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EFFECT OF VARIOUS LEVELS OF NITROGEN AND PHOSPHORUS ON THE YIELD AND OTHER AGRONOMIC CHARACTERS OF RICE VARIETY TRIVENI*

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'Triveni' is a recently introduced, high yielding, short duration variety of rice, and hence information regarding its requirements cf nitrogen and phosphorus under various agro-climatic conditions of Kerala State are not available. The present investigation was therefore, carried out under Vellayani conditions to study the performance of this variety to graded doses of nitrogen and phosphorus.

Materials and Methods

The experiment was conducted at the Agricultural College Farm Vellayani, during the third crop season/(Punja) of 1972. The soil of the experimental area was sandy clay loam with 0.163% total nitrogen, 0.045% phosphorus, 0.171% potash and 0.022% available potash, with a pH of 4.9.

The rice variety 'Triveni' which is high yielding, short duration (95 to 100 days) and photo insensitive was used in the trial. The experiment was laidout as a 2^4 factorial experiment in randomised block design with three replication . The treatments included four levels of nitrogen (0, 40 80 and 120 kg N per hectare) and four levels of phosphorus (0, 15, 30 and 45 kg P_2O_5 per hectare). Nitrogen was applied through ammonium sulphate in two split doses, half as basal dressing and the remaining half 40th day after sowing. The total quantity of phosphorus was applied at the time of sowing through single superphosphate. In addition to this all the treatment? received a uniform dose cf 34 kg K_2O per hectare as basal dressing.

Results and Discussion

Height of plants and number of tillers per hill

From the data in table 1 it is seen that application of 120 kg N/ha increases the plant height during all the growth stages, but significant difference between 120 kg and 180 kg/ha was observed only during the early stages. The application of 120 kg N/ha significantly increased the number of tillers per hill over all the other levels during the maximum tillering stage. The reduction in number of tillers noticed towards the end of crop growth especially at higher levels of

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Table 1

Height of Plants and Number of tillers/hill at successive stages of growth

Treatments	Maximum Tillering (50th day after planting)		Flowering (70th day after planting)		Harvest (99th day after planting)	
	Mean height of plants in c. m	Mean number of tillers/hill	Mean height of plants in c. m.	Mean number of tillers/hill	Mean height of plants in c. m.	Mean number of tillers/hill
n^0p^0	50.7	7.5	67.5	11.9	73.5	13.4
n^0p^1	48.6	6.6	64.4	9.0	72.5	13.4
n^0p^2	48.3	7.2	72.1	9.7	71.9	10.1
n^0p^3	47.6	7.2	68.3	11.2	75.0	1.1.0
n^1p^0	56 5	7.2	70.8	11.4	79.6	10.3
n^1p^1	57.0	8.5	70.3	11.0	73.0	9.2
n^1p^2	57.1	7.1	70.0	10 6	75.5	10.2
n^1p^3	57.9	8.6	71.9	11.1	79.0	11.3
n^2p^0	65.3	8 6	77.4	13.8	80.9	9.8
n^2p^1	61.1	8.8	75.7	9.4	80.9	9.4
n^2p^2	55.1	8.9	74.3	11.0	§0.7	9.7
n^2p^3	62.7	8.1	76.3	8.1	80.7	9.9
n^3p^0	67.4	9.7	77·6	12.5	85.4	12.2
n^3p^1	65.4	9.7	75.6	13.6	85.4	11 0
n^3p^2	66.7	9.2	74.6	11.5	84.1	8.4
n^3p^3	71.1	9.4	76.9	10.7	83.0	8.3

	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E of Mean	C.D.	S. E. of Wean
1. Between levels of nitrogen	3.879	..	0.87	..	4.081	..	N.S.	±0.58	3.879	..	N.S.	±0 43
2. Between levels of Phosphorus	N. S.	± 0.400	N. S.	±0 11	N S.	±0.425	N.S.	±0.58	N.S.	±390	N.S.	±043
3. Between levels of nitrogen with different doses of phosphorus	N. S.	± 1.600	1.64	..	N.S.	± 1.700	N.S.	±1.16	N.S.	±560	N.S.	±0.87

n^0 - 0 kg nitrogen/hectare p^0 - 0 kg P_2O_5/hectare n^1 - 40 kg nitrogen/hectare p^1 - 15 kg P_2O_5/hectare
n^2 - 80 kg nitrogen/hectare p^2 - 30 kg P_2O_5/hectare n^3 - 120 kg nitrogen/hectare p^3 - 45 kg P_2O_5/hectare

nitrogen is a character associated with many of the indica varieties. The influence of nitrogen on various vegetative characters is a well recognised phenomenon (Black, 1957)

Phosphorus had no effect on the height of plants and number of tillers per hill. The reason for lack of response to phosphorus may be the higher phosphorus status of soil at various growth stages of the crop (David 1960). The possible influence of phosphorus in increasing nitrogen absorption by providing the plants with a well developed roor system (Russel, 1962) explains the reason for thg significant effect of interaction between nitrogen and phosphorus in tiller production,

Percentage of effective tillers

From the data presented in table II it is evident that application of 120 kg N/ha has significantly increased the percentage of productive tillers over 40 kg and no nitrogen treatments. The length of the panicle and the number of grains per panicle were also significantly increased by the application of 120 kg N/ha than ail other levels. The higher levels of nitrogen might have enhanced its uptake resulting in high photosynthetic activity and the consequent increase in the length of panicle and the total number of grains per panicle (Matsuo 1955)

Thosand grain weight

Thousand grain weight was significantly influenced by the application of 120 kg N/ha over no nitrogen and 40 kg N/ha leveals (Table II). According to Kumara (1957) under heavy nitrogen supply the percentage of ripened grain is roughly determined by the total amount of carbohydrate tran located to the ear. It may be that the photosynthesis at 120 kg N was maximum (as can be seen from the percentage of productive tillers at 120 kg N level) compared to other 1 vels of nitrogen and this increased rate of carbohydrate accumulation might have contributed to the i:crease in 1000 grain weight at 120 kg N level. Application of different levels of phosphorus did not have any positive effect on any of the yield attributes. This lack of response to added phosphorus may be due to the higher rtatus of available phosphorus in the soil.

It is evident from Table II that grain yield was significantly increased with increasing levels of nitrogen upto 120 Kg N/ha. The highest yield of 4565 kg N/ha was obtained at 120 kg N/ha. However, there was no significant difference between 80 kg and 120 kg N/ha. The increase in grain yield of rice with incremental dosers of nitrogen has been reported by various workers (Mahapatra and Padalia, 1963; Potty, 1964 and Have, 1972). The significant effect of nitrogen up to 120 kg N/ha is expected of this variety, since one of its parents i. e. Annapurna, is a high fertilizer responsive variety.

But, quite contrary to the effect of nitrogen, no significant effect on grain yield was noticed by the application of different levels of phosphorus. The lack of

Table 2

Percentage of Productive tillers, Length of Panicle, Number of grains per Panicle, 1000 grain weight, Yield of grain and Yield of Straw

Treatments	Percentage of Productive tillers	Length panicle in C. M.	Number of grain/ Panicle,	100 grain weight in grams	Yield of grain in kg/ha	Yield og Straw in kg/ha
n^0p^0	65 62	17.4	64.1	23.99	3187	4957
n^0p^1	67.05	17.6	62.3	23.05	2775	4777
nV	64.44	17.9	66.1	21.76	3479	5441
n^0p^3	70.66	17.7	59.6	23.39	2701	4624
nV	68.16	18.3	70.7	24.37	3842	6306
n^1p^1	72.43	18.3	68.3	24.07	4071	6260
n^1p^2	68.25	19.2	68.1	25.23	3909	6304
n^1p^3	70.95	19.1	73.3	23.99	4278	6200
n^2p^0	72.37	18.7	72.4	26.34	4414	6492
n^2p^1	69.61	19.0	80.1	24.31	4225	6500
ny	74.78	19.0	73.0	24.06	4206	6606
ny	77.05	19.4	68.1	24.74	4243	6061
n^3p^0	73.08	20.0	84.3	25.59	4445	6034
nV	77.56	20.1	83.4	24.76	4565	6815
n^3p^2	77.85	18.7	84.7	24.89	4551	7111
n^3p^3	73.69	20.0	77.5	25.08	4539	6053

	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean	C. D.	S. E. of Mean
1. Between levels of Nitrogen	3 06		0.69	..	7.14	..	1.368	..	475	..	624	..
2. Between levels of Phosphorus	N. S	±0.39	N. S.	±0.25	N. S.	±2.52	N. S.	±0.137	N. S.	±47	N. S.	±62
3. Between levels of nitrogen with different levels of phosphorus	N S.	±1.56	N. S.	±0.44	N. S.	±5.01	N. S.	±0.550	N. S.	±190	N. S.	±187

n^0 - Okg Nitrogen/hectare p^0 - 0kg P_2O_5/hectare n^1 - 40 kg Nitrogen/hectare p^1 - 15 kg P_2O_5/hectare
n^2 - 80kg Nitrogen/hectare p^2 - 30 kg P_2O_5/hectare n^3 - 120 kg Nitrogen/hectare p^3 - 45 kg P_2O_5/hectare

response may be due to the high status of available phosphorus in the soil during various growth stages, i. e. 49.7, 83.4, 78.8 and 60.7 kg P_2O_5/ha before sowing, maximum tillering, flowering and harvest stages respectively. David (1960) reported that unless a soil is deficient in phosphorus, yield response to its addition cannot be detected.

Application of nitrogen significantly increased the yield of straw (Table 2). The highest yield of 7111 kg/ha was obtained by the application of 120 kg N. Since the number of tillers and height of plants were more in treatments receiving higher levels of nitrogen it is but natural that the highest straw yield was also obtained from these treatments. No significant response was observed by the application of phosphorus on straw yield. As already stated, this may be due to the higher status of available phosphorus even in control plots.

Summary

The performance of the rice variety 'Triveni' was studied under four levels of nitrogen and four levels of phosphorus in the sandy clay loam soils of Vellayani, Kerala State. Application of nitrogen increased the height of plants, number of productive tillers, length of panicle, number of grains per panicle and 1000 grain weight whereas phosphorus had no effect on these characters. The highest yield was obtained at 120 kg N/ha, but it was not significantly superior to 80 kg N/ha. Phosphorus had no influence on grain yield. Maximum straw yield was obtained at 120 kg N/ha.

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