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RESEARCH PAPER

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Selection of effective indigenous *Rhizobium* strains in district Sagar for chickpea bioinoculant

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An attempt has been made to isolate and characterize nitrogen fixing bacteria, *Rhizobium*, from the root nodules of chick pea collected from different fields of the district Sagar, (M.P.). A total of 26 isolates were obtained. The isolated strains were identified on the basis of colonial and morphological characteristics on Yeast mannitol agar medium by Congo red test. Out of 26 isolates, 14 were confirmed to be *Rhizobium* on the basis of the results of Gram staining, carbol fuchsin staining for the presence of Poly β hydroxybutyrate granules, motility test and lactose agar test. The isolates were further characterized biochemically by performing indole, methyl red, vogues proskauer, citrate utilization, nitrate reduction test. The isolates were also tested for its phosphate solubilising efficiency, capability to tolerate variability in salt concentration, pH and presence of amylase and catalase enzymes. Out of 14, 5 isolates showed very good phosphate solubilising zones upto 15 mm on one day incubation and 2 isolates namely CP3 and CP13 also showed siderophore production and thus were found to be the best strains which could be further characterized for their use as bioinoculant.

Key words : *Rhizobium*, Chickpea, Bioinoculant

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INTRODUCTION

Nitrogen is required by all living organism for the synthesis of proteins, nucleic acids and other nitrogen- containing compounds. *Rhizobium* is soil-inhabiting bacteria with the potential of forming specific root structures called nodules. In effective nodules the bacteria fix nitrogen gas from the atmosphere into ammonia (O'Gara and Shanmugam, 1976), which is assimilated by the plants and supports growth, particularly in nutrient deficient soils. Chickpea is one of the most important grain legumes traditionally cultivated in deprived areas and saline soils (Rao *et al*., 2002). The agronomical importance of chickpea (*Cicer arietinum* L.) is based on its high protein concentration 25.3- 28.9% (Hulse, 1991) for the human and animal diet being used more and more as an alternative protein source. Chickpea can obtain a significant proportion of its N requirement through symbiotic nitrogen fixation when grown in association with effective and compatible *Rhizobium* strains. However, indigenous population of *Rhizobium* are present in soil, they cannot establish an effective association, hence, inoculation is essential to ensure that a large and effective rhizobial population is available in the rhizosphere of the plant (Hynes *et al*., 1995).

The isolation of superior *Rhizobium* is very important because the effective rhizobial strains are used as inoculants to ensure the effective nodulation (Moxley *et al*., 1986). The competitive ability of a inoculant strain is a major factor determining the success of rhizobial inoculation.

Rhizobia like other growth promoting rhizobacteria (PGPR), stimulate the plant growth and are also able to solubilize both organic (Abd-Alla, 1994) and inorganic phosphates (Antoun *et al.*, 1998). The main advantage of rhizobia, as PSM will be their dual beneficial nutritional effect resulting both from phosphate mobilization and nitrogen fixation (Peix *et al.,* 2001).

The present study was therefore, undertaken for isolation and characterization of *Rhizobium* from the root nodules of chickpea, to study their efficiency and to bring up an efficient strain which can be used as bioinoculant for chickpea.