

Results of Manurial Trials in Madras State on Millets Part II—*Ragi*, *Samai* and *Pani Varagu*

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Synopsis: This article forms the second part of the review of manurial experiments carried out in the Madras State on millets. Experiments on *Samai* (*Panicum miliare*) was confined to Nanjanad in the Nilgiris while the experiments on other millets were done primarily in the Agricultural Research Stations at Coimbatore, Kovilpatti and Palur.

Ragi (*Eleusine coracana*): *Ragi* is usually grown under irrigated conditions and the experiments mentioned below were carried under irrigated conditions only.

Nitrogenous Manures: *Ammonium sulphate compared to Chilean nitrate*: This was compared at the Agricultural Research Station, Palur in the years 1954—'56, applied alone or over a basal dressing of farm yard manure. Ammonium sulphate was found better (2).

Sodium nitrate (containing 15 per cent N): This was tried at Central farm, Coimbatore by applying one cwt of sodium nitrate during the years 1909 to 1913. The additional yield obtained was only 2.1 per cent over the no manure plot, which gave 2030 lb of grain per acre (10).

Ammonium phosphate (containing 10 per cent N and 60 per cent P_2O_5): This was tried at the Agricultural Research Station, Palur, between the years 1930—'40 with the variety *Perum ragi* by applying one cwt per acre, over a basal dressing of five cart loads of farm yard manure. An additional yield of 31 per cent over control (farm yard manure at five cart loads per acre) was obtained (9).

Calcium cyanamide (containing 20 per cent N): This was tried at the Central Farm, Coimbatore, in the years 1919 to 1922. Calcium cyanamide at 20 lb N was compared to no-manure plot. Though the yield (2440 lb) was slightly more than the control (2380 lb), it was not significant (10). But in a similar experiment conducted between the years 1925—'30 for a period of five years, calcium cyanamide at 38 lb N level had given additional significant yield of 17.6 per cent over the control yield of 1650 lb of grain per acre (10).

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Calcium cyanamide and bone-meal: This was tried at the Central Farm, Coimbatore for four years during 1924 to 1928. Calcium cyanamide at 224 lb along with bone-meal at 500 lb was compared with bone-meal at 500 lb alone with and without a basal application of two tons of farm yard manure. There was an increase of 19.3 per cent yield of grain over the yield of bone-meal plot of 1400 lb (10). So it is clear that *ragi* responds well to nitrogenous manures and that ammonium sulphate seems to be the best among the fertilisers tried.

Phosphatic Manures: Super phosphate: This was tried for five years from 1925 to 1930 at the Central Farm, Coimbatore, by the application of three cwt of super phosphate. There was no response. But when cyanamide was added along with super-phosphate at one and two cwt per acre, significant response was seen as compared to super phosphate alone.

In a similar experiment conducted from 1954 to 1956 at the Agricultural Research Station, Palur, a response of 18 per cent additional yield was obtained (10).

Bone-meal: This was tried at Agricultural Research Station, Palur, for ten years between the years 1912—'22. Bone-meal was applied at 56 lb per acre. There was no response, the average yield being 970 lb as compared to no-manure plot yield of 900 lb (10). Thus, it will be seen that the response for phosphoric acid is seen in *ragi* only when applied along with nitrogenous fertilisers.

Potassic Manures: Potassium chloride: This was tried at Central Farm, Coimbatore, from 1909 to 1913 along with sodium nitrate and super phosphate separately and in combination at one cwt per acre. There was no response due to potash application (10).

Potash experiments: In the potash experiments conducted between the years 1955—'57 in 24 trials in South Arcot district, response to an extent of 10 to 14 per cent were obtained by N plus P plus K plots over N plus P plots (7). Thus potash seems to be essential for *ragi* crop in sandy loamy soils as in South Arcot district.

Lime: This was tried at the Agricultural Research Station, Palur between the years 1912 to 1922 with shell lime (burnt and powdered) at 56 and 140 lb per acre with and without cattle manure at 20 cart loads. There was no response to the application of lime.

Bulky Organic Manures: Response of farm yard manure prepared under different systems: This was done at Central Farm, Coimbatore, in the

years 1929—'30. Farm yard manure at five tons prepared under (a) loose box system, (b) loose box without dung but added with 500 lb ash and 160 lb groundnut cake were compared on equal N basis.

There was response of eight per cent in (c), seven per cent in (a) and five per cent in (b) over no-manure yield of 2190 lb of grain (10).

In another experiment conducted at Central Farm, Coimbatore, in the years 1928—'30, the residual effects of different types of farm yard manure (a) loose box, (b) urine soaked silt and (c) urine soaked silt with groundnut cake were compared. There was significant response over no manure control plot; but between the treatments there was no difference in their residual effect (10).

Farm yard manure compared to night soil compost: This was compared at the Central Farm, Coimbatore, in the year 1946—'47 at the levels of 5, 10, and 15 tons per acre. No significant difference for the different doses were seen (1).

Farm yard manure compared to compost: In an experiment conducted at the Central Farm, Coimbatore, in the years 1928—'31, farm yard manure was compared to compost at the level of five tons per acre. There was no difference, the yield being 2360 lb in no-manure plot as compared to 2410 and 2460 lb under manured plots.

The residual effects, were also not significant where the *ragi* crop was followed by cotton and *chulam* crops (10).

Farm yard manure compared to compost prepared by Indore method: In an experiment conducted at the Agricultural Research Station, Palur between the years 1930—'40 the response of 'Indore' compost was compared to farm yard manure on equal nitrogen basis to supply 80 lb N. There was significant response to compost with 53 per cent additional yield over no manure plot (1540 lb grain) and 16 per cent additional yield over farm yard manure plot (9).

Combination of manure: In the experiments conducted in the permanent manurial experiments (old and new) at Central Farm, Coimbatore, results of crops of *ragi* raised in different years indicated the response as follows. (The different levels of manure applied were ammonium sulphate—1 cwt; potassium sulphate—1 cwt and super phosphate—3 cwt.)

In the case of old permanent manurial experiment, N plus P plus K gave the maximum response followed by N plus P treatments. In the case of new permanent manurial experiment, both N plus P plus K and N plus P treatments gave equally good response followed by N plus K treatment (10).

Thus, it can be seen that *ragi* crop requires not only nitrogen, but also phosphate for proper growth and yield. Potash also seems to be essential for *ragi* crop.

Samai [*Panicum miliare*] : This is a crop usually grown under dry conditions in poor soils. The experiments conducted on *samai* were mainly confined to the Agricultural Research Station at Nanjanad in the Nilgiris district, where it is raised as a rainfed crop, in rotation with potato.

Ammonium sulphate compared to niciphos and Nanjanad mixture : This was compared between the years 1930—40 as a mixture with one cwt of ammonium sulphate plus $1\frac{1}{2}$ cwt of niciphos with three cwt of Nanjanad mixture. There was no difference between the two, though both have given an additional yield of 12 per cent and 15 per cent over no-manure plot yield of 783 lb grain (9; 10).

Green manure application : Lupin (*Lupinus angustifolius*) as green manure crop was applied at three different stages of flowering, pod forming, and at mature stage for incorporation. The incorporation in the flowering stage had given 850 lb of grain, as compared to 720 lb in pod forming stage and 460 lb in the mature stage (9; 10).

Method of application of ammonium sulphate : Drilling of ammonium sulphate was compared to broadcast method and covering with monsoon plough. The method of drilling the fertiliser was found to be better (9; 10).

Residual effects of manure applied to the preceding potato crop : This was tested between the years 1930—'40. A yield of 960 lb of *samai* grain was obtained from the residual plots of the main crop of potato which was treated with inorganic fertilisers, farm yard manure and lime as against 645 lb of *samai* grain in the plots treated with inorganic fertilisers only for the main potato crop. Similar results were obtained when *samai* was followed after second crop potato also (9; 10).

Pani Varagu [*Panicum miliaceum*] : *Panivaragu* is grown usually as a dry land crop in the cold season.

Combination of manures : In the new permanent manurial plots in the years 1930—'40, farm yard manure gave increase of 23 per cent over the control plot of no-manure. Other treatments comprising of inorganic fertilisers namely ammonium sulphate, super phosphate and potassium sulphate individually and in combination with a basal dressing of cattle manure did not show any response except ammonium sulphate alone which gave an increase of 19 per cent over the control (9).

In the case of old permanent manurial plots conducted between the years 1930—'40 maximum response was in the case of N plus P plots followed closely by K plus P plots and farm yard manure plots, all yielding 400 per cent over the no-manure plot (101 lb of grain per acre). The other treatment had given increased yields ranging from 23 per cent to 196 per cent (9).

In the case of other minor millets, no experimental work was carried out.

Summary: A review of manurial experiments carried out in the Agricultural Research Station on *ragi*, *samai* and *pani varagu* for the past half a century is presented. These experiments which are reviewed were mainly confined to the Research Stations at Coimbatore, Kovilpatti, Palur and Nanjanad (The Nilgiris):

1. *Ragi (Eleusine coracana)* :

- (a) Nitrogenous: Ammonium sulphate, chilean nitrate, ammonium phosphate and calcium cyanamide.
- (b) Phosphate: Superphosphate and bone-meal.
- (c) Potassic: Potassium sulphate and potassium chloride.
- (d) Other nutrients—Lime

2. *Samai (Panicum miliare)* :

- 1. Ammonium sulphate, niciphos, Nanjanad mixture and green manure.

3. *Pani varagu (Panicum miliaceum)* :

Ammonium sulphate, superphosphate and potassium chloride in the permanent manurial experiments.

Though it may not be possible to fix a definite manurial schedule for these millets, the following general recommendations can be made.

<i>Irrigated:</i>	FYM	N	P ₂ O ₅	K ₂ O (per acre)
Ragi	5 tons	40	20	20

Rainfed:

Less than 30"

rainfall 5 tons Residual effect of fertilizers supplied to the previous crop would suffice.

Over 30"

rainfall 5 tons 30 20 ...

Ammonium sulphate seems to be the best form as nitrogen supplier. Response to phosphatic fertilizers is more when combined with nitrogenous ones. Residual effects of the manure applied to the previous crop is generally seen for millets. A combination of manures is the best for obtaining maximum response.

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