

## Response of cowpea [*Vigna unguiculata* (L.) Walp.] to phosphate solubilizing bacteria isolated from rhizosphere

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A pot culture experiment was carried out to assess the impact of novel phosphate solubilizing bacteria on yield parameters, nodulation and nutrient uptake of cowpea [*Vigna unguiculata* (L.) Walp.]. The experiment consists of nine treatments. Among them plants receiving phosphate solubilizing bacteria identified as *Pseudomonas* sp. and *Acetobacter* sp. amended with or without rock phosphate was superior over other treatments in all respects and were comparable with the treatment receiving *Pseudomonas striata*.

Key words : Phosphate solubilizing Bacteria, *Vigna unguiculata*, Rhizosphere.

### INTRODUCTION

Phosphorus is one of the most important plant nutrients, which is required in optimum amount for proper growth of plants and soil microorganisms. About 98% of Indian soils have inadequate supply of available phosphorus (Ghosh and Hassan, 1979). Various number of soil bacteria possess mineral phosphate solubilizing activity (Mikanova and Kubat, 1994). In addition, microorganism involved in P solubilization as well as better scavenging of soluble P can enhance plant growth by increasing the efficiency of biological nitrogen fixation, enhancing the availability of other trace elements such as Fe, Zn etc. and by production of plant growth promoting substances (Kucey *et al.*, 1989). Many plants have shown to benefit from the association with microorganisms under phosphorus deficient conditions. Taking these points into account an investigation was carried out to evaluate the effects of local phosphate solubilizing bacteria on the yield parameters, nodulation and nutrient uptake of cowpea.

### MATERIALS AND METHODS

Twenty seven phosphate solubilizing bacterial isolates were obtained from rhizosphere soil of different crops viz. coconut, vanilla, rubber, banana, paddy, ladies finger, pea and pumpkin. All the bacterial isolates were subjected to *in vitro* tricalcium phosphate solubilization. Zone of clearance produced in Pikovskaya's agar was also taken as criteria for selection. Based on these two isolates (*Acetobacter* sp. and *Pseudomonas* sp.) and a standard

culture (*Pseudomonas striata*) obtained from IARI, New Delhi was used for further study.

Experiments with cowpea as test crop was conducted in loamy soil obtained from Kottayam district to evaluate the effect of inoculation of selected strains of phosphate solubilizing bacteria on yield and uptake of nutrients by cowpea. The soil collected from the top 15 cm layer was air dried, passed through 2 mm sieve and filled in polythene bags of 20'15 cm size. The soil is loamy with pH 6.1, electrical conductivity  $0.1 \times 10^{-3}$  mhos/cm, organic carbon level 1.3%, available phosphorus 8.8 kg/ha and available potassium content 11 kg/ha. Fertilizers at the rate of Urea 32.5 kg/ha, Muriate of potash 21.375 kg/ha, Farm yard manure 20 t/ha and Lime 250 kg/ha were weighed separately for each pot and added to the soil as basal dose before sowing.

The seeds were mixed with *Rhizobium japonicum* culture and rice water for two hours and then dried in shade and used for sowing. 2 ml of the 3 days old cultures of the phosphate solubilizing bacteria (OD 1) were poured over the seeds. Super phosphate and rock phosphate were added to the respective pots after one week to allow the bacterial cultures to establish themselves in the soil. When the plants were established the total number of plants in each pot was thinned to three. The plants were watered regularly to maintain the optimum soil moisture regime. Plant protection measures were taken up whenever necessary. A booster inoculation of cultures was given (2 ml suspension of 3 days old culture) in the rhizosphere of each plant after 30 days. Observations were taken at

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