliptic, acute or acuminate at the apex, 3-7 in. long, 1½-2½ in. broad, glabrous or softly pubescent on the nerves beneath. Flowers creamy-white, waxy, fragrant, about 1½ in. in diameter, in many-flowered often paired pedunculate pubescent or glabrous inflorescences. Berries green, spherical.

Equatoria.

V. obtusa K. Schum.

Tree usually 20-30 ft. high, occasionally attaining 50 ft. Leaves crowded at the ends of branches, obovate, rounded or obtuse at the apex, 4-10 in. long, 2-4 in. broad, glabrous. Flowers yellow-white, waxy, fragrant, 1½-2 in. diameter, in few-flowered often paired pedunculate glabrous inflorescences.

Equatoria.

116. ASCLEPIADACEAE

Perennial herbs or undershrubs or shrubs or rarely trees, sometimes climbing, often with milky juice. Leaves without stipules, opposite or verticillate or very rarely alternate, simple, the margins often rolled back (revolute). Inflorescences usually cymose, often corymbose or subumbellate. Flowers actinomorphic, hermaphrodite. Calyx-lobes imbricate or open in bud. Corolla-lobes 5, the lobes contorted or valvate. Corona simple or of 5 or more scales, either adnate to the corolla-tube or to the stamens or to both. Stamens 5, usually inserted at the base of the corolla; filaments separate or connate into a tube; anthers converging around and often adnate to the stigma, 2-locular, the margins or their basal prolongations below the pollen-cells being more or less horny or wing-like (the anther-wings); pollen granular or in glutinous masses attached in pairs or fours usually by means of arm-like processes to each of the 5 horny or rarely soft turgid or bilobed bodies (the pollen-carriers) each of which rests on one of the 5 angles of the dilated part of the style, the whole forming the pollinia. Disk absent. Ovary of 2 free carpels, superior; styles 2, separate, but united at the apex into a single stigma, the latter often thick and disk-like; ovules usually numerous, pendulous in several series. Fruit of 2 usually divergent follicles; seeds often crowned by a beard of long silky hairs.

KEY TO GROUPS.

- A. Filaments of the stamens free; anthers with connectives produced beyond the loculi; pollen granular, the granules composed of 4 pollen grains united in tetrads GROUP 1.

- AA. Filaments of the stamens connate into a tube; anthers adnate to the top of the dilated part of the style; pollen-grains united into 2 or 4 waxy masses:
- B. Pollen-contents of each anther-loculus consisting of two distinct but minute waxy masses attached in fours to each of the pollen-carriers; style usually produced beyond the dilated portion and beyond the anthers GROUP 2.
- BB. Pollen-contents of each anther-loculus united into one waxy mass; style usually not produced beyond the anthers:
- C. Pollen-masses opaque, without a transparent margin, attached in pairs to each of the pollen-carriers:
- (a) Pollen-masses pendulous in the anther-loculi ... GROUP 3.
- (aa) Pollen-masses erect or horizontal or ascending, never pendulous in the anther-loculi GROUP 4.
- CC. Pollen-masses with a transparent margin or apex:
- (b) Leafy plants or if leafless then not fleshy; stems often climbing GROUP 5.
- (bb) Leafless or nearly so; stems fleshy, angular, dwarf, tuberculate or toothed on the angles GROUP 6.

GROUP 1.

- A. Corolla-tube a mere ring with the lobes almost free, or corolla rotate with a tube less than $\frac{1}{4}$ in. long; erect or twining shrubs:
- (a) Corona in a single series; lobes simple or divided:
- (b) Anthers glabrous; style conical at the apex TACAZZEA. 29.
- (bb) Anthers more or less hairy; style convex or subtruncate at the apex PERIPILOCA. 22.
- (aa) Corona double, spreading; corolla rotate OMPHALOGONUS. 17.
- AA. Corolla-tube distinctly companulate or cylindrical:
- (c) Twining or erect shrubs CRYPTOLEPIS. 6.
- (cc) Herbs with a tuberous rootstock RAPHIONACME. 24.

GROUP 2.

- Twining shrubs SECAMONE. 27.

GROUP 3.

- A. Leafy climbing or twining or decumbent plants, or erect shrubs or herbs:
- B. Climbers or plants with twining or decumbent branches:
- (a) Corona in one series:
- (b) Flowers up to $\frac{1}{2}$ in. in diameter:
- (c) Corona very small and inconspicuous, arising from the filament-part of the staminal-column, easily overlooked and may be thought to be absent; much-branched shrubs with some branches twining PODOSTELMA. 23.

- (cc) Corona distinct:
- (d) Corona-lobes flattened:
- (e) Corona-lobes dorsally flattened CYNANCHUM. 7.
- (ee) Corona-lobes laterally flattened PENTATROPIS. 20.
- (dd) Corona-lobes not flattened, obconic, trumpet- or slipper-shaped with infolded margins, truncate or rounded at the apex with a horn directed forwards over or towards the anthers PENTARRHINUM. 19.
- (bb) Flowers about $1\frac{1}{2}$ in. in diameter, few (2-4) in each inflorescence OXYSTEMMA. 18.
- (aa) Corona in 2 series, the inner corona-lobes spurred at the base PERGULARIA. 21.
- BB. Erect shrubs or herbs:
- C. Flowers spirally arranged around the apical part of the peduncles, the latter being racemously scattered along the upper part of the branches; often riverside shrubs ... KANAHIA. 13.
- CC. Flowers not arranged as above, cymose or solitary or umbellate:
- D. Flowers cymose or solitary:
- (f) Cymes lax, 2-6-flowered, or flowers solitary GLOSSONEMA. 10.
- (ff) Cymes densely many-flowered ... SOLENOSTEMMA. 28.
- DD. Flowers umbellate (all arising from about the same point):
- E. Corona-lobes spurred at the base ... CALOTROPIS. 3.
- EE. Corona-lobes not spurred:
- F. Corona-lobes not petal-like:
- (g) Corona-lobes hood-like, or more or less folded one over the other or channelled down on the inner face, laterally compressed with or without a horn or other processes in the cavity, never dorsally flattened ASCLEPIAS. 1.
- (gg) Corona-lobes dorsally flattened, or if concave or with incurved edges then always broader than they measure from back to front, usually with 2 slight or wing-like parallel keels and with or without one or more horns or other processes on the inner face, never laterally compressed, or with a single median keel SCHIZOGLOSSUM. 26.
- (ggg) Corona-lobes very thick or laterally compressed, with or without teeth or keels on the inner face, or if dorsally flattened still comparatively thick and without keels, or with only one stout longitudinal median keel, but no thread-like horn-like or other process on the inner face, solid XYSMALOBIMUM. 30.

- FF. Corona-lobes petal-like and coloured, larger and more conspicuous than the corolla-lobes
MARGARETTA. 15.
- AA. Leafless shrubs, small trees or trailers SARCOSTEMMA. 25.

GROUP 4.

- A. Corona arising from and adnate to the corolla-tube
GYMNEMA. 11.
- AA. Corona arising from the staminal column MARS DENIA. 16.

GROUP 5.

- A. Corolla-tube elongated, much longer than broad
CEROPEGIA. 5.
- AA. Corolla-tube short and not longer than broad, or corolla rotate or subrotate:
- B. Corona inserted on the corolla, the 5 lobes with hairy tips
LEPTADENIA. 14.
- BB. Corona double, inserted on the staminal column, none on the corolla
BRACHYSTEMMA. 2.

GROUP 6.

- A. Stems cylindric, branching, several-angled; angles tessellately divided into very obtuse and minutely apiculate tubercles, not spiny nor bristly
ECHIDNOPSIS. 9.
- AA. Stems not tessellate, often spiny-toothed or with bristle-like tips to the tubercles, 4-6-angled:
- (a) Corolla with the base of the sinuses between the lobes produced into small triangular teeth
HUERNIA. 12.
- (aa) Corolla without teeth in the sinuses between the lobes:
- (b) Outer corona cup-shaped or annular and entire or variously toothed
CARALLUMA. 4.
- (bb) Outer corona in one piece, disk-like, pentagonal, resting on the rim of the raised disk of the corolla and closing the tube formed by it
DUVALIA. 8.

1. ASCLEPIAS L.

Asclepias lineolata (Decne.) Schlechter.

Erect undershrub 2-4 ft. high, pubescent in the upper parts, with spindle-shaped roots. Leaves oblong or oblong-lanceolate, rounded to obtuse at the apex, rounded or cordate at the base, $2\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, up to 2 in. broad, with numerous lateral veins, scabrous on both surfaces and especially on the margin. Flowers greenish-white with red-purple markings, in axillary pedunculate several-flowered umbels. Corona-lobes distinctly shorter than the staminal column. Follicle 3-4 in. long, 2 in. in diameter, inflated, ellipsoid, smooth and glabrous.

Equatoria.

A. schweinfurthii N. E. Br.

Undershrub 2 or more ft. high; stems simple, pubescent. Leaves lanceolate-ovate, subobtusate and apiculate at the apex, cordate to subcordate at the base, 2-3½ in. long, 1-2¼ in. broad, glabrous, slightly rough beneath and scabrous on the margin. Flowers 1 or more in. in diameter, in 4-6-flowered lateral umbels on pubescent peduncles 1½-5½ in. long. Corona-lobes as long as or longer than the staminal column.

Equatoria.

A. semilunata (A. Rich.) N. E. Br.

Erect herb 2-5 ft. high, more or less tomentose in the upper part. Leaves opposite or 3-4 in a whorl, linear or linear-lanceolate, acute or acuminate at the apex, more or less rounded or tapering at the base, 3½-7 in. long, ¼-¾ in. broad, the margin narrowly revolute, glabrous except on the midrib beneath. Flowers white or cream, in axillary pedunculate umbels, the peduncle tomentose and 1-1½ in. long. Follicles half-moon-shaped, very inflated, 2¼-3 in. long, covered with long bristles.

Upper Nile: White Nile bank, Sudd region.

A. flavida N. E. Br.

Much-branched shrub 3-4½ ft. high; branches white-tomentose. Leaves spreading, linear, acute at the apex, tapering at the base, 1½-3 in. long, ⅙-¼ in. broad, glabrous, with the mid-rib appressed-pubescent beneath. Flowers yellow with a purple centre, in several 4-6-flowered pedunculate umbels lateral at the nodes along the upper part of the branches; peduncle and pedicels ½-1 in. long, white-tomentose. Follicles ellipsoid, rather long-beaked and sparsely bristly when mature.

Red Sea Hills.

A. pedunculata (Decne.) Dandy, comb. nov.

Gomphocarpus pedunculatus Decne.; *A. macrantha* Hochst. ex Oliv.

Herb 9-18 in. high; stems simple, with two puberulous lines or puberulous all round. Leaves linear-lanceolate, acuminate at the apex, 3-10 in. long, ¼-½ in. broad, more or less puberulous on both sides. Flowers yellow or scarlet-red, ¾-1½ in. in diameter, in 2-4 lateral and terminal 3-6-flowered umbels towards the top of the stem; peduncle 3½-11 in. long, puberulous or almost glabrous. Follicles usually solitary, lanceolate, acuminate at the apex, tapering at the base, 3-4 in. long, ½ in. thick.

Equatoria.

A. phillipsiae N. E. Br.

Shrub; branches rather densely pubescent or subtomentose with minute white curved hairs. Leaves linear, acute and mucronate at the apex, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{24}$ - $\frac{1}{12}$ in. broad, sparsely and minutely pubescent when young, later glabrous, the margin often revolute to the midrib. Flowers in several 3-6-flowered pedunculate umbels lateral at the nodes along the upper part of the branches; peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. long, puberulous. Follicles about 2 in. long, lanceolate, setose, very minutely and rather sparsely pubescent all over or the bristles glabrous.

Darfur: Jebel Marra, 7200-9000 ft.

2. **BRACHYSTELMA** R. Br.**Brachystelma phyteumoides** K. Schum.

Dwarf perennial herb; stems about 4 in. high, several from a thick rhizome. Leaves erect, linear, acuminate at the apex, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, revolute, glabrous except for a few hairs on the midrib beneath. Flowers dark-purple-brown, about $\frac{3}{4}$ in. long, shortly pedicellate, in a terminal many-flowered umbel placed between a pair of leaves. Follicles fusiform.

Equatoria.

B. lineare A. Rich.

Dwarf perennial herb; stems 3-4 in. high, branching at the base, pubescent, from a depressed-globose tuber about 2 in. in diameter. Leaves subsessile, linear, acute at the apex, narrowed at the base, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, glabrous. Flowers solitary or in pairs, sublateral at the nodes. Follicles fusiform, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long.

Equatoria: Imatong Mountains.

3. **CALOTROPIS** R. Br.**Calotropis procera** (Ait.) Ait. f.

Sodom Apple. Fig. 149.

Soft-wooded shrub or small tree up to 18 ft. high with a clean bole 6-8 ft. long; bark yellow-brown, thick, corky; young parts covered by a white tomentum. Leaves pale-green, fleshy, sessile or shortly petiolate, ovate to obovate, obtuse and often with a short abrupt point at the apex, cordate at the base, $2\frac{1}{2}$ -12 in. long, $1\frac{1}{2}$ -7 in. broad. Flowers in 3-10-flowered subumbellate cymes arising from between the bases of the leaves on peduncles up to 3 in. long. Corolla campanulate with 5 greenish-white lobes with purple tips, $\frac{3}{4}$ -1 in. in diameter. Corona purple at the top with white spurs below. Fruit green, subglobose to obliquely ovoid, 3-6 in. long, with a thick spongy inflated pericarp.

Widespread.



Fig. 149—*CALOTROPIS PROCERA* (Ait.) Ait. f.

A, flower. B, longitudinal section of flower. C, stamen with portion of corona. D, style with pollinia. E, pollinia. F, dehiscent fruit. G, young ovary cut across showing one carpel atrophied. H, seeds.

4. *CARALLUMA* R. Br.

Caralluma longidens N. E. Br.

Stems erect, branching, glabrous; branches erect, 5-8 in. long, attenuated upwards, 4-angled; angles slightly toothed; teeth with fleshy terete acuminate deciduous leaves, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers dark-purple-brown, solitary or two together, subaxillary along the upper part of the stem; pedicels $\frac{1}{2}$ in. long, elongating to $\frac{1}{2}$ - $\frac{1}{2}$ in. long in fruit, glabrous. Corolla-tube $\frac{1}{2}$ - $\frac{1}{2}$ in. long; lobes $\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Northern Sudan: between Berber and Suakin.

C. vittata N. E. Br.

Herb 6-8 in. high; branches 4-angled, glabrous, much attenuated upwards; angles slightly toothed; teeth bearing minute deciduous fleshy ovate very acuminate leaves. Flowers erect, solitary or 2-4 together, scattered along 2-4 in. of the very slender terminal part of the branches; pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Corolla-tube whitish, longitudinally striped with dark-purple, about $\frac{1}{2}$ in. long and broad; lobes dark-purple, $\frac{1}{2}$ in. long.

Red Sea District: 21° N., between sea-level and 4000 ft.

C. retrospicuens (Ehrenb.) N. E. Br.

Fig. 150.

Herb 1 $\frac{1}{2}$ -2 ft. high; stems branched, very stout, acutely 4-angled; angles about $\frac{1}{2}$ in. broad, with broad triangular teeth, glabrous. Flowers blackish-purple, in terminal sessile umbels usually several clustered together and forming a large compound globose umbel 3-4 in. in diameter containing 100 or more flowers; pedicels $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, glabrous. Corolla rotate, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter. Follicles 5-6 in. long.

Red Sea Hills.

C. venenosa Maire.

Stems similar to those of *C. hesperidum*. Flowers extra-axillary, in clusters of 2-4 buds but solitary in bloom through abortion of the remaining buds. Corolla-tube faintly purple-brown inside, greyish-green faintly suffused with chestnut and marked with blackish-purple spots outside, glabrous; lobes rotate, blackish-purple and densely papillate inside, faintly chestnut spotted with purple-brown outside, glabrous. Follicles greyish-green with dark-purple lines similar to those of *C. hesperidum*.

Nuba Mountains.

C. hesperidum Maire.

Stems greenish-white, irregularly mottled with purple spots, simple or branched from a smooth whitish rhizome, faintly 4-angled, the angles very obtusely rounded, with fleshy conical very pointed spine-like teeth. Flowers extra-axillary, borne near the apex of the stem, in clusters of 2 to 10 with very short pedicels. Corolla greenish outside, dark-brownish-purple and velvety-papillate inside, the base of the tube glabrous and yellowish, about $\frac{1}{2}$ in. in diameter. Follicles separate from the base, 3 $\frac{1}{4}$ -4 in. long at maturity.

Red Sea Hills: Gebeit valley.

C. penicillata var. **robusta** (N. E. Br.) White & Sloane.

Stems tall, robust, succulent, acutely 4-angled, 1-3 in. square, glabrous and apparently glaucous; angles toothed, teeth $\frac{1}{4}$ - $\frac{1}{2}$ in. long, deltoid, horizontally spreading. Flowers pale-green outside, livid-brown inside with yellowish spots, small, in lateral sessile or subsessile globose umbels $\frac{1}{2}$ -1 $\frac{1}{2}$ in. in diameter scattered along the upper part of the stems; pedicels up to $\frac{1}{2}$ in. long. Corolla about $\frac{1}{2}$ in. in diameter, rotate.

Red Sea Hills.



Fig. 150--*CARALLUMA RETROSPICIENS* (Ehrenb.) N.E.Br.
A, seed.

C. baldratii White & Sloane.

Stems greenish-white, the side facing the sun purpled all over, not mottled, about 6 in. high, simple or branching, 4-angled, the teeth more or less horizontal with the tips pointing upwards. Flowers sessile, solitary or very few together at the apex of the stems. Corolla-lobes at the base light-mahogany or sometimes cream-coloured with tiny red spots, upper portion dark-mahogany.

Red Sea Hills: Erkowit.

5. **CEROPEGIA** L.**Ceropegia nilotica** Kotschy.

Glabrous tuberous twiner; stems slender, fleshy. Leaves somewhat fleshy, ovate-lanceolate, narrowed at both ends, acuminate and denticulate towards the apex with callose cuspidate teeth, 1 in. long, $\frac{3}{8}$ in. broad. Flowers blackish-purple with a yellow spot at the base, $1\frac{1}{2}$ in. long, on lateral quadrangular 2-flowered peduncles. Corolla-lobes free at the tips.

Southern Sudan.

C. racemosa N. E. Br.

Slender glabrous twiner. Leaves lanceolate or oblong-lanceolate, apiculate and acute or obtuse at the apex, rounded at the base, $1\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous but slightly scabrous above near and along the margin. Flowers about 1 in. long, on few-flowered glabrous peduncles $1\frac{1}{2}$ -4 in. long including the flowering part. Corolla-lobes connate or cohering at their tips only.

Equatoria.

C. stenantha K. Schum.

Slender glabrous twiner with a tuberous root. Leaves lanceolate, acute and apiculate at the apex, cuneate-acute at the base, 1 - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad (sometimes larger), glabrous, entire or with very small rather distant teeth. Flowers in 3-6-flowered umbel-like cymes sublateral at the nodes on glabrous peduncles $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Corolla-lobes connate or cohering at the tips only.

Southern Sudan.

6. **CRYPTOLEPIS** R. Br.**Cryptolepis oblongifolia** (Meisn.) Schlechter.

Erect shrub; branches reddish-brown, minutely scabrous, usually long and slender. Leaves narrowly lanceolate to oblong-elliptic, apiculate and obtuse or acute at the apex, cuneate or rounded at the base, $\frac{1}{2}$ -2 in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad, glabrous, pallid beneath. Flowers yellowish-green, small, in 3-16-flowered trichotomous sub-axillary subsessile cymes or on peduncles up to $\frac{1}{4}$ in. long. Follicles narrowly fusiform, 3 - $3\frac{3}{4}$ in. long, glabrous.

Equatoria.

7. **CYNANCHUM** L.**Cynanchum polyanthum** K. Schum.

Twiner; stems slender, more or less pubescent or villous often along two lines. Leaves ovate, acute with a fine point about $\frac{1}{2}$ in. long at the apex, cordate with rounded lobes at the base, 2-3 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, glabrous or with a few scattered hairs above, paler and with scattered hairs beneath. Flowers greenish-white, sometimes flushed with purple, in 10-30-flowered compound pedunculate umbels; peduncle 1-1 $\frac{1}{2}$ in. long, shortly pubescent along one side or glabrous.

Equatoria.

8. **DUVALIA** Haw.**Duvalla sulcata** N. E. Br.

Stems whitish-green, mottled with purple, decumbent, 1-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, 4-angled, with subulate teeth up to $\frac{1}{2}$ in. long, glabrous. Flowers brownish-red, densely covered with long pale rose hairs on the annulus, 1 $\frac{1}{2}$ in. in diameter, in clusters of 1-3.

Red Sea Hills.

9. **ECHIDNOPSIS** Hook. f.**Echidnopsis nubica** N. E. Br.

Herb; stems fleshy, leafless, cylindric, obtusely 8-angled, $\frac{1}{2}$ - $\frac{3}{4}$ in. thick; angles tessellately divided into obtuse tubercles, glabrous. Flowers purple-brown, sessile, clustered near the tips of the stems. Corolla rotate, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, 5-lobed to rather more than half-way down. Follicles purplish with darker markings, up to 4 in. long, $\frac{1}{2}$ in. thick.

Red Sea District.

10. **GLOSSONEMA** Decne.**Glossonema nubicum** Decne.

Erect branched grey-pubescent perennial herb or undershrub up to 12 in. high, from a creeping rhizome; stems shortly pubescent. Leaves linear or linear-lanceolate, acute at the apex, $\frac{3}{4}$ -5 in. long, $\frac{3}{4}$ in. broad, undulate on the margin, pubescent beneath. Flowers white or lilac, small, 2-6 in sessile cymes. Follicles lanceolate, acuminate, 1 $\frac{1}{2}$ in. long, pubescent and covered with soft spines.

Red Sea District: near Khor Ashat, 70 miles from Port Sudan. Khartoum. Kordofan.

G. lineare (Fenzl) Decne.

Slender annual herb 6-15 in. high; stems erect, unbranched, rough with minute points. Leaves spreading, linear or linear-lanceolate, acute at both ends, $\frac{3}{4}$ -2 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous but usually rough with minute points on margin and midrib beneath. Flowers small, solitary in one axil of a pair of leaves, decurved. Follicles linear-terete, erect, 3-4 in. long, smooth and glabrous.

Central Sudan.

G. boveanum (Decne.) Decne.

Dwarf perennial herb 3-10 in. high, branching from the base; stems more or less pubescent with white hairs. Leaves spreading, ovate-lanceolate, acute or obtuse at the apex, cuneately narrowed or broadly rounded into the petiole at the base, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, more or less undulate or crisped on the margin, thinly or densely white-pubescent on both surfaces or glabrous above. Flowers small, 1-3 together, sublateral. Follicles ovoid, strongly echinate, 1 $\frac{1}{2}$ -2 in. long.

Red Sea District: between sea-level and 4000 ft.

11. **GYMNEMA** R. Br.**Gymnema sylvestre** (Retz.) R. Br. ex Schult.

Climber; stems woody, shortly tomentose. Leaves ovate to ovate-lanceolate, obtusely acuminate at the apex, cuneately rounded or cordate at the base, up to 2 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ in. broad, glabrous or thinly to densely pubescent. Flowers yellowish-white or greenish, small, in many-flowered sessile or stalked subaxillary umbels. Fruit lanceolate, 2 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, beaked, glabrous.

Equatoria.

12. **HUERNIA** R. Br.**Huernia macrocarpa** (A. Rich.) Sprenger.

Herb; stems fleshy, glaucous, subquadrangular, about 4 in. long; angles coarsely toothed; teeth fleshy, acute, recurved, spinescent at the apex. Peduncle 1-flowered, erect, simple, arising from the sinus at the base of the branches. Follicles marked with interrupted purple lines, 2-5 in. long, erect, narrow, compressed, acute or hooked at the apex.

Red Sea Hills. Equatoria.

13. **KANAHIA** R. Br.**Kanahia laniflora** (Forsk.) R. Br.

K. glaberrima (non N.E.Br.) Broun & Massey.

Herb up to 4-5 ft. high; stems glabrous, branching. Leaves with a cluster of short bristles or teeth in their axils and along the rudimentary stipular line connecting their bases, lanceolate or linear-lanceolate, gradually tapering to an acute point, acutely narrowed into the petiole, 2 $\frac{1}{2}$ -6 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous. Flowers on glabrous rather stout peduncles 1-2 in. long, which are many-flowered at the apical part and become raceme-like from the gradual development of the flowers. Petals bordered with hairs. Corona-lobes fleshy, solid, with a short entire or bifid beak extended over the staminal column. Follicles lanceolate, acuminate into a beak, 2-2 $\frac{1}{2}$ in. long, glabrous, pitted but not echinate.

Central and Southern Sudan.

14. **LEPTADENIA** R. Br.**Leptadenia lancifolia** (Schumach.) Decne.

Leafy twiner from a woody base; sap greenish, viscid. Leaves very variable, from linear to broadly ovate, rounded or subcordate to subhastate at the base, 1-5 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, one or both surfaces puberulous and sometimes scabrous. Flowers yellow-green, $\frac{1}{4}$ in. long, in short lateral umbels. Follicles lanceolate, 3 or more in. long, obtusely beaked, glabrous, smooth.

Widespread.Fig. 151—**LEPTADENIA HETEROPHYLLA** (Del.) Decne.**L. heterophylla** (Del.) Decne.

Fig. 151.

Glabrous twiner from a woody base. Leaves very variable, sometimes linear or linear-lanceolate, acute or acuminate at the apex, with a hastate base and rounded auricles, but usually varying from lanceolate or ovate and acuminate at the apex to elliptic and

obtuse and apiculate or acute at the apex, cuneate or rounded or subtruncate or cordate at the base, $\frac{3}{4}$ -3 in. long, $\frac{1}{2}$ -2 in. broad, glabrous on both surfaces. Flowers whitish, about $\frac{1}{4}$ in. long, in lateral umbels. Follicles lanceolate, obtusely acuminate, $2\frac{1}{2}$ -3 in. long, smooth, glabrous.

Widespread.

L. pyrotechnica (Forsk.) Decne.

Fig. 152.

L. spartium Wight.

Leafless shrub 5-10 ft. high; branchlets pale-green, whip-like, rarely with small leaves on the young shoots. Flowers small, in several-flowered subaxillary umbels. Follicles $3\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. thick, terete, attenuate into a beak.

Northern and Central Sudan.



Fig. 152—LEPTADENIA PYROTECHNICA (Forsk.) Decne.

A, inflorescence. B, flower. C, longitudinal section of flower. D, pollinia. E, dehiscent fruit. F, seeds with tufts of hairs. G, habit.

15. MARGARETTA Oliv.

Margaretta rosea Oliv.

Herb up to 20 in. high from a carrot-shaped tuber; stems simple or slightly branched, pubescent. Leaves narrowly oblong, acute at the apex, cordate or subcordate or rounded at the base, $1\frac{1}{2}$ -4 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, both surfaces with a minute sparse pubescence. Flowers pink and white, in few-flowered umbels; umbels about 3, corymbose at the apex of the stems.

Equatoria.

16. MARSDENIA R. Br.

Marsdenia abyssinica (Hochst.) Schlechter.

M. spissa S. Moore.

Half-woody climber, the young shoots as well as the inflorescences reddish-yellow-pubescent. Leaves ovate or elliptic-ovate, broadly acuminate at the apex, usually broadly and very shortly cuneate but not cordate at the base, $1\frac{1}{2}$ -5 in. long, $\frac{3}{4}$ -4 in. broad, reddish-pubescent at first, later glabrous. Flowers whitish, $\frac{1}{2}$ in. in diameter, crowded into subumbellate cymes on short lateral peduncles. Follicles elongate-ovoid, acuminate, 3-4 in. long, 1- $1\frac{1}{2}$ in. broad, beaked, with several longitudinal frill-like wings.

Central and Southern Sudan.

M. rubicunda (K. Schum.) N. E. Br.

Stout woody climber, the tips of the shoots as well as the young leaves and inflorescences and young fruit more or less covered with a salmon-red tomentum. Leaves elliptic or elliptic-ovate, acute or obtuse or subtruncate and apiculate at the apex, broadly cuneate to cordate at the base, $1\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -3 in. broad, glabrous or becoming glabrous beneath when mature. Flowers about $\frac{1}{2}$ in. in diameter, in cymes as in *M. abyssinica*. Follicles lanceolate, tapering to a blunt point, 3-3 $\frac{1}{2}$ in. long, broadly 4-winged.

Central and Southern Sudan.

17. OMPHALOGONUS Baill.

Omphalogonus nigritanus N. E. Br.

O. calophyllus (non Baill.) Broun & Massey.

Twiner; stems turning blackish, glabrous. Leaves opposite or in threes, very broadly ovate-elliptic, abruptly acuminate at the apex, cordate or truncate at the base, 4-6 in. long, $1\frac{1}{2}$ -4 $\frac{1}{2}$ in. broad, glabrous, pale-glaucous beneath, often blackish when dry; petiole up to 2 in. long. Flowers deep-red outside, violet-brown with a yellow throat inside, in few-flowered axillary cymes. Fruit 4-6 in. long.

Equatoria.

18. **OXYSTELMA** R. Br.**Oxystelma bornouense** R. Br.

Slender twiner. Leaves oblong-lanceolate, mucronate at the apex, rounded or truncate or cordate-hastate at the base, $1\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, glabrous. Flowers white with deep-purple-stained centre, $1-1\frac{1}{2}$ in. in diameter, in 2-4-flowered cymes. Fruit obliquely ellipsoid, about 2 in. long, much inflated, glabrous.

Widespread.

O. esculentum var. **alpini** (Decne.) N. E. Br.

Similar to *O. bornouense* but leaves linear to linear-lanceolate, acute at the apex, usually narrowed into the petiole but never cordate at the base, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. Corolla white or pinkish veined with purple at the base.

Northern and Central Sudan.

19. **PENTARRHINUM** E. Mey.**Pentarrhinum insipidum** E. Mey.

Twiner; stems glabrous or puberulous, or with a puberulous line down one side. Leaves ovate, acute or acuminate at the apex, cordate with rounded basal lobes, 1-3 in. long, $\frac{1}{2}$ -2 in. broad, glabrous or puberulous; petiole $\frac{1}{2}$ -2 in. long. Flowers in corymbs 1- $1\frac{1}{2}$ in. in diameter elongating into racemes as the flowers expand. Corolla brownish-green. Follicles lanceolate, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. thick, more or less tuberculate-echinate, sometimes nearly glabrous.

Darfur: Jebel Marra, Niurnya, 6500 ft.

20. **PENTATROPIS** R. Br. ex Wight & Arn.**Pentatropis spiralis** (Forsk.) Decne.

P. cynanchoides R.Br. ex B. D. Jackson.

Slender twiner, glabrous except in the axils of the leaves and at the base of the young shoots which are more or less pubescent. Leaves more or less fleshy, oblong or ovate or elliptic-ovate, mucronate and acute or obtuse at the apex, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, glabrous. Flowers $\frac{1}{2}$ - $\frac{1}{2}$ in. long, in 3-6-flowered subaxillary umbels. Corolla lobes twisted in bud. Follicles lanceolate, acuminate into a beak, 2-3 in. long, about $\frac{1}{2}$ in. thick, smooth, glabrous.

Widespread.

21. **PERGULARIA** L.**Pergularia tomentosa** L.

Doemia cordata R.Br. ex Schult.

Undershrub; branches decumbent, more or less pale-yellowish or white-tomentose. Leaves ovate-orbicular, slightly apiculate at the apex, deeply cordate at the base, up to 2 in. in diameter, tomentose on both surfaces. Flowers white and purple, $\frac{1}{2}$ in. in diameter, in corymb-like racemes. Fruit ovoid, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, beaked, minutely tomentose, covered with soft prickles.

Northern and Central Sudan.

P. daemia (Forsk.) Chiov.*Doemia extensa* (Soland.) Ait. f.

Fairly strong twiner; stems as well as the petioles harshly pubescent. Leaves ovate-orbicular, cuspidate-acuminate at the apex, widely cordate at the base, up to 6 in. long, 4½ in. broad, shortly pubescent on both surfaces or only on the nerves. Flowers creamy-white and purple, ½-¾ in. in diameter, corymbose-racemose. Fruit lanceolate, 2-3½ in. long, beaked, usually echinate, pubescent.

*Widespread.*22. **PERIPLUCA** L.**Peripluca aphylla** Decne.

Glabrous or puberulous shrub; stems stiff, leafless, or sometimes the young shoots with small oblong or linear leaves, obtuse or acute at the apex, ¾-1 in. long on very short petioles. Flowers about ½ in. in diameter, in terminal 5-20-flowered cymes on very short lateral branches. Follicles widely divergent, terete, 3-4 in. long, ½ in. thick, acuminate at the apex, glabrous or puberulous.

*Red Sea District.***P. linearifolia** Dillon & Rich.

Glabrous climber, sometimes woody. Leaves linear, acute at the apex, 1½-3½ in. long, ½-¾ in. broad. Flowers red and white, about ½ in. in diameter, in lax several-flowered pedunculate axillary and terminal cymes often forming large compound cymes at the ends of the branches. Follicles horizontally diverging, terete-attenuate, straight, 3½-5 in. long, ½ in. broad, sometimes solitary.

*Equatoria.*23. **PODOSTELMA** K. Schum.**Podostelma schimperi** (Vatke) K. Schum.

Fig. 153.

Small woody much-branched shrub; branches sometimes twining; young shoots as well as the petioles and pedicels and calyces all densely and minutely tomentose. Leaves somewhat fleshy, ovate or elliptic, obtuse or apiculate or acute at the apex, ¾-1 in. long, ½-¾ in. broad. Flowers small, in 2-6-flowered sessile cymes or clusters. Follicles lanceolate, acuminate at the apex, 1½-2 in. long, ¾-1 in. broad, smooth, more or less glaucous.

*Northern Sudan.*24. **RAPHIONACME** Harv.**Raphionacme jurensis** N. E. Br.

Herb 1½ or more ft. high; rootstock tuberous. Leaves narrowly elliptic, obtuse to acute at the apex, cuneate at the base, 2-2½ in. long, ¾-1 in. broad, glabrous. Flowers grey-violet, from the axils of the upper part of the plant or axillary and terminal, solitary or in pairs or on 2-3-flowered peduncles.

Equatoria.



Fig. 153—*PODOSTELMA SCHIMPERI* (Vatke) K. Schum.

R. brownii Scott-Elliot.

Erect branched herb 6-15 in. high from a tuberous edible root-stock. Leaves sessile, linear-thread-like, $\frac{1}{4}$ - $1\frac{1}{2}$ in. long, glabrous. Flowers usually appearing before the leaves, pink or reddish-purple, $\frac{1}{2}$ in. long, in terminal lax cymose puberulous inflorescences. Fruit linear, erect, about 6 in. long, minutely puberulous.
Equatoria: Azza Forest.



Fig. 154—SARCOSTEMMA VIMINALE (L.) Ait. f.

A, part of plant with fruit. B, flowering branch. C, flower with calyx and part of corolla removed. D, the same after removal of corona. E, pollinia and stamen. F, pollinia.

25. **SARCOSTEMMA** R. Br.**Sarcostemma viminale** (L.) Ait. f.

Fig. 154.

Shrub; stems trailing or twining, more or less succulent, becoming woody in the lower parts, glabrous, leafless or with minute rudimentary ovate leaves. Flowers greenish-white or sulphur-coloured, small, in lateral or terminal many-flowered sessile umbels. Follicles linear-lanceolate, smooth, $2\frac{1}{2}$ -4 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. thick. *Widespread.*

26. **SCHIZOGLOSSUM** E. Mey.**Schizoglossum abyssinicum** (Hochst.) K. Schum.

Perennial herb 4-5 ft. high; stems sparingly branched, pubescent. Leaves linear-thread-like, acute at the apex, $1\frac{1}{2}$ -3 in. long, very sparsely and minutely pubescent. Flowers small in numerous lateral sessile 10-20-flowered umbels; pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in. long, pubescent.

*Equatoria.***S. angustissimum** K. Schum.

Perennial herb 1-2 ft. high from a carrot-shaped rootstock; stems branched above, puberulous. Leaves sessile, linear, $\frac{2}{3}$ - $3\frac{1}{2}$ in. long, puberulous. Flowers greenish-purple, very small, in numerous sessile lateral 6-10-flowered umbels; pedicels $\frac{1}{2}$ in. long, puberulous. Fruit slender, beaked, $\frac{1}{2}$ in. long, pubescent.

*Equatoria.***S. petherickianum** Oliv.

Erect pale-tomentose herb, branched from a woody base. Leaves oblong-lanceolate, subacute at the apex, softly pubescent. Flowers whitish and purple-tinged, in very shortly pedunculate axillary panicles; pedicels $\frac{2}{3}$ in. long, pubescent. Follicles lanceolate, $2\frac{1}{2}$ in. long.

*Equatoria.***S. eximium** (Schlechter) N. E. Br.

Perennial tall herb; stems villous. Leaves oblong-ovate, acute or obtuse at the apex, cordate at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{2}{3}$ - $1\frac{1}{2}$ in. broad, both surfaces somewhat harshly villous. Flowers white, about $\frac{2}{3}$ in. in diameter, in several lateral and terminal pedunculate 6-10-flowered umbels; peduncle 1 - $2\frac{1}{2}$ in. long, villous.

*Equatoria.*27. **SECAMONE** R. Br.**Secamone afzelii** (Roem. & Schult.) K. Schum.

Glabrous twining shrub. Leaves more or less oblong, acute or acuminate at the apex, more or less rounded at the base, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, glabrous. Flowers greenish-yellow, small, in numerous cymes arranged in panicles. Style not protruding beyond the anthers.

Equatoria.



Fig. 155—SOLENOSTEMMA ARGEL (Del.) Hayne.

S. schweinfurthii K. Schum.

Glabrous twiner. Leaves lanceolate, more or less acuminate at the apex, rounded to cuneate at the base, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, glabrous. Flowers white, small, in small axillary

umbellately 3-6-flowered cymes about $\frac{1}{2}$ in. in diameter. Style shortly exserted beyond the anthers.
Equatoria.

28. **SOLENOSTEMMA** Hayne

Solenostemma argel (Del.) Hayne.

Fig. 155.

Shrub 8-12 ft. high; stems pale-grey-green, minutely puberulous. Leaves pale-grey-green, lanceolate, obtuse to subacuminate at the apex, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, minutely puberulous. Flowers white, numerous in axillary cymes. Follicles ovoid-lanceolate, tapering to a blunt apex, 2 $\frac{1}{2}$ -4 in. long, glabrous.

Northern and Central Sudan.

29. **TACAZZEA** Decne.

Tacazzea venosa Decne.

Shrub; stems pubescent, later glabrous. Leaves lanceolate, acute at the apex, subacute at the base, 2 $\frac{1}{2}$ -7 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, glabrous above, pubescent or tomentose beneath; petiole $\frac{1}{2}$ in. long. Flowers small, in panicles 1 $\frac{1}{2}$ -4 in. long, glabrous. Sepals broadly ovate, subobtuse or acute at the apex. Corona-lobes filiform, about $\frac{1}{2}$ - $\frac{2}{3}$ as long as the corolla-lobes.

Kassala: Gallabat.

Var. *martini* (Baill.) N. E. Br.

Sepals very broadly elliptic or nearly orbicular, very obtuse at the apex. Corona-lobes about as long as the corolla-lobes, flat and linear at the base, divided $\frac{1}{2}$ - $\frac{2}{3}$ of the way down into 2 filiform segments.

Kassala: Gallabat.

T. apiculata Oliv.

Twining shrub; stems more or less pubescent or tomentose. Leaves oblong or elliptic-oblong, obtuse or broadly rounded or emarginate and shortly cuspidate-apiculate at the apex, emarginate or cordate at the base, 2-5 in. long, 1-3 $\frac{1}{2}$ in. broad, glabrous above, whitish and densely puberulous or very minutely tomentose beneath. Flowers red or yellowish, in panicles 2 $\frac{1}{2}$ -6 in. long. Follicles 2 $\frac{1}{2}$ -3 in. long, about $\frac{1}{2}$ in. thick at the base, tapering gradually to a point.

Central and Southern Sudan.

30. **XYSMALOBIUM** R. Br.

Xysmalobium heudelotianum Decne.

Erect perennial herb 1-2 or more ft. high from a carrot-shaped tuber; stems pubescent. Leaves linear-oblong to oblong-lanceolate, subacute to rounded at the apex, up to 4 in. long, 1 in. broad, glabrous, with numerous prominent lateral nerves. Flowers greenish-white and purple, numerous, $\frac{1}{2}$ in. long, in lateral umbels at the nodes. Fruit narrow, acute at both ends, up to 6 in. long.

Equatoria.

117. RUBIACEAE

Trees or shrubs or more rarely herbs. Leaves opposite or verticillate, entire, simple, sometimes symbiotically infected with bacterial nodules; stipules inter- or intra-petiole, free or connate, sometimes leafy and indistinguishable from the leaves. Flowers usually hermaphrodite, actinomorphic or very rarely slightly zygomorphic, solitary to capitate. Calyx adnate to the ovary. Corolla epigynous, more or less tubular or rarely campanulate; lobes 4-12, contorted or imbricate or valvate. Stamens epipetalous, as many as and alternate with the corolla-lobes. Ovary inferior, 2- or more-locular with axile or apical or basal placentas, or rarely 1-locular with parietal placentas; ovules 1 to many. Fruit a capsule or berry or drupe.

KEY TO GROUPS.

- A. Corolla-lobes contorted; trees, shrubs or climbers; flowers never in globose heads:
- B. Ovules 2 or more in each ovary-loculus:
- (a) Fruit a capsule; seeds usually winged GROUP 1.
- (aa) Fruit a berry or dry and indehiscent; seeds not winged:
- (b) Inflorescences elongated, spike-like GROUP 2.
- (bb) Inflorescences cymose or corymbose or flowers solitary GROUP 3.
- BB. Ovules solitary in each ovary-loculus:
- (c) Ovule pendulous from near the top of the loculus GROUP 4.
- (cc) Ovule erect from near the base or attached to the septum of the ovary GROUP 5.
- AA. Corolla-lobes imbricate or valvate:
- C. Corolla-lobes imbricate; trees or shrubs; flowers in globose heads GROUP 6.
- CC. Corolla-lobes valvate; trees, shrubs or herbs:
- D. Ovules 2 or more in each ovary-loculus:
- E. Fruit a capsule or of two cocci; seeds sometimes winged or appendaged:
- (d) Trees or shrubs:
- (e) Flowers in spike-like racemes or terminal cymes GROUP 1.
- (ee) Flowers in globose heads GROUP 6.
- (dd) Herbs or small undershrubs GROUP 7.
- EE. Fruit a berry or dry and indehiscent GROUP 8.
- DD. Ovules solitary in each ovary-loculus:
- F. Ovule pendulous from near the top of the loculus:
- (f) Woody plants GROUP 9.
- (ff) Herbs GROUP 7.
- FF. Ovule erect from the base or attached to the septum of the ovary:
- G. Stipules not leaf-like:
- H. Calyx-tubes confluent in fruit; flowers in heads; fruits more or less united into a mass GROUP 10.

- HH. Calyx-tubes not confluent:
 (g) Flowers hermaphrodite:
 (h) Ovule attached to the base of the loculus; usually trees or shrubs; flowers in panicles or clusters or heads or rarely solitary GROUP 11.
 (hh) Ovule attached to the septum of the ovary; herbs, usually with clustered axillary flowers GROUP 12.
 (gg) Flowers unisexual GROUP 13.
 GG. Stipules leaf-like, the "leaves" verticillate; herbs or herbaceous climbers GROUP 14.

GROUP 1.

- A. Corolla-lobes contorted; flowers numerous in dense corymbose panicles CROSSOPTERYX. 13.
 AA. Corolla-lobes valvate:
 (a) Flowers in spike-like racemes; calyx without a segment expanded into a petaloid lamina ... HYMENODICTYON. 23.
 (aa) Flowers in terminal cymes; one calyx-segment expanded into a yellow petaloid lamina PSEUDOMUSSAENDA. 44.

GROUP 2.

- Only Sudan genus BERTIERA. 5.

GROUP 3.

- A. Ovary 1-locular, with parietal placentas:
 (a) Stigma subglobose, exserted by as long as the flower; flowers in clusters MACROSPHYRA. 28.
 (aa) Stigma club-shaped, not long-exserted; flowers solitary or rarely corymbose GARDENIA. 19.
 AA. Ovary 2- or more-locular:
 B. Calyx-lobes open in bud:
 C. Style entire or at most dentate at the apex or with converging branches:
 D. Inflorescences or solitary flowers terminal, sometimes terminating short lateral branches:
 (b) Flowers solitary or few together ... ROTHMANNIA. 46.
 (bb) Flowers numerous in corymbs TARENNA. 50.
 DD. Inflorescences or solitary flowers not terminal:
 E. Ovules numerous:
 (c) Spiny shrubs or trees LACHNOSIPHONIUM. 26.
 (cc) Unarmed shrubs or trees:
 (d) Inflorescences arranged on one side of the branches, sometimes at alternate nodes; corolla-tube short AIDIA. 2.
 (dd) Inflorescences not so arranged; corolla-tube usually very long and slender OXYANTHUS. 39.

- EE. Ovules 2-4, impressed on the large fleshy placentas; ovary 4-locular MORELIA. 32.
- CC. Style divided at least at the tip into 2 spreading branches:
- (e) Anthers sessile or subsessile:
- (f) Endosperm mottled due to the infolding of the inner testa; aril small; leaves 3-10 in. long GALINIERA. 18.
- (ff) Endosperm not as above; aril absent; leaves 1-2 in. long FERRETIA. 16.
- (ee) Anthers with fairly long filaments; epicalyx present, single or double, often cupular TRICALYSIA. 52.
- BB. Calyx-lobes contorted in bud; flowers in dense terminal cymes ... LEPTACTINA. 27.

GROUP 4.

- A. Corolla glabrous inside the throat; style divided BELONOPHORA. 4.
- AA. Corolla densely hairy inside the throat; style not divided:
- (a) Corolla-lobes 5-6; stamens 5-6 CREMASPORA. 12.
- (aa) Corolla-lobes 4; stamens 4 POLYSPHAERIA. 43.

GROUP 5.

- A. Bracteoles not connate into an epicalyx:
- B. Style usually divided; ovules attached near the middle of the axis:
- (a) Style shortly exerted; upper leaves often bract-like and ovate IXORA. 25.
- (aa) Style long-exserted; upper leaves usually not bract-like PAVETTA. 40.
- BB. Style not divided; ovules inserted on small fleshy placentas ascending from the base of the ovary RUTIDEA. 47.
- AA. Bracteoles connate into a cupular epicalyx; seeds with a longitudinal furrow on one side COFFEA. 10.

GROUP 6.

- A. Calyx-tubes not confluent; fruit a capsule; corolla-lobes valvate:
- B. Branches without spines; flowers subtended by chaffy bracteoles:
- (a) Calyx distinctly lobed ADINA. 1.
- (aa) Calyx truncate or obscurely toothed MITRAGYNA. 31.
- BB. Branches with recurved spines; bracteoles absent UNCARIA. 53.
- AA. Calyx-tubes confluent in fruit; fruits forming a fleshy syncarp; corolla-lobes imbricate NAUCLEA. 35.

GROUP 7.

- A. Ovules numerous in each loculus:
- B. Fruit of two cocci:
- (a) Calyx-lobes unequal, one lobe elongated OTOMERIA. 38.
- (aa) Calyx-lobes equal OLDENLANDIA. 37.

- BB. Fruit a capsule:
 (b) Calyx-lobes unequal; capsule loculicidally 2-valved PENTAS. 42.
 (bb) Calyx-lobes equal OLDENLANDIA. 37.
 AA. Ovules solitary in each loculus; fruit indehiscent; calyx-lobes unequal PENTANISIA. 41.

GROUP 8.

- A. Inflorescences terminal; one of the calyx-lobes of the outer flowers often enlarged and petaloid MUSSAENDA. 34.
 AA. Inflorescences axillary, enclosed in one or two large bracts STIPULARIA. 49.

GROUP 9.

- A. Corolla-tube always straight, usually short but sometimes elongated and narrow:
 B. Flowers solitary or few together or in subsessile clusters, never in branched inflorescences:
 (a) Leaves verticillate, 3-5 in a whorl FADOGIA. 15.
 (aa) Leaves opposite:
 (b) Flowers 1-6 together RYTIGYNIA. 48.
 (bb) Flowers in dense subsessile clusters CANTHIUM. 7.
 BB. Flowers in umbels or usually in conspicuously branched inflorescences or in pedunculate clusters:
 C. Inflorescences umbellate or cymose-corymbose; flowers usually small and numerous; calyx truncate or minutely denticulate; style often long-exserted:
 (c) Style subentire; corolla-lobes glabrous inside CANTHIUM. 7.
 (cc) Style bifid at least at the tip; corolla-lobes hairy inside near the base CRATERISPERMUM. 11.
 CC. Inflorescences cymose-racemose, the ultimate branches always elongated; flowers usually medium-sized; calyx-limb mostly spreading, lobed or rarely long-subulate-dentate; style usually shortly exserted:
 (d) Corolla-throat glabrous; ovary 2-locular; fruit divided into 2 lobes, or by abortion 1-locular VANGUERIOPSIS. 56.
 (dd) Corolla-throat villous; ovary 3-5-locular; fruit usually of 3-5 pyrenes:
 (e) Flower parts in 5-8's; leaves opposite VANGUERIA. 55.
 (ee) Flower parts in 4-5's; leaves crowded, pseudo-verticillate in fours MEYNA. 29.
 AA. Corolla-tube usually curved, broad and rather long; stems annual from a rhizome; calyx truncate TEMNOCALYX. 51.

GROUP 10.

- Only Sudan genus MORINDA. 33.

GROUP 11.

- A. Flowers in terminal or rarely axillary panicles or clusters:
- B. Corolla-tube straight, usually short:
- (a) Endosperm mottled due to the infolding of the inner testa; ovules wrinkled GRUMILEA. 22.
- (aa) Endosperm not mottled; ovules smooth ... PSYCHOTRIA. 45.
- BB. Corolla-tube curved, rather long CHASSALIA. 9.
- AA. Flowers solitary or in heads:
- (b) Small creeping herbs GEOPHILA. 21.
- (bb) Undershrubs or shrubs:
- (c) Flower-heads pedunculate CEPHAELIS. 8.
- (cc) Flower-heads sessile GRUMILEA. 22.

GROUP 12.

- A. Fruit separating into 2 cocci, each remaining indehiscent:
- (a) Herbs; stipules multisetose; stigma subcapitate .. DIODIA. 14.
- (aa) Undershrubs; setae of stipules usually 2 or rudimentary; style with 2 short linear branches GAILLONIA. 17.
- AA. Fruit with one or both of the cocci dehiscent:
- B. Fruit separating vertically into 2 halves:
- (b) Calyx-teeth subulate or lanceolate:
- (c) Both cocci of the fruit dehiscent at the apex BORRERIA. 6.
- (cc) Both cocci remaining united at the apex HYPODEMATIUM. 24.
- (bb) Calyx-teeth rounded; flowers densely crowded in heads within the sheathing stipules; leaves linear or thread-like OCTODON. 36.
- BB. Fruit divided into two lobes, opening transversely across the middle MITRACARPUS. 30.

GROUP 13.

- Only Sudan genus ANTHOSPERMUM. 3.

GROUP 14.

- A. Flowers axillary, ternate, the middle one hermaphrodite, the lateral ones male VALANTIA. 54.
- AA. Flowers in terminal or axillary cymes or panicles ... GALIUM. 19.

1. *ADINA* Salisb.

Adina microcephala (Del.) Hiern.

Fig. 156.

Medium-sized to tall tree. Leaves glossy when young, often in whorls of 4, lanceolate, acute at the base, subacutely acuminate at the apex, 4-6 in. long, 1-2 in. broad, glabrous, with numerous lateral nerves. Flowers creamy-white, in axillary solitary globose heads nearly 1 in. in diameter. Seeds winged at each end.

Central and Southern Sudan.



Fig. 156—ADINA MICROCEPHALA (Del.) Hiern.
A, fruiting head. B, flowers.

2. AIDIA Lour.

Aidia genipiflora (DC.) Dandy, comb. nov.

Randia genipaeiflora DC.

Shrub or small tree. Leaves oblong-elliptic, acuminate at the apex, 4-6 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, glabrous. Flowers whitish, about $\frac{3}{4}$ in. long, in short densely branched axillary cymes arranged on one side of the branches. Fruit globose, about $\frac{1}{2}$ in. in diameter.

Equatoria: Dar Fertit.

3. **ANTHOSPERMUM** L.**Anthospermum pachyrrhizum** Hiern.

Heath-like undershrub branching from a thick woody stock; branches wiry, 6-9 in. long. Leaves clustered, linear, apiculate, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, scabrous; stipules subulate. Flowers small, solitary, axillary.

Darfur: Jebel Marra, 8200 ft.

A. usambarense K. Schum.

Heath-like shrub or undershrub up to 5 ft. high. Leaves densely verticillate, linear, apiculate at the apex, about $\frac{3}{4}$ in. long, glabrous, the margin revolute; stipules with 3-5 setae about $\frac{1}{2}$ in. long. Flowers greenish-white, small, axillary, clustered, dioecious, glabrous. Fruit glabrous.

Equatoria: Imatong Mountains, summit of Mount Kineti.

4. **BELONOPHORA** Hook. f.**Belonophora glomerata** M. B. Moss.

Under-storey shrub or tree up to 40 ft. high. Leaves elliptic to obovate-elliptic, rather abruptly long-acuminate at the apex, cuneate and sometimes unequal-sided at the base, 5-10 in. long, $1\frac{1}{2}$ -3 in. broad; stipules triangular to subulate, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers white, fragrant, sessile, $\frac{1}{4}$ - $\frac{2}{3}$ in. long, in clusters of 3-10, usually from the axils of fallen leaves.

Equatoria: Lotti and Laboni Forests.

5. **BERTIERA** Aubl.**Bertiera aethiopica** Hiern.

Pubescent shrub. Leaves elliptic or elliptic-oblong, subacuminate at the apex, cuneate to almost rounded at the base, 3-6 in. long, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. broad, ciliolate, appressed-pubescent on the nerves beneath; petiole $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers in spicate or oblong cymes. Corolla-tube cylindric, much exceeding the calyx. Fruit a subglobose shortly pubescent bluish-grey berry, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter and crowned by the short 5-toothed calyx-lobes, arranged in clusters along the drooping pubescent spicate cymes.

Equatoria.

6. **BORRERIA** G. F. W. Mey.

- A. Annual herbs; leaves at the base of the flower-heads spreading or rarely reflexed:
- B. Bracteoles not numerous nor conspicuous, or plant very slender:
- C. Calyx-teeth very small and obscure (occasionally 1 or 2 prolonged and subulate) *B. tenuissima*.
- CC. Calyx-teeth 4, obvious, not very small:
- D. Calyx-teeth subequal:
- E. Corolla-tube exceeding the calyx-teeth ... *B. phyteuma*.

- EE. Corolla-tube short, not exceeding the calyx-teeth:
- (a) Margins of the leaves not whitish, more or less scabrous:
 - (b) Leaves lanceolate or elliptic *B. senensis*.
 - (bb) Leaves linear or very narrowly lanceolate:
 - (c) Capsule not more than $\frac{1}{2}$ in. long:
 - (d) Fruit pubescent at the apex; calyx-teeth linear-spathulate *B. hebecarpa*.
 - (dd) Fruit glabrous; calyx-teeth subulate ... *B. pusilla*.
 - (cc) Capsule about $\frac{1}{2}$ in. long *B. leucadea*.
 - (aa) Margins of the leaves whitish, sometimes minutely scabrous *B. radiata*.
- DD. Calyx-teeth 2 longer than the other pair *B. ruelliae*.
- BB. Bracteoles numerous, conspicuous; plant not very slender:
- (e) Stems and branches hispid *B. dibrachyiata*.
 - (ee) Stems and branches glabrous:
 - (f) Flower-heads about 1 in. in diameter *B. kotschyana*.
 - (ff) Flower-heads $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter *B. compacta*.
- AA. Undershrub; leaves at the base of the flower-heads reflexed or rudimentary *B. verticillata*.

***Borreria tenuissima* (Hiern) K. Schum.**

Spermacoce tenuissima Hiern.

Very slender glabrous annual herb. Leaves narrowly linear, sessile, rigid, $\frac{1}{2}$ -1 in. long, scabrous; stipules with 1-4 short setae about equalling the sheath. Flowers pale-purplish, few together in small sessile terminal heads and in the upper axils, mixed with slender bracteoles, and with 2 spreading decussate pairs of leaves at the base of the head. Capsule puberulous at the apex, splitting down from the apex.

Equatoria.

***B. phyteuma* (Schweinf.) Dandy, comb. nov.**

Spermacoce phyteuma Schweinf. ex Hiern.

Erect hispid-hirsute annual herb about 2 ft. high. Leaves sessile, linear-lanceolate or linear-apiculate, cuneate towards the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, scabrous above and on the revolute margins; sheath short, with about 3-5 setae. Flowers pale-purple, about $\frac{1}{2}$ in. long, numerous, sessile, crowded into heads $\frac{3}{4}$ - 1 in. in diameter based by 1-3 pairs of leaves. Corolla-throat bearded with short thick hairs.

Equatoria.

***B. senensis* (Klotzsch) K. Schum.**

Spermacoce senensis (Klotzsch) Hiern.

Herb; stems straw-coloured, pubescent. Leaves sessile, lanceolate or elliptic, narrowed at both ends, 2-3 in. long, more or less scabrous and shortly pubescent above with depressed veins, shortly pubescent beneath; stipules with a short villous sheath and 5-7

longer setulose setae. Flowers white, $\frac{1}{2}$ in. long, verticillate in heads $\frac{1}{2}$ in. in diameter and sessile in the upper axils based by 1-2 pairs of leaves. Capsule straw-coloured, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, somewhat hairy near the apex.

Central and Southern Sudan.

B. hebecarpa Hochst. ex A. Rich.

Spermacoce hebecarpa (Hochst.) Oliv., non DC.

Slender erect branched annual herb up to 2 ft. high; stems and branches glabrous or nearly so. Leaves sessile, linear, narrowed at both ends, up to 3 in. long, $\frac{1}{2}$ in. broad, glabrous or nearly so, scabrous on the margin, glaucescent beneath; stipules with a hairy sheath $\frac{1}{2}$ - $\frac{1}{3}$ in. long and 3-5 equalling or rather longer setae. Flowers white or pinkish, in terminal and axillary somewhat leafy sessile heads $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter based by the dilated sheaths of the stipules of 1-3 pairs of leaves. Capsule pubescent towards the apex.

Central and Southern Sudan.

B. pusilla (Wall.) DC.

Glabrous herb a few inches to 1 or more ft. high. Leaves sessile, usually linear, narrowed at both ends, 1-1 $\frac{1}{2}$ in. long, slightly scabrous. Flowers white, very small, in axillary clusters.

Equatoria.

B. leucadea (Hochst.) K. Schum.

Spermacoce leucadea Hochst. ex Hiern.

Erect annual herb, hispid-hirsute with whitish hairs. Leaves sessile, linear or very narrowly lanceolate, acute at the apex, 1-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad; stipular sheath pale-yellowish, $\frac{1}{2}$ in. long with 5 equalling setae. Flowers several together, verticillate and capitate, in terminal and axillary sessile bracteate or leafy heads $\frac{1}{2}$ -1 $\frac{1}{2}$ in. in diameter. Capsule about $\frac{1}{2}$ in. long, pubescent above.

Central and Southern Sudan.

B. radiata DC.

Spermacoce radiata (DC.) Sieber ex Hiern.

Erect hispid herb, somewhat woody below, 1-2 ft. high; stems often red-purple. Leaves sessile, linear to narrowly lanceolate, acute at the apex, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long, more or less hispid on the prominent midrib beneath; stipules truncate, terminated by 7-9 long slender stiff setae $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Flowers white, in hemispherical dense clusters $\frac{1}{2}$ -1 in. diameter terminating the stem and branches as well as the short lateral shoots.

Central and Southern Sudan.

B. ruelliae (DC.) K. Schum. ex H. Thoms.*Spermacoce ruelliae* DC.

Stout-branched more or less hispid-hirsute herb. Leaves sessile, narrowly elliptic to almost linear, up to 3 in. long, scabrous above, somewhat hispid-hirsute beneath; stipules with a very short sheath and about 7 slender setae about $\frac{1}{2}$ in. long. Flowers white, $\frac{1}{2}$ in. long, crowded in the axils and terminal, often hidden by the leaves of axillary shoots.

*Equatoria.***B. dibrachiata** (Oliv.) K. Schum.*Spermacoce dibrachiata* Oliv.

Annual herb 9-18 in. high; stems hispid with white hairs. Leaves sessile, lanceolate, 2-3 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, rugose above, scabrous on the midrib and revolute margin beneath; stipules with a long hispidulous sheath and about 3 setae about the same length. Flowers blue or purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, densely packed in terminal and subterminal sessile heads based by the dilated stipules of the uppermost leaves.

*Upper Nile Province: Jongol's Post.***B. kotschyana** (Oliv.) K. Schum.*Spermacoce kotschyana* Oliv.

Erect herb 6-18 in. high; stems glabrous. Leaves sessile, linear to narrowly lanceolate, $1\frac{1}{2}$ -3 in. long, scabrous above, somewhat hispid beneath, the floral leaves dilated at the base into the hairy stipular sheath tipped with about 5-7 longer setae. Flowers small, crowded into dense verticillate terminal and axillary leafy and bracteate heads 1 in. in diameter; bracteoles pale-reddish.

*Central and Southern Sudan.***B. compacta** (Hochst.) K. Schum.*Spermacoce compacta* Hochst. ex Hiern.

Glabrous erect annual herb 8-16 in. high; stems marked with narrow raised lines. Leaves linear or narrowly elliptic, 1-2 in. long, somewhat scabrous on the margins, the floral leaves dilated at the base into the glabrous or puberulous stipular sheath tipped with about 5 rather longer setae. Flowers small, densely crowded in verticillate leafy sessile terminal and axillary heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. Capsule $\frac{1}{2}$ in. long, puberulous towards the apex.

*Central Sudan.***B. verticillata** (L.) G. F. W. Mey.*Spermacoce globosa* Schumach.

Glabrous undershrub 2-3 ft. high. Leaves subsessile, oblanceolate, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, glabrous; stipules truncate, short, 3-7-setose. Flowers white, very small, in compact spherical terminal and subterminal heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter based by the reflexed or rudimentary pair of uppermost leaves.

Central Sudan.

7. **CANTHIUM** Lam.

- A. Flowers in simple umbels on very short or rudimentary axillary peduncles:
- (a) Fruit obliquely oblong, somewhat narrowed towards the base; calyx-lobes broadly ovate *C. euryoides*.
- (aa) Fruit globose or divided into two lobes, rounded at the base
C. malococarpum.
- AA. Flowers in panicles or cymes:
- B. Style pubescent *C. zanzibaricum*.
- BB. Style glabrous:
- C. Flower parts in 5's:
- D. Tertiary nerves of leaves inconspicuous:
- (b) Stipules $\frac{1}{2}$ in. long, ovate *C. polycarpum*.
- (bb) Stipules $\frac{1}{2}$ - $\frac{1}{4}$ in. long:
- (c) Leafy shoots with only one pair of leaves
C. lactescens.
- (cc) Leafy shoots with more than one pair of leaves
C. crassum.
- DD. Tertiary nerves of leaves conspicuous on the lower surface ...
C. venosissimum.
- CC. Flower parts in 4's:
- E. Tertiary nerves of the leaves inconspicuous:
- (d) Midrib and lateral veins (sometimes the whole surface of the leaf) red beneath *C. rubrocostatum*.
- (dd) Midrib and lateral nerves not red beneath:
- (e) Erect shrub or tree *C. vulgare*.
- (ee) Straggling undershrub or shrub *C. afzelianum*.
- EE. Tertiary nerves of leaves conspicuous on the lower surface ...
C. venosum.

Canthium euryoides Bullock ex Hutch. & Dalziel.*C. nitens* Hiern, non DC.

Spreading shrub or tree up to 30 ft. high; bark pale-grey-brown. Leaves ovate-elliptic to ovate-lanceolate, gradually acuminate at the apex, cuneate at the base, 2-3 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, glossy above, glabrous. Flowers greenish-white, small, densely clustered, usually only about two in each cluster maturing. Fruit obliquely oblong, $\frac{1}{2}$ - $\frac{1}{4}$ in. long.

Equatoria.**C. malococarpum** (Schum. & Krause) Bullock.

Scrambling or climbing shrub; branchlets glabrous. Leaves short-petiolate, elliptic or very rarely ovate-elliptic, shortly acuminate at the apex, rounded at the base or slightly decurrent into the petiole, 2-3 $\frac{1}{2}$ in. long, 1-1 $\frac{1}{2}$ (or rarely 2 $\frac{1}{2}$ in.) broad, glabrous on both surfaces and shiny above. Flowers greenish-white.

Equatoria.

C. zanzibaricum Klotzsch.

Much-branched sometimes climbing shrub. Leaves ovate or elliptic, rather abruptly acuminate at the apex, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, 1 - $2\frac{1}{2}$ in. broad, glabrous or nearly so, rather paler beneath; stipules lanceolate-subulate from a broad base, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers white, about $\frac{1}{2}$ in. long, in dense dichotomous panicles 1-2 in. in diameter. Fruit divided into two lobes or dimidiate, $\frac{3}{4}$ - $\frac{1}{2}$ in. long.
Equatoria.

C. polycarpum Schweinf. ex Hiern.

Tree up to 40 ft. high; stem very slender. Leaves elliptic, acuminate at the apex, obtusely narrowed to rounded at the base, $3\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ -2 in. broad, glabrous or with short scattered curved hairs on the midrib; stipules ovate, subacuminate, $\frac{1}{2}$ in. long, glabrous. Flowers in repeatedly dichotomous subglobose panicles 2-3 in. long. Fruit $\frac{1}{2}$ - $\frac{1}{3}$ in. long, divided into two lobes or dimidiate.
Equatoria.

C. lactescens Hiern.

Shrub or small tree. Leaves dark-green, rather fleshy, oblong-elliptic to ovate or suborbicular, triangular-subacute at the apex, cuneate to cordate at the base, $2\frac{1}{2}$ - $6\frac{1}{2}$ in. long, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. broad; stipules leathery, triangular-subacute, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Flowers creamy.
Equatoria.

C. crassum Hiern.

Shrub or tree up to 15 ft. high; bark very thick, sometimes pale in colour, sometimes almost black. Leaves obovate or elliptic, rounded to obtuse (sometimes almost acuminate) at the apex, cuneate at the base, up to 6 in. long, $2\frac{1}{2}$ in. broad, glabrous above, glabrous to shortly tomentellous and paler beneath; stipules lanceolate, acuminate at the apex, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Flowers greenish-white, in dense panicles $\frac{1}{2}$ -1 in. in diameter. Fruit yellow-green, up to $1\frac{1}{2}$ in. in diameter.
Equatoria.

C. venosissimum Hutch. & Dalziel.

Scrambling or climbing shrub, or sometimes a tree; branchlets pubescent. Leaves oblong-elliptic, obtusely acuminate at the apex, rounded to obtuse at the base, $3\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ -2 in. broad, paler and setose-pubescent on the nerves beneath. Flowers white, small, in short axillary cymes. Fruit oblique, $\frac{3}{4}$ in. long.
Equatoria.

C. rubrocostatum Robyns.

Under-storey tree up to 30 ft. high; bark pale-grey. Leaves ovate to oblong-elliptic, acuminate at the apex, acute to broadly rounded at the base, 2½-5 in. long, 1-2½ in. broad, glabrous; stipules subulate, up to ¾ in. long. Flowers white, small, fragrant. Fruit ½ in. in diameter.

Equatoria.

C. vulgare (K. Schum.) Bullock.

Shrub or tree up to 35 ft. high. Leaves ovate to oblong-ovate, acuminate at the apex, acute to rounded at the base, 2½-4½ in. long, 1½-2 in. broad; stipules subulate, broad-based, less than ½ in. long. Flowers creamy-white, fragrant. Fruit ½ in. in diameter.

Equatoria.

C. afzelianum Hiern.

Much-branched more or less scrambling glabrous shining shrub. Leaves elliptic, obtusely acuminate at the apex, 3-5 in. long, 1½-2½ in. broad, glabrous; stipules deltoid, subapiculate, ½-¾ in. long. Flowers yellowish-white, in dense dichotomous panicles 1-2 in. in diameter.

Equatoria.

C. venosum (Oliv.) Hiern.

Straggling shrub or woody climber or small tree, rusty-tomentose on the younger parts, later becoming glabrous. Leaves oblong-elliptic, sometimes rather narrowly so, gradually and obtusely acuminate at the apex, up to 4 in. long, 1½ in. broad; stipules ovate, acuminate at the apex from a broad base, ½ in. long. Flowers greenish-white or creamy, in globose dichotomously branched panicles about 1½ in. in diameter.

Equatoria.

8. **CEPHAELIS** Sw.**Cephaelis suaveolens** Schweinf. ex Hiern.

Undershrub 3-5 ft. high; young parts shortly tomentose and puberulous. Leaves elliptic, shortly acuminate at the apex, cuneate at the base, 6-9 in. long, 3-4½ in. broad, nearly glabrous except on the nerves beneath; stipules broadly elliptic, connate at the base, bifid, ¾ in. long. Flowers white, fragrant, about ¼ in. long, crowded into solitary hemispherical heads about 1 in. in diameter. Berry subglobose.

Equatoria.

9. **CHASSALIA** Commers. ex Poir.**Chassalia** sp.

Herb; stems as well as the petioles pubescent. Leaves elliptic, acute at the apex, cuneate at the base, 2-2½ in. long, 1-1½ in. broad,

glabrous except on the midrib beneath. Berries orange, clustered at the apex of the stems with 2 leaves at the base of the cluster.
Equatoria: Imatong Mountains, Talanga Forest.

10. **COFFEA** L.**Coffea canephora** Pierre ex Froehner.

Wild Robusta Coffee.

C. robusta L. Linden.

Heavily foliaged under-storey shrub or tree usually 6-12 ft. high, but exceptionally attaining 25 ft.; branches down-curved. Leaves elliptic, long-acuminate at the apex, rounded to cuneate at the base, 6-12 in. long, 2-6 in. broad. Flowers white, fragrant, $\frac{3}{4}$ in. long, numerous in each leaf-axil, with leafy bracts scattered among them. Corolla 5-lobed. Berry red, up to $\frac{1}{2}$ in. long.

Equatoria: depression-forests.**C. excelsa** A. Chev.

Under-storey shrub or tree 15-25 ft. high. Leaves broadly obovate-elliptic, shortly and obtusely acuminate at the apex, cuneate at the base, usually 13-16 in. long, 6-8 in. broad. Flowers white, fragrant, 1-1 $\frac{1}{2}$ in. long, few in each leaf-axil, without interspersed leafy bracts. Corolla 6-9-lobed. Berry red, $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Equatoria.**C. arabica** L.

Arabian Coffee.

Shrub or small tree. Leaves elliptic, acuminate at the apex, cuneate at the base, 3-8 in. long, 1 $\frac{1}{2}$ -3 in. broad. Flowers white, fragrant, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, 2-9 or more in short axillary clusters interspersed with bracts. Anthers wholly exerted. Berry finally blue-black, $\frac{3}{4}$ - $\frac{1}{2}$ in. long.

Equatoria: Azza Forest.**C. eugenioides** S. Moore.

Copiously branched glabrous shrub. Leaves coriaceous, ovate-oblong, long-acuminate at the apex, shortly narrowed to the base, 1 $\frac{1}{2}$ -4 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, shiny above, rather pallid beneath. Flowers white, axillary, solitary or 2-3 together, shortly pedunculate. Berry oblong, about $\frac{1}{2}$ in. in diameter.

Equatoria: Azza Forest.**C. spathocalyx** K. Schum.

Glabrous shrub 6-9 ft. high. Leaves shortly petiolate, oblong, long-tailed at the apex, shortly cuneate at the base, 3 $\frac{1}{2}$ -6 $\frac{1}{2}$ in. long, glabrous on both surfaces. Flowers white, in small clusters with three bracteoles to each flower. Calyx tubular, irregularly split down one side and spathe-like.

Equatoria: Laboni and Lotti Forests.

11. **CRATERISPERMUM** Benth.**Craterispermum laurinum** (Poir.) Benth.

Glabrous under-storey shrub or tree up to 20 ft. high. Leaves yellow-green when dry, oblong-elliptic to oblong-obovate, shortly and obtusely pointed at the apex, cuneate at the base, 2-9 in. long, $\frac{3}{4}$ -3 $\frac{1}{2}$ in. broad. Flowers waxy-white, tubular, $\frac{1}{2}$ in. long, in stalked axillary clusters. Filaments exceeding the anthers. Fruit blue-black when ripe, shortly stalked, up to $\frac{1}{4}$ in. in diameter.

Equatoria.

C. schweinfurthii Hiern.

Undershrub. Leaves elliptic, more or less acute to acuminate at the apex, cuneate at the base, 5-6 in. long, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, pale-yellowish-green on both surfaces when dry. Flowers white, $\frac{1}{3}$ in. long, sessile, several in supra-axillary pedunculate heads. Filaments half the length of the anthers or shorter. Berry purplish-black, ovoid, $\frac{3}{8}$ in. long.

Equatoria.

12. **CREMASPORA** Benth.**Cremaspora triflora** (Thonn.) K. Schum.*C. africana* Benth.

Shrub: branchlets rusty-pubescent, usually spreading and more or less straggling. Leaves oblong or oblong-elliptic, usually broadly and often abruptly acuminate at the apex, rounded to subacute at the base, 2 $\frac{1}{4}$ -4 in. long, 1-2 in. broad, pubescent on the nerves beneath. Flowers white, fragrant, subsessile, $\frac{1}{2}$ in. long, usually several together in the axils. Berry purplish-black, ellipsoid, $\frac{3}{8}$ in. long, glabrous or nearly so.

Equatoria.

13. **CROSSOPTERYX** Fenzl**Crossopteryx febrifuga** (Afz.) Benth.*C. kotschyana* Fenzl.

Tree up to 30 ft. high; branchlets pendulous, reaching almost to the ground; bark pale-grey to pale-brown, with small grey crumbly scales; slash salmon-pink. Leaves elliptic to suborbicular, rounded to shortly acuminate at the apex, broadly cuneate to rounded at the base, 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad. Flowers creamy-white, tinged with pink on the corolla-tube, unpleasant-smelling, very numerous in rather dense corymbose panicles. Fruit a subglobose blackish capsule, splitting into 2 sections across the black seeds, the halves remaining on the tree for a long time after the seed has been shed.

Central and Southern Sudan.

14. **DIODIA** L.**Diodia scandens** Sw.*D. breviseta* Benth.

Trailing or climbing rather scabrous herb. Leaves strongly nerved, oblanceolate to ovate-elliptic, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, setulose or glabrous; stipule-segments thread-like. Flowers white or pink, small, clustered in the axils of the leaves. Fruit up to $\frac{1}{2}$ in. long.

*Equatoria.*15. **FADOGIA** Schweinf.**Fadogia leucophloea** Hiern.

Small puberulous tree 15 ft. high; branchlets pale, finally white. Leaves ternate, elliptic, obtuse at both ends, 2-3 in. long, $1-1\frac{1}{4}$ in. broad, asperous above, pale and harshly tomentellous beneath. Flowers greenish-white, in clusters at the nodes of the previous season's growth. Fruit green, about $\frac{1}{2}$ in. in diameter, sparsely pubescent.

*Equatoria.***F. agrestis** Schweinf. ex Hiern.

Undershrub 1-2 ft. high; stems yellowish, tomentellous. Leaves obovate, rounded at the apex, subcuneate at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, densely softly tomentose beneath. Flowers yellow-green, in short axillary cymes, tomentose all over. Fruit costate, nearly glabrous, $\frac{1}{2}$ in. broad, tipped by the persistent calyx, 1-3-seeded.

*Equatoria.***F. cienkowskii** Schweinf.

Undershrub; stems erect, annual, tomentose, 1-4 ft. high. Leaves obovate or elliptic-obovate, subacute at the apex, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, softly tomentellous beneath. Flowers yellowish, about 3 in each axillary cyme. Calyx-lobes subulate-dentate. Fruit globose, nearly $\frac{3}{4}$ in. in diameter.

*Central and Southern Sudan.***F. glaberrima** Schweinf. ex Hiern.

Glabrous undershrub. Leaves ternate, subsessile, elliptic, obtuse at the apex, cuneate at the base, $1-2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{4}$ in. broad. Flowers greenish-white, $\frac{1}{2}$ in. long, 3 together on axillary peduncles.

*Equatoria.*16. **FERRETIA** Del.**Ferretia apodanthera** Del.

Shrub 4-10 or more ft. high. Leaves elliptic, more or less narrowed at both ends, 1-2 in. long, $\frac{3}{4}$ - $\frac{1}{2}$ in. broad, more or less glabrous. Flowers white, often with a pink tinge on the corolla-

lobes, $\frac{3}{8}$ - $\frac{1}{2}$ in. long in bud, often appearing before the leaves, in clusters usually on short lateral shoots. Fruit green with red streaks when young, white with black streaks when mature, $\frac{1}{4}$ in. in diameter.

Central and Southern Sudan.

17. **GAILLONIA** A. Rich. ex DC.

Gaillonia calyptera (Decne.) Jaub. & Spach.

Rigidly virgately branched nearly glabrous undershrub 1-2 ft. high. Leaves rather fleshy, sessile, narrowly linear, $\frac{1}{2}$ -1 in. long, the margin revolute. Flowers subsessile, about $\frac{1}{2}$ in. long, solitary or a few together, sheathed at the base by a pale involucre, in simple and alternately branched terminal spikes. Fruit, including the calyx-teeth, $\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Red Sea Hills: Soturba Hills.

18. **GALINIERA** Del.

Galiniera coffeoides Del.

Shrub or tree up to 35 ft. high, usually on the edge of forest; bark pinkish-grey; crown rounded, composed of several whorls of slender horizontal or down-curved branches. Leaves elliptic-oblong, shortly acuminate at the apex, cuneate at the base, 3-10 in. long, 1-3 $\frac{1}{2}$ in. broad. Flowers waxy-white, tinged with pink, fragrant, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, in axillary corymbose cymes 1-2 in. long. Berry red, $\frac{1}{2}$ in. in diameter.

Equatoria: Imatong Mountains, Lomuleng Forest, 8000 ft.

19. **GALIUM** L.

Galium dasycarpum Hochst. ex Schweinf.

G. rotundifolium (non L.) Broun & Massey.

Herb; root creeping, perennial; stems slender, ascending or prostrate, hispidulous. Leaves 4 in a whorl, 3-nerved, elliptic, obtuse and cuspidate-mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, setulose on the margin and nerves. Flowers white, small, in terminal branched panicles. Fruit setose-hispid.

Darfur: Jebel Marra, 9200 ft.

G. aparine L.

Goose-grass.

Scrambling herb; stems and branches quadrangular, aculeate-scabrous with down-directed short hairs or nearly glabrous. Leaves 6-9 in a whorl, 1-nerved, sublinear or narrowly elliptic, mucronate, $\frac{1}{2}$ -1 in. long the margin retrorsely aculeate. Flowers white or greenish, small, in panicles not divaricately branched. Fruit $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, hispid with hooked hairs or rarely glabrous.

Red Sea Hills: Erkowit; Has Has.

G. mollugo L.

Hedge Bedstraw.

Herbaceous perennial herb 1-3 ft. long; stems slender, glabrous. Leaves 6-8 in a whorl, 1-nerved, linear, acute at the apex, about $\frac{1}{2}$ in. long, finely scabrous on the margin. Flowers white, small, in small divaricately branched terminal panicles. Fruit very small, glabrous.

Red Sea Hills: 21° N.

G. setaceum Lam.

Low herb; stems much divided and thread-like above. Leaves in verticils of usually 5 to 7, linear, acute but not mucronate at the apex, revolute, ciliate along the margin. Flowers very small, in small corymbs each with a setaceous bract at the base. Fruit minutely hispid.

Red Sea District: between sea-level and 4000 ft.

G. hochstetteri P.- Sermolli.

G. simense Hochst. ex A. Rich., non Fresen.

Glabrous herb; branches decumbent or prostrate, up to 12 in. long, angular. Leaves 6 in a whorl, 1-nerved, sublinear, mucronate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous. Flowers purplish, 3-4 together on short peduncles terminating short lateral branches. Fruit smooth.

Red Sea District.

G. chlorolonanthum K. Schum.

Scrambling herb up to 6 ft.; stems angular, striate, more or less sparsely covered with minute recurved prickles. Leaves in verticils of 4-6, sessile, oblanceolate, mucronate and acute at the apex, narrowed at the base, about 1 in. long, $\frac{3}{4}$ in. broad, the margin and lamina and midrib covered with minute recurved prickles. Flowers greenish-yellow, in few-flowered lateral and terminal umbels.

Equatoria: Imatong Mountains, Issore to Itobol, 4520-6400 ft.

G. decaisnei Boiss.

Annual erect or decumbent herb 6-9-in. high. Upper leaves usually 6 together, 1-nerved, linear, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the margin revolute; lower leaves spatulate. Flowers purple, minute, in very divaricately branched terminal panicles.

Red Sea District.

20. **GARDENIA** Ellis**Gardenia jovis-tonantis** Hiern.

Savannah shrub or tree up to 15 ft. high, usually stunted and twisted; bark pale, puberulous. Leaves ternate, obovate, rounded to broadly acuminate at the apex, cuneate at the base, up to $2\frac{1}{2}$ in.

broad, glabrous or hairy only in the axils of the nerves. Flowers creamy-white, fragrant, terminal or terminating short lateral branches. Corolla-tube 2-3 in. long, glabrous or nearly so; lobes 8-9 (rarely 7), 1-1½ in. long. Fruit subwoody, ellipsoid, sometimes curved, 2-4 in. long, up to about 1 in. in diameter, edible.
Equatoria.

G. erubescens Stapf & Hutch.

Savannah shrub or tree up to 20 ft. high, usually stunted and twisted; branchlets silky-tomentose; bark pale. Leaves often pinkish when dry, verticillate, subsessile, broadly obovate, rounded at the apex, cuneate at the base, 2¼-4 in. long, 1-2 in. broad, glabrous on both surfaces. Flowers white, fragrant. Calyx-lobes thread-like, up to ½ in. long, the tube densely tomentose outside. Corolla-tube 2-3 in. long, pubescent outside; lobes 6, about 1 in. long. Fruit yellow, not ribbed, spindle-shaped, 2-3 in. long, somewhat fleshy, edible.

Equatoria.

G. aqualla Stapf & Hutch.

Much-branched shrub 3-6 ft. high. Leaves coriaceous, oblanceolate or elliptic, rounded or more rarely obtusely acuminate at the apex, 1-7½ in. long, ½-2 in. broad, scabrous above, hispid beneath. Flowers white, at length cream. Calyx-lobes thread-like, the tube densely tomentose outside. Corolla-tube 1-1½ in. long, densely appressed-pubescent outside; lobes 6, ¾-1 in. long. Fruit elliptic, ribbed, about 1½ in. long, ¾ in. in diameter.

Equatoria.

G. trilacantha DC.

Stiff shrub; branches tortuous. Leaves sessile, obovate, rounded at the apex, 2½-4½ in. long, up to 2½ in. broad, shortly scabrous-pubescent beneath. Flowers white, fragrant. Calyx-lobes linear-oblong to subulate, not thread-like, about ¾ in. long. Corolla-tube 1½-2½ in. long, slightly pubescent; lobes 6, narrowly obovate, 1½-2 in. long. Fruit ribbed, narrowly ellipsoid, about 3½ in. long.
Equatoria: near Wau; around Aweil.

G. vogelii Hook. f. ex Planch.

Shrub 8-15 ft. high. Leaves membranous, elongate-oblong-obovate, acuminate at the apex, up to 12 in. long, 4 in. broad, glabrous or hairy only in the axils of the nerves. Flowers white, fragrant. Corolla-tube about 5 in. long; lobes 5, oblong, up to 3½ in. long. Fruit elongate-spindle-shaped, often curved, about 4 in. long.

Equatoria.

G. lutea Fresen.

Fig. 157.

Shrub or tree up to 15 or more ft. high, rarely spinous. Leaves opposite, ternate or 4 together, elliptic or obovate, obtuse or sub-acuminate at the apex, up to 6 in. long, 3 in. broad, glabrous or nearly so on both surfaces. Flowers white, turning cream or yellow, fragrant, parts in 6-7's, up to 6 in. long but usually shorter, terminal, solitary. Calyx often spathaceous, slit down one side, hairy inside. Corolla hairy at the mouth, otherwise almost glabrous. Fruit ellipsoid, ovoid, globose or conical, 1-4 in. long, very faintly ribbed.

Central and Southern Sudan.

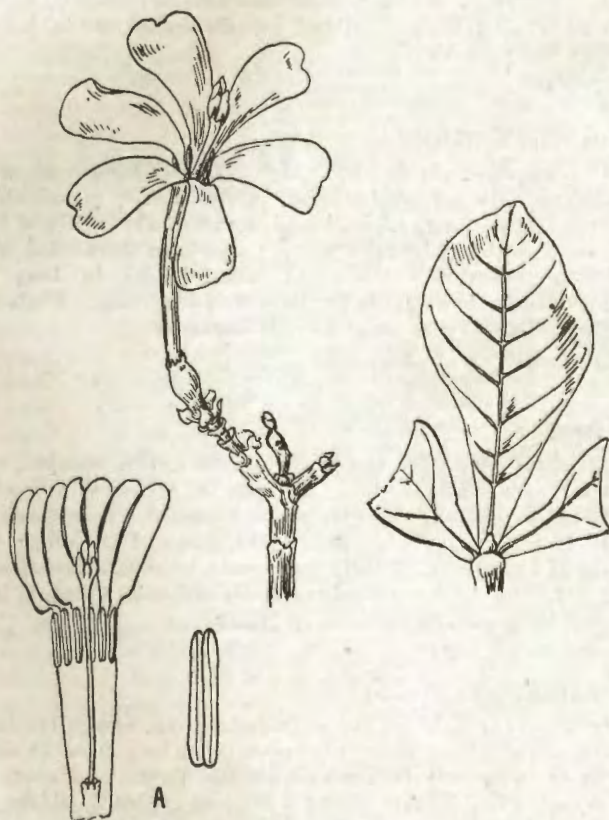


Fig. 157—GARDENIA LUTEA Fresen.

A, corolla laid open, and anther.

G. tinneae Kotschy & Heuglin.

Almost stemless plant arising from a rhizome. Leaves ternate, obovate-oblong or oblong or spatulate, up to $2\frac{1}{2}$ in. long, 1 in. broad, shiny above, paler beneath. Flowers solitary, up to 6 in. long. Calyx puberulous outside. Fruit subglobose.

Equatoria.

21. **GEOPHILA** D. Don**Geophila herbacea** (Jacq.) K. Schum.

G. uniflora Hiern.

Prostrate herb, rooting at the nodes. Leaves ovate to almost orbicular, 5-7-nerved and cordate at the base, $\frac{3}{4}$ -2 in. long, glabrous or shortly pubescent. Flowers white, waxy, $\frac{1}{2}$ in. long, solitary. Fruit red, ribbed, succulent, about $\frac{1}{2}$ in. long.

Equatoria.

22. **GRUMILEA** Gaertn.**Grumilea psychotrioides** DC.

Glabrous shining shrub or small tree. Leaves variable in shape from narrowly obovate to suborbicular, 4-8 in. long, up to $5\frac{1}{2}$ in. broad, glabrous; stipules elliptic, undivided, about $\frac{3}{4}$ in. long. Flowers white, sessile, $\frac{1}{2}$ - $\frac{1}{3}$ in. long when expanded, in sessile terminal solitary globose heads. Berry oblong, $\frac{1}{2}$ in. long, 10-ribbed, crowned by the calyx-teeth.

Equatoria: valley of River Yei near source.

G. succulenta Hiern.

Large glabrous succulent shrub. Leaves elliptic, shortly pointed at the apex, $5\frac{1}{2}$ - $7\frac{1}{2}$ in. long, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, the margin revolute; stipules ovate, clasping, undivided, $\frac{3}{4}$ in. long. Flowers white, about $\frac{1}{2}$ in. long, in rather dense terminal trichotomous corymbs 6 in. in diameter.

Equatoria.

G. sulphurea Hiern.

Psychotria sulphurea (Hiern) Schweinf. ex B. D. Jackson, non Ruiz & Pav.

Puberulous undershrub 5 ft. high. Leaves broadly ovate or elliptic, obtusely narrowed at the apex, 5-6 in. long, $2-3\frac{1}{2}$ in. broad, puberulous on both surfaces; stipules broadly ovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, tricuspidate at the tip. Flowers yellow, about $\frac{1}{2}$ in. long, crowded in terminal simple or capitate cymes. Berry 2-lobed, depressed-globose, faintly ribbed, $\frac{1}{2}$ in. in diameter, 2-seeded.

Equatoria.



Fig. 158—*IXORA RADIATA* Hiern.

A, flowering shoot. B, calyx and ovary. C, anther. D, pistil. E, fruits. F, cross-section of fruit.

23. HYMENODICTYON Wall.

Hymenodictyon floribundum (Steud. & Hochst.) B. L. Robinson.*H. kurria* Hochst.

Deciduous savannah shrub or tree up to 30 ft. high; bark grey-black. Leaves green, turning scarlet on falling, obovate, abruptly acuminate at the apex, cuneate at the base, 3-7 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, puberulous on the nerves beneath or entirely glabrous. Flowers red, small, in unbranched spike-like racemes 3-9 in. long with a pair of long-stalked lanceolate bracts 2-3 in. long at the apex of the peduncle. Capsule narrowly ellipsoid, about $\frac{1}{2}$ in. long; seeds winged.

Equatoria.

24. HYPODEMATIUM A. Rich.

Hypodematium sphaerostigma A. Rich.*Spermacoce sphaerostigma* (A. Rich.) Oliv.

Branched erect or decumbent annual herb up to $2\frac{1}{2}$ ft. high. Leaves subsessile, lanceolate or narrowly elliptic, acute or apiculate at the apex, cuneate at the base, up to 4 in. long, 1 in. broad, more or less scabrous above, paler and somewhat hairy beneath. Flowers up to $\frac{1}{2}$ in. long, crowded in dense sessile terminal and axillary heads exceeded by the uppermost spreading leaves.

Central and Southern Sudan.

25. IXORA L.

Ixora radiata Hiern.

Fig. 158.

Glabrous shrub 12-20 ft. high. Leaves subsessile, elliptic, rounded at the base, the uppermost pair ovate-elliptic, rounded or subcordate at the base, 6-8 in. long, $2\frac{1}{2}$ -4 in. broad, glabrous. Flowers white, wine-red outside, slender, tubular, 2-3 in. long, in a dense terminal corymb. Fruit $\frac{1}{2}$ in. long.

Equatoria.

26. LACHNOSIPHONIUM Hochst.

Lachnosiphonium niloticum (Stapf) Dandy, comb. nov.

Fig. 159.

Randia nilotica Stapf.

Deciduous savannah shrub or tree up to 15 ft. high, usually many-stemmed; branchlets stiff, spiny, pubescent, densely beset with rosettes of small leaves; bark pale-grey to white; spines borne above the leaves, $\frac{1}{2}$ -1 in. long, very strong and woody, pale with dark tips. Leaves obovate, rounded at the apex, long-cuneate at the base, $\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad. Flowers white, rapidly fading to yellow, fragrant, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, solitary in the leaf-axils and often very numerous. Fruit subglobose, up to $1\frac{1}{2}$ in. long.

Central and Southern Sudan.



Fig. 159—*LACHNOSIPHONIUM NILOTICUM* (Stapf) Dandy.
A, calyx laid open. B, flower laid open and fruit.

27. *LEPTACTINA* Hook. f.

Leptactina platyphylla (Hiern) Wernham.

Large shrub; branches unequally 4-sided, sulcate. Leaves broadly ovate, subacuminate at the apex, abruptly narrowed at the base, 3-8 in. long, 2-5½ in. broad, shortly pubescent at least on the nerves; stipules broadly ovate, about ½ in. long. Flowers 2-3½ in. long; corolla-tube densely brownish-villous. Fruit ovoid, ¾-1 in. long, 10-ribbed, almost glabrous.

Equatoria.

28. **MACROSPHYRA** Hook. f.**Macrosphyra longistyla** (DC.) Hiern.

Climbing shrub; branchlets pubescent. Leaves ovate-orbicular, shortly pointed at the apex, up to $4\frac{1}{2}$ in. long, softly tomentose especially when young. Flowers greenish-white, fragrant, tubular, $1\frac{1}{2}$ -3 in. long, in terminal head-like clusters. Style long-exserted, with a large subglobose stigma. Fruit subglobose, $1\frac{1}{2}$ in. in diameter.

Equatoria.

29. **MEYNA** Roxb. ex Link**Meyna tetraphylla** (Schweinf.) Robyns.

Puberulous shrub 20 ft. high; branches dull-reddish, more or less climbing, spinous; spines subulate, tapering from a robust base, $\frac{1}{2}$ -1 in. long, decussate or opposite to a short spine-like branchlet, supra-axillary. Leaves crowded on the short lateral shoots, pseudo-verticillate in 4s, ciliolate-obovate to ovate, rounded or obtuse at the apex, cuneate to rounded at the base, $1-1\frac{1}{2}$ in. long, $\frac{1}{2}-\frac{3}{4}$ in. broad. Flowers small, in very short axillary clusters appearing before the leaves. Corolla hispidulous.

Equatoria.

30. **MITRACARPUS** Zucc.**Mitracarpus scaber** Zucc.

Annual erect branched herb, woody at the base, up to 2 ft. high. Leaves lanceolate, subacute at the apex, $1\frac{1}{2}-2\frac{1}{2}$ in. long, $\frac{1}{2}-\frac{3}{4}$ in. broad, scabrous above or nearly smooth, glabrous beneath. Flowers white, small, densely crowded at the nodes within the pectinately divided stipular sheath. Calyx-lobes unequal, 2 oblong and 2 subulate smaller ones.

Central and Southern Sudan.

31. **MITRAGYNA** Korth.**Mitragyna inermis** (Willd.) Kuntze.

M. africana Korth.

Small tree up to 30 ft. high, chiefly occurring in swamps. Leaves elliptic, acute at the apex, rounded at the base, $2\frac{1}{2}-5\frac{1}{2}$ in. long, $1\frac{1}{2}-2$ in. broad, thinly pubescent on the nerves and in the nerve-axils beneath; stipules coloured, lanceolate-oblong or ovate, $\frac{1}{2}-1$ in. long. Flowers cream, strongly scented, in solitary heads 1 in. in diameter terminating short lateral branchlets; peduncle tomentose. Capsule with a callous ring at the apex.

Equatoria.

M. stipulosa (DC.) Kuntze.*M. macrophylla* Hiern.

Tree up to 100 ft. high, in swamp forest; bark grey-brown. Leaves dark-green, glossy, broadly elliptic to obovate, rounded at the apex, rounded to shortly acute at the base, up to 20 in. long, 12 in. broad, glabrous or pubescent on the nerves and in the nerve-axils; stipules obovate-orbicular, $1\frac{1}{2}$ -4 in. long, flabellately nerved. Flowers yellow-white, in spherical heads $\frac{1}{2}$ -1 in. in diameter, intermixed with numerous small stiff spatulate pubescent bracteoles. Capsule obovoid, about $\frac{1}{2}$ in. long, dehiscing by 4 valves, leaving the disc supported on 4 fibrous ribs between the valves.

*Equatoria.*32. **MORELIA** A. Rich. ex DC.**Morolla senegalensis** A. Rich. ex DC.

Evergreen shrub or tree up to 30 or more ft. high, with aerial roots. Leaves oblong-elliptic, rather abruptly and obtusely acuminate at the apex, up to 5 in. long, 2-2 $\frac{1}{2}$ in. broad, glabrous. Flowers white, fragrant, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in abundant somewhat extra-axillary short many-flowered cymes. Stamens exerted; anthers $\frac{3}{8}$ in. long. Fruit green, globose, $\frac{1}{2}$ in. in diameter, crowned by the short calyx.

*Central and Southern Sudan: in watercourses.*33. **MORINDA** L.**Morinda lucida** Benth.

Tree up to 40 ft. high; bark smooth, grey; branchlets slender, pendulous, usually with many tortuous curves and bends. Leaves dark-green, glossy, broadly elliptic to broadly ovate, more or less acuminate at the apex, rounded to broadly cuneate at the base, 3-7 in. long, $1\frac{1}{2}$ -3 $\frac{1}{2}$ in. broad, glabrous; stipules foliaceous, $\frac{3}{4}$ in. in diameter, soon falling off. Flowers white, fragrant, up to 1 in. long, clustered in heads; common peduncles 1-3 in. long, axillary, usually 3 together. Fruit a deeply-lobulate syncarp, black when ripe, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter.

*Equatoria.***M. morindoides** (Bak.) Milne-Redh.*M. confusa* Hutch.

Glabrous climbing shrub. Leaves elliptic or oblong-elliptic, shortly and obtusely acuminate at the apex, shortly cuneate to almost rounded at the base, 2 $\frac{1}{2}$ -6 in. long, $1\frac{1}{2}$ -3 $\frac{1}{2}$ in. broad, glabrous. Flowers white, fragrant, about 1 in. long, with a stout tube, in heads on solitary peduncles. Fruit yellow, lobulate, $1\frac{1}{2}$ in. in diameter.

Equatoria.



Fig. 160—MUSSAENDA ERYTHROPHYLLA Schumach.

A, flowering shoot. B, longitudinal section of flower. C, stamen. D, style. E, young fruit. F, cross-section of ovary.

34. MUSSAENDA L.

Mussaenda arcuata Lam.

Nearly glabrous shrub, erect or more or less climbing, about 6-8 ft. high. Leaves broadly elliptic to obovate, sharply and sometimes abruptly acuminate at the apex, acute at the base, about $4\frac{1}{2}$ in. long, $2-2\frac{1}{2}$ in. broad, glabrous, often prominently reticulate above and beneath. Flowers pale-yellow with orange or deep purple in the hairy throat, fragrant, over 1 in. long, $\frac{1}{2}$ -1 in. in diameter, in lax terminal panicles. One lobe of calyx sometimes produced into a white acuminate lamina 1- $1\frac{1}{2}$ in. long. Fruit subglobose or ellipsoid, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, fleshy, glabrous, indehiscent.

Equatoria.

Var. **pubescens** Wernham.

Stems more or less densely pubescent, slowly becoming glabrous. Leaves more or less sparsely puberulous on the midrib beneath. Corolla-tube often with pubescent lines towards the base.

Equatoria.

M. erythrophylla Schumach.

Fig. 160.

Climbing shrub, but sometimes more or less erect or even a small tree; branchlets softly rusty-pubescent. Leaves ovate-elliptic, acuminate at the apex, acute to subcordate at the base, about $4\frac{1}{2}$ in. long, $2\frac{1}{2}$ in. broad, softly pubescent to tomentose beneath. Flowers cream or pale-yellow, 1- $1\frac{1}{2}$ in. long, in dense hispid cymes. One calyx-lobe produced into a bright-red suborbicular stalked lamina 2- $4\frac{1}{2}$ in. long. Corolla-tube densely rusty-pubescent. Fruit ovoid, $\frac{3}{4}$ -1 in. long, rusty-pubescent, usually crowned by the calyx-lobes, indehiscent.

Equatoria.

M. elegans Schumach.

Much-branched usually scrambling shrub. Leaves elliptic, shortly acuminate at the apex, subacute to rounded at the base, $2\frac{1}{2}$ - $5\frac{1}{2}$ in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, more or less pubescent with rather stiff hairs above and beneath. Flowers orange-red or flame-coloured with a yellow centre, 2 or more in. in diameter, in pedunculate cymes. Fruit ovoid, $\frac{3}{4}$ in. long, indehiscent.

Equatoria.

35. NAUCLEA L.

Nauclea latifolia Sm.

Fig. 161.

Sarcocephalus esculentus Afz. ex Sabine; *S. russeggeri* Kotschy ex Schweinf.

Savannah shrub or tree up to 30 ft. high; branchlets stout, glabrous or minutely puberulous, drooping; bark grey or brown, deeply fissured; slash yellow with crimson streaks. Leaves shining, broadly elliptic to ovate, abruptly and shortly acuminate



Fig. 161.—NAUCLEA LATIFOLIA Sim.

at the apex, shortly cuneate to subcordate at the base, 4-8 in. long, $3\frac{1}{2}$ -5 in. broad, glabrous, dark-green above, pale beneath; petiole red. Flowers white, fragrant, in dense globose shortly pedunculate heads about 2 in. in diameter. Fruit a red-brown syncarp, globose or ovoid, 2-3 in. in diameter, pitted with the pentagonal scars of the flowers, having a sweet edible crimson flesh.

Central and Southern Sudan.

36. **OCTODON** Thonn.

Octodon filifolium Schumach.

Erect slender glabrous herb up to 2 ft. high. Leaves thread-like, subterete, $1\frac{1}{2}$ -4 in. long, glabrous, expanded at the base into the broad cupular sheath. Flowers white, sometimes tipped with lavender, short, tubular, crowded at the upper nodes within the stipular sheaths. Fruit pubescent towards the apex.

Equatoria.

37. **OLDENLANDIA** L.

A. Calyx-segments 4 (rarely 5) without intervening teeth:

B. Capsule subglobose, dehiscent:

C. Flower parts in 4's:

D. Corolla salver-shaped, clearly exceeding the calyx:

E. Flowers $\frac{1}{2}$ or more in. long:

(a) Corolla-lobes obtuse; scabrous herbs:

(b) Leaves all radical, forming a rosette .. *O. welwitschii*.

(bb) Leaves not radical *O. schimperii*.

(aa) Corolla-lobes acute or acuminate:

(c) Corolla-lobes linear to elliptic:

(d) Flowers 3 in. or more long *O. dolichantha*.

(dd) Flowers less than 3 in. long:

(e) Calyx-lobes about equalling the tube

O. senegalensis.

(ee) Calyx-lobes nearly 3 times the length of the tube; flowers opening in the evening and by night

O. noctiflora.

(cc) Corolla-lobes ovate to obovate, apiculate

O. grandiflora.

EE. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. long:

F. Flowers solitary and axillary or loosely paniculate:

(f) Pedicels not rigid, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long; flowers usually in terminal paniculate cymes

O. effusa.

(ff) Pedicels rigid, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; flowers usually solitary and axillary

O. herbacea.

FF. Flowers not as above:

(g) Plant scabrous with minute tubercles; flowers 1-2 together on the branches of a wide terminal corymbose cyme, not clustered

O. strumosa.

(gg) Plant not scabrous, smooth; flowers, at least some of them, clustered

O. virgata.

DD. Corolla funnel-shaped, scarcely exceeding the calyx:

G. Flowers solitary, very small, pedicellate ... *O. lancifolia*.

GG. Flowers 2 or more together:

(h) Peduncles solitary, bearing 2 or more flowers

O. corymbosa.

(hh) Peduncles more than one together:

(i) Peduncles 2 or more together, each 1-flowered

O. capensis.

(ii) Peduncles very short, crowded several together

O. goreensis.

CC. Flower parts in 5's *O. macrophylla*.

BB. Capsule obconic-oblong, tardily dehiscent; flower parts usually

in 5's *O. wauensis*.

AA. Calyx-lobes 4 with intervening subulate teeth; fruit indehiscent

O. hedyotoides.

Oldenlandia welwitschii Hiern.

Puberulous scabrous annual herb 3-6 in. high; stems reduced to flowering scapes. Leaves all radical or nearly so, sessile or subsessile, crowded, forming a rosette, lanceolate or narrowly elliptic, apiculate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the margin turned in. Flowers milk-white or bluish, nearly $\frac{1}{2}$ in. long, pedicellate, on scapes ascending from the crown of the root.

Red Sea Hills: Erkowit; Dungunab.

O. schimperii (C. Presl) T. Anders.

Fig. 162.

Ascending or decumbent glandular-scabrous annual or perennial herb 1-3 ft. high. Leaves narrowly or broadly linear, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long; stipules 1-3-cuspidate. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. long, subsessile and pedicellate in terminal corymbose cymes. Capsule subglobose, loculicidally dehiscent from the apex.

Northern and Central Sudan.

O. dolichantha Stapf.

Annual erect usually almost glabrous herb 1 or more ft. high. Leaves sessile, linear or lanceolate, acute to acuminate at the apex, rounded at the base, 1-2 $\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Flowers white, fragrant, up to 4 in. long, sessile, axillary, solitary or 2-3 together. Corolla-tube very slender. Capsule ellipsoid-ovoid, 4-ribbed.

Equatoria.

O. senegalensis (Cham. & Schlecht.) Hiern.

Erect rather slender branched annual herb 1-2 or more ft. high, slightly scabrous with minute tubercles. Leaves sessile, linear to narrowly lanceolate, up to 3 in. long, $\frac{1}{2}$ in. broad; stipules bicuspidate, or shortly setose from a truncate apex. Flowers white or purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, subsessile or pedicellate on the branches of a panicle cyme. Fruit subglobose, $\frac{1}{2}$ in. in diameter, at length dehiscent loculicidally.

Widespread.

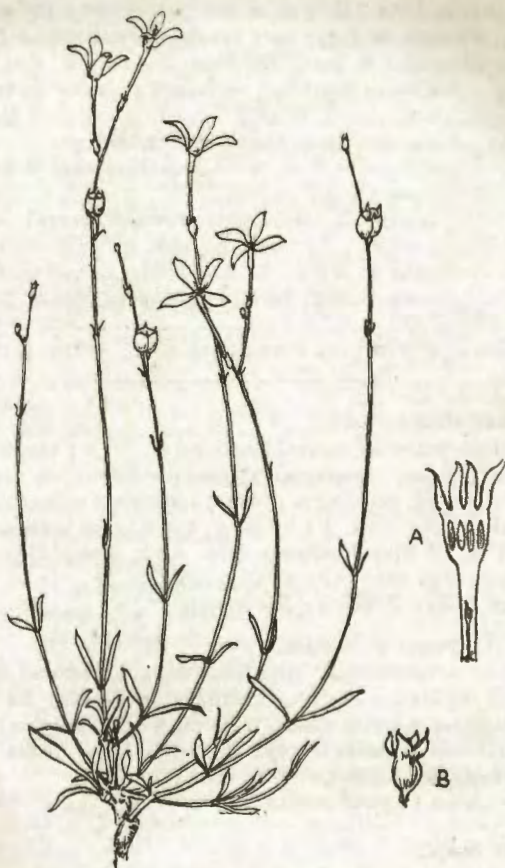


Fig. 162—*OLDENLANDIA SCHIMPERI* (C. Presl) T. Anders.
A, corolla laid open. B, calyx and ovary.

***O. noctiflora* Hiern.**

Erect slender nearly glabrous annual herb 1-1½ ft. high, unbranched below the inflorescence. Leaves sessile, linear, 1-2 in. long; stipules short, truncate, bicuspidate. Flowers white, ¾-¾ in. long, opening in the evening and at night, pedicellate or subsessile, in a lax oblong 2-3-chotomous somewhat leafy cyme.

Red Sea District: Suakin.

Fig. 163—*OLDENLANDIA GRANDIFLORA* (DC.) Hiern.

A, flowering shoot. B, stipules. C, longitudinal section of flower. D, anther. E, cross-section of ovary. F, fruit.

***O. grandiflora* (DC.) Hiern.**

Fig. 163.

Erect annual herb 1-3 ft. high, often branched from the base. Leaves sessile, linear or narrowly lanceolate, up to 3 in. long and $\frac{1}{4}$ in. broad; stipules short, sheathing, truncate, 2-3-cuspidate. Flowers pink (sometimes white), $\frac{1}{2}$ - $\frac{3}{4}$ in. long, subsessile or pedicellate, numerous in a corymbose cyme. Fruit subglobose, $\frac{1}{2}$ in. in diameter, loculicidally dehiscent.

Central Sudan.

***O. effusa* Oliv.**

Somewhat decumbent herb 1-3 ft. high. Leaves sessile, narrowly linear-lanceolate, 1-3 in. long, the margin turned in; stipules setose. Flowers lilac, slender, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in open spreading paniculate cymes. Fruit globose, $\frac{1}{2}$ or more in. in diameter, loculicidally dehiscent.

Central Sudan.

***O. herbacea* (L.) Roxb.**

O. heynei (R.Br.) Don.

Erect much-branched slender herb up to 1 ft. high. Leaves sessile, linear to linear-lanceolate, up to 3 in. long, $\frac{1}{2}$ in. broad; stipules truncate with subciliate margins, not divided into thread-like segments. Flowers white, solitary and axillary below, sometimes forming a paniculate cyme above. Fruit subglobose, glabrous, loculicidally dehiscent.

Central and Southern Sudan.



Fig. 164—*OLDENLANDIA STRUMOSA* (A. Rich.) Hiern.

A, leaves with stipules. B, flower and fruit. C, longitudinal section of flower. D, dehiscent capsule. E, longitudinal section of capsule. F, seeds.

***O. strumosa* (A. Rich.) Hiern.**

Fig. 164.

Erect annual herb $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. high, leafy from the base upwards. Leaves sessile, linear to narrowly lanceolate, up to 2 in. long; stipules sheathing, truncate or ovate, setose. Flowers slender, $\frac{1}{2}$ in. long, usually subsessile. Fruit subglobose, $\frac{1}{2}$ in. in diameter, loculicidally dehiscent.

Central Sudan.

O. virgata (Willd.) DC.

Erect perennial herb 2 in. to 2 ft. high; branches numerous, virgate, slender, glabrous above, puberulous or nearly glabrous below. Leaves sessile, narrowly or broadly linear, apiculate at the apex, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long; stipules shortly sheathing, truncate, with 2-3 rather long erect setae at the apex. Flowers pink or whitish, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, at least some clustered, pedicellate in an ample terminal corymbose panicle. Fruit subglobose, up to $\frac{1}{2}$ in. in diameter, loculicidally dehiscent.

Central and Southern Sudan.

O. lancifolia (Schumach.) DC.

Erect or straggling glabrous herb. Leaves sessile, linear or narrowly lanceolate, narrowed at both ends, 1-2 in. long, glabrous; stipules shortly sheathing, truncate or apiculate, bicuspidate with subulate or thread-like diverging or distant teeth. Flowers white (sometimes pink or lilac), solitary, on slender axillary alternate and opposite pedicels about $\frac{1}{2}$ in. long. Capsule globose, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter, marked with a furrow down each of the broader sides, loculicidally dehiscent.

Central and Southern Sudan.

O. corymbosa L.

Erect or branched nearly glabrous herb up to 1 or more ft. high. Leaves linear or nearly so, up to $1\frac{1}{2}$ in. long, usually glaucous and paler beneath; stipules truncate, shortly sheathing, indistinctly 3-setose. Flowers white or lilac, $\frac{1}{16}$ in. long, 2-5 together in axillary and terminal umbellate corymbs. Fruit $\frac{1}{16}$ in. in diameter, loculicidally dehiscent.

Southern Sudan.

O. capensis L.f.

Decumbent or semi-erect herb 4-9 or more in. high, often in wet places. Leaves sessile, narrowly linear, $\frac{1}{2}$ -1 in. long; stipules truncate or shortly ovate, sheathing, 2-3 setose. Flowers white, about $\frac{1}{16}$ in. long; pedicels numerous, rarely only 2 together, axillary and terminal, clustered, 1-flowered. Capsule subglobose, 4-ribbed, $\frac{1}{16}$ in. in diameter, at length dehiscing loculicidally.

Central and Southern Sudan.

O. gorensis (DC.) Summerh.

O. trinervia (non Retz.) Broun & Massey.

Decumbent yellowish-green herb $\frac{1}{2}$ - $1\frac{1}{2}$ ft. high. Leaves shortly petiolate, elliptic-ovate or obovate, obtuse or apiculate at the apex, cuneate at the base, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad; stipules ovate, bicuspidate. Flowers white or purple, up to $\frac{1}{16}$ in. long, axillary and terminal, crowded (6 or fewer) in each of opposite axils. Capsule globose, hirsute, loculicidally dehiscent.

Equatoria.

O. macrophylla DO.

Straggling half-succulent aquatic or marsh herb. Leaves sessile or subsessile, linear or lanceolate or ovate-lanceolate, usually acute at the apex, 1-3 in. long, $\frac{1}{2}$ -1 in. broad, glabrous or sparsely puberulous; stipules broad at the base, entire or 2-3-toothed. Flowers white or pink, about $\frac{1}{2}$ in. long, pedicellate, in axillary and terminal dichotomous cymes. Capsule about $\frac{1}{2}$ in. in diameter, loculicidally dehiscent.

Central and Southern Sudan.

O. wauensis Hiern.

Nearly glabrous branched herb up to about 12 in. high; branches marked with 4 raised lines. Leaves sessile, linear or nearly so, usually apiculate at the apex, $\frac{1}{2}$ -1 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad; stipules sheathing, multisetose at the truncate apex. Flowers scarcely $\frac{1}{2}$ in. long, usually in pairs, subsessile, axillary and terminal. Capsule about $\frac{1}{2}$ in. long, tardily dehiscent at the apex.

Equatoria: River Jur.

O. hedyotoides (Fisch. & Mey.) Boiss.

O. octodon (A. Rich.) Broun & Massey.

Profusely branched nearly glabrous herb $\frac{1}{2}$ -1 ft. high. Leaves subsessile, linear-elliptic, $\frac{1}{2}$ -1 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad; stipules pluri-setose, shortly sheathing. Flowers white, $\frac{1}{2}$ in. long, very shortly pedunculate, a few together clustered in the leaf-axils. Fruit subglobose, truncate, 4-ribbed, indehiscent.

Widespread.

38. **OTOMERIA** Benth.**Otomeria dilatata** Hiern.

Erect more or less hirsute herb 2-3 ft. high, usually in moist places. Leaves very shortly petiolate, lanceolate, more or less rounded at the base, 2-4 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad, pilose with weak hairs on both surfaces or glabrous. Flowers pink or scarlet, 1 in. long, few in elongated spikes 6-12 in. long. Fruit turbinate, about $\frac{1}{2}$ in. long, ribbed.

Equatoria.

O. madiensis Oliv.

Decumbent or ascending somewhat shrubby herb 1-2 $\frac{1}{2}$ ft. high; branches hispid or pubescent or becoming glabrous. Leaves elliptic, narrowed at both ends, 1 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, pubescent at least on the nerves beneath. Flowers crimson outside, paler inside, $\frac{1}{2}$ -1 in. long, in terminal simple or branched spikes 12 or more in. long. Fruit $\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Equatoria.

39. OXYANTHUS DC.

Oxyanthus unilocularis Hiern.*O. macrophyllus* Schweinf. ex Hiern.

Under-storey shrub or tree up to 20 ft. high; branchlets stout, angular, hollow. Leaves sessile or subsessile, ovate-elliptic, very unequal-cordate at the base, 10-20 in. long, 5-15 in. broad, coarsely hairy on the nerves beneath; stipules ovate, about 1½ in. long. Flowers white, crowded in a short many-flowered corymb. Calyx divided into distinct teeth or lobes. Corolla-tube very slender, 4-8 in. long. Fruit ovoid to subglobose, 1-1½ in. long, ¾-1 in. broad.

*Equatoria.***O. formosus** Hook. f. ex Planch.

Forest shrub up to 15 ft. high; branchlets stout, soft-wooded. Leaves oblong, triangular-acuminate at the apex, unequally subcordate at the base, 8-12 in. long, up to 4½ in. broad; stipules ovate, ½-1 in. long. Flowers white, fragrant, in an oblong panicle of cymes. Calyx truncate, with very minute widely separated teeth. Corolla-tube very slender, 4-7 or more in. long.

*Equatoria.***O. oxycarpus** S. Moore.

Shrub or small tree 10-20 ft. high; branchlets glabrous or puberulous. Leaves shortly petiolate, somewhat coriaceous, elliptic-oblong, long-acuminate at the apex, cuneate at the base, 3½-4½ in. long, 1-2 in. broad, glabrous above, more or less softly pubescent beneath; stipules free, acuminate at the apex, broadly subulate at the base. Flowers greenish, about ¼ in. long, in 3-4 flowered racemes. Fruit ovoid, attenuate at the apex.

Equatoria: Azza Forest.

40. PAVETTA L.

A. Corolla-throat bearded:

(a) Leaves distinctly petiolate *P. insignis* var. *glabra*.(aa) Leaves sessile or subsessile *P. schweinfurthii*.

AA. Corolla-throat glabrous or pubescent but never bearded:

B. Flowering-shoots longer than the leaves:

C. Leaves glabrous on both surfaces *P. bilineata*.

CC. Leaves not glabrous on both surfaces:

(b) Ovary and calyx glabrous or puberulous or sparsely pubescent:

(c) Upper part of calyx falling away, the lower part persistent; leaves scabrous-pubescent on both surfaces ...

P. ruwenzoriensis.(cc) Whole calyx persistent; leaves pubescent on the nerves beneath *P. abyssinica*.(bb) Ovary and calyx densely pubescent; leaves densely pubescent or tomentose beneath *P. oliveriana*.

BB. Flowering-shoots shorter than the leaves:

D. Calyx dentate, denticulate or truncate; stipules glabrous inside *P. crassipes*.

DD. Calyx with triangular or quadrangular lobes or rarely truncate and then with the stipules silky-villous in the axil:

E. Corolla-tube more than twice as long as the lobes:

(d) Leaves pubescent *P. subcana*.

(dd) Leaves glabrous or becoming glabrous *P. albertina*.

EE. Corolla-tube less than twice as long as the lobes:

(e) Leaves elliptic or oblong or obovate *P. gardeniifolia*.

(ee) Leaves lanceolate or oblanceolate
P. hochstetteri var. *glaberrima*.

***Pavetta insignis* var. *glabra* Bremek.**

Shrub or small tree; young branchlets as well as the leaves glabrous. Leaves petiolate, elliptic or oblong or obovate, acuminate at the apex, acute at the base, $4\frac{1}{2}$ - $7\frac{1}{2}$ in. long, 2- $4\frac{1}{2}$ in. broad, glabrous; stipules shortly aristate, scrophulous outside, silky-villous inside. Flowers white, about $\frac{1}{2}$ in. in diameter, in dense puberulous umbellate clusters principally towards the ends of the branches. Corolla-tube about $\frac{1}{2}$ in. long, the lobes about $\frac{2}{3}$ in. long.
Equatoria: Acholi Hills, between Laboni and Issore, 4300 ft.

***P. schweinfurthii* Bremek.**

P. baconia (non Hiern) Broun & Massey.

Shrub about 3 ft. high; young branchlets pubescent. Leaves sessile, obovate, obtuse to attenuated at the apex, cuneate at the base, 2-6 in. long, $\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, more or less pubescent with the nerves prominent beneath; stipules silky-villous inside, shortly aristate. Flowers white, in dense terminal corymbs 2-3 in. in diameter with a pair of leaves or foliaceous bracts at the base. Corolla-tube and lobes each about $\frac{1}{2}$ in. long.

Equatoria.

***P. bilineata* Bremek.**

Shrub 10-15 ft. high. Leaves petiolate, narrowly obovate to oblanceolate, 4- $4\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ -2 in. broad, glabrous on both surfaces. Flowers white, in terminal corymbs. Corolla-tube about $\frac{1}{2}$ in. long, glabrous inside; lobes about $\frac{2}{3}$ in. long.

Equatoria.

***P. ruwenzoriensis* S. Moore.**

Shrub 10-15 ft. high; young branchlets pubescent. Leaves petiolate, elliptic, acute or acuminate at the apex, cuneate or narrowed at the base, $5\frac{1}{2}$ - $7\frac{1}{2}$ in. long, 2 $\frac{1}{2}$ - $2\frac{3}{4}$ in. broad, scabrous-pubescent on both surfaces. Flowers white, in many-flowered axillary corymbs.

Equatoria.

P. abyssinica Fresen.

Shrub about 5 ft. high; branchlets pale. Leaves elliptic, narrowed at both ends, $1\frac{1}{2}$ -5 in. long, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. broad, pubescent at least on the nerves beneath. Flowers 1-1 $\frac{1}{2}$ in. long, on short pedicels, crowded in dense terminal sessile clusters 2-4 in. in diameter. Calyx shortly pubescent to almost glabrous. Fruit shining, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, glabrous.

Red Sea Hills.

P. oliveriana Hiern.

Velvety shrub; branchlets pale. Leaves elliptic, subacuminate at the apex, obtuse at the base, $1\frac{1}{4}$ -4 in. long, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. broad, shortly pubescent on the upper surface, velvety beneath. Flowers white, 1-1 $\frac{1}{2}$ in. long, on short pubescent pedicels in dense terminal hemispherical corymbs about 5 in. in diameter.

Equatoria.

P. crassipes K. Schum.

Glabrous savannah shrub, or occasionally a tree up to 15 ft. high; branchlets frequently corky, stout, pale, the bark cracking and peeling. Leaves clustered at the ends of the branches, linear to narrowly elongate-oblong or oblanceolate, rounded at the apex, attenuate at the base, 5-9 in. long, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, the midrib straw-coloured and prominent. Flowers white or greenish-white, fragrant, $\frac{3}{4}$ in. long, in many-flowered subsessile corymbs.

Nuba Mountains: Talodi. Equatoria: near Azza Forest.

P. subcana Hiern.

More or less scrambling shrub, pubescent on the young parts; branchlets whitish. Leaves subsessile, elliptic, rounded or obtuse or retuse at the apex, cuneate at the base, 1-2 $\frac{1}{2}$ in. long, $\frac{3}{4}$ - $\frac{1}{2}$ in. broad, shortly and softly pubescent. Flowers white, about 1 in. long, crowded in clusters on short lateral branches; flowers and leaves turning blackish on drying. Calyx velvety-pubescent outside. Fruit about $\frac{3}{4}$ in. in diameter.

Equatoria.

P. albertina S. Moore.

Shrub or small tree; branchlets glabrous, white. Leaves subsessile, narrowly elliptic or lanceolate, obtuse at the apex, shortly attenuate to the base, $1\frac{1}{4}$ -2 $\frac{1}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous. Flowers white, in dense many-flowered umbels at the apex of the branchlets; pedicels short, glabrous or puberulous. Corolla about $\frac{1}{6}$ in. long.

Upper Nile Province: Adok.

P. gardeniifolia Hochst. ex A. Rich.

Nearly glabrous shrub up to 10 ft. high. Leaves elliptic or oblong or somewhat obovate, more or less acute at the apex, cuneate at the base, 1-3½ in. long, ½-1 in. broad. Flowers white, ¼-⅓ in. long, on short glabrous pedicels, several in short lateral and subterminal often drooping corymbs ¼-1½ in. long. Calyx glabrous. Fruit ¼ in. in diameter, shining.

Kordofan: Jebel Daier.

P. hochstetteri var. **glaberrima** Bremek.

P. gardeniifolia (non Hochst.) Broun & Massey.

Shrub. Leaves sessile, lanceolate or oblanceolate, acute or acuminate or obtuse at the apex, cuneate at the base, 2¼-3½ in. long, ½-1 in. broad, glabrous on both surfaces. Flowers in a lax corymb. Corolla-tube about ⅓ in. long; lobes ¼ in. long. Fruit black, about ¼ in. in diameter.

Red Sea Hills: Has Has. Darfur: Jebel Marra, 6800 ft. Nuba Mountains.

41. **PENTANISIA** Harv.**Pentania schweinfurthii** Hiern.

Dwarf sometimes straggling herb usually only a few inches high. Leaves narrowly-oblanceolate, acute to obtuse at the apex, ¾-1 in. long, glabrous or nearly so. Flowers bright-blue, turning violet, sessile, narrow, about ½ in. long, in rather few-flowered almost head-like cymes. Fruit ½ in. long, puberulous.

Equatoria.

42. **PENTAS** Benth.**Pentas arvensis** Hiern.

Herb from a woody base, 6-12 in. high, often appearing in tufts after grass fires. Leaves oblanceolate, obtuse at the apex, 2-3½ in. long, about ¾ in. broad, scabrous above, minutely setulose on the nerves beneath. Flowers white or pink or bluish, ½ in. long, shortly pubescent, in terminal several-flowered branched cymes.

Equatoria.

P. globifera Hutch.

Tall herb or undershrub; branchlets brownish, glabrous to pubescent. Leaves subsessile, lanceolate, subacute at the apex, 2¼-3½ in. long, ¾-1½ in. broad, more or less minutely pubescent on the lateral nerves and surface beneath. Flowers white, 2 or more in. long, narrow, tubular, pubescent, in dense heads with the calyces crowded into a globose mass.

Equatoria: Laboni.

P. carnea Benth.

Erect or decumbent pallid shortly and rather harshly puberulous to densely pubescent perennial herb 1-2 ft. high. Leaves elliptic-ovate or lanceolate-oblong, acute at the apex, narrowed at the base, 1-6 in. long, $\frac{3}{8}$ -2 in. broad. Flowers pale-purple to pink, subsessile, $\frac{3}{8}$ -1 in. long, in dense or rarely lax cymes 1-3 in. in diameter. Corolla densely hairy at the throat.

Equatoria: Imatong Mountains; Laboni.

P. herbacea (Hiern) K. Schum.

Slender erect herb up to 2½ ft. high; stems and branches puberulous above. Leaves elliptic to lanceolate, more or less narrowed at both ends, 2-3½ in. long, $\frac{1}{2}$ -1½ in. broad, puberulous with short pallid hairs especially along the veins beneath. Flowers white, subsessile, scarcely $\frac{1}{2}$ in. long, in terminal or subterminal small crowded cymes $\frac{1}{2}$ -¾ in. in diameter elongating in fruit to an infructescence up to 4 in. long. Fruit $\frac{1}{2}$ in. long.

Equatoria.

43. **POLYSPHAERIA** Hook. f.**Polysphaeria schweinfurthii** Hiern.

Much-branched glabrous shrub up to 20 ft. high. Leaves glossy, oblong-ovate, narrowed to the obtuse apex, rounded or subcordate at the base, 2½-4 in. long, $\frac{1}{2}$ -1½ in. broad; petiole glabrous, up to $\frac{1}{2}$ in. long. Berries 1-2 together, sessile or subsessile, $\frac{1}{2}$ in. in diameter, glabrous.

Equatoria.

P. parvifolia Hiern.

Shrub 6-7 ft. high; young branchlets puberulous. Leaves narrowly oblong-elliptic to ovate, obtuse or acute at the apex, rounded or subcordate at the base, the lower leaves sometimes suborbicular and cordate at the base, $\frac{3}{4}$ -2½ in. long, $\frac{1}{2}$ -1 in. broad, pubescent or becoming glabrous on the midrib beneath; petiole pubescent. Flowers white, about $\frac{1}{2}$ in. long, subsessile, 3-5 together in sessile axillary clusters. Berry $\frac{1}{2}$ in. in diameter.

Upper Nile Province: Sobat.

44. **PSEUDOMUSSAENDA** Wernham**Pseudomussaenda flava** Verdcourt.

Mussaenda luteola Del. p.p.

Closely branched shrub; branches pubescent towards the apex. Leaves ovate or elliptic, subacuminate at the apex, usually oblique at the base, 1-3 in. long, $\frac{3}{8}$ -1½ in. broad, shortly appressed-pubescent at least on the nerves beneath. Flowers yellow, fragrant, subsessile, about 1 in. long, in rigid terminal

cymes. Calyx pubescent; one lobe produced into a pale-yellow elliptic or orbicular apiculate stalked lamina 1-1½ in. long. Fruit oblong, hispidulous or almost glabrous, about ½ in. long, at length dehiscing loculicidally.

Central and Southern Sudan.

45. PSYCHOTRIA L.

Psychotria cristata Hiern.

Shrubby glabrous sometimes twining herb. Leaves elliptic, acuminate sometimes abruptly at the apex, 3½-7 in. long, 1½-3½ in. broad, shining on both surfaces, paler beneath. Flowers white, throat yellow, about ½ in. long, in dense corymbose terminal branched puberulous cymes 1½-3 in. diameter; bracts and bracteoles very small. Corolla-lobes keeled and crested on the back.

Equatoria.

P. schweinfurthii Hiern.

Undershrub; young parts shortly pubescent. Leaves elliptic, acuminate at the apex, 4½-5½ in. long, 1½-2½ broad, glabrous and shining above, paler and puberulous along the midrib beneath; stipules broad, ½-¾ in. long. Flowers white, about ½ in. long, crowded several together in hemispherical terminal bracteate panicles; common peduncle about 2½ in. long, shortly pubescent; bracts narrowly elliptic, ½-¾ in. long. Corolla-lobes thickened at the back near the tip.

Equatoria.

P. mucronata Hiern.

Almost glabrous undershrub 2-3 ft. high. Leaves elliptic, usually mucronate but not acuminate at the apex, attenuate at the base, 3-5½ in. long, 1-1½ in. broad, puberulous on the midrib and paler beneath and scattered with small black dots; stipules ovate, ½-¾ in. long. Flowers white, fragrant, ¾-1 in. long, several together in rather dense corymbose or hemispherical axillary or subaxillary cymes 1½ in. in diameter; bracts and bracteoles tailed, hairy within.

Equatoria.

P. nubica Del.

Shrub. Leaves elliptic, narrowed at both ends, 3 in. long, glabrous above, pubescent on the lateral nerves beneath; stipules triangular. Flowers ½ in. long, 3-6 together forming little clusters in branched cymes nearly 4 in. in diameter. Corolla pubescent outside.

Fung District: Singa. A plant of uncertain identity.

46. **ROTHMANNIA** Thunb.**Rothmannia urcelliformis** (Hiern) Bullock ex Robyns.*Gardenia urcelliformis* Hiern.

Under-storey tree up to 25 ft. high. Leaves oblanceolate-elliptic to elliptic, acuminate at the apex, cuneate at the base, 3-5 in long, 1-1½ in. broad, glabrous. Flowers white with chocolate-purple markings, erect, trumpet-shaped, fragrant, solitary, axillary 2½-3 in. long. Calyx-tube pubescent, ½-¾ in. long; lobes thread-like. Fruit ovoid, about 2½ in. long, 1 in. wide.

*Equatoria.***R. whitfieldii** (Lindl.) Dandy, comb. nov.

Fig. 165.

Gardenia whitfieldii Lindl.; *Randia malleifera* (Hook.) Hook. f.

Under-storey shrub or tree up to 15 ft. high. Leaves obovate to elliptic, shortly acuminate at the apex, cuneate at the base, 5-10 in. long, 2-4½ in. broad, glabrous or nearly so. Flowers white or brownish-white, fragrant, trumpet-shaped, pendulous, usually 6-9 in. long. Calyx-tube tawny-pubescent, ½-¾ in. long; lobes narrowly linear, ¾-1½ in. long. Fruit broadly ovoid, 1½-1¾ in. in diameter, ribbed.

Equatoria: gallery-forests.

Fig. 165—ROTHMANNIA WHITFIELDII (Lindl.) Dandy.

A, a short-tubed flower. B, corolla-bud. C, upper part of corolla laid open.
D, anthers. E, stigma. F, cross-section of ovary.

R. macrantha (Schult.) Robyns.*Randia macrantha* (Schult.) DC.

Erect scrambling or more or less climbing nearly glabrous unarmed shrub. Leaves clustered at the ends of the shoots, narrowly obovate-elliptic, acuminate at the apex, acute at the base, 2½-3 in. long, 1-3½ in. broad, glabrous except on the midrib beneath, turning black or dark-green when dry; stipules chaffy, persistent, crowded at the base of the leaves and flowers, about ¾ in. long. Flowers white with red spots, fragrant, 6-10 in. long, solitary. Corolla-tube often red-brown externally. Fruit subglobose, 1-1½ in. in diameter, faintly ribbed.

*Equatoria.*47. **RUTIDEA** DC.**Rutidea smithii** Hiern.

More or less pubescent climbing shrub. Leaves ovate-elliptic, acuminate at the apex, more or less rounded at the base, 4-6 in. long, 2-2½ in. broad, minutely pubescent on the nerves beneath and particularly in the nerve-axils. Flowers whitish, sickly-scented, ¼-½ in. long, in pyramidal often dense panicles.

Equatoria: gallery-forest near source River Yubo.**R. olenotricha** Hiern.

Rusty-tomentose climbing shrub. Leaves elliptic, obtuse to rounded at the apex, rounded at the base, 2½-6 in. long, 1½-3½ in. broad, more or less tomentose beneath and densely so in the axils of the nerves. Flowers white, ¼ in. long, crowded into pyramidal panicles leafy at the base.

*Equatoria.*48. **RYTIGYNIA** Bl.**Rytigynia senegalensis** Bl.*R. euonymoides* Broun & Massey.

Glabrous more or less scrambling shrub. Leaves ovate-elliptic, broadly acuminate at the apex, acute at the base, 2-2½ in. long, ¾-1½ in. broad. Flowers white or greenish-white, ¼-½ in. in diameter, paired on slender axillary peduncles. Fruit obliquely ellipsoid, ¾ in. long.

*Equatoria.***R. pauciflora** (Schweinf.) Robyns.

Spiny shrub 15 ft. high; branchlets pubescent; spines supra-axillary, opposite, ⅓-½ in. long. Leaves ovate or elliptic, obtusely acuminate at the apex, rounded or emarginate at the base, 1-2 in. long, ½-1 in. broad, glabrous or with a few scattered hispid hairs above, paler and nearly glabrous or with scattered short hispid hairs on the lamina and midrib or in the nerve-axils beneath. Flowers ¼ in. long, axillary, 1-2 together. Fruit ¾ in. long, 3-4-ribbed and -locular.

Equatoria.

R. perluoidula Robyns.*Canthium schimperianum* (non A. Rich.) Broun & Massey.

Shrub; young branchlets more or less pubescent. Leaves usually at the apex of the branches, glaucescent and more or less pellucid, shortly petiolate, lanceolate-elliptic, obtusely and abruptly acuminate at the apex, attenuate at the base, $\frac{3}{4}$ - $1\frac{1}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, rather shiny above, sparsely appressed-pilose or becoming glabrous beneath. Flowers yellowish-white, 3-6 together in the leaf-axils.

*Equatoria.*49. **STIPULARIA** Beauv.**Stipularia elliptica** Schweinf. ex Hiern.

Soft-stemmed shrub, often occurring in wet places; branchlets quadrangular. Leaves elliptic or broadly lanceolate to obovate, acute at the apex, 4-6 in. long, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. broad, hoary-white with slender distinct lateral nerves beneath; petiole softly pubescent; stipules oblong-lanceolate, about $\frac{1}{2}$ in. long. Flowers white, enclosed in a flask-like involucre of red-tinged bracts 1 or more in. long, axillary; bracts woolly-pubescent in the upper half.

*Equatoria.*50. **TARENNA** Gaertn.**Tarenna nilotica** Hiern.

Shrub 20 ft. high; branchlets dull-reddish. Leaves elliptic or somewhat obovate, acuminate at the apex, cuneate at the base, 3-9 in. long, $1\frac{1}{2}$ -4 in. broad, glabrous above, shortly pubescent especially on the nerves beneath; petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, shortly pubescent. Flowers white, $\frac{1}{2}$ in. long, on very short densely pubescent pedicels in dense hemispherical corymbs 2-3 in. in diameter. Corolla salver-shaped.

*Equatoria.***T. pavettoides** (Harv.) Sim.

Shrub or small tree 10-20 ft. high; branchlets dark-coloured, bluntly 4-angled. Leaves obovate-oblong, acuminate at the apex, cuneate at the base, 4-7 in. long, $1\frac{1}{2}$ -3 in. broad, glabrous above, the midrib sparsely puberulous or glabrous beneath; petiole $\frac{1}{2}$ -1 in. long; glabrous. Flowers white, about $\frac{3}{8}$ in. long, on branched shortly pubescent pedicels forming a hemispherical corymb.

*Equatoria: Azza Forest.*51. **TEMNOCALYX** Robyns**Temnocalyx ancylanthus** (Schweinf.) Robyns.

Puberulous undershrub or tall woody herb 5 ft. high. Leaves usually ternate, elliptic, 1-3 in. long; stipules apiculate, covering a ring of white hairs which fall early. Flowers greenish-white, nearly 1 in. long, 1-4 together on short peduncles.

Equatoria.

Var. **puberulus** Robyns.

Leaves pubescent on the nerves beneath.

Equatoria.

52. **TRICALYSIA** A. Rich. ex DC.

Tricalysia niarniamensis Schweinf. ex Hiern.

Puberulous shrub. Leaves narrowly elliptic or lanceolate, sub-acuminate at the obtuse apex, more or less narrowed to the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, becoming glabrous except for the axils of the principal nerves beneath. Flowers fragrant, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 3-10 together, subsessile, axillary. Calyx $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Style glabrous. Fruit $\frac{1}{2}$ in. in diameter, shortly pubescent.

Equatoria.

T. djurensis Schweinf. ex Hiern.

Puberulous shrub 15-20 ft. high. Leaves ovate-elliptic, subobtuse at the apex, rounded at the base, 1 - $2\frac{1}{2}$ in. long, $\frac{3}{4}$ - 1 in. broad, becoming glabrous except for the midrib and tufts of hairs in the axils of the principal nerves. Flowers greenish, $\frac{3}{4}$ in. long, subsessile, 3-6 together, axillary. Calyx $\frac{1}{2}$ in. long. Style glabrous. Fruit red, about $\frac{1}{2}$ in. in diameter, 1-seeded.

Equatoria.

T. okelensis Hiern.

Shrub 20 ft. high. Leaves rather narrowly elliptic or somewhat lanceolate, scarcely acuminate at the apex, attenuate at the base, 3-5 in. long, 1-2 in. broad, glabrous. Flowers several together in axillary clusters. Style somewhat hairy above. Fruit yellow, at length red, $\frac{1}{2}$ in. in diameter, nearly glabrous, 1-9-seeded.

Equatoria.

53. **UNCARIA** Schreb.

Uncaria africana Don.

Fig. 166.

Armed climbing shrub; spines recurved, hooked, axillary, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Leaves elliptic or ovate-elliptic, rather long-acuminate at the apex, more or less rounded at the base, $3\frac{1}{4}$ -6 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, glabrous beneath. Flowers yellowish-silky, sessile in dense globose heads $1\frac{1}{2}$ -2 in. in diameter. Calyx densely tomentose. Corolla densely tomentose with reflexed hairs. Fruiting head 4 in. in diameter; seeds with long tails, one of them split to the base.

Equatoria: south of Bendere, near Belgian Congo border.

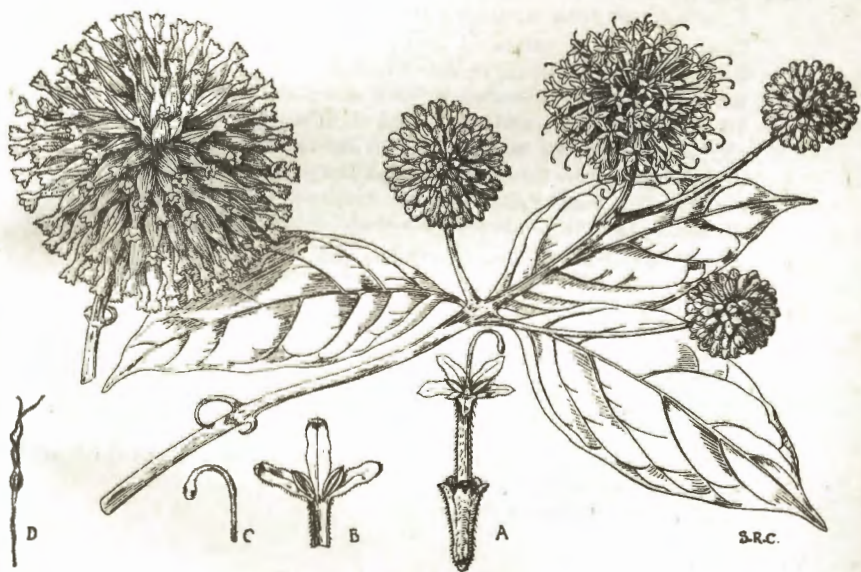


Fig. 166—*UNCARIA AFRICANA* Don.

A, flower. B, part of corolla laid open. C, stigma. D, seed.

54. **VALANTIA** L.**Valantia hispida** L.

Annual herb 2-12 in. high; stems almost glabrous to hispid. Leaves in fours, oblanceolate, almost rounded at the apex, somewhat narrowed to the base, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, more or less hispid on one or both surfaces. Flowers yellow, very small, sessile, axillary in threes, the lateral ones male, the central one hermaphrodite. Fruit crescent-shaped, with three deflexed horns.

Red Sea Hills: Jebel Shellal, Soturba Hills.

55. **VANGUERIA** Juss.**Vangueria tomentosa** Hochst.

V. abyssinica (non A. Rich.) Broun & Massey.

Tawny-tomentose unarmed shrub 4-10 ft. high or a small tree. Leaves ovate or elliptic or suborbicular, more or less narrowed at the apex, usually rounded or obtuse at the base, $1\frac{1}{2}$ -9 in. long, 1-5 in. broad, paler and softly and shortly rusty-tomentose especially on the nerves beneath. Flowers creamy-white, $\frac{1}{2}$ in. long, in branched more or less hairy axillary panicles 1-2 in. in diameter, often with a flower in the fork. Fruit globose, $\frac{1}{2}$ -1 in. in diameter, smooth, glabrous, 5-seeded.

Kordofan: Jebel Daier. Fung District.

V. venosa Hochst. ex Del.

Glabrous shrub 8 or more ft. high; branches dull-reddish. Leaves elliptic, more or less acuminate at the apex, cuneate to rounded at the base, 2-8 in. long, 1-4 in. broad, glabrous, paler beneath. Flowers greenish, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, on short alternate pedicels in branched lateral and axillary puberulous panicles 1-2 in. in diameter. Fruit subglobose, more or less 4-5-sided, about 1 in. in diameter, 4-5-seeded, edible.

Central and Southern Sudan.

V. apiculata K. Schum.

Shrub, sometimes climbing, or tree up to 40 ft. high. Leaves elliptic or ovate, obtusely long-acuminate at the apex, broadly cuneate to rounded at the base, $1\frac{1}{4}$ - $4\frac{1}{2}$ in. long, $\frac{1}{2}$ -2 in. broad, glabrous. Flowers greenish-white, in opposite corymbose inflorescences. Fruit up to 1 in. in diameter, edible.

Equatoria.

56. **VANGUERIOPSIS** Robyns**Vangueriopsis sillitoel** Bullock.

Climbing shrub; bark reddish-brown. Leaves petiolate, narrowly oblong-elliptic, broadly cuspidate at the apex, subacute at the base, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, about 1 in. broad, green and very shortly strigose above, whitish-strigose and markedly reticulate beneath. Flowers white, very small, in many-flowered branched axillary cymes.

Equatoria.

118. *DIPSACACEAE*

Perennial or annual herbs. Leaves without stipules, opposite or verticillate. Flowers hermaphrodite, zygomorphic, often in heads. Calyx epigynous, cupular or divided into pappus-like segments. Corolla epigynous, gamopetalous; lobes imbricate. Stamens usually 4 or rarely 2-3, alternate with the corolla-lobes and inserted at the bottom of the tube; filaments free or united in pairs. Ovary inferior, 1-locular, usually adnate to the receptacle; ovule solitary, pendulous from the top of the loculus. Fruit dry, indehiscent.

1. *DIPSACUS* L.

Dipsacus pinnatifidus Steud. ex A. Rich.

Erect branched herb 3-5 ft. high; stem hollow, shining, glabrous or like the branchlets aculeate or sparsely setose above. Leaves dentate, ovate or elliptic or lanceolate, acute or acuminate at the apex, up to 6 in. long and 3 in. broad or even larger, with scattered appressed setae; the upper leaves sessile and more or less connate at the base, the lower ones petiolate. Flowers white, in terminal subglobose heads 1-1½ in. in diameter.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

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