

DETERMINATION OF PLANT GROWTH PROMOTING ACTIVITIES OF FLUORESCENT *PSEUDOMONAS*

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ABSTRACT- Plant growth promoting rhizobacteria (PGPR) are a group of microorganisms beneficial to plant. In the present study Fluorescent *Pseudomonas* were isolated from vishnupuri region of Nanded. These isolates were characterized by morphological and biochemical characters. They were studied for their different plant growth promoting activities such as IAA production, GA production and phosphate solubilization. It was observed that all the isolates were positive for IAA and GA production. Maximum IAA production was observed by PS6. Maximum GA production was observed by PS3. The isolates PS1,PS2,PS5,PS7,PS8 were positive for phosphate solubilization.

Keywords: PGPR, Fluorescent *Pseudomonas*, IAA production, GA production, Phosphate solubilization, plant growth promoting activities, Nanded

INTRODUCTION

Fluorescent *Pseudomonas* is very widely studied group of microbes among the Plant growth promoting rhizobacteria (PGPR). They are able to produce water-soluble yellow-green pigments. They are *P. aeruginosa*, *P. aureofaciens*, *P. chlororaphis*, *P. fluorescens*, *P. putida*, and the plant pathogenic species such as *P. cichorii* and *P. syringae* [1,2]. Plant growth promoting rhizobacteria (PGPR) are able to rapidly colonize roots of many plant species and provide beneficial effects in terms of increased plant growth and suppress plant pathogens [3]. PGPR affect the plant growth by direct or indirect mechanisms. In direct mechanism, PGPR promote plant growth by nutrient acquisition and alter the physiological signaling by synthesizing bioactive constituents [4] while in indirect mechanism, These PGPR produce antagonistic metabolites such as antibiotics [5], siderophores [6], HCN. PGPR have also been known to produce plant hormones such as IAA, cytokinin, and gibberellins which are synthesized through plant-secreted precursors [7]. In the present study attempts were made to isolate and determine plant growth promoting activities of such PGPR i.e. fluorescent *Pseudomonas* which will be useful to increase crop yield.

MATERIALS AND METHODS

Isolation of fluorescent *Pseudomonas*: Fluorescent *Pseudomonads* were isolated by using King's B (KB) agar medium [8] The plates were incubated at 30⁰ C for 24 h. Colonies were observed under UV light on a transilluminator. The fluorescent colonies under UV light were sub-cultured and used for further studies.

IAA production

All Isolates were inoculated in 50 ml King's B broth supplemented 0.1mg/ml tryptophan and incubated at 27 ± 2 °C for 4 days. Supernatant was centrifuged, acidified to pH 2.5 and extracted with 10 ml of ethyl acetate. Ethyl acetate fraction was evaporated at 40 °C under vacuum and residue was suspended in 2 ml ethanol and mixed with Fe-HClO₄ reagent. The absorbance was measured at 530nm after 25 min [9].

Estimation of GA

Twenty-five ml of the culture filtrate was taken in a test tube to which two ml of zinc acetate was added. After two minutes, two ml of potassium ferrocyanide was added and centrifuged at 1000 rpm for 15 minutes. To five ml of this supernatant, five ml of 30 per cent HCl was added and incubated at 20⁰ C for 75 minutes. The blank sample was treated with five per cent HCl and the absorbance of the samples as well as blank was measured at 254 nm in a UV-vis spectrophotometer. The amount of GA present in the extract was calculated from the standard curve and expressed as µg/ml of the medium. The standard curves of GA were prepared by using graded concentrations of GA [10].

Phosphate Solubilization

The active bacterial cultures were spot inoculated on pikovaskay's media plate and incubated at 30⁰c for 5 days. The colonies showing clear zone of solubilization were taken as P solubilizers.

RESULTS AND DISCUSSION.

The present study focused on isolation, morphological and biochemical characterization of plant growth promoting *Pseudomonas* of Banana plants form Nanded region. The study also focused on plant growth promoting activities the isolated *Pseudomonas* strains .A total of 8 strains were isolated and identified by morphological and biochemical characterization. *Pseudomonas* were gram negative short rods and colonies were fluorescent under UV-light. All the isolates were positive for oxidase.PS2, PS3, PS4, PS6, PS8 were negative for starch hydrolysis. All the isolates were positive for gelatin liquefaction and arginine hydrolysis.All the isolates were positive for IAA production.IAA production ranged from 68 µg/ml to 89 µg/ml. Maximum IAA production was observed by PS6. The auxin type phytohormone known as indole-3-acetic acid (IAA) is the main type produced by plant growth promoting bacteria (PGPB) [11]. All the isolates were positive for GA production. GA production ranged from 56 µg/ml to 78 µg/ml. Maximum GA production was observed by PS3. The isolates PS1,PS2,PS5,PS7,PS8 were positive for phosphate solubilization. Many agricultural soils have large amounts of inorganic, these phosphates are unavailable to plants. Several microorganisms including *Pseudomonas* are able to convert this phosphate and make it available to plants [6]. It was evident from the study that Fluorescent *Pseudomonas* are common in the rhizosphere of Banana. Many of the isolates were having multiple beneficial functions like Phosphate-solubilization, production of plant growth promoting substances like IAA and GA. Such isolates could be useful in agriculture.

Table 1: Morphological and biochemical characters of the isolates

Isolate Code	Morphology	Gram's nature	Fluorescent pigmentation	Oxidase test	Arginine hydrolysis	Starch hydrolysis	Gelatin liquifaction
PS1	Rod shaped	Gram negative	Pink	+	+	-	+
PS2	Rod shaped	Gram negative	Pink	+	+	-	+
PS3	Rod shaped	Gram negative	White	+	+	-	+
PS4	Rod shaped	Gram negative	Pink	+	+	-	+
PS5	Rod shaped	Gram negative	Green	+	+	-	+
PS6	Rod shaped	Gram negative	Green	+	+	-	+
PS7	Rod shaped	Gram negative	White	+	+	-	+
PS8	Rod shaped	Gram negative	Pink	+	+	-	+

Table 2: Plant growth promoting activities of the isolates

Isolate code	IAA Production($\mu\text{g/ml}$)	GA Production($\mu\text{g/ml}$)	Phosphate solubilization
PS1	74	70	+
PS2	82	68	+
PS3	81	78	-
PS4	68	74	-
PS5	75	56	+
PS6	89	73	-
PS7	76	69	+
PS8	81	71	+

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