RESEARCH PAPER

Asian Journal of Bio Science (October, 2010) Vol. 5 Issue 2 : 169-173

Physiochemical characterization of PGPR isolates of *Rhizobial* strains from Shekhawati region in India

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(Accepted : May, 2010)

Soils contain natural reserves of plant nutrients, but these reserves are largely in forms unavailable to plants, and only a minor portion is released each year through biological activity or chemical processes. For optimum plant growth, nutrients must be available in sufficient and balanced quantities. Nitrogen being an essential component of proteins and nucleic acids plays an important role in improving the crop production. A study on physiochemical characterization *viz.*, physiological, biochemical characteristics and antibiotic resistance signifies that rhizobial strains were sensitive to pH and antibiotic like rifampicin and ciproflaxin. It was also concluded that these rhizobial bacterial strains utilize glucose, arabinose and sorbitol as sole carbon source.

Key words : *Rhizobium*, Biochemical, Antibiotic, Leguminous plants.

INTRODUCTION

Leguminous plants are known as a dietary protein source. These plants show symbiotic nitrogen fixation with the association of *Rhizobium* present in its root nodules. Soil bacteria are one of the major groups of microbes which are abundant in rhizosphere soil ranging between 106 to 108 colony-forming units (cfu) per gram (Clark, 1967) and some of them have shown great potential as biocontrol agents of nematodes (Zavaleta-Mejia and VanGundy, 1982). Plant growth promoting rhizobacteria (PGPR) are free-living bacteria and some of them colonies the tissues of living plants and cause unapparent and symptomatic infections when applied to seeds or crops, enhance the growth of the plant or reduce the damage from soil borne plant pathogens (Kloepper *et al.*, 1980). Rhizobacteria that exert beneficial effects on plant growth and development are referred to as plant growth-promoting rhizobacteria (PGPR). In last few decades a large array of bacteria including species of *Pseudomonas, Azospirillum, Azotobacter, Klebsiella, Enterobacter, Alcaligenes, Arthrobacter, Burkholderia, Bacillus* and *Serratia* have reported to enhance plant growth (Okon and Labandera-Gonzalez, 1994; Glick, 1995). In addition to these traits, plant growth promoting bacterial strains must be rhizospheric competent, able to survive and colonize in the rhizospheric soil (Cattelan *et al.*, 1999). The use of PGPR to promote plant growth has increased in various parts of the world. PGPR can affect plant growth by producing and releasing secondary metabolites and facilitate the availability and uptake of certain nutrients from the root environment (Zahir *et al.*, 2003). Unfortunately, the interaction between associative PGPR and plants can be unstable. The good results obtained *in vitro* cannot always be dependably reproduced under field conditions (Chanway and Holl, 1993; Zhender *et al.*, 1999). Therefore, it is necessary to develop efficient strains in field conditions. One possible approach is to explore physiochemical characterization for PGPR having combination of PGP activities and well adapted to particular soil environment. So keeping in view the above constrains, the present study was designed to screen certain rhizospheric bacterial isolates belonging to the genera *Rhizobium* from different sites of Shekhawati region of India for their multiple plant growth promoting activities.

MATERIALS AND METHODS

Isolation of *Rhizobium* strains:

The rhizospheric soil samples (six) were collected from fields growing different leguminous plants were collected from different areas of Shekhawati region of India. *Rhizobium* bacterial strains were isolated on isolated on yeast extract mannitol agar (Vincent, 1970) containing (per liter) 0.5 g K_2HPO_4, 0.2 g $MgSO_4.7H_2O$,

Sakshi Issar, Saroj Sharma, V.K. Gupta, R.K. Gaur and Harish Dhingra (2010). Physiochemical characterization of PGPR isolates of *Rhizobial* strains from Shekhawati region in India, *Asian J. Bio. Sci.*, **5** (2) : 169-173