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STUDIES ON THE EFFECT OF TOP DRESSING WITH NITROGEN AT DISTINCT GROWTH PHASES OF RICE (Var-IR-8)*

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Many studies have been conducted regarding the full and split application of nitrogen on paddy, but studies on the effect of nitrogen given as top dressing at the distinct growth stages of rice are lacking especially under the agro-climatic conditions of Kerala. The present investigation was therefore taken up with three levels of basal nitrogen combined with a fixed quantity of nitrogen as top dressing at the four distinct growth stages of paddy (active tillering, initiation of ear primordia, boot leaf, and heading).

Materials and Methods

The experiment was laid out in a randomised block design with four replications in the farm attached to the Agricultural College and Research Institute. Vellayani during the first crop season (July-October) of 1968-69. The physical and chemical composition of the surface soil recorded prior to planting is presented below:

Physical and chemical composition of the surface soil:

Coarse sand	34 39%	Total nitrogen	3480 kg/ha
Fine sand	22.56%	Available Phosphorus	9.55 kg/ha
Silt	3.00%	,, Potash	37.60 kg/ha
Clay	39.00%	pH	5.4

A uniform dose of 2800 kg farm yard manure ha and 80 kg each of P205 and K2O/ha was applied to the field a day prior to transplanting. The levels of basal nitrogen were fixed as 40, 80, 120 kg/ha. Top dressings were done at the four distinct stages of growth in rice plant, viz. (1) active tillering stage, 47th day after seeding, (2) panicle initiation stage, 67th day after seeding, (3) boot leaf stage, 81st day after seeding and (4) heading stage, 97th day after seeding.

Results and Discussion

The data presented on yield attributes (Table 1) indicate that the levels and time of application had no significant effect on the ear length of

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panicle. Similar observations were made by Chalam and Venketeswarlu (1965). It is also seen from the Table that 80 kg basal nitrogen/ha has given the maximum total number of filled grains per panicle which was significantly superior to 120 and 40 kg basel nitrogen/ha. Among timings maximum number of both total and filled grains were noticed for the application of nitrogen at the panicle initiation stage. This is in agreement with the findings of Matasushima (1964), Patnaik and Gaikward (1968). Both nitrogen and time of application have increased the mean weight of 1000 grains significantly (Kumura, 1956 and Matasushima 1964). Among timings maximum grain weight was noticed for the application of nitrogen at heading stage. This may be due to the fact that nitrogen applied at this stage has definitely contributed for the filling up of the individual grains as reported by Kinchi (1960) and Matasushima (1964).

It is evident from Table 2 that grain yield increased significantly up to 120 kg/ha of total nitrogen beyond which there was a decline in yield. In other words maximum yield was obtained in the treatment which received a basal application of 80 kg nitrogen/ha followed by a top application of 40 kg/ha, at panicle initiation stage, which was significantly superior only with the top application of nitrogen at heading stage. The response of yield to nitrogen is found to be of the quadratic type, the equation being $Y = 1338.08 + 77.885\ N - 0.2893\ N^*$. (Fig. 1). The optimum level of nitrogen calculated from the response function was found to be 134.56 kg/ha. Considering the price of one kg of Paddy grain as Rs. 0.75, the economic dose of nitrogen was found to be 128-28 kg/ha. The higher yield observed for the aaplication of nitrogen at panicle initiation is due to the increased number of spikelets per panicle (Table 1).

Regarding straw yield (Table 2) maximum was recorded for 80 kg basal nitrogen, which was significantly superior to 40 kg N/ha. At 120 kg N/ha there was a slight reduction on the yield of straw. Similar observations were made by Tanaka *et al* (1964) where in the straw weight is reported to increase only upto a certain level beyond which there is a reduction on yield. Between timings maximum straw yield was noticed for the application of nitrogen at the active tillering stage and the grain straw ratio for tillering stage was 0.832.

It is seen from Table 3, that the levels and timings of application of nitrogen have increased significantly the content of protein in grains and nitrogen in straw. The maximum content was noticed at 160 kg total nitrogen per hectare. Among timings, application of nitrogen at heading has increased the content of protein in grain and nitrogen in straw. Similar observations were made by Anon (1967) Kik and Hall (1961).

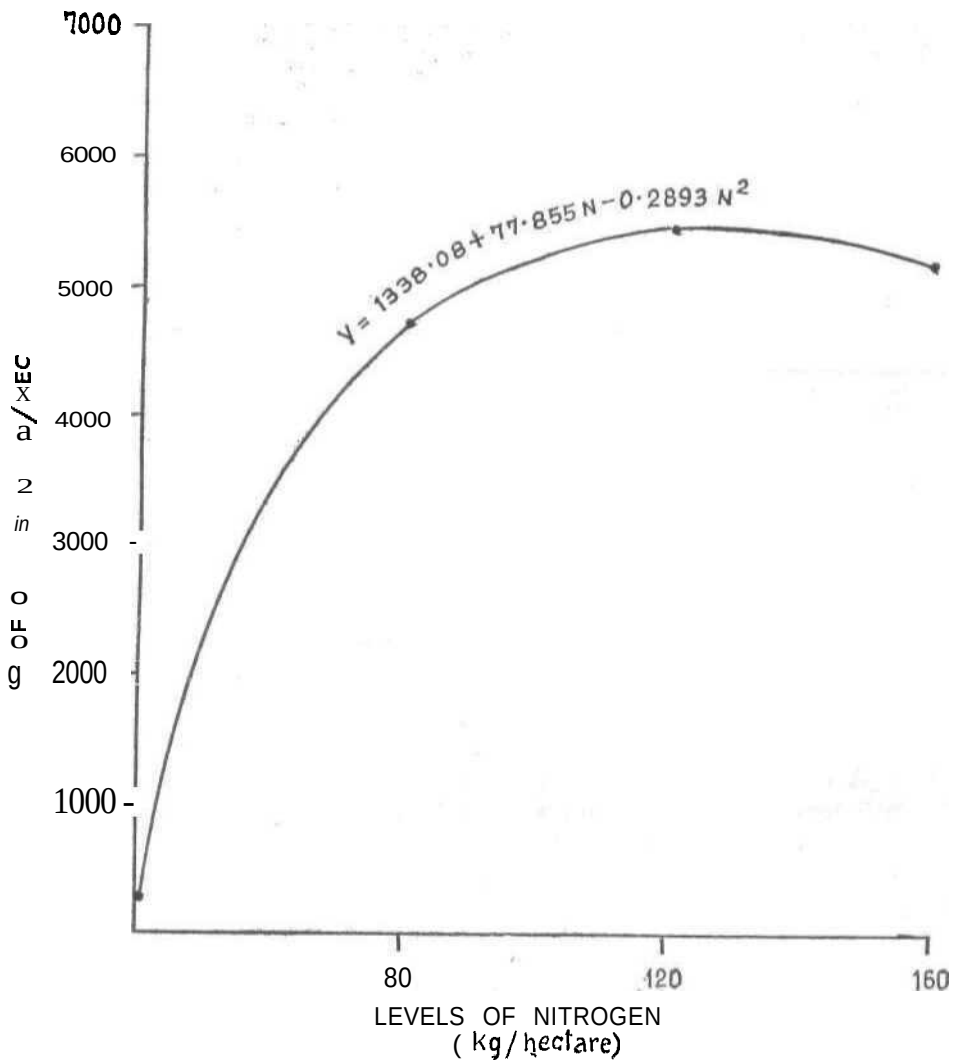
Table 1

Productive tillers at harvest, Mean length of Panicle, No. of filled grains/panicle & wt. of ICOO grains.

Stages of top dressing	Productive tiller at harvest.				Mean length of panicle (cm)				No. of filled grains per panicle.				Weight of 1000 grains (gm)			
	Levels of basel N. (kg/ha)				Levels of base! N. (kg/ha)				Levels of basel N. (kg/ha)				Levels of basel N. (kg/ha)			
	40	80	120	Mean	40	80	120	Mean.	40	80	120	Mean.	40	80	120	Mean.
Tillering	5.8	7.6	7.0	6.8	20.5	20.8	20.4	20.5	76.4	84.0	81.2	80.5	32 4	32.6	32.9	32.6
Primordial initiation.	5.4	6.1	6.2	5.9	21.3	21.1	21 1	21.1	96.0	107.0	83 0	95.3	32.7	32.2	32.9	32.9
Boot leaf	5.4	5.6	6.2	5.7	21.5	21.2	21.2	21.3	89,6	97.7	84.7	90.6	32.7	33.3	32.9	32.9
Heading	4.9	6.0	6.7	5.8	19.6	20.5	20.5	20.2	79.4	88.7	94.3	87.5	32.6	33.3	33.0	33.0
Mean	5.4	6.5	6.5	. .	20.7	20.9	20.8	. .	85.3	94.3	85.8	. .	32.6	33.3	33.0	33.0
G.D. at 5% level.																
Nitrogen (N)	0.404				0.592				4.501				0.1/9			
Stages (S)	0.508				N.S. ,				5.190				0.203			
N X S	0.808				0.184 .,				9.003				0.359			

Fig.

RESPONSE CURVE OF NITROGEN



Yield of grain and straw in tonnes/ha and grain straw ratio

Stages of top dressing	Grain yield (tonnes/ha) Levels of basal nitrogen 40	80	120	Mean	Yield of straw Levels of basal Nitrogen 40	80	120	Mean	Grain straw ratio Levels of basal nitrogen (kg/ha) 40	80	1?0	Mean
Tillering	5.8?2	[illegible]	?.297	?.272	?.86?	7.?06	7.??8	7.5?8	0.847	0.845	0.8?4	0.832
Primordial initiation	5.7??	[illegible]	?.38?	?.?74	?.?5?	7.475	7.0?6	7.?4?	0.8??	0.9?5	0.913	0.985
Flag leaf	?.?57	?.408	?.24?	?.??7	6.724	7.031	7.17?	?.977	0.948	0.911	0.8?7	0.98?
Heading	4.915	5.?2	[illegible]	5.842	5.47?	?.?22	[illegible]	?.3??	0.8?6	0.9??	0.912	0.98?
Mean	5.715	?.515	[illegible]		?.4?2	7.2??	7.247		0.8??	0.9??	0.874	

C.D. at 5% level

	Grain yield	Yield of straw	Grain straw ratio
Nitrogen	0.?4?	0.104	0.02?
Stage	0.4??	0.121	0.04
N × S	0.7??	0.208	N.S.

Table 3

Protein content of grain and nitrogen content of straw

Stages of (op dressing.	Protein content of grain (%) Levels of basal Nitrogen (Kg/ha)				Nitrogen content of straw (%) Levels of basal Nitrogen (kg/ha)			
		80	120	Mean	40	80	120	Mean
Tillering	7.83	7.82	8.11	7.92	0.66	0.69	0.72	0.69
Primordial initiation	7.92	7.96	8.16	8.01	0.66	0.71	0.73	0.70
Boot leaf	8.01	8.24	8.57	8.27	0.69	0.75	0.74	0.75
Heading	8,14	831	8,32	8.32	0.69	0.76	0.82	0.76
Mean	8.08	8.08	8.34		0.67	0.7/3	0.75	
C. D. at 5% leavel								
Nitrogen		0.126				0.157		
Stages		0.144				0.018		
NX S		NS				NS		

Summary

A field experiment was conducted to study the effect of top dressing with nitrogen at different growth phases of rice in combination with 3 levels of basal nitrogen at the Agricultural College and Research Institute, Vellayani, Kerala, The salient features of the experimental results are summarised below.

Application of nitrogen at the active tillering stage increased the number of Productive tillers per hill. Application of nitrogen at the flower primordial initiation stage significantly increased the number of total and filled grains per panicle, and that at heading stage increased the content of protein in grains and nitrogen in leaves. Regarding the net yield per hectare, a total nitrogen dose of 120 kg/ha was found to be significantly superior to 80 kg per hectare. The difference in yield

between levels of 120 and 160 kg/ha remained non-significant. Stages of top dressing were statistically at par excepting in the case of top dressing at heading which gave significantly lower grain yield values. Therefore it can be concluded that the variety IR.8 requires two top dressings one at the active tillering stage to increase the number of productive tillers and another at ear primordial initiation stage to enhance the number of grains per panicle.

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