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Manurial Trials with Ammonium Sulphate on Ryots' Fields in the Madras State

By

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Various experiments on rice or paddy at many of the research stations have shown that ammonium sulphate as a manure for paddy has been efficacious and the increases obtained varied from 10 to 30 per cent depending upon the locality and the dosages of ammonium sulphate. Most of the experiments have also shown that the best results with ammonium sulphate are obtained when it is applied some time after planting, i. e. 3 to 4 weeks in the case of short duration varieties and 4 to 6 weeks in the case of medium and long duration rices. With the pressing need for increasing the production of rice, the quickest and surest way would appear to be the use of this manure to the rice crop where irrigation facilities exist. To estimate exactly what percentage of increase of yield ammonium sulphate would give and also to serve as demonstration to other ryots, experiments were started with the application of ammonium sulphate on ryots fields in this State.

Location of Experiments: The experiments were conducted in the several paddy growing taluks in the districts where there are more or less secure irrigation facilities in the official year 1950—'51 as shown below:

District	Taluks and number of experiments (within brackets) in each taluk	Total number of experiments in the district
East Godavary	Peddapuram (9), Pithapuram (7), Rajamundry (6), Amalapuram (8), Ramachandrapuram (6), Kothapeta (7), Rajole (8), Kakinada (6), Tuni (8)	65
West Godavary	Elluru (6), Tadepalligudem (8), Tanuku (8), Bhimavaram (8), Kovvur (5), Narasapur (8)	43
Krishna	Masula (8), Avanigadda (8), Bezwada (5), Gudivada (7), Kaikalur (8)	36
Guntur	Repalle (8)	8
Nellore	Nellore (8), Kovur (8)	16
Madura	Madura (7), Melur (8) Uttamapalayam (3), Periakulam (1)	19
Tanjore	Kumbakonam (8), Pappanasam (7) Nannilam (8), Sirkali (9) Tanjore (7), Kodavasal (3)	42
Pattukottai	Pattukottai (7), Tiruturaipoondi (8)	15
Tiruchirappalli	Lalgudi (8), Tiruchirappalli (8), Kulitalai (8), Karur (4), Musiri (7)	35
Tirunelveli	Tirunelveli (8), Ambasamudram (8) Srivaikuntam, (8), Tiruchendoor (4)	28

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The actual centres of the experiment in each taluk were selected by the District Agricultural Officers concerned. As the object of the experiment was to assess the possible increased yield resulting from the use of ammonium sulphate and not the gross yields, strict randomisation was not adopted.

Treatments: (i) It was thought adequate if two stages of application after planting are considered. This is borne out from a knowledge of a method of nutrition of the paddy plant. For the short duration paddy, 3 weeks and 5 weeks after transplanting were the stages of application and for medium and long duration varieties (Sarva and Samba) the times of application were 4 and 6 weeks after planting.

(ii) Two dosages of ammonium sulphate, i. e. 100 lb. and 150 lb. per acre were included in the experiment. The former is one that is being recommended at present and 150 lb., the higher dosage for such people as could afford it if the increased yield obtained is encouraging. Also two times of application, 3 weeks and 5 weeks for short duration and 4 weeks and 6 weeks for long duration were adopted. The intended trials on the short duration Kuruvai crop could not be laid out as the season for application of the manures was long past by the time the scheme was sanctioned.

Size of the experimental plot: As the soil heterogeneity in most of the cultivators' fields is larger than on a research station, 10 cent plots were fixed up for each treatment from which five cents were harvested for yield purposes.

Growth and harvests: The progress of the experiments was now and then studied and special features were noted in the experiment area which might vitiate the results. Such of the plots, which showed excessive variation due to differential rat attack, weediness, want of timely irrigations, etc., were eliminated from the computation of results. All data on the basal dressing of manure, if any, that was applied, the date of planting, etc., and the variety used were gathered. The weights of the produce, both grain and straw from the 5 cents of each treatment were gathered by the Agricultural Demonstrators who were in direct charge of the experiments and these results were analysed by the Paddy Specialist.

Analysis of results: As the original idea of the experiment was to gather the increase of yield that ammonium sulphate would confer under conditions obtaining in the ryots' fields, the yields were recalculated as percentages of the controls, under each time of application and these percentages were statistically analysed. As in most cases two separate fields were taken for each time of application of the manure, these fields were taken as separate series and the control in each of them was taken for that field for calculation of percentages.

It may be mentioned that in some experiments the straw weights were recorded when the straw is totally green resulting in a very high yield. It was therefore found not possible to get at the actual yields of straw. It was found that by the application of ammonium sulphate, straw yield increased from 8 to 30 per cent. In some cases, the weights were of the wet straw. These increased yields in straw were however, not taken into consideration for commenting the economics of the treatments. This extra gain could be set off against the extra labour that would be involved in the spacing of the manure and the additional harvesting charges due to the increased crop production. Only the average percentage of increase of straw in each district is given in statement III.

It was found that the 6 weeks application followed more or less the trend of the results of the 4 weeks application. Hence only the grain yields of the 4 weeks application were statistically analysed taking the villages as replications.

In most of the taluks there were 7 to 8 experiments under each time of application and these were taken as separate replications and the results were analysed statistically for each taluk as one stratum. It was found that the general effect of ammonium sulphate application was significant by the 'Z' test at all taluks except Tirunelveli and Kodavasal. The results of the analysis of grain yields are set out in statement I talukwar. The average increase for the district was weighted where there are different number of plots in the taluks.

The following are brief comments districtwise on the results of the experiment:

East Godavary: Application of 100 lb. of ammonium sulphate (20 lb. of Nitrogen), 4 weeks after planting resulted in increases in the several taluks varying from 6·9 percent in Pitapuram to 21 percent in Tuni. The average increase for the district is 13 percent over control. By an application of 150 lb. of ammonium sulphate (to give about 30 lb. N) there was an increase of 18 percent over control. Though it may not be very correct to estimate from these small number of trials the actual increased production, we may at a safe estimate reckon the increase at 300 lb. of grain from 100 lb. ammonium sulphate application and 400 lb. for 150 lb. application. It may be pointed out that the control plots yield about 2500 lb. per acre including the tank-fed areas of Tuni and Pithapuram. Thus, though the increased percentage is about 15 and 18 by the applications of 100 lb. and 150 lb. of ammonium sulphate, the increased production is fairly high. Most of the ryots in this district manure their lands either with cattle manure or some leaf. It may be mentioned that application of ammonium sulphate 6 weeks after planting has secured slightly less increases and hence for this district application of ammonium sulphate 30 days after planting is the best stage.

West Godavary: In most of the villages, the treatments included application of 80 to 100 lb. of ammonium sulphate and hence they were analysed with no ammonium sulphate and ammonium sulphate as a paired set. The increase of grain by application of ammonium sulphate varied from 12 to 35 percent and the average yield increases in the district was found to be 23·7 percent with a net profit of Rs. 54/- per acre. Most of the areas here are also well cultivated. The application of the artificial manures gave good response even in saline areas. It was also more efficacious in sandy and loamy types than on the stiff black clay which usually support a good paddy crop.

Krishna: In this district comparing the 150 lb. and 100 lb. applications it was found that ammonium sulphate at 150 lb. gave slightly higher yields within the critical difference. Application of 100 lb. of ammonium sulphate gave 10 to 32 percent increased yields over 'no ammonium sulphate' control, the average for the district working out to 20·4 percent, equivalent to 460 lb. of grain with a profit of Rs. 41/- per acre. It was found that application of manure four weeks after planting was better than application at six weeks after planting.

Guntur: The experiments were laid out only in one taluk, Repalle, as in the other taluk, Tenali, planting was done much ahead and the season for application of ammonium sulphate was over by the time the scheme could start. It was found in this taluk that 150 lb. ammonium sulphate had given a significantly higher yield than 100 lb. application. Application of 150 lb. sulphate gave 25 percent increase in yield equivalent to 600 lb. while 100 lb. gave 15 percent increase corresponding to 350 lb. grain. The soils in this taluk are loamy to sandy and the fertility is not as high as in other parts of the Krishna delta. Thus for this taluk, 150 lb. dosage of ammonium sulphate may be recommended for application of the sulphate is better done at four weeks after planting than otherwise.

Nellore: In the two delta tuluks, Kovur and Nellore, the experiments were conducted as in other East Coast districts. The application of ammonium sulphate 4 weeks after planting was somewhat superior to '6 weeks after planting' though the difference is only 4 percent. Application of 150 lb. gave increases ranging from 0 to 80 percent and 100 lb. application from 4 to 71 percent (the highest percentage being in the poorer types of soil near the coast). The average increase for 150 lb. application was 21 percent equivalent to 420 lb. of grain while 100 lb. application gave 14 percent increase, equivalent to 270 lb. of grain. In 8 of the 16 villages 150 lb. application gave higher yield than 100 lb. application. The profits were Rs. 17/- for 100 lb. application and Rs. 28/- for 150 lb. application.

Southern districts: Tanjore: The trials were conducted in seven taluks. Due to the very high bunds in the delta it was generally reported

that there was some amount of rat damage in the several experiments and this fact does naturally vitiate the results considerably. It is difficult under the ryots' conditions to estimate such loss and allow for it in the computation. It was also reported that some fields suffered for want of water at the last stages and the yields from them are therefore generally lower than these with fuller supplies. It was also seen that in many of the plots the ryots did not apply any basal dressing of organic matter. This is another feature which sets a limit to the action of ammonium sulphate. Even with the limitations, however, it was found that applications of ammonium sulphate at 100 lb. at 4 weeks after planting secured an increase varying from 7 per cent in Kodavasal (200 lb.) to 26 per cent in Tanjore (450 lb.) with an average increase of 13·5 per cent (270 lb.) over no ammonium sulphate treatment. With 150 lb. application the increases varied from 13 per cent to 36 per cent (620 lb.) over no ammonium sulphate with an average of 23 per cent (460 lb.). Application of ammonium sulphate six weeks after planting did not show much advantage and as a matter of fact 150 lb., four weeks after planting was found to be somewhat better. Valuing the grain and manure at the present rates it was found that 100 lb. ammonium sulphate application four weeks after planting gave Rs. 17/- profit while 150 lb. application secured Rs. 33/-.

Pattukkottai: The new delta in this tract included a large area which has been recently reclaimed. The cultivation here is generally poor. As can be seen from statement I the acre yield of the control plot (where no ammonium sulphate is applied) is only 1630 lb. It was found that 100 lb. of ammonium sulphate applied four weeks after planting gave 12·9 per cent increase (equivalent to 210 lb.) and 150 lb. gave 16·6 per cent increase equivalent to 270 lb.) of grain working out to a profit of Rs. 10/- and Rs. 9/- for the two applications respectively. Ammonium sulphate applied six weeks after planting gave less yields than the 'four weeks application'.

Tiruchirapalli: This is one of the rich areas of the State and the average acre yield of the control itself is as high as 3010 lb. Usually a crop of green manure is raised for the samba areas. One hundred pounds of ammonium sulphate applied four weeks after planting gave an increase of 10·9 per cent (equal to 330 lb.) with a net gain of about Rs. 25/- while 150 lb. application gave a 15 per cent (equal to 450 lb.) with a net gain of Rs. 32/- per acre.

It was found in this district ammonium sulphate applied six weeks after planting gave higher percentage of increase than the application four weeks after planting. 100 lb. of ammonium sulphate when applied six weeks after planting secured 21·3 per cent increase (630 lb.) with a

net gain of about Rs. 32/-. There was no difference in yield between 100 lb. and 150 lb. when applied six weeks after planting.

Madura: The rice area of this district especially that under the Periyar Project is one of the most fertile zones of the State and high yields of rice are recorded. The ryots are usually very painstaking and try to manure the lands with some manure or other. The control plot in this district gave an average acre yield of 2610 lb. It was found that the application of ammonium sulphate four weeks after planting was superior to that applied six weeks after planting. Application of 100 lb. of ammonium sulphate four weeks after planting secured an increased yield of 22·9 per cent over control (equivalent to 600 lb. per acre) with a net gain of Rs. 59/- per acre while, the application of 150 lb. of ammonium sulphate secured a substantial increase of 1100 lb. per acre, i. e. 42 per cent over control, the net gain working out to Rs. 113/-. This might appear somewhat high but considering the soils which are well drained, with good irrigation facilities, the yields might be taken to be normal for the tract.

Tirunelveli: The Tamraparni basin consisting of about half a lakh of acres of double-croped wet land is one of the most fertile of rice zones usually met with. The kar crops give high average yields of 3500–4000 lb. per acre but the second crop harvest is usually not of this magnitude. It was reported that due to the failure of the North-east monsoon during 1950–'51 there was certain amount of drought in the second crop and consequently the yields were affected to some extent. The control (no sulphate) plots gave an average acre yield of 2520 lb. Application of ammonium sulphate of 100 lb. four weeks after planting gave increases varying from 5 to 20 per cent with an average of 12·3 per cent (equivalent to 310 lb.) working out to a net profit of Rs. 22/-. There were no differences in the efficacy of 100 lb. or 150 lb. of ammonium sulphate, the high dose giving a less economic return. It was also found in this district that the applicaiton of ammonium sulphate at six weeks after planting was better than four weeks; the 100 lb. application at six weeks gave a net return of Rs. 37/- and 150 lb. a net return of Rs. 25/-.

Conclusion: A perusal of the statement shows that in general, ammonium sulphate applied four weeks after planting at a dosage of 100 lb. is efficacious securing at least an increased yield of 259 lb. of grain per acre. In certain districts 100 lb. was quite optimum and efficacious as it gave as good and sometimes higher returns than 150 lb. As a general practice, 100 lb. of ammonium sulphate to be applied four weeks after planting over some basal dressing of organic matter, if it could be secured, may safely be recommended. If funds permit, 150 lb. of sulphate can also be applied but this may depend upon the inherent fertility of the field, the nature of soil; etc. This higher dosage is more effictive on lighter soils than on heavier types.

STATEMENT No. I.

Results of application of Ammonium sulphate on ryots' field four weeks after planting

District	Acre yield of control plot	100 lb. Ammonium sulphate			150 lb. Ammonium sulphate		
		Increase		Profit for acre	Increase		Profit for acre
		%	Grain in lb.		%	Grain in lb.	
				Rs. A. P.			Rs. A. P.
East Godavari ..	2520	13·1	330	25 1 0	17·9	450	31 9 0
West Godavari ..	2350	23·7	560	53 9 0	..	..	..
Krishna ..	2260	20·4	460	41 1 0	24·8	560	45 4 0
Guntur ..	2380	14·7	350	27 7 0	25·2	600	50 4 0
Nellore ..	2010	13·4	270	17 7 0	20·9	420	27 12 0
Tanjore ..	2000	13·5	270	17 7 0	23·0	460	32 12 0
Pattukottai ..	1630	12·9	210	9 13 0	16·6	270	9 0 0
Tiruchi ..	3010	10·9	330	24 13 0	15·0	450	31 8 0
Madura ..	2610	22·9	600	58 9 0	42·1	1100	112 12 0
Tirunelveli ..	2520	12·3	310	22 5 0	9·9	250	6 8 0

(1) Grain valued at 0—2—0 per lb. (2) Cost of ammonium sulphate at Rs. 16—7—0 per 100 lb.; Rs. 24—12—0 for 150 lb. (3) Value of straw not taken into consideration, for profit. (4) Includes super application also in some taluks.

STATEMENT No. II.

Results of application of Ammonium sulphate six weeks after planting

District	Yield of control	100 lb. Ammonium sulphate			150 lb. Ammonium sulphate		
		Increase		Net profit nearest to rupee	Increase		Net profit nearest to rupee
		Grain yield lb.	%		Grain yield lb.	%	
East Godavari ..	2240	280	12·5	19	340	15·2	18
Krishna ..	2220	310	14·0	22	430	19·4	29
Guntur ..	2220	250	12·6	15	540	24·3	43
Nellore ..	2140	240	11·2	14	360	16·8	20
Tanjore ..	1990	290	14·6	20	410	20·6	27
Pattukottai ..	1710	100	5·8	4	200	11·7	..
Tiruchi ..	2960	630	21·3	62	600	20·3	50
Madura ..	2640	430	16·3	37	690	26·2	65
Tirunelveli ..	2420	430	17·8	37	400	16·5	25

STATEMENT No. III.

Yield of straw in the several districts Ammonium sulphate applied four weeks after planting

District	Control	Ammonium sulphate	
		100 lb.	150 lb.
West Godavari ..		Not available	
Krishna ..		Not available	
Guntur ..	100	113	126·6
Nellore ..	100	116	124·0
Pattukottai ..	100	115·8	128·3
Tanjore ..	100	111·7	118·1
Tiruchirappalli ..	100	108·2	116·5
Madura ..	100	115·7	135·5
Tirunelveli ..	100	107·5	114·5