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Influence of Ammonium Sulphate on Rainfed X3 *Cumbu* and K6 Cotton*

by

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Synopsis: In this paper the need for application of nitrogen to the rainfed crops of *cumbu* and cotton in the black cotton soils of Madras State is stressed. The experiment conducted at Koilpatti during 1961—'62 and 1962—'63 indicated that application of 20 lb of nitrogen in the form of ammonium sulphate over a basal dressing of 5 tons of compost per acre increased the yield upto 23 per cent in cotton and 60 per cent in *cumbu*.

Introduction: *Cumbu* and cotton are the two important crops of the black soil region in the Southern districts of Ramanathapuram, Madurai and Tirunelveli occupying about four lakhs of acres. Both cotton and *cumbu* when continuously cropped deplete the soil to a great extent. An average crop of rainfed cotton in India takes away from the soil about 23 lb of nitrogen, 18 lb of phosphoric acid and 78 lb of potash (Sawhney and Sikka, (1960). Unless this annual loss is periodically replenished the yield of the crops is bound to slide down year by year. Application of adequate organic matter is useful in the rainfed areas but required quantities are not readily available. Hence there is need for use of chemical fertilizers.

Previous work: Originally the use of fertilizers for rainfed crop was considered impracticable as it was thought that it would injure the crop and would also be uneconomical. At the Agricultural Research Station, Kovilpatti it was definitely established that cotton responded to direct application of nitrogenous manures whether organic or inorganic (*Anon*, 1954). It was also established elsewhere, by numerous manurial trials in cotton that application of nitrogen alone was essential for increasing the yield while phosphoric acid and potassium produced no beneficial results except in isolated localities in different tracts (*Anon*, 1954). In the case of *cumbu* also, it was reported that an increase in the dose of nitrogen resulted in a marked increase in the size of vegetative characters as also length and width of ear (Krishnaswamy, 1961). Kanitkar (1960), in dryland farming, found manuring necessary to maintain the fertility and better physical condition of the eroded lands of South India.

Materials and Methods: To formulate a regimen of agronomic practices ideally suited to rainfed cotton and *cumbu* in the black soil tract of Tirunelveli district in Madras State trials were conducted scattered in ten centres in the

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district. The new cotton strain, K6 was raised with 20 lb nitrogen per acre as ammonium sulphate over a basal dressing of five tons of compost compared to K2 cotton raised with sheep penning alone at the rate of 1,000 sheep per acre. Ammonium sulphate was broadcast just before sowing the seeds and then covered. The hybrid *cumbu*, X3 was raised with 20 lb nitrogen per acre as ammonium sulphate over a basal dressing of five tons of compost and compared to local *cumbu* grown with five tons of compost alone. Each plot was 1·25 acres and an area of 50 cents in the centre was harvested for study. The trials were conducted for three seasons.

Results and Discussion: (i) *Cotton:* The varietal-cum-manurial trials, except in the first year (when the season was unfavourable) showed clearly the advantages of ammonium sulphate to rainfed cotton. In the second year, seven out of ten centres recorded higher yields and the mean increase in the yield of *kapas* was 11·15 per cent over the local method. However, this did not stand the statistical test though a 22 per cent increase in the money value was obtained giving statistical significance. But in the third season, eight out of ten centres recorded higher yields for ammonium sulphate giving 28 per cent increase showing statistical significance. In the money value too, there was 35·96 per cent increase for the fertilizer treated plots. It is, therefore, advantageous to manure rainfed cotton with 20 lb N as ammonium sulphate. The mean yield of ten centres for the three years is furnished below:

Mean yield of kapas in kg/ha for ten centres

1960—'61		1961—'62		1962—'63	
Sheep penned on K2	20 lb N as ammonium sulphate on K6	Sheep penned on K2	20 lb N as ammonium sulphate on K6	Sheep penned on K2	20 lb N as ammonium sulphate on K6
347	310	313	349	355	455·50

In the cotton varietal-cum-manurial trial, application of ammonium sulphate proved beneficial and there was no soil and plant injury affecting the yield. (*Vide* Table I.)

TABLE I.

Particulars	Improved method	Local method	S. E.	C. D.	Whether significant
1961—'62					
Kapas yield in kg/ha	348·50	312·50	32·785	104·785	No
Kapas yield as per cent on control	111·15	100			

TABLE I. (*Contd.*)

Particulars	Improved method	Local method	S. E.	C. D.	Whether significant
Money value in Rs./ha	564·00	462·5	23·70	75·80*	Yes
Money value as per cent on control	122	100			
1962—'63					
Kapas yield in kg/ha	455·50	355·80	20.99	67·45†	Yes
Kapas yield as per cent on control	128	100			
Money valve in Rs./ha	675·50	493·50	54·20	173·40*	Yes
Money value as per cent on control	136·9	100			

* Significant at P = ·05 level

† Significant at P = ·01 level

(ii) *Cumbu:* The experiments revealed the superiority of rainfed X3 *cumbu* and its suitability for large scale cultivation. In the first year, six out of seven centres produced higher yields while in the second and third years all the ten centres recorded higher yields for X3-ammonium sulphate plots, thus clearly proving beyond doubt, its usefulness.

In the first year, there was a 20 per cent increase in mean yield over the untreated plot while in the second and third years the mean increase shot upto 38 per cent and 60 per cent respectively. In the money value too, there was a 34·5 per cent and 46 per cent increase in the second and third years and in these two years the results were statistically significant, both for yield and money value. The mean yield of ten centres for the three seasons is furnished below:

Mean yield of cumbu in kg/ha for ten centres

1960—'61		1961—'62		1962—'63	
Local with Compost	Ammonium sulphate on X3	Local with Compost	Ammonium sulphate on X3	Local with Compost	Ammonium sulphate on X3
285	344	452	623	292	467

The germination of X3 *cumbu* was earlier by two to three days and also matured earlier by about a week.

In the *cumbu* varietal-cum-manurial trial not only the yield but also the economics were very encouraging. (*Vide* Table II.)

TABLE II.

Particulars	Improved method	Local Method	S. E.	C. D.	Whether significant
1961—'62					
Grain yield in kg/ha	622·50	451·75	30·00	95·80 †	Yes
Grain yield as per cent on control	138	100			
Money value in Rs./ha	216·05	160·75	7.685	22·58 †	Yes
Money value as per cent on control	134·5	100			
1962—'63					
Grain yield in kg/ha	477.75	292·25	23·304	71·35 †	Yes
Grain yield as per cent on control	160	100			
Money value in Rs./ha	188	129	5·120	20·145 †	Yes
Money value as per cent on control	146·1	100			

† Significant at 1 per cent level

The experiments clearly showed that by using an improved strain and fertilizing the crop at 20 lb nitrogen per acre, yields of rainfed cotton and *cumbu* in black soils could be increased appreciably.

It was all these years contented that application of fertilizers will not be useful for rainfed crops and may even be injurious. The rotation followed was cotton-*cumbu*. The present fertilizer experiments were conducted in the same plot and continuous cropping of cotton and *cumbu* with application of ammonium sulphate for three seasons have shown no ill effects and on the other hand has proved its usefulness.

Application with ammonium sulphate at 20 lb N per acre costs only about Rs. 75/- to Rs. 125/- in cotton and from Rs. 7/- to Rs. 30/- in *cumbu*.

(iii) *Effect on Mixed Crops:* Usually in the black soil tract, neither cotton nor *cumbu* is cultivated alone. The usual mixture is black gram for cotton and green gram for *cumbu*. The effect of the application of ammonium sulphate has indirectly benefited these crops, resulting in higher yields. (*Vide* Table III).

TABLE III.

Mean yield in kg/hectare for ten centres

Black gram with Cotton

1961—'62		1962—'63		Grand mean		
Local with sheep penned plot	K6+ Ammonium sulphate plot	Local with sheep penned plot	K6+ Ammonium sulphate plot	Local with sheep penned plot	K6+ Ammonium sulphate plot	Increase %
93	122	75	95	84	109	30

Green gram with Cumbu

1961—'62		1962—'63		Grand Mean		
Local with compost plot	X-3+ Ammosulphate plot	Local with compost plot	X-3+ Ammonium sulphate plot	Local with compost plot	X-3+ Ammonium sulphate plot	Increase %
37	42	32	42	35	42	20

Conclusions and Summary: The fertilizer experiments not only disproved the myth of fertilizer injury to rainfed crops but also conclusively indicated that increased yields upto 23 per cent in cotton and 60 per cent in *cumbu* can be achieved by raising the departmental strains and fertilizing them with 20 lb nitrogen per acre over 5 tons of compost, in the black soils of Tirunelveli tract. The black gram or green gram which is sown as a mixed crop is also benefited and give higher returns.

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