

COMBINED APPLICATION OF GREEN MANURE AND AMOPHOS ON P NUTRITION AND YIELD OF RICE

Poor utilization efficiency of phosphorus due to fixation-immobilization and immobility phenomenon in soil is a principal constraint in realizing high crop yields. Several reports suggests that incorporation of green manures to soil influence P uptake and crop yield by the direct contribution of P contained in green

manures and by its indirect effect on the availability of inorganic P present in the soil and applied as fertilizers. The present investigation was undertaken to assess the effect of incorporation of varying quantities of green manure in the absence and presence of inorganic fertilizer on P uptake and yield of rice.

Table 1. Yield attributes, yield and P uptake of rice

| Treatments | Panicles/ hill | Spikelets/ panicle | 1000 grain weight, g | Grain yield | Total dry matter yield | P uptake, mg pot ⁻¹ |
|---|-------------------|-----------------------|-------------------------|----------------|------------------------------|-----------------------------------|
| | Number | | | | | |
| Soil alone (control) | 4.50 | 34.50 | 20.53 | 2.29 | 4.46 | 9.69 |
| Soil + amophos @ 35 kg ha ⁻¹ | 4.50 | 51.60 | 22.06 | 4.05 | 8.50 | 22.56 |
| Soil + GM at 0.25% by wt. of soil | 5.25 | 48.20 | 22.54 | 4.31 | 9.28 | 23.41 |
| Soil + GM at 0.25% by wt. of soil + amophos @ 35 kg ha ⁻¹ | 5.50 | 59.20 | 22.90 | 5.70 | 11.68 | 31.83 |
| Soil + GM at 0.50% by wt. of soil | 4.25 | 50.20 | 21.86 | 3.51 | 6.91 | 18.08 |
| Soil + GM at 0.50% by wt. of soil + amophos @ 35 kg ha ⁻¹ | 5.00 | 55.26 | 22.24 | 5.14 | 10.52 | 28.17 |
| SEm | 0.36 | 0.36 | 0.74 | 0.25 | 0.56 | 1.63 |
| CD(0.05) | NS | 9.10 | NS | 0.74 | 1.66 | 4.84 |

The experiment was conducted at the College of Horticulture, Vellanikkara using *Sesbania aculeata* as green manure and amophos (20 per cent P₂O₅) as P fertilizer. The green manure contained 3.04 per cent N, 0.22 per cent P and 2.18 per cent K. The C:N and C:P ratios were 13.16 and 183.90 respectively. The soil used for the study was having a pH of 5.4, total N 0.14 per cent, available P 14 ppm and available K 163 ppm. The trial was conducted in pots filled with 1 kg of soil and laid out in CRD with six treatments and four replications. The treatment details are given in the table. The rice variety *Annapurna* was used and one hill consisting of three seedlings was planted per pot. The green manure was oven dried at 60°C till constant weight and was applied five days before transplanting and 5 cm water level was maintained continuously during the crop period. The air-dried soil passed through a 2 mm sieve was used for the study. The data on various characters under study are presented in the table.

Among the yield attributes, number of spikelets per panicle alone showed significant difference between treatments. The spikelet number increased 14.7 per cent when green manure was applied at 0.25 per cent (w/w of soil) along with amophos over amophos application alone which could be attributed to the greater availability of nutrients under green manuring caused by its direct effect of nutrients supply and the indirect effects of ameliorating soil physical and chemical environment (Pushpa *et al.*, 1995). The P uptake by rice in the same treatment was also the highest with 41 per cent increase over amophos application alone, possibly due to the high crop dry matter production and P content. A low fixation of applied P in the presence of organic matter in flooded acidic low land soil was reported by Mandal and Mandal (1973) and Bhattacharya and Das (1975). They attributed it to the formation of complexes of soil Fe and Al by the decomposition products of organic matter.

The grain yield, total dry matter and P uptake were the highest in the treatment receiving green manure at 0.25 per cent + amophos. Green manure incorporation at the high rate (0.50 per cent) without amophos resulted in negative response with respect to the yield and P uptake. A high concentration of CO₂ and organic acids produced during the anaerobic decomposition of excessive organic matter in the soil might have affected the root growth and uptake of nutrients and consequent reduction in yields as reported by Ponnampereuma (1964). The initial immobilization of the available nutrients by the microorganisms involved in the decomposition of the added green manure also might have resulted in the temporary unavailability

of nutrients to plants due to the so called priming effect. When the quantity of green manure was reduced to 0.25 per cent all the parameters were positively influenced. Irrespective of the quantity of green manure applied, combined application of green manure and amophos increased the yield and P uptake. This can be explained in terms of lessening the immobilization and enhanced decomposition and subsequent availability of nutrients in soil plant system.

From the study, it was revealed that combined application of moderate level of green manure and inorganic fertilizer is more efficient in increasing the availability of P to rice thereby increasing the growth and yield of rice.

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