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Time of Application of Nitrogen to Paddy in the Old Cauvery Delta

by

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Introduction: In recent years, chemical fertilizers such as urea, Ammonium sulphate nitrate, Calcium ammonium nitrate etc. are being used for better crop production and there is no crop which has not responded for the application of nitrogen. When once it is decided what type if fertilizer is to be used for a particular crop the important problem arises for determining when and how they are to be applied in order to get maximum benefit. Hence it becomes necessary to evolve or fix by experimentation the right time and the right way of utilising the fertilizers.

Mariakulandi (1957) has reported from trials conducted at Aduthurai during 1953—'56 that there was no significant difference between single and split application ; however, ammonium sulphate showed encouraging responses when applied at planting. No differences was noticed between ammonium sulphate and urea as they gave equal responses at 20 and 40 lb. nitrogen level in cultivators' fields. Manamohan Lal and Surendranath Naidu (1963) have stated that better yields are possible if ammonium sulphate is applied in two equal doses, one half at planting and the other 30 or 60 days after planting for *kuruvai* and *thaladi* crops respectively.

Material and Method: With a view to compare the relative merits of the two nitrogenous fertilizers, Ammonium sulphate and urea, and to fix the best time of their application to rice either in single dose or split doses, a trial was conducted on cultivators' fields in randomised block design with the following seven treatments.

1. Full dose (40 lb N per acre) before planting
2. Full dose at planting
3. Full dose at tillering
4. Half the dose before planting and half at tillering
5. Half at planting and half at tillering
6. One third before planting, 1/3 at tillering and 1/3 a week before flowering
7. One third at planting, 1/3 at tillering and 1/3 a week before flowering

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Basal dressing of 20 lb P_2O_5 as triple superphosphate and 5000 lb farm yard manure per acre was given to all plots. There were three replications of 15 treatments including one control plot in each replication. The trial was conducted with strain ADT 3 in the *kharif* season and Co. 25 in the *rabi* season, the former during 1956—'57 and 1957—'58 and the latter during the years 1958—'59 to 1961—'62.

Results and Discussion: The mean acre yields for the different treatment combinations for individual years, the mean yields for *kharif* and *rabi* seasons and the percentage over the control are presented in Table 1. The yield data reveal that the rice crop gives very good response to the application of nitrogen, the response varying from 37·4 per cent to 38·3 per cent in *kharif* season and 20·1 per cent to 20·6 per cent in the *rabi* season. Increased yields are obtained through application of nitrogen irrespective of the source from which it is supplied.

TABLE 1. *Mean Acre Yields in Pounds per Acre.*

Particulars	KHARIF				RABI					
	1956 –'57	1957 –'58	Mean	% on control	1958 –'59	1959 –'60	1960 –'61	1961 –'62	Mean	% on control
TYPES:										
Ammonium sulphate	3038	2267	2653	138·3	2028	2991	1926	3707	2663	120·1
Urea	2985	2285	2635	137·4	2077	2961	2075	3587	2675	120·6
TIME OF APPLICATION:										
E	3266	2344	2805	146·2	2019	2742	1834	3371	2492	112·4
P	2959	2277	2618	136·5	1983	2856	2176	3678	2673	120·6
T	3024	2403	2716	141·6	2397	3168	2073	3561	2800	126·3
ET	2907	2287	2597	135·4	1909	3108	2071	4135	2806	126·6
PT	3026	2199	2612	136·2	2019	2985	2030	3288	2580	116·4
ETF	2938	2142	2540	132·4	2017	3016	1991	4034	2764	124·7
PTF	2963	2276	2619	136·6	2024	2957	1824	3464	2567	115·8
TYPES X TIME OF APPLICATION:										
Ammonium sulphate E	3415	2335	2875	149·9	2079	2748	1767	3249	2461	111·0
P	2957	2236	2597	135·4	1919	2912	1997	3368	2549	114·9
T	2981	2483	2732	142·4	2416	3240	1807	3424	2722	122.7
ET	2996	2315	2656	138·5	1870	3082	2072	4490	2878	129·8
PT	2956	2169	2563	133·6	1969	2881	2124	3634	2652	119·6
ETF	2942	2053	2498	130·2	2004	3177	1885	4447	2878	129·8
PTF	3019	2280	2650	138·2	1939	2894	1827	3340	2500	112·7

TABLE 1. *(Contd.)*

Particulars		KHARIF				RABI					
		1956 –'57	1957 –'58	Mean	% on control	1958 –'59	1959 –'60	1960 –'61	1961 –'62	Mean	% on control
Urea	E	3116	2353	2735	142·6	1959	2736	1909	3402	2524	113·9
	P	2961	2318	2640	137·6	2046	2798	2354	3987	2796	126·1
	T	3066	2333	2700	140·8	2378	3095	2339	3698	2878	129·8
	ET	2817	2259	2538	132·3	1947	3133	2070	3780	2733	123·3
	PT	3096	2228	2662	138·8	2069	3089	1936	2942	2509	113·2
	ETF	2934	2230	2582	134·6	2029	2855	2097	3020	2650	119·5
	PTF	2904	2271	2588	134·9	2199	3020	1821	3588	2635	118·9
CONTROL		2559	1575	1918	100·0	1645	2368	1470	3386	2217	100·0

NOTE: E – Before planting. P – At planting. T – At tillering.

ET – Half before planting and half at tillering.

PT – Half at planting and half at tillering.

ETF – $\frac{1}{3}$ before planting + $\frac{1}{3}$ at tillering + $\frac{1}{3}$ a week before flowering.

PTF – $\frac{1}{2}$ at planting + $\frac{1}{2}$ at tillering + $\frac{1}{2}$ a week before flowering.

As regards the time of application, nitrogen supplied in one dose before planting gives the best results, with a mean acre yield of 2805 lb which is 46·2 per cent more than the control in *kharif* season. The next best in the time of application is at tillering which has a given a mean yield of 2716 lb per acre or 41·6 per cent more than the control. In the *rabi* crop, application of nitrogen in two equal doses, one half before planting and the other at tillering, has recorded the maximum yield of 2806 lb per acre on an average, which is 26·6 per cent more than control, closely followed by single application at tillering with a mean acre yield of 2800 lb. Among the interactions, between types of nitrogenous fertilizers and time of application, similar trends are obtained in the case of *kharif* crop, as Ammonium sulphate or Urea applied in one dose either before planting or at tillering alone has been found advantageous. But in the *rabi* season it appears necessary that ammonium sulphate should be given in two equal splits, before planting and at tillering, and Urea in one dose at tillering to achieve best results.

The response of paddy to per pound nitrogen for the two kinds of fertilizers and the time of their applications is given in Table 2.

The results have made it clear that paddy crop does respond to Ammonium sulphate and Urea, leaving the choice of the fertilizer to its availability in the market. Better responses are obtained in the *kharif* crop compared to *rabi* crop.

TABLE 2. *Response to perpound Nitrogen in Pounds.*

Particulars	KHARIF			RABI				
	1956 –'57	1957 –'58	Mean	1958 –'59	1959 –'60	1960 –'61	1961 –'62	Mean
Ammonium sulphate	19·5	17·3	18·4	9·6	15·6	11·4	8·0	11·2
Urea	18·2	17·7	17·9	10 8	14·8	15·1	5·0	11·5
TIME OF APPLICATION:								
Single dose	20·6	19·2	19·9	12·2	13·9	14·0	3·8	11·0
Two splits	17·7	16·7	17·2	8·0	17 0	14·5	8·2	11·9
Three splits	17.3	15·8	16·6	9 4	15·5	11·0	9·1	11·2
TYPES X TIMES OF APPLICATION:								
Ammonium sulphate								
Single dose	21·5	19 4	20·4	12·3	15·0	9·7	1·0	9·0
Two splits	17·9	16·7	17·3	6·9	15·4	15·7	16·9	13·7
Three splits	18·1	14·8	16·4	8·2	16·7	9·7	12·7	11·8
Urea								
Single dose	19·7	19·0	19·4	12·1	12·7	18·3	8·5	12·9
Two splits	17·5	16·7	17·1	9·1	18·6	13 3	0·6	10·1
Three splits	16·5	16·9	16·7	10·6	14·3	12·2	5·5	10·7

The data on the averages of yields indicate that application of nitrogen in one full dose to short term crop, either before planting or at tillering, is the best. This lends support to the view that all the nitrogen should be applied in one dose sufficiently early for paddy crop with duration of 100 days and less. It is also significant to note that split applications in three equal doses *viz.* 1/3 before or at planting, 1/3 at tillering and 1/3 a week before flowering, do not help in increasing the grain yield in *kharif* crop. In the case of the *rabi* crop, the picture is quite different where two split application, before planting and at tillering, has given the maximum yield. In some years three split application has recorded as good or slightly better yields than two split application. In general, fractional application, in two or three splits, appears to be more efficacious than single dose for the *rabi* crop.

From a study of the results of interaction, it is seen that responses to per pound nitrogen varies inversely with the number of applications in the *kharif* crop. But in the *rabi* season, maximum response of 13·7 lb has been recorded with two split application of Ammonium sulphate while Urea registered only 12·5 lb when applied in single dose. Thus the results are helpful for the better utilisation of the fertilizers that are supplied to the crop.

Summary and Conclusions: The experiment showed that there is not much difference between Ammonium sulphate and Urea on equal nitrogen basis. Nitrogen application in single dose before planting or at tillering is advantageous to *kharif* crop rather than *rabi*. Split application, one half before planting and the other half at tillering, is the best for the long duration crop. A portion of nitrogen applied a week before flowering does not appear to increase the yield of rice, especially in a short term variety. The response to nitrogen application tends to decline when it is applied in split doses to short duration paddy.

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AWARD OF Ph. D. DEGREE

Thiru V. N. Madhava Rao, Reader in Horticulture (on leave) Agricultural College and Research Institute, Coimbatore-3 has been awarded the Ph. D. degree by the Indian Agricultural Research Institute, New Delhi, for his thesis on "Effect of pruning severity and certain fertilizer treatments on growth, cropping behaviour and fruit bud formation in Pusa Seedless grapes (*Vitis vinifera* L.)".

Our hearty congratulations to him.