

STUDIES ON THE UPTAKE PATTERN OF PHOSPHORUS BY RICE UNDER GRADED DOSES OF PHOSPHORUS IN CONJUNCTION WITH LIME

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Phosphorus is concerned with many vital growth processes in plants. Information on the stage of growth of rice plant at which uptake of this element is maximum is useful in evaluating the best time for supplying phosphatic fertilizers to low land rice. It was with this objective that an experiment was laid out at the Agricultural College, Vellayani, Kerala to study the uptake pattern of phosphorus by rice under graded doses of phosphorus, in conjunction with lime.

Materials and Methods

The experiment was laid out in sandy clay loam soils of the Agricultural College Farm, Vellayani, Kerala during the first crop (Virippu) season of 1968. The rice variety I.R.8 was used for the trial. The soil of the experimental site contained 0.189% total nitrogen, 0.0018% available P_2O_5 and 0.0221% available K_2O with a PH of 5.1. The treatments consisted of 4 levels of phosphorus (0, 50, 100 and 150 kg P_2O_5 /ha) and two levels of lime (0 and 3273 kg slaked lime/ha). The experiment was laid out in randomised block design with four replications. Nitrogen and potash were applied at 136 and 90 kg/ha, respectively in addition to 5000 kg/ha of farm yard manure applied as basal dressing. Plant samples were collected at active tillering stage (45th day) ear primordia-initiation stage (74th day) stem elongation stage (89th day) flowering stage (96th day) and milky stage (110th day) of sowing and analysed for the uptake of phosphorus colorimetrically following standard A. O. A. C. methods.

Results and Discussion

The phosphorus content of plant samples at different stages of growth was determined and presented in Table I.

The data showed that the pattern of phosphorus absorption followed an increasing trend upto the primordia initiation stage followed by a gradual decrease thereafter at the stem elongation flowering and milky stages. Consistently higher phosphorus uptake was noted in all the plots under the treatments compared to that of control at all stages of growth. This is in agreement with the findings of Patnaik *et al* (1965).

Table 1
P₂O₅ contents of plant at different stages of growth

Tiller stage	P ₂ O ₅ in tiller		P ₂ O ₅ in stem		P ₂ O ₅ in leaf		P ₂ O ₅ in root		P ₂ O ₅ in whole plant						
	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁					
P ₀	0.309	0.427	0.368	0.399	0.463	0.431	0.336	0.496	0.416	0.373	0.454	0.414	0.379	0.345	0.362
P ₁	0.327	0.427	0.377	0.473	0.546	0.505	0.441	0.518	0.479	0.374	0.634	0.419	0.418	0.435	0.427
P ₂	0.482	0.473	0.478	0.575	0.561	0.569	0.515	0.518	0.517	0.430	0.544	0.464	0.454	0.418	0.436
P ₃	0.345	0.527	0.336	0.570	0.577	0.574	0.536	0.454	0.517	0.517	0.518	0.518	0.473	0.515	0.439
Mean	0.366	0.464	—	0.504	0.536	—	0.457	0.508	—	0.434	0.472	—	0.431	0.42.	—

Treatment comparisons	O. P.		S. E. of mean		C. P.		S. E. of mean		D. P.		S. E. of mean			
	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁	O ₀	C ₁		
1. Between levels of phosphorus	0.0314	—	—	—	0.012	—	—	—	0.0352	—	0.0208	—	0.0055	—
2. Between levels of tiller	0.0291	—	—	—	0.011	—	—	—	0.0270	—	0.0164	—	N.S.	0.001
3. Between levels of whole plant	0.0448	—	—	—	0.016	—	—	—	0.0540	—	0.0299	—	0.0027	—

The absence of significant influence of calcium on phosphorus uptake, observed at the the milky stage may appear strange at first, especially in view of the consistantly significant effect of calicum and calcium phosphorus interaction on phosphorus uptake noted upto the flowering stage. But it may be noted that there is no inconsistency in this result and the same will be apparent if a correct appreciation is made on the nature and trend of phosphorus absorption by the growing rice crop. Kasai and Asada (1960) have experimentally proved that most of the phosphorus translocated to the grains from milky stage onwards is derived from the leaves and culm of the rice plant. In other words it is the metabolic uptake rather than physico-chemical that plays a dominant role in the absorption and translocation of phosphorus. The effect of calcium in its relation to phosphorus is that it enhances the solubilisation and better utilisation of added and native phosphorus in the soil. Since the plant requirements of phosphorus from milky stage onwards is mostly satisfied by the translocation from leaves and stem the absence of significant effect of calcium on phosphorus uptake can be expected especially in view of the fact that the absorption of phosphorus is a metabolic process from this phase of crop growth.

The significant calcium phosphorus interaction obtained in this growth phase appears to be a continuation of the significant interaction effect noted in all the other growth phases and more so because of the fact that 60 to 80 percent of the phosphorus already absorbed and present in the leaves and culm of the plant. This also accounts for the observed absence of individual effect of calcium.

Summary

An experiment was laid out in the sandy clay loam soils of the Agricultural College, Vellayani, Kerala during the first crop (*Virippu*) season of 1968 to study the uptake pattern of phosphorus by rice under graded doses of phosphorus in conjunction with lime using the rice variety I.R.8. The treatments consisted of 4 levels of phosphorus (0, 50, 100 and 150 kg P_2O_5 /ha, respectively) and two levels of lime (0 and 3273 kg slaked lime/ha, respectively) laid out in randomised block design replicated four times.

There was significant increase, in the uptake of phosphorus by the plant with increasing levels of phosphorus whether applied alone or in conjunction with lime. The pattern of phosphorus absorption showed an increasing trend upto the primordia initiation stage, followed by a gradual depression thereafter. Application of lime has favourably influenced the uptake of phosphorus at all stages of growth.

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സംഗ്രഹം

ഐ. ആർ. 8 എന്നയിനം നെല്പിന് കുമ്മായത്തോടൊപ്പം വിവിധ അളവുകളിൽ ഭാവഹം നല്ലമ്പേര അതു് എപ്രകാരം ആഗിരണം ചെയ്യപ്പെടുന്നു എന്ന് നിരീക്ഷിക്കുന്നതിനു് വേണ്ടി വെള്ളായണി കാർഷികകോളേജിൽ 1968-ലെ വിരിപ്പു കൃഷിക്കാലത്തു് ഒരു പരീക്ഷണa നടത്തിനോക്കിയതിൽ rarositsasm പ്രായംവരെ rarajcoTrasroo ചെയ്യപ്പെടുന്ന ഭാവഹത്തിന്റെ അളവു് വർദ്ധിക്കുകയും അതിനു്ശേഷം കുറഞ്ഞുവരുന്നതായും കുമ്മായം എല്ലായ്പ്പോഴും ഭാവഹത്തിന്റെ ആഗിരണത്തിനു് സഹായകമായിരുന്നതായും രേഖപ്പെടുത്തിയിരിക്കുന്നു.

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