

THE RESPONSE OF TWO HIGH YIELDING VARIETIES OF RICE TO NPK APPLICATIONS IN AN ACID PEAT SOIL OF KERALA

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Fertiliser experiments conducted all over the world indicate that rice responds well to fertilisers, especially to nitrogen. In India Daji (1965) found that the response of paddy to nitrogen and phosphorus varied from moderate to high, while it was generally low for potassium. Mahapatra and Sahu (1961) observed that the response of paddy to phosphorus was generally lower than that to nitrogen. Kochappan Nair and Koshy (1966) noted that the growth and yield characters of rice varied appreciably with variety as well as with nitrogen applications. With the introduction of a number of high yielding and fertiliser responsive varieties of rice to Kerala in recent years it has become necessary to evaluate their response to applications of nitrogen, phosphorus and potassium under the different soil conditions of Kerala. Hence the present pot culture study was undertaken to investigate the response of two high yielding varieties of paddy to NPK applications in an acid peat soil from Kuttanad which is one of the major rice producing tracts of the State.

Material and Methods

The experiment was carried out in three series simultaneously. In the first series phosphorus and potassium were applied at constant levels of 100 kg P_2O_5 and 100 kg K_2O per hectare and nitrogen at four levels, viz., 0, 50, 100 and 150 kg N/ha. In the second series nitrogen and potassium were kept constant at 100 kg N and 100 kg P_2O_5 per hectare and phosphorus applied at four levels viz., 0, 50, 100 and 150 kg P_2O_5 /ha. The third series had nitrogen and phosphorus constant at 100 kg N and 100 kg P_2O_5 per hectare and potassium applied at four levels, viz., 0, 50, 100 and 150 kg K_2O /ha. The rice varieties used were I. R. 9.60 and I. R. 8.246. The soil was from the kari areas in Thottappally, Alleppey District. Its pH was 4.5 and it had a lime requirement of 10 tonnes of $CaCO_3$ per hectare. Earthenware pots of 5 kg capacity were filled with the soil and a basal application of lime at half the lime requirement given to all the pots. Phosphorus and potassium were also applied basally in the form of superphosphate and muriate of potash. Nitrogen was applied in two equal split doses, one dose just before transplanting and the other 15 days after planting. After the basal application of the fertilisers the soil in each pot was well puddled and planted with 25 days old seedlings at the rate of 3 seedlings per pot. The experiment was conducted in a randomised block design with four replications. Results were assessed in terms of height of plants at tillering, the number of tillers, yield of grain and the 1000-grain-weight.

Results

The data given in Table I reveal that for both the varieties studied there was significant increase in yield with increase in levels of nitrogen. However, the response of the variety I. R. 8.246 was more than that of the variety I. R. 9.60. There was appreciable increase in the height of plants when the level of nitrogen was increased from 0 to 50 kg N/ha, but the effect of still higher levels of nitrogen was not significant. The tiller production was more for I. R. 8.246 than for I. R. 9.60 at all levels of nitrogen. The 1000-grain-weight was also more for I. R. 8.246 than for I. R. 9.60. In general it may be concluded that of the two varieties studied I. R. 8.246 responded better than I. R. 9.60 to applications of nitrogen at the different levels.

Table 1

Effect of different levels of nitrogen on the growth and yield characters of two high yielding varieties of rice.

Variety	Level of nitrogen kg/ha	Height of plant cm.	No. of tillers	Yield of grain g/pot	1000-grain-weight g
I. R. 9.60	0	23.1	6.0	24.8	26.2
	50	28.2	9.1	25.1	25.7
	100	25.5	6.0	30.9	26.5
	150	29.6	8.5	38.2	26.3
	Mean	26.6	7.4	29.8	26.2
I. R. 8.246	0	21.7	9.1	29.7	29.4
	50	26.5	10.9	26.2	28.1
	100	23.0	11.0	29.6	29.1
	150	27.2	10.7	40.0	28.1
	Mean	24.6	10.4	31.6	28.7

C. D. for yield of grain at 95% level

I. R. 9.60 - 2.37

I. R. 8.246 — 2.41

Table 2 shows that for both the varieties the maximum yield of grain was obtained for phosphorus application at 100 kg P_2O_5 per hectare; at 150 kg P_2O_5 per hectare there was significant decrease in the yield. The height of plants and tiller counts also showed a similar trend. It appears that very high levels of phosphorus application tended to suppress the availability of some of the micronutrients which resulted in reduced growth and yield. I. R. 8.246 was superior to I. R. 9.60 in 1000 grain-weight and the level of phosphorus application had very little effect on this character.

Table 2
Effect of different levels of phosphorus on the growth and yield characters of two high yielding varieties of rice

Variety	Level of phosphorus kg P ₂ O ₅ /ha	Height of plant cm	No. of tillers	Yield of grain g/pot	1000-grain-weight g
I. R. 9.60	0	28.7	10.2	29.5	25.1
	50	29.2	8.5	23.0	27.1
	100	31.7	11.0	34.3	26.3
	150	29.5	10.1	29.9	29.3
	Mean	29.8	10.0	29.2	27.0
I. R. 8.246	0	28.0	9.5	30.8	30.2
	50	26.7	12.0	37.9	30.5
	100	28.0	12.3	40.3	27.0
	150	28.5	12.3	33.3	30.0
	Mean	27.8	11.5	35.6	29.6

C. D. for the yield of grain at 95% level

I. R. 9.60-2.75

I. R. 8.246-4.81

The data in Table 3 show that the yield of grain in both the varieties increased with increase in potassium application upto a level of 100 kg K₂O per hectare. The increase was statistically significant for the variety I. R. 9.60. There was only a slight decrease in the yield of grain when the level of potassium was increased to 150 kg K₂O per hectare. The plant height generally decreased and the tiller counts increased with increase in the levels of potassium application. The 1000-grain-weight was found to decrease with increasing levels of potassium, but the mean weights of 1000 grains for all the treatments tended to be equal for both varieties.

Table 3
Effect of different levels of phosphorus on the growth and yield characters of the high yielding varieties of rice

Variety	Level of potassium kg K ₂ O/ha	Height of plant cm	No. Of tillers	Yield of grain g/pot	1000-grain-weight g
I. R. 9.60	0	32.6	8.5	25.7	29.2
	50	29.7	9.6	29.4	27.5
	100	30.7	10.1	33.8	25.8
	150	33.0	9.5	31.1	27.3
	Mean	31.5	9.4	30.0	27.5
I. R. 8.246	0	34.0	9.7	30.7	29.7
	50	29.0	11.9	33.6	28.0
	100	28.8	11.2	36.8	27.2
	150	26.2	11.9	35.8	26.2
	Mean	29.5	11.2	34.2	27.8

C. D. for the yield of grain at 95% level

I. R. 9.60 — 1.95

I. R. 8.246 — Not significant

Summary

A pot culture experiment in randomised block design with four replications was carried out to study the relative response of two high yielding varieties of rice, I. R. 9.60 and I. R. 8.246 to varying levels of N, P_2O_5 and K_2O in an acid peat soil of Kerala. Each of the nutrients was applied at four levels, viz., 0, 50, 100 and 150 kg/ha keeping the other two nutrients constant at 100 kg/ha. The maximum response was shown to nitrogen; the highest yields were obtained with nitrogen applied at 150 kg N/ha; the response to nitrogen was more for the variety I. R. 8.246 than for variety I. R. 9.60. With phosphorus the highest yields were secured for an application of P_2O_5 at 100 kg/ha. The yields were generally more for the variety I. R. 8.246 than for the variety I. R. 9.60. With potassium the highest yields were obtained for an application of K_2O at 100 kg/ha. Variety I. R. 8.246 gave higher yields than variety 9.60. The tiller counts were generally more for I. R. 8.246 than for I. R. 9.60. The effect of the different treatments on the 1000-grain-weight was not appreciable.

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