EFFECT OF PHOSPHORUS ON THE NITROGEN FIXING ABILITY OF SELECTED RHIZOBIAL STRAINS INOCULATED TO COWPEA (Vigna unguiculata (L.) Walp) AND MUNG BEAN (Vigna radiata (L.) Wilczek.)

By

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ABSTRACT

Nitrogen fixation by cowpea and mungbean in symbiosis with the cowpea group of Rhizobium may be limited by the availability of phosphorus. Soils of dry zone and Intermediate Zone of Sri Lanka contain effective indigenous strain of Rhizobium which have an ability to nodule cowpea and mungbean. But the effect of P on N fixation of these legumes inoculated with these strains have not yet been demonstrated. Hence the effect of phosphorus application and inoculation with effective strains of cowpea group rhizobia on the efficiency of nitrogen fixation in cowpea Vigna unguiculata L.Walp.CV.M1-35) and mungbean (Vigna radiata L. Wilczek.CV.M1-5), were studied in two different locations of Sri Lanka namely Mahailluppallama (reddish brown earth soil) in the dry zone and Meewathura (Alluvial soil) in the wet zone. A factorial experiment with three levels of P(0, 60, 180kg/ha), two selected native Rhizobium strains (CP-30, YC-6/MC-6) and one standard strain obtained from NifTAL (TAL 209) were used. These three native strains were isolated from cowpea.

Rhizobium strain YC 6 and 180kg/ha of P was the most effective combination for nitrogen fixation in cowpea, which showed the highest nodulation (10 DAS), Acetylene Reduction Assay (40 DAS), shoot dry weight (40, 60 DAS), N uptake(40,60 DAS),P uptake(40,60 DAS) and grain yield in dry

zone experiments. Highest nodulation (20, 40 DAS), Acetylene Reduction Assay (40 DAS) and N uptake (60 DAS) were also highest with the same combination in wet zone trials. The grain yield was also found to be the highest in cowpea inoculated with the strain YC 6 at all three levels of P.

Cowpea inoculated with Rhizobium strain CP 30 performed at best at 180kg/ha and also at 60kg/ha of P with regard shoot weight, N and P uptake at the earliest stage of growth in wet zone. Cowpea(1935.1 kg/ha) and mungbean(1510.3 kg/ha) inoculated with CP 30 recorded the second highest grain yield in wet zone. In dry zone,strain CP 30 recorded the second highest grain yield of mungbean (1141.23kg/ha) while cowpea (2045.43kg/ha) recorded the third highest yield.

Rhizobium strain TAL 209 with cowpea produced the highest nodulation (20 DAS), Acetylene Reduction Activity (40 DAS), shoot dry weight (20, 40, 60 DAS) and grain yield at 60kg P/ha in Mahailluppallama. In Meewathura the highest nodulation (20 DAS), the second highest Acetylene Reduction Activity (40 DAS), and the highest shoot dry weights (40, 60 DAS) were recorded with the same combination.

Only at 20 DAS cowpea treated with TAL 209 and 180 kg P/ha showed the highest shoot weight, uptake of N and P in the same location. In Meewathura the above combination recorded the lowest values for shoot weights, uptake of N

and P at 20 DAS. The strain TAL 209 was not very effective in N - fixation in mungbean at both locations.

Application of 180kg P/ha in mungbean nodulated with MC 6 resulted the highest nitrogen fixation and grain yeild in Mahailluppallama and Meewathura.