
EFFICIENCY OF UREA AND SULPHATE OF AMMONIA AS A SOURCE OF NITROGEN FOR RICE IN THE SANDY SOILS OF THE BATTICALOA DISTRICT

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INTRODUCTION

SULPHATE of Ammonia is at the present moment, that most widely used nitrogenous fertilizer, for rice in this country. While it is generally accepted, that the rice plant takes up its nitrogen in the form of ammonia, particularly during the early stages of growth, there is evidence, that the continued use of Sulphate of Ammonia, as a source of nitrogen is not a desirable practice. Trials conducted by the Technical Co-operation Mission in India on cultivators' fields, over a three year period, indicated that Urea was as effective as a source of nitrogen as Sulphate of Ammonia. (1) Anderson and Co-workers reviewing investigations carried out till that time, concluded that, while Sulphate of Ammonia was the most efficient source of Nitrogen, Urea was very often to be preferred. (2) Rhind and Tin reported an initial appreciable increase in yield followed by a decline, as a result of the continued use of ammonia over a ten year period in Burma. (3) These considerations, along with the observed occurrence of extensive root damage during the latter stages of growth of rice crops in the sandy soils of the Batticaloa District, prompted this investigation into the efficiency of Urea and Sulphate of Ammonia as a source of nitrogen for rice under these conditions.

MATERIALS AND METHOD

These studies were carried out at the Department of Agriculture Experiment Station at Karadiyan Aru (Batticaloa District). The soils of this area are sandy in texture and acid in reaction. The pH being 5.5 to 6 with a low content of iron.

The trial was commenced in Yala 1961 and continued for four seasons until Maha 1962-63.

There were four fertilizer combinations and one unfertilized control. The details of the treatments are given in Table I.

TABLE I—FERTILIZER TREATMENTS

<i>Plot No.</i>	<i>Treatment</i>	<i>Details of Fertilizer Application</i>
1 ..	Unfertilized control ..	—
2 ..	40 lbs. Nitrogen as Sulphate of Ammonia	$\frac{1}{3}$ at Planting $\frac{1}{3}$ Three weeks after Planting $\frac{1}{3}$ Eight weeks before harvest
3 ..	40 lbs. Nitrogen as Sulphate of Ammonia and Urea	$\frac{1}{3}$ as S. A. at Planting $\frac{1}{3}$ as S. A. 3 weeks after Planting $\frac{1}{3}$ as Urea 8 weeks before harvest
4 ..	40 lbs. Nitrogen as Sulphate of Ammonia and Urea	$\frac{1}{3}$ as S. A. at Planting $\frac{1}{3}$ as Urea 3 weeks after Planting $\frac{1}{3}$ as Urea 8 weeks before harvest
5 ..	40 lbs. Nitrogen as Urea ..	$\frac{1}{3}$ at Planting $\frac{1}{3}$ Three weeks after Planting $\frac{1}{3}$ Eight weeks before harvest

The five fertilizer combinations were laid out in the field in four randomised blocks. The individual plots were 29' $\times$ 10'.

Six to eight seeds were dibbled in hills spaced 6" $\times$ 6" and thinned out to 3 seedlings per hill 21 days after sowing except in the last season (Maha 1962-63) when the trials were transplanted at the same spacing with 3 seedlings per hill. All the plots including the unfertilized control received applications of P_2O_5 and K_2O . P_2O_5 was given as a basal dressing at 25 lbs. P_2O_5 per acre in the form of Saphos Phosphate. The K_2O was applied as a single top dressing at 25 lbs. K_2O per acre as Muriate of Potash 3 weeks after planting. The plots were weeded manually thrice each season. In all seasons the variety H4 was used.

There were no serious outbreak of pests or diseases but all plots were treated with Endrex '20' and 5 per cent B. H. C. (Gammexane) at the appropriate times as a precautionary measure against possible attack of paddy stem borer and paddy fly respectively.

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At harvest a two-row border was discarded. The nett harvested area was 27' × 8'.

RESULTS AND DISCUSSION

Yield data and analysis of variance are given in Tables II and III.

In the first scason (Yala 1961) the control plots gave the highest grain yield. The plots receiving Sulphate of Ammonia and Urea were next in order of descending yield. However the differences between treatment yields did not make the level of statistical significance in this season. The erratic nature of these results may have been due to the heavy rains that were experienced at flowering resulting in extensive lodging in all plots.

In Maha 1961-62 yield differences were statistically significant at the 1.0 per cent level. The treatment Urea alone outyielded all other treatments giving 33 per cent. over Sulphate of Ammonia, while the latter out-yielded the control by 11 per cent. The combinations of the two forms of nitrogen also significantly out-yielded Sulphate of Ammonia and the control.

In Yala 1962, yield differences were statistically significant at the 1.0 per cent. level. Urea alone with a yield of 49 bushels per acre gave 31 per cent. more than the Sulphate of Ammonia, and the latter yielded 27 per cent. more than the control.

In the final season, the results were again statistically significant at the 1 per cent. level and similar to those of the two previous seasons. Urea alone gave the highest yield, 27 per cent. over the Sulphate of Ammonia plots which were 25 per cent. higher than the control.

To summarise the results of the 3 seasons, when the plot yield differences were statiscally significant then ; the application of Sulphate of Ammonia resulted in an increase of 33.7 per cent. over the unfertilized control while the application of Urea alone resulted in an increase in yield of 73.4 per cent. over the control. We may therefore conclude that Urea is a distinctly more efficient source of nitrogen for rice under these conditions.

From the observation of root damage to plants and the fact that these soils are low in iron, it is possible that the use of Sulphate of Ammonia results in H_2S toxicity.

SUMMARY

The efficacy of Urea and Sulphate of Ammonia as a source of nitrogen for rice in the sandy soils of the Batticaloa District was investigated for four seasons.

Four fertilizer combinations of Urea and Sulphate of Ammonia with an unfertilized control were tested using the variety H4.

On the average Sulphate of Ammonia gave a 33.7 per cent. increase in yield over the control while the increase in yield as a result of using Urea was 73.4 per cent.

It is therefore clear that Urea is a more effective source of Nitrogen under these conditions.

These results are also an indication of the potentialities for increasing yield in the Batticaloa District.

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TABLE II—YIELD DATA FOR ALL SEASONS

<i>Treatment No.</i>	<i>Yala 1961</i>				<i>Maha 1961-62</i>				<i>Yala 1962</i>				<i>Maha 1962-63</i>			
	<i>Grain Yield Bush/Ac.</i>		<i>Percentage of S. A.</i>		<i>Grain Yield Bush/Ac.</i>		<i>Percentage of A. S.</i>		<i>Grain Yield Bush/Ac.</i>		<i>Percentage of S. A.</i>		<i>Grain Yield Bush/Ac.</i>		<i>Percentage of S. A.</i>	
1	..	48.6	..	106	..	27.6	..	89	..	23.4	..	63	..	50.6	..	75
2	..	45.5	..	100	..	31.1	..	100	..	37.2	..	100	..	67.6	..	100
3	..	43.1	..	94	..	39.3	..	126	..	39.6	..	106	..	73.3	..	108
4	..	36.6	..	80	..	36.5	..	117	..	42.4	..	114	..	78.4	..	116
5	..	38.3	..	84	..	41.6	..	133	..	48.8	..	131	..	85.8	..	127

SUMMARY OF YIELDS FROM MAHA 1961-62 TO MAHA 1962-63 (3 SEASONS)

<i>Treatment</i>	<i>Yield Bush. per Acre</i>	<i>Percentage of control</i>
Control	101.6	100.0
Suphate of Ammonia	135.9	133.7
Urea	176.2	173.4

TABLE III—ANALYSIS OF VARIANCE OF GRAIN YIELD

Factors	D. F.	Sums of Squares				Mean Squares				Variance Ratio			
		Yala 1961	Maha 61/62	Yala 1962	Maha 62/63	Yala 1961	Maha 1961/	Yala 1962	Maha 62/63	Yala 1961	Maha 61/62	Yala 1962	Maha 62/63
Blocks	.. 3	10.875	3.9059	3.0055	2.4836	3.625	1.3017	1.0018	0.8278	—	—	—	—
Treatments	.. 4	19.9187	25.5632	69.5836	143.5744	4.9796	6.3908	17.3959	35.8936	2.65	21.4**	65.4**	119.5**
Error	.. 12	22.5263	3.598	3.1890	3.5941	1.8771	0.2998	0.26576	0.2995	—	—	—	—