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Response of *Rhizobium* VA-Mycorrhiza and phosphorus on yield and yield contributing characters of pea (*Pisum sativum* L.)

VIJAY KUMAR SINGH AND R.P. SINGH

SUMMARY

Response of *Rhizobium*, VA-mycorrhiza (VAM) and phosphorus on yield and yield contributing characters of pea (*Pisum sativum* L.) was conducted at Instructional Farm of N.D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during *Rabi* season 2009-10 with three replications. Inoculation of *Rhizobium*, VAM and 50 kg P_2O_5 gave better response in respect to nodulation, VAM colonization and spore population of VAM fungi, yield and yield attributes and protein content in grain. Chemical properties of the soil was also improved after inoculation of *Rhizobium* and VAM.

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KEY WORDS : Rhizobium, VA-mycorrhiza, Phosphorus, Pea, Yield

The pea (*Pisum sativum* L.) plant is able to fix atmospheric nitrogen by the formation of root nodules with symbiotic association of Rhizobium. In this process Rhizobium spp. reduced atmospheric N₂ to ammonia (NH₂) using the enzyme nitrogenase and NH₂ is supplied as nitrogen sources for the host plant. Many researchers (Rahman et al., 1994; Solaiman and Rabbani, 2005) have reported the beneficial effects of Rhizobium inoculation to the leguminous crop. The effect of VA-mycorrhiza (VAM) in improving plant growth by improved uptake of nutrients, specially phosphorus, which is due to exploration by external hyphae of the soil beyond the root hairs and phosphorus depletion zone. VAM fungi also improve the uptake of minor elements like zinc, copper and water. Besides this, VAM fungi also produce plant hormones, which increase the activity of nitrogen fixing organisms and reduce the severity of disease. Higher concnetraiton of IAA and GA produced by microbes may be other cause for more nodulation (Singh, 1993). Phosphorus is a macronutrient and occurs in most of the plants in concentrations between 0.1 to 0.4 per cent phosphorus not only enhances the root growth but also promotes early plant maturity (Mullins et al., 1996). Since, legumes are heavy feeder of phosphorus, therefore application of phosphatic fertilizer to pea promotes to growth, nodulation and enhance the yield. It is therefore, necessary to find out the interaction of *Rhizobium*, VAM and phosphorus on yield and yield contributing characters of pea.

EXPERIMENTAL METHODS

The study was carried out at Instructional Farm of the Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Faizabad (U.P.), during *Rabi* season of 2009-10. The chemical properties of the soil are presented in Table A.

The experiment was laid out in a complete RBD (Randomized Block Design) with three levels of phosphorus. Each treatment was replicated thrice. In order to eliminate the contamination, inoculation treatments (with and without) were randomly applied to main plots and phosphorus doses (0, 25 and 50 kg P ha⁻¹) as single super phosphate were randomly applied to the subplot before sowing. Plot size was 5 x 3 m. The seed was sown 30 cm row spacing. A basal dose of 25 kg N ha⁻¹ as urea was applied to each plot at the time of sowing. *Rhizobium* was inoculated by the seed treatment. VAM fungi were applied as soil inoculants at the time of seeds sowing. Plants were harvested in the month of March, 2010.

Plants with intact root system uprooted after 30 and

Address of the corresponding author : R.P. SINGH, Department of Soil Science, N.D. University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA

Address of the co-authors : VIJAY KUMAR SINGH, Department of Soil Science, N.D. University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA