

SUDAN GOVERNMENT

DEPARTMENT OF AGRICULTURE AND FORESTS
RESEARCH DIVISION

BULLETIN No. 2

WAD MEDANI

JULY 1947.

SOYA BEAN IN THE SUDAN

BY

J. STEVEN

Inspector, Plant Propagation, Research Division,
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This pamphlet has been written with the object of making available as comprehensive an account as possible of work on Soya Beans in the Sudan.

The information given comes from Experimental Farm reports (including the Gezira Research Farm) and from the reports of various field trials conducted by the staff of the Agriculture and Forests Department.

The importance of the Soya Bean (*Glycine Soja*, *Glycine Max*, *Soja Max*) has for many years inspired research workers and others here to find suitable varieties for this country. There are hundreds of varieties of Soya Bean however and it is probable that the most suitable varieties for the Sudan have still to be found. The work continues.

A. EARLY TRIALS.

Shambat prior to 1920.

The following varieties were introduced and grown:-- Barmeli Nepali, Bengal, Darjeeling, Tokio, Nankour, Tunisian, Mammoth, Mesko, Hollybrook early, Haberlandt, Black eyebrow, Black beauty "Green", "Greenish Yellow", "Chocolate" and "Black". Poor crops were obtained even after inoculation of the soil. The winters at Shambat were considered too hot and short for success. No notes have been made on the origin or description of the varieties nor on cultural methods, yields etc.

Nasir 1933.

The variety Mammoth Yellow was grown during the rainy season. The seed, at the rate of 2 every 6 inches, was sown on drills 3 feet apart. The soil was kept mulched. No further information is available.

Gezira Research Farm.

1927—1931.

A number of strains (seed probably obtained from Mr. Massey) were tried without marked success.

1932.

The following varieties (origin U.S.A.): -- Biloxi, Chiquita, Mammoth Yellow, Peking, Laredo, Herman, Virginia, Easy Cook 29, Dixie, Mansoy Harbin Soy, Manchu, Easy Cook 12, Easy Cook 17, Ootootan, Mammoth Brown, Illini, George Washington, Tokya Haberlandt were tried along with Barberton from South Africa and Poona Brown, Poona Black, Kalimpong Brown Small, Kalimpong Brown Large, Kalimpong Barmali and Kalimpong Green from India. They were sown in November on ridges 80 cms. apart.

Presowing cultivation consisted of ploughing, clod crushing and ridging up. The soil was typical Gezira cotton soil. The Indian types grew much better than the American or South African varieties. Poona Black made the best growth with Kalimpong Brown Small second best. Barberton was very poor. Of the American types Ootootan was best followed by Biloxi and Virginia. Mammoth Yellow, Laredo, Mammoth Brown, Illini and Haberlandt were fairly successful. Mansoy and Easy Cook 17 were almost complete failures. The remainder were poor to fair in growth. No yields were recorded.

1933.

The following varieties were tried again:— Poona Black, Kalimpong Brown Small, Kalimpong Brown Large, Barmali, Ootootan and Biloxi. Poona Black gave the best vegetative growth but took 4 months to set seed. Kalimpong Brown Large set seed in 9—12 weeks.

1934.

In 1934 the varieties Pusa White, Pusa Chocolate and Pusa Black from India were tried. No notes on development are available but seed was collected for further trials.

1936.

The Pusa Black variety was sown in July on ridges 80 cms apart with spacing 45 cms between holes. The plant developed fairly bushy growth up to 18 ins. high. It was recorded that the variety appeared to have possibilities as a forage crop.

1937.

The following U.S.A. varieties were grown to increase seed stocks:— Dunfield, Illini, Mansoy, Virginia and Wilson.

In addition the following new introductions from India were tried:— Nagpur 59, Pusa Yellow, Sind Mirjohnhat, Punjab Yellow, Indore Harbinsoy and Indore Easy Cook. Nagpur 59 was described as a similar type to Pusa Black, and Pusa Yellow similar to Pusa Black in habit. Sind Mirjohnhat was a distinct type with sparse foliage but much bigger leaves and pods. The beans were sown on ridges 80 cms apart with 30 cms between holes. As some nodules had been discovered on the roots of the previous season's crop, soil in which the soya had been grown was scattered on the ridges at sowing time in 1937. Nodules were later found to be fairly numerous on the roots of better grown plants. Pusa Yellow was considered worth trying as a fodder crop and Sind Mirjohnhat as a pulse crop. The other varieties were considered inferior or failures under normal G.R.F. summer sown conditions.

1938.

The variety Pusa Black was sown in July in continuous double drills on the flattened top of 80 cms ridges. The crop was watered

fortnightly. Growth was poor and the yield was 60 rotls per feddan. The following varieties were sown in November and watered at 7-day intervals while the plants were young: Pusa Black, Pusa Yellow, Sind Mirjohhat, Nagpur 59, Dunfield, Pusa Black (ex Dueim), Pusa Chocolate (ex Dueim) and Doleib Hill (ex U.S.A.). Better growth was obtained than in the previous year. Nagpur 59 was considered the most likely type for a fodder crop.

1939.

The Indian varieties Pusa Black, Pusa Yellow, Sind Mirjohhat and Nagpur 59 were tried along with the Russian varieties Staroukrainskya, Kurshulia 93 and Illini (U.S.A.). The beans were sown in July. Growth of the Indian varieties was poor but the plants lived through the rains and set some seed. The other varieties germinated poorly and did not survive the seedling stage.

Gash Delta 1937.

The varieties Pusa Yellow, Sind Mirjohhat, Punjab Yellow and Nagpur 59 were sown on flooded soil and on unwatered soil as rain crops. On the flooded soil only Pusa Yellow survived beyond the seedling stage and was deemed of no practical value. As rain crops all were complete failures.

Dueim 1937 and 1938.

The varieties Pusa Black, (ex Roseires) Pusa Chocolate, Pusa Yellow, Pusa Black (ex G.R.F.) Sind Mirjohhat and Nagpur 59 were grown on heavy soil at Dueim. The beans were sown in mid-December. In the second season the trial plot was inoculated with soil from the previous year's crop. The varieties Pusa Black (ex G.R.F.) and Nagpur 59 produced healthy plants and a good yield. Sind Mirjohhat produced small plants but a big yield. The other varieties developed healthy plants but the yield was poor.

Gedaref.

It is reported that Soya bean was "tried but uneconomic at ruling prices."

B. MORE RECENT TRIALS.

Blue Nile Province, White Nile Pump Schemes 1941.

The variety Nagpur 59 was sown at Dueim, Hashaba and Fatisa in the last week of August, 1941. The crop was sown on ridges 75 cms apart with 40 cms between plants and watered at fortnightly intervals. From 8 to 10 waterings brought the crops to maturity. The plants grew to a height of 1 foot with the pods forming in a cluster at the apex. The seed was described as being slightly smaller but of the same shape "as the seed of sunt (Acacia Arabica)" and of a dark black colour. The beans were not tried as human food but, as a fodder crop, it was especially palatable to sheep.

The average yields were :—

	Rotls per feddan.
Fatisa	1,260
Hashaba	910
Dueim	630

Hashaba 1943.

The variety Pusa Black was tried at Hashaba varying the sowing date. Germination was poor necessitating much resowing. Early growth was weak but the onset of the cooler weather in November favoured subsequent development. The seed rate was 20 rotls per feddan. The crop was harvested in the second half of December. The average yields for the different sowing dates were:-

Date sown	Average yield per feddan
15.7.43	600 rotls
1.8.43	690 ..
15.8.43	500 ..

Dueim 1943.

As at Hashaba the variety Pusa Black was sown at different dates. The soil was a heavy clay and the seed rate was 20 rotls per feddan. The young seedlings suffered damage from blister beetle, and locusts damaged the plants when full grown. After 9 irrigations the crop was harvested between 15.11.43 and 15.12.43. A true picture of the potentiality of the bean was not possible on account of the damage already mentioned.

The average yields for the different sowing dates were:—

Date sown	Average yield per feddan
18.7.43	296 rotls
1.8.43	232 ..
15.8.43	248 ..
30.8.43	512 ..

Gezira Research Farm.

From 1939 onwards a considerable number of importations were made from America and India in an attempt to find a Soya Bean that would be liked by the Sudanese: the black types were obviously unacceptable. Some promising types have been tested for palatability and found acceptable, and trials are now being made to find the best yielding and most palatable variety for the Central Sudan.

Northern Province.

Shendi 1943.

The variety Pusa Black was tried varying the sowing date. The beans were sown on ridges 60 cms apart with 30 cms between

plants. Vegetative growth was excellent, giving a smother crop almost as good as a first class crop of *Dolichos lablab*. The crop was given a total of 10 waterings and harvested between 5th and 11th December. All plots, particularly the early sown ones, yielded a very heavy crop of haulm which was eaten with relish by cattle. The average yields per feddan for the different sowings dates were:

Date sown	Average yield per feddan
28.6.43	1426 rotls
6.7.43	1420 ..
14.7.43	1582 ..
30.7.43	1366 ..

Shendi 1944.

The same variety was tried again in 1944 with the following results:-

Date sown	Date harvested	Average yield per feddan.
10.6.44	4.12.44	678 rotls
25.6.44	4.12.44	964 ..
10.7.44	4.12.44	1449 ..
25.7.44	20.12.44	1215 ..
10.8.44	6. 1.45	458 ..

Kordofan Province—Kadugli.

1940.

An unnamed variety was grown on an observation plot. The results, although not good, indicated further trial.

1941.

The varieties Herman, Sind No.10 and Nagpur 103 were tried. The Herman variety germinated poorly but matured early (maturation period 75 days), producing well filled pods. Plants grew to a height of 2—3 ft. producing round about 40 pods per plant with 2 seeds per pod. The other two varieties germinated well producing strong plants but the pods did not fill properly on account of insufficient rainfall. It was decided not to continue trials of these varieties as they required a greater rainfall than that obtaining in the Western Gebels.

1942.

The Herman variety was tried again without success. It was "now definitely evident that this area was unsuited to any variety of Soya so far tried."

1943.

The Herman variety produced the following result:-

Date sown	Date harvested	Yield
17.6.43	4.9.43	174 rotls
1.7.43	17.9.43	168 ..

The soil was of a light clay loam. The beans were sown on the flat in rows. The seeding rate was 24 rotls per feddan. No diseases or pests of importance were recorded.

1944—1946.

The same variety was purposely grown each year on the same land with increasing yields which supports the theory that unless the correct bacteria are introduced to the soil it is advisable to crop the same area several years in succession to build up the bacterial population.

Dilling

The Herman variety was tried out for one season without success.

Equatoria Province.

Meridi 1938.

The following varieties were grown:

Variety	Yield
Herman	854 rotls per feddan
Barberton Yellow	679
Haberslandt	532
Midwest	581

No details of cultivation etc. are available.

1939.

Results of trials were:-

Variety	Yield on ridge	Yield on flat
Herman	408 rotls/fed.
Barberton Yellow	462
Haberslandt	444
Midwest	492
Nagpur 103	1400	2150 rotls fed.
G. R. F. Black	1350	1580 ..
Pusa Yellow	1200	240 ..
Sind No. 10	1260	370 ..

1940.

More information is available on the trials of 1940. Summarised details are:-

VARIETY.	DESCRIPTION.	Date sown	Date harvested	REMARKS.
Nagpur 103	Spreading type, small black bean ...	May	September	Excellent vegetative growth.
G.R.F. Black Sind No. 10	Upright type, yellow bean " " " " " "	"	"	" More acceptable to natives.
Pusa Yellow	Spreading variety ...	"	November	Excellent vegetative growth.
Haberslandt	Upright variety ...	"	August	--

1941.

The varieties Sind No. 10, G.R.F. Black and Nagpur 103 were sown on two different dates with the following results :-

VARIETY.	Date sown	Date harvested.	Yield	Date sown	Date harvested	Yield
Sind No. 10	20.6.41	25.10.41	1217 r/f	7.7.41	27.11.41	1000 r/f
G.R.F. Black	20.6.41	27.10.41	1480 r/f	7.7.41	29.11.41	1041 r/f
Nagpur 103	20.6.41	4.11.41	1072 r/f	7.7.41	29.11.41	1015 r/f

It is recorded that Sind No. 10 was the most suitable for distribution among the natives. G.R.F. Black, although a heavy yielder, was not popular.

1943.

A plot of Sind No. 10 Soya Bean sown in June and harvested in October yielded 1110 rotls per feddan.

1944.

A propagation plot sown on 2.6.45 and harvested on 3.10.45 yielded 1320 rotls per feddan. The spacing was 50 cms x 80 cms and a note was made to the effect that closer spacing (50 x 50 cms) would be better. The bean was utilised by the S.M.S. hospitals and included in the patients' diets.

1945.

Again the variety Sind No. 10 was grown for supplying the S.M.S. hospitals. The crop was sown on 25th May and harvested during the last week of September. The spacing was 50 x 50 cms and an average yield of 1321 rotls per feddan was obtained.

Kagulu 1940.

The varieties G.R.F. Black, Nagpur 103, Haberslandt, Sind No. 10 and Pusa Yellow were sown at Kagulu on 15th July with the following results:-

Variety	Description of Variety	Yield
G.R.F. Black	Creeping habit with small black flat seed	500 rotls.
Nagpur 103	ditto	500 ..
Haberslandt	Upright with full yellow seed	150 ..
Sind No. 10	Upright with smallish flat yellow seed and many pods	530 ..
Pusa Yellow	Upright with full yellow seed	150 ..

1941.

Only the varieties Sind No. 10 and G.R.F. Black were tried in 1941. They were sown earlier than in 1940 with better results. It was decided that the variety Sind No. 10 was the more attractive to the native and that it would be bulked up and distributed

1943.

Since 1943 the Sind No. 10 variety of Soya has been distributed to the chiefs but it has not caught on widely.

1946.

A local variety (ex Uganda) was tried out. The plants grew to a height of 1 metre giving seed of excellent quality and larger in size than Sind No. 10. It is a tall erect variety with large round yellow seeds taking 3½ to 4½ months to mature. It was grown on ironstone soil varying from deep to shallow. The seeds were broadcast at the rate of 25-30 rotls per feddan. Germination was often low. An average yield of 741 rotls per feddan was realised. The variety showed promise.

Yambio. 1945.

The variety Sind No. 10 was grown varying the sowing date. Results were :-

VARIETY.	Date sown.	Cultivation.	Yield rotls
Sind No. 10	3.7.45	In rows. Spacing 50 x 50 cms.	800
	6.7.45	" As Azande sow groundnuts."	764
	7.7.45	In rows. Spacing 50 x 50 cms.	535
	9 7.45	Broadcast and hood in	690

Juba 1943.

The variety Sind No. 10 was sown on the river plots at Juba at different sowing dates. The best yield obtained was 1020 rotls per feddan with an average in the region of 850 rotls per feddan.

3. What is the Future of Soya Bean in the Sudan.

From the above information it would appear that a measure of success has been attained with the yellow seeded variety Sind No. 10 in the Southern Sudan. This is a palatable bean which is being grown on a small scale for distribution to hospitals in the area. This is a limited demand however, and propaganda among the natives stressing the nutritional value of the bean is necessary to foster its wider cultivation. In the Northern Sudan the black seeded variety Pusa Black has given a satisfactory yield but on grounds of palatability the bean was not accepted by the people. As mentioned above some promising types recently tried out on the G.R.F. have been found palatable but more information is being determined on their relative yields. It is hoped therefore, that in the near future, the best yielding and most palatable variety can be released, possibly to establish itself among the crops of the Sudan. Again one cannot over-emphasise the need for propaganda on the merits of the bean in order to hasten its adoption. The channels for this propaganda are many and the assistance of departments other than our own should be invoked. Then there is the question of growing the bean as a cash crop for export. Enquiries are being made to determine the export value of the crop and its important oil product. A good economic price would probably do more to popularise the bean than its loudly acclaimed nutritional qualities.