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Results of Manurial trials in Madras State on Oilseeds *

by

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Synopsis: A review of the results obtained in the different Agricultural Research Stations on oilseed crops of the Madras State are given in this paper. From the factual presentation made in the paper of the few manurial experiments and after taking into consideration the discussions held at the Fertiliser seminar in 1959 at Coimbatore, general fertiliser recommendations are also made.

This paper forms one of the series of reviews on manurial trials in Madras State for the past fifty years and deals with Oilseed crops. Manurial experiments conducted in Madras State on oilseeds have been comparatively few and were confined to the research stations of Palur and Tindivanam of South Arcot district. Palur has a sandy loamy soil while Tindivanam has a sandy red soil type. Only a brief review of results of manurial trials on (a) groundnut *(Arachis hypogaea)*. (b) gingelly *(Sesamum orientale)* and (c) castor *(Ricinis communis)* are presented. The results of trials conducted on coconut *(Cocos nucifera)* at Pattukottai are also included.

A. GROUNDNUT *(Arachis hypogaea)*

Manurial experiments on this crop were mainly conducted in the earlier years at Palur and later at Tindivanam in South Arcot District. The manurial problem with this crop did not engage attention of the workers in the earlier years. Later however, continuous cultivation of this crop in the same land affected the yield and hence the problem of levels and forms of manures came to be studied.

Response to Ammonium sulphate and Super phosphate: This was tried between the years 1930–'40 at Palur and Tindivanam with 2 Cwt. of ammonium sulphate and 1 Cwt. of super phosphate under irrigated conditions. There was increase in yield of 20 per cent over the control plot yield of 1130 pounds of pods per acre. (8)

Response to superphosphate: At Tindivanam with the application of 2 Cwt. of superphosphate, the response was insignificant. (8)

Response to bone meal: This was tried at Palur for 10 years from 1912 to 1922. The application of 56 pounds of bone meal per acre had no effect under irrigation, the yield being 1936 pounds of pods against no manure control yield of 2470 pounds per acre.

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Response to potassic manures: Potassium sulphate at 1 Cwt. per acre, was applied at Tindivanam. Though there was response to the application of potash the additional yield obtained was not commensurate with the cost of manure used. (8)

Potascheme experiments: In trials conducted by potascheme in South Arcot district in the year 1955–'57, the response to potash at 300 pounds K_2O over N.+P. treatments was 16 per cent (264 pounds) in 1955–'56 and 11 per cent (182 pounds) in 1956–'57. (6)

Response to lime: At Palur between 1912–'22, the application of 112 pounds of burnt shell lime or 140 pounds of powdered shell lime, with the variety local Mauritius, were tried under irrigation. There was no response, the average yield being 2040 pounds of pods and 2165 pounds of pods against the no manure control plot of 2474 pounds of pods. (9)

In a similar experiment in the same place, for a period of five years, during 1917–'22, burnt lime at 52 pounds per acre was applied, under irrigated conditions. The yield difference was not significant, the average yield being 2240 pounds of pods against the no manure plot yield of 2060 pounds. (9)

In a similar experiment, in the same place during 1917–'21 under dry conditions, with 52 pounds of lime per acre, no difference was seen, the yield being 780 pounds of pods against the no manure yield of 800 pounds of pods per acre. (9)

Response to sulphur and calcium sulphate: In trials conducted during the year 1917–22, application of sulphur at 25 pounds or Calcium sulphate at 160 pounds per acre had no significant effect on the yield under irrigation. The yield was 2060 pounds of pods in control plot against 2140 and 2200 pounds in the sulphur and calcium sulphate treated plots respectively.

In a similar experiment in the same place during 1917–'21 under dry conditions, there was no response either to sulphur or calcium sulphate the yields being 790 pounds and 750 pounds of pods against the control yield of 800 pounds per acre (9).

Combination of manures: (1) Phosphoric acid at 42 pounds as super phosphate, Potash at 54 pounds as potassium sulphate and 11 pounds of N. as ammonium sulphate, in combination, with and without basal farm yard manure at 3 tons per acre were tried, at Tindivanam between the years 1937–'40 under an I. C. A. R. scheme. The results indicated significant response to the combination of artificials N+P+K, the increase being 12 per cent over the control which gave an average yield of 950 pounds of pods per acre. The cattle manure at 3 tons per acre did not show any effect on yield. (7)

(2) To find out the optimum and economic dose of phosphoric acid and potash, an experiment was conducted at Tindivanam in the year 1945–'50, superphosphate to supply 20, 40 and 60 pounds of P_2O_5 and potassium sulphate to

supply 25, 50 and 75 pounds of K_2O were applied and compared. It was found that higher doses of phosphoric acid (40 and 60 pounds P_2O_5 per acre) and potash (50 and 75 pounds K_2O per acre) over basal dressing of cattle manure gave the best results. (7)

Manure mixture with three placemcnts: During the years 1954–'60 manure mixtures were tried at Tindivanam to determine the effects of complete fertiliser and the best method of application. Two manure mixures, one with 10 pounds N+20 pounds P_2O_5+50 pounds K_2O and the second with 20 pounds N+30 pounds P_2O_5+50 pounds K_2O were compared with three methods of application namely, (1) broadcast (2) side placement and (3) placement below seed.

There was no difference between the manure mixtures and the mode of application. (4)

Response to farm yard manure: This was tried at Tindivanam in the years 1957–'60 with 5 tons of farm yard manure under irrigated condition. Though the yield was more than the control, it was not significant. (4)

In an earlier experiment, also conducted at Tindivanam, between the years 1930–'40, basal application of 3 tons of farm yard manure did not show any effect on the yield.

Substitution of farm yard manure with groundnut cake: To investigate the possibility of substituting groundnut cake for farm yard manure, an experiment was conducted, on rainfed crop at Tindivanam in the years 1946–'48 with the following treatments, the quantity being based on equal money value.

Groundnut cake at 200 pounds, tank silt at 20 cart loads, town rubbish at 500 pounds per acre.

They were compared with farm yard manure at 5000 pounds per acre.

There was no significant increase in yield, although farm yard manure and groundnut cake recorded 10 per cent increased yield over control.

Response to groundnut shell, haulms and cake: To find out the comparative response to groundnut shell, haulms and cake an experiment was conducted in the years 1912–'22 at Palur under rainfed condition. All the quantity got from the field as haulms, shell and cake were applied. There was no response due to treatment. (9)

Residual effects of manure applied to previous crop on groundnut: No manure was applied to the groundnut crop, but the previous *cholam* crop was treated with N at 0, 20 and 40 pounds as ammonium sulphate, P_2O_5 at 0, 20 and 40 pounds as superphosphate and K_2O at 0, 20 and 40 pounds as muriate of potash under irrigated condition with and without a basal dose of 5000 pounds of farm yard manure. This experiment was done under the Model Agronomic Experiments at Bhavanisagar in Coimbatore district. (5) On the study of

residual effects, it was found that a maximum yield of 1981 pounds of pods per acre was recorded by the treatment 40 pounds P_2O_5 alone with an increase of 199·3 per cent over the control (no manure) plot yield of 994 pounds per acre. The next best yield was obtained by 40 pounds P_2O_5+20 pounds N+40 pounds K_2O. (5).

Thus from the few experiments that have been carried out on groundnut, there were indications to show that N+K may be beneficial to the groundnut crop and the applications of cattle manure, lime, sulphur and calcium sulphate did not prove to be necessary under the condition of the experiment.

B. GINGELLY *(Sesamum orientale)*.

Ammonium sulphate compared to chilean nitrate: At Tindivanam, in the years 1954 to 1956 ammonium sulphate at 30 and 45 pounds N was compared under irrigated condition with chilean nitrate on equal nitrogen basis over a basal dressing of superphosphate to supply 30 pounds P_2O_5 and 3 tons of farm yard manure.

Though there was difference in growth, flowering and fruiting in favour of ammonium sulphate, the yield differences were not significant. (2)

Combination of manures: Ammonium sulphate, super phosphate and potassium sulphate were applied alone and in combination at Tindivanam in 1958–'59. N at 30 lb., P_2O_5 and K_2O each at 20 lb. per acre singly and in combination over a basal dressing of cattle manure at 2½ tons per acre were applied under irrigated condition. The results indicate that combination of P and K was found to be better than either of them applied alone over a basal dressing of cattle manure. It can therefore, be concluded that combination of N, P, and K gave maximum response than when either of them applied alone.

C. CASTOR *(Ricinis communis)*.

Response to N, P and K: This was tried at Tindivanam in the year 1954–'56 to find out the effect of ammonium sulphate, super phosphate and potassium sulphate either singly or in combination to supply 30 pounds N, 20 pounds P_2O_5 and 30 pounds K_2O over a basal dressing of 5 cart loads of cattle manure.

N, NP, NK and NPK were reported to be superior to control both singly and in combination, the response being 17·9 per cent to 99·8 per cent over control.

The residual effect of manures applied in the previous season was studied. The yield differences in manurial plots were significantly superior to the control.

D. COCONUT *(Cocos nucifera)*.

Manurial experiments on coconut were confined to the Agricultural Research Station at Pattukottai in Tanjavur District.

Ammonium sulphate compared to groundnut cake: This was tried for a period of 4 years between 1942–'46 to compare the effects of ammonium sulphate and groundnut cake. Three pounds of ammonium sulphate per tree was compared to 9 pounds of groundnut cake. There was no difference in the yield of nuts. (1)

Ammonium sulphate compared with farm yard manure in combination with ash: This was compared at Pattukottai in the year 1932–'37 on equal nitrogen basis to supply 0·6 pounds N per tree along with 20 pounds of ash. The dose of 3 pounds ammonium sulphate plus 20 pounds of ash per tree was found to be the best. (7)

Ammonium sulphate–Optimum dose: In an experiment conducted in 1938–'46 at Pattukottai, when different doses of 1½ pounds, 3 pounds and 4½ pounds of ammonium sulphate per tree were applied, the maximum yield was obtained when 4½ pounds was applied (1). But in an earlier experiment conducted in the same place between 1922–'32, it was found that 3 pounds of ammonium sulphate alone had no beneficial effect and it had to be mixed with 20 pounds of ash to have maximum benefit. (9).

Potash manures: Ash compared to potassium chloride: This was compared in 1951–'56, with a view to replace ash with potassium chloride on equal K_2O basis, that is, 20 pounds ash was compared with 1½ pounds potassium chloride. There was no significant difference and hence ash can be replaced by potassium chloride in places where ash may not be easily available. (2)

Ash compared to potassium sulphate: This was compared in 1938–'46. There was no significant difference between the two, 1½ pounds of potassium sulphate can be substituted for 20 pounds of ash when ash is not available. (7)

Green manures: In an experiment conducted in 1948–'49 on the suitability of green manure as a cover crop in coconut fields, it was found that *Calopagonium mucunoides*, was the best compared to *kolingi (Tephrosia purpurea)* and sunnhemp *(crotolaria juncea)*. (1)

Methods of application of manures: Broadcasting vs. pitting: Application of manures in trenches around the trees and broadcasting and ploughing in the entire garden, were compared. Application of manure by broadcasting and ploughing in, was found to be the best.

Broadcasting vs. trenching: This was tried between the years 1938–'46 with ammonium sulphate at 3 pounds, farm yard manure at 100 pounds and ash at 20 pounds per tree, broadcasted and applied in trenches. The result indicated no difference between the two methods. Broadcasting method was however considered cheaper. (1)

Summary: The results of manurial experiments conducted on oilseeds in Madras for the last 50 years are reviewed in this paper. The Table I gives a summary of the results.

TABLE I.

Crop	Place	No. expt	Bulky: Manures tried	Bulky: Dose	N as	P as	K as	Combination of N+P+K	Other nutrients tried	Conclusions
Groundnut	Palur & Tindivanam	23	Farm yard manure Groundnut shell	5 tons The quantity obtained from the field itself.	Ammonium Sulphate 20 lb. to 30 lb. N/ac.	Superphosphate and bone meal to supply up to 50 lb. of P_2O_5/ac.	Potassium sulphate to supply 50 lb. of K_2O.	20 to 30 lb. of N, 60 lb. of P_2O_5 & 50 lb. of K_2O.	Lime 56 lb. of burnt limesulphur 25 lb. Cal. Sulphate 100 lb/ac.	**Groundnut :** 1. There was no response to the application N and P_2O_5. K has increased yield but not commensurate with the expenditure involved. 2. No response to limo, sulphur & calcium sulphate. 3. Combination of N, P + K gave better yield. *General recommendations :* Rainfed crop — N 10, P_2O_5 20, K_2O 30 Groundnut (Irrigated and over 30" of rainfall) — N 15, P_2O_5 30, K_2O 45
Gingelly	do.	6			Ammonium Sulphate and chilian Nitrate 30 to 45 lb. N.			30 lb. N 20 lb. P & 20 lb. K+ 2½ tons Farm Yard manure.		**Gingelly :** Between Ammonium sulphate and chilean nitrate there was no difference. *General recommendations :* Combination of N, P, K has given better yield than applied individually.
Castor	do.	3			Ammonium Sulphate 30 lb. N/ac.	Superphosphate 20lb. P_2O_5/ac.	Potash 30 lb. K_2O/ac.	N P K 20, 20, 30 + 5 cartloads of FYM.		**Castor :** Combination was superior to control and the individual nutrients applied singly.
Coconut	Pattukottai	5 years	Green manure Calapogonium grown *in situ*.		Ammonium Sulphate 1½ to 4½ lb.		Potash as ash 20 lb. to supply 0·6 lb. of K_2O and Potassium chloride to supply 0·6 lb. of K_2O	Applied in combination.		1. 4½ lb. of Ammonium sulphate + 20 lb. ash gave maximum yield of nut per tree. Ash or potassium chloride or Potassium Sulphate to supply 0·6 lb. K_2O per tree gave the same response. 2. Calapagonium gave the best response.

The following general recommendations are made :—

	N (lb.)	P_2O_5 (lb.)	K_2O (lb.)
Groundnut — Rainfed ...	10	20	30
Groundnut — Irrigated and in places over 30" rainfall ...	15	30	45
Gingelly and Castor — ...	(5 tons of farm yard manure or compost)		
Coconut ...	0·6	0·6	1·2
	(per tree over a basal dressing of 100 pounds of greenleaf per tree)		

No response to lime, sulphur and calcium sulphate was seen on groundnut in the experiments reviewed in this paper. Combination of N plus P plus K gave better yields than when applied alone in the case of groundnut, gingelly and castor. There was no difference in the response to different methods of placement of fertilisers in groundnut.

Residual effect of manure applied to the previous crop was seen in the case of groundnut and castor. Application of $4\frac{1}{2}$ pounds of ammonium sulphate and 20 pounds of wood ash per tree gave maximum number of nuts in coconuts.

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