

Effect of phosphorus on nitrogen fixing potential of *rhizobium* and their response on yield of mung bean [*Vigna radiata* (L.)]

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ABSTRACT

Experiment was carried out in sandy loam soil during *kharif* season 2007 to find out the effect of various levels of phosphorus on nitrogen fixing potential of *rhizobium* and their response on mungbean variety of N.D.M.-1. The data revealed that the 45 kg P₂O₅ ha⁻¹ and *Rhizobium* inoculation significantly increased microbiological parameters such as number of nodules, fresh weight of nodules and nitrogenase activity. Application of 45 kg P₂O₅ ha⁻¹ along with *Rhizobium* significantly increased the yield of mungbean.

Key words : Phosphorus, *Rhizobium*, Nitrogenase activity.

Mung bean (*Vigna radiata* L.) is an important rainy season pulse crop of arid and semi-arid zones of Uttar Pradesh. Being a grain legume, mungbean requires phosphorus for a number of metabolic functions. There is, however, considerable inconsistency in respect of response of mungbean to phosphorus in soil having low to medium in available P, as availability of applied phosphorus is about 10 to 20% due to their phosphorus fixing nature. Availability of phosphorus also depends upon the organic matter content of soil (Black, 1973).

Pulses enhance the soil fertility through nitrogen fixation with the help of symbiotic *rhizobium* (Rai and Singh, 1999). The *rhizobium* inoculation has been proved as a cheapest source of nitrogen fertilizer input for better crop yield particularly in legumes. Biological nitrogen fixation contributes 69 per cent of the global nitrogen fixation. It is, therefore, necessary to find out the interaction of phosphorus and *rhizobium* on nitrogen fixing potential and their role in legume production.

MATERIALS AND METHODS

The field experiment was conducted during *kharif* season of 2007 at Students Instructional Farm of N.D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) The soil of experimental field was alkaline in reaction (pH 8.8), low in organic carbon (0.40 %), available nitrogen (262.00 kg), available phosphorus (19.71 kg) and medium in potassium (272.80 kg) ha⁻¹. Soil of experimental field was analysed by the method of Jackson (1973) and available phosphorus was analysed by the method of Olsen *et al.* (1954).

Mung bean (*Vigna radiata* L.) variety NDM-1 was sown by drilling the seeds in rows 30 cm apart @ 15 kg

seeds ha⁻¹. The entire dose of nitrogen as urea (20 kg ha⁻¹), phosphorus as per treatment were applied as single super phosphate, however *rhizobium* inoculation was done by seed treatment. The treatment combinations with different levels of phosphorus (0, 15, 30, 45, 60 and 75 kg P₂O₅ ha⁻¹) and *rhizobium* were tested in RBD with 3 replications. For the study of nodulation five plants were uprooted with the help of Khurpi and washed without any damage to the roots. The number of nodules and fresh weight of nodules were recorded and average are presented. Nitrogenase activity was estimated by the method of Rai (1983).

RESULTS AND DISCUSSION

Number of nodules :

Number of nodules increased with increasing levels of phosphorus from 0-75 kg P₂O₅ ha⁻¹. The maximum number of nodules were recorded at 75 kg P₂O₅ ha⁻¹ and significantly at par with 45 and 60 kg P₂O₅ ha⁻¹ with and without inoculation of *rhizobium* (Table 1). The increased number of nodules with increasing levels of phosphorus may be attributed to supply of phosphorus to the plant roots at various growth stages. The phosphorus requirement is very essential specially at the time of nodules formation and the association of phosphorus with *rhizobium* inoculation improved the number of nodules. These results are in conformity with those observed by Kumar and Chandra (2003).

Fresh weight of nodules :

Fresh weight of nodules also improved with the increasing levels of phosphorus alone or with *rhizobium* inoculation. The maximum fresh weight of nodules was