

RESPONSE OF RICE TO DIFFERENT FORMS OF PHOSPHATIC FERTILISERS AND LIME IN THE ACID SOILS OF KUTTANAD (KERALA STATE)

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Available phosphorus in the Kuttanad soils of Kerala is very low. Precipitation of phosphorus with Fe and Al oxides (Gopalaswamy 1961) and fixation of the element in the clay colloids (Koshy and Britomuthunayagom 1965) are known to be the two reasons making the contents of available phosphorus in the soil low. These two processes have posed perennial problems in the phosphorus nutrition of rice crop cultivated in these soils. Application of lime to counteract the toxic effects of the salts and application of a phosphatic fertiliser to make up the phosphorus deficiency are necessary to solve these problems. Koshy (1960) reported that lime when applied in acid soils at high rates had a depressing effect upon phosphorus absorption. Kurup and Koshy (1968) observed that water soluble phosphorus from superphosphate was equally efficient as citric soluble phosphorus in the Kuttanad soils. Apart from these nothing is known about the suitability of the different forms of phosphorus fertilisers in the acid soils of Kuttanad. Hence the studies presented in this paper were undertaken at the Regional Rice Research Station, Moncompu, Kerala State, with a view to assess the performance of different forms of phosphatic fertilisers with and without lime.

Material and Methods

The soil of the experimental plots was alluvial clay, having a pH of 4.5. Four forms of phosphatic fertilisers to supply 45 kg P_2O_5 per hectare (see Table I for details) and two levels of lime (0 and 1123 kg lime per hectare) were included in the trial, laid out in a split plot design with six replications. Liming was taken as the major treatment in the main plots and the forms of fertilisers were allotted at random in the sub plots. The experiment was repeated for three years from 1961-62 to 1963-64 during the Punja seasons extending from September-October to February-March. Ptb 10, a short duration variety of paddy was used for the trials. The sub plots measured 4.88 X 3.66 metres and the seedlings were planted in doubles at a spacing of 23 x 15cm. Nitrogen and potash were applied at 23.0 kg and 11.2 kg per hectare respectively in all the treatments and were applied in the form of ammonium sulphate and muriate of potash respectively. The entire dose of lime, phosphorus and potash were applied basally and nitrogen was applied in two split doses, one at transplanting and the second at the tillering stage. Results were assessed by recording the plant height and the number of productive tillers per hill from ten hills selected at random from each plot and the yield of paddy from a net area of 4.65 X 3.5 metres.

Results and Discussion

Table 1 summarises the effect of the different forms of phosphorus on the yields of grain and straw, on plant height and on the number of tillers of paddy produced. It is seen that the different forms of phosphatic fertilisers had a striking influence on the yield of paddy. Superphosphate was found to give a marked increase in the yield of grains over bonemeal and the control, but from the view point of statistical significance it was on a par with rock phosphate and hyperphosphate. Among the three fertilisers, hyperphosphate, rock phosphate and bonemeal, no significant difference in their performance was in evidence.

In the combined analysis of the yield of straw, the fertilisers ranked in the same order of performance as in the case of the grain yield. All the forms were significantly superior over the control with superphosphate performing appreciably better than hyperphosphate and bonemeal.

The plant height was significantly higher in the plots receiving the phosphates as against the control receiving no phosphate. There was, however, no significant difference among the different forms. The production of tillers was not at all affected by the different forms of fertilisers.

Table 1

Effect of different forms of phosphorus on certain plant characters and yield of paddy (Average of 3 years' experiments)

Plant characters	No phosphate P0	Super phosphate P1	Hyper phosphate P2	Rock phosphate P3	Bonemeal P4	Significance and ranking
Grain yield gm/plot	2977.4	3528.6	3353.5	3383.5	3170.6	Sig. P1P3P2P4P0
Straw yield kg/plot	7.48	9.33	8.45	8.67	8.28	Sig. P1P3P2P4P0
Tillers/hill	9.72	10.38	10.18	10.01	10.13	Not Sig.
Height in cm.	97.16	104.97	103.39	101.98	101.12	Sig. P1P2P3P4P0

Table 2

Effect of lime on certain plant characters and yield of paddy (Average of 3 years' experiments)

Plant characters	No lime	Lime 1123 kg/ha	Significance
Grain yield gm/plot	3311.40	3254.40	Not significant
Straw yield kg/plot	8.47	8.41	-do-
Tillers/hill	10.06	10.10	-do-
Height in cm	102.72	100.73	-do-

The results of the performance of the various forms of phosphatic fertilisers observed in the present studies agree with the findings of Kurup and Koshy (1968) that citric soluble and water soluble phosphates are equally effective in the acid soils of Kuttanad. The findings of Pierre and Norman (1953) and others on the influence of citric soluble phosphorus on the performance of short duration crops also find support in the present studies.

Table 2 shows that application of lime did not show any significant influence on any of the plant characters studied in the trial. This appears to be because the doses of lime in the present trials were insufficient as to show any favourable effects on the growth and yield of rice in the acid soils of Kuttanad.

Summary

Effect of four forms of phosphatic fertilisers, viz. superphosphate, rock phosphate, hyperphosphate and bone meal (each at 45 kg P_2O_5 /ha) with 1123 kg lime per hectare and without lime on the growth and yield of paddy in the acid soils of Kuttanad was assessed in thrice repeated field trials.

Superphosphate, hyperphosphate and rock phosphate increased the grain yield significantly over control and bone meal; superphosphate was statistically better than hyperphosphate and bone meal in the production of straw. All the phosphatic fertilisers had the same effect in increasing the plant height. Lime did not exhibit any favourable influence on the plant characters either independently or in association with the different phosphates tried.

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