

EFFECT OF DIFFERENT LEVELS OF NITROGEN AND PHOSPHORUS ON THE UPTAKE OF PHOSPHORUS BY RICE VARIETY - TRIVENI

K. M. ALEXANDER, N. SADANANDAN and V. K. SASIDHAR

College of Agriculture Vellayani, Kerala

Considerable literature is available regarding the effect of nitrogen and phosphorus on the yield of rice. (Sethi *et al*, 1952., Mahapatra, 1963.; Sahu, 1953 and Suseelan, 1969); but very little is known regarding the effect of different levels of nitrogen and phosphorus on the uptake of phosphorus by rice. Moreover, phosphorus application to rice generally gives little or no response in most places in Kerala under wet land conditions. Hence the present investigation was undertaken with a view to study the effect of different levels of nitrogen and phosphorus on the uptake of phosphorus at different stages of growth of rice variety Triveni.

Materials and Methods

The experiment was conducted at the Agricultural College Farm, Vellayani, during the third crop season (Punja) of 1972. The soil was sandy clay loam, containing 0.163% nitrogen, 0.045% phosphorus and 0.171% potash, with a pH of 4.9. The experiment was laid out as a 2⁴ factorial experiment in randomized block design and replicated three times. Nitrogen and phosphorus were applied at four levels each i. e. 0, 40, 80 and 120 kg N/ha as ammonium sulphate and 0, 15, 30 and 45 kg P₂O₅/ha as superphosphate. In addition to this all plots received a uniform dose of 34 kg K₂O/ha. Full dose of P₂O₅ and K₂O and half dose of nitrogen were applied as basal dressing and the remaining half dose of nitrogen on the 40th day after sowing.

The plant was analysed for uptake of phosphorus during maximum tillering stage and flowering stage and the grain and straw at harvest. Phosphorus was determined colorimetrically by the method suggested by Fiske and Subbarow (1925).

Results and Discussion

The data presented in Table 1 show that nitrogen significantly influenced the uptake of phosphorus during all the three growth stages i. e. at maximum tillering stage, flowering stage and at harvest. Nitrogen at 120 kg/ha showed the

Table 1

Uptake of Phosphorus at successive stages of growth (Kg P₂O₅/ha) of rice

	Maximum tillering (50th day after planting)					Flowering (70th day after planting)					Harvest (99th day after planting)				
	n ₀	n ₁	n ₂	n ₃	Mean	n ₀	n ₁	n ₂	n ₃	Mean	n ₀	n ₁	n ₂	n ₃	Mean
P ₀	0.82	1.02	1.07	1.18	1.02	4.7	4.9	7.6	7.8	6.2	20.1	24.2	28.6	29.4	26.3
P ₁	0.84	1.03	1.19	1.60	1.05	4.3	5.3	7.2	10.3	6.8	17.8	31.1	28.6	33.5	27.8
P ₂	0.77	0.92	1.12	1.14	0.98	5.2	6.0	7.0	8.5	6.6	23.0	26.0	27.6	35.2	28.8
P ₃	1.14	1.21	0.94	1.31	1.15	6.4	7.4	7.8	7.3	7.2	20.1	30.3	30.9	34.6	29.0
Mean	0.89	1.05	1.08	1.18		5.1	5.9	7.4	8.5		20.0	28.0	28.9	31.7	

$$\overline{n_3 \ n_2 \ n_1 \ n_0}$$

$$\overline{n_3 \ n_2} \quad \overline{n_1 \ n_0}$$

$$\overline{n_3 \ n_2 \ n_1} \quad \overline{n_0}$$

Sl. No.	Treatment comparisons	C. D.	S. E. of mean	C. D.	S. E. of mean	C. D.	S. E. of mean
1.	Between levels of nitrogen	0.179	—	1.327	—	2.450	—
2.	Between levels of phosphorus	N. S.	± 0.017	N. S.	± 0.464	N. S.	± 0.241
3.	Between levels of nitrogen with different doses of phosphorus	N. S.	± 0.070	N. S.	± 0.922	4.693	—

n₀ — 0 kg N/han₂ — 80 kg N/haP₀ — 0 kg P₂O₅/haP₂ — 30kg P₂O₅/han₁ — 40kg N/han₃ — 120kg N/haP₁ — 15kg P₂O₅/haP₃ — 45kg P₂O₅/ha

maximum effect at all the three growth stages. But the effect of different levels of phosphorus was not significant during any of the growth stages studied.

From the Table it is also evident that there was a gradual increase in phosphorus uptake from maximum tillering to flowering stage and then a rapid increase from flowering to harvest. Similar results were also reported by Patnaik (1965) for short duration varieties of rice.

It is also clear from the Table that increasing levels of nitrogen increased the uptake of phosphorus during all the three growth stages of the crop. Hanway (1962) found that the uptake of nitrogen by rice caused greater absorption of phosphoric acid,

The increased absorption of phosphoric acid by nitrogen application can be mainly due to two reasons. Firstly, when the soil was supplemented with additional nitrogen, along with top growth root growth was also proliferated. This increased root growth might have enabled the roots to get in contact with more and more soil particles which in turn might have resulted in more absorption of phosphorus. Secondly, when the top growth is enhanced by additional application of nitrogen, the plants will have to maintain an optimum ratio of major nutrients within the plant. In order to maintain this ratio, it is essential that an increased nitrogen uptake will have to be necessarily accompanied by a proportionate increase in the uptake of phosphorus and potassium if the soil is not deficient in these nutrients. Similar increase in the uptake of phosphorus by the application of nitrogen has been reported by Gruns *et al* (1958) and Shinde and Datta (1964).

The effect of different levels of phosphorus was not significant in increasing phosphorus uptake by the plant at any of the above growth stages. This may be due to the presence of adequate amounts of phosphorus in the soil, even in control plots. However, it is seen that NP interaction has significant influence on phosphorus uptake by plants at harvest time. The maximum uptake of 35.2 kg/ha of P_2O_5 was found in treatment receiving 120 kg nitrogen and 30 kg phosphorus and the minimum of 17.8 kg of P_2O_5 /ha in treatment of no nitrogen and 15 kg phosphorus. Similar results by the combined application of nitrogen and phosphorus towards the later stages of growth have been reported by Khan and Eaqub (1968).

Summary

A field experiment was undertaken during the third crop season of 1971 to study the effect of different levels of nitrogen and phosphorus on the uptake of

phosphorus by the rice variety 'Triveni'. It was found that with increasing levels of nitrogen, the total uptake of phosphorus increased during all the growth stages of the crop. Similarly nitrogen phosphorus interaction significantly increased the phosphorus uptake at harvest.

Different levels of phosphorus had no significant effect on the uptake of phosphorus during any of the growth stages of the crop.

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സംഗ്രഹം

വിവിധ അളവിൽ നൈട്രജനും, ഫോസ്ഫറസും നൽകുന്നതുമൂലം ത്രിവേണി നെല്ല് വലിച്ചെടുക്കുന്ന ഫോസ്ഫറസിന്റെ അളവിലുണ്ടാകുന്ന വ്യത്യാസം മനസ്സിലാക്കുന്നതിനുവേണ്ടി വെള്ളായണി കാർഷികകോളേജിൽ 1971-ലെ മൂന്നാം വിളയിൽ ഒരു പരീക്ഷണം നടത്തുകയുണ്ടായി.

വളർച്ചയുടെ എല്ലാ ഘട്ടങ്ങളിലും നൈട്രജൻ കൂടുതൽ നൽകുന്നതനുസരിച്ച് ചെടി വലിച്ചെടുക്കുന്ന ഫോസ്ഫറസിന്റെ അളവും വർദ്ധിക്കുന്നതായി കാണുകയുണ്ടായി. എന്നാൽ ഒരു ഘട്ടത്തിലും ഫോസ്ഫറസ് കൂടുതൽ നൽകുന്നതുകൊണ്ട് വലിച്ചെടുക്കുന്ന ഫോസ്ഫറസിന്റെ അളവ് കൂടുന്നതായിക്കണ്ടില്ല.

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