

Occurrence of phosphate solubilizing *Pseudomonas* species from rhizosphere and non rhizosphere soils of Bhavnagar, India

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ABSTRACT

Thirty six phosphate solubilizing *Pseudomonas* sp. were isolated from rhizosphere and non-rhizosphere soils of Bhavnagar, India. 21 were fluorescent type of *Pseudomonas* sp. while remaining were non-fluorescent type of *Pseudomonas* sp. The size of the phosphate solubilization zone was highest with fluorescent *Pseudomonas* sp. followed by green pigmented *Pseudomonas* sp. while no phosphate solubilizing zone was observed with other pigmented *Pseudomonas* sp. In Pikovskaya's broth, P - solubilization by fluorescent *Pseudomonas* sp. ranged from 28.6 to 163.1 mg % P_2O_5 while for green pigmented *Pseudomonas* sp. ranged from 26.6 to 87.0 mg % P_2O_5 . Rhizospheric fluorescent *Pseudomonas* sp. were better performers in terms of P solubilization than non rhizospheric fluorescent *Pseudomonas* sp. Five promising isolates were selected based on their phosphate solubilizing activity for subsequent studies. The drop in pH was noted in all the cases.

Key words : Soil microflora, *Pseudomonas* species, Phosphate solubilization, Tricalcium phosphate.

INTRODUCTION

Phosphorus (P) is second only to nitrogen as mineral nutrient required by both, plants and microorganisms. About 98% of Indian soils have inadequate supply of available P (Gaur, 1987). In Indian soils, P is predominantly inorganic chiefly locked as tricalcium phosphate (TCP) (Narsian and Patel 2006, Gaur 1990, Gaur and Gaid 1983). On monitoring the available P status of Gujarat soils in 1984, the State Department of Agriculture termed Bhavnagar soil as "medium" type. It is however, encouraging that the fixed phosphate present in soil can be made available by their solubilization through some microbes. Soil microflora plays a significant role in mineralization / solubilization of bond phosphate, either in the form of organic or inorganic form of phosphatic compounds, and makes available to plant (Narsian and Patel 2006, Kundu *et al.* 2002, Krishna Raj *et al.* 1999, Bangar & Mishra 1990, Kundu and Gaur 1981). Phosphate solubilizing microorganisms (PSMs) include bacteria, fungi, yeast and cyanobacteria can be isolated from rhizosphere soils, non-rhizosphere soils, rhizoplane, areas where phosphate deposited and marine environment (Gaur 1990). However, the response is not always consistent because soil, environment and plant influence the phosphate solubilizing (PS) activity of microorganisms (Kundu *et al.* 2002). Katznelson & Bose (1959) reported that the origin zones / sites of bacterial isolates have direct effect upon their PS activity. Isolates from rhizoplane, rhizosphere and non-rhizosphere have highest, intermediate and least PS activity, respectively. Among

bacteria most efficient phosphate solubilizers belong to genera *Bacillus* and *Pseudomonas* (Ostwal and Bhide 1972, Baradiya and Gaur 1974, Venkateshvarlu *et al.* (1984), Gaur 1985, Gaur 1990,). The genus *Pseudomonas* has been reported as best phosphate solubilizer among bacteria by Arora & Gaur (1979), Gaur (1985), Ostwal and Bhide (1972), Venkateshvarlu *et al.*, (1984), Gaur (1987), Gaur (1990). The present study deals with isolation, identification and screening of *Pseudomonas* sp. from rhizosphere and non rhizosphere soils of Bhavnagar District for their PS activity.

MATERIALS AND METHHODS

Source of Organisms:

Pseudomonas sp. were isolated from rhizosphere and non-rhizosphere soils. Sampling of the rhizosphere soil was done by uprooting the plants gently and soil particles were collected by shaking the roots and stored in sterile wide mouth glass-stoppered bottles. The non-rhizosphere soils from different places of Bhavnagar district were collected up to the depth of 20 cm. in sterile wide mouth glass stoppered bottle

Medium for isolation, identification and screening of PS Pseudomonas sp. :

Nutrient agar and selective media i.e. King's A, King's B and Cetrimide agar (Krieg & Holt, 1984) were used to isolate and identified *Pseudomonas* sp. Pikovskaya's medium (Pikovskaya 1948) was used for screening of phosphate solubilizing *Pseudomonas* sp.