ABSTRACT

A field experiment entitled, "Direct and residual effect of phosphorus in winter rice-groundnut sequence under irrigated conditions" was carried out at the Instructional-Cum-Research Farm, Assam Agricultural University, Jorhat on medium land during 2001-02 and 2002-03 to study (a) the direct and residual effect of phosphorus and (b) to find out an optimum dose of phosphorus for rabi groundnut, in winter rice-groundnut sequence. The experimental site was sandy loam in texture having pH 5.1, medium in available N and P$_2$O$_5$ and low in available K$_2$O. The treatments on rice consisted of two sources of phosphorus, viz., SSP and MRP with four levels of phosphorus (0, 20, 40 and 60 kg P$_2$O$_5$/ha) in a factorial randomized block design with three replications. After harvest of rice, each individual plot was divided into three sub-plots and groundnut was raised with three levels of phosphorus (0, 20 and 40 kg P$_2$O$_5$/ha) as SSP in a split-plot design.

Rice grain yield and its yield attributes were significantly affected by levels of phosphorus and the highest grain yield (33.18 and 34.75 q/ha in first and second year, respectively) was obtained at 40 kg P$_2$O$_5$/ha which was at par with 60 kg P$_2$O$_5$/ha. Similar results were also obtained in straw yield in both the years. SSP and MRP were equally effective in rice production.

N, P and K uptake were increased with increasing levels of phosphorus at all the growth stages of rice up to 40 kg P$_2$O$_5$/ha. Available P$_2$O$_5$ content of soil was increased significantly with increasing levels of phosphorus recording the highest at 60 kg P$_2$O$_5$/ha at all the growth stages. MRP treated plots showed significantly higher available P$_2$O$_5$ content in soil than SSP treated ones at harvest of rice.

The direct and residual effect of phosphorus was found significant on growth and yield attributing characters of groundnut resulting in the highest pod yield (19.68 and 18.73 q/ha in first and second year, respectively) at direct application of 40 kg P$_2$O$_5$/ha. In the case of residual effect of sources, MRP
recorded significantly higher pod yield than SSP. Higher the dose of P₂O₅ applied to rice, the more was the effect of residual phosphorus as exhibited by the yield attributing characters and yield of groundnut.

The N, P, K uptake, oil content, oil yield, protein content and protein yield were significantly increased due to direct and residual effect of phosphorus resulting the highest at direct application of 40 kg P₂O₅/ha to groundnut. Residual effect of MRP registered significantly higher uptake of N, P, K than SSP. The available nitrogen and phosphorus content of soil were improved at the end of the sequence irrespective of treatments except the control.

The highest benefit-cost ratio (2.35) in the sequence was found at the treatment combination of 40 kg P₂O₅/ha as MRP applied to rice and 20 kg P₂O₅/ha as SSP applied to groundnut. However, the same combination using SSP instead of MRP in rice gave the cost benefit ratio of 2.07. The optimum economic dose of phosphorus as SSP for groundnut was found to be 25.69 kg P₂O₅/ha with direct application of 40 kg P₂O₅/ha to rice as MRP in winter rice-groundnut sequence.

Considering the economy and availability of sources, application of 40 kg P₂O₅/ha to rice as MRP and 20 kg P₂O₅/ha to groundnut as SSP was an economic dose with a net return of Rs. 54,230/ha. On the other hand, same combination using SSP instead of MRP in rice gave the net return of Rs. 49,706/ha in winter rice-groundnut sequence.