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Enhancing resistance in bhendi to powdery mildew disease by foliar spray with fluorescent pseudomonads

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ABSTRACT

The antagonistic properties of different isolates of phylloplane *Pseudomonas fluorescens* were evaluated against powdery mildew of Bhendi caused by *Erysiphe cichoracearum* in *in-vitro* experiments. Among the 45 isolates evaluated, three isolates *viz.*,I_{18},I_9 and I_{36} recorded least conidial germination and maximum germ tube growth inhibition in cavity slide technique. Effect of these isolates was further tested under glass house condition by foliar spraying. Bhendi plants of 30 days age were sprayed with bacterial suspension (10^9 cfu /ml) as pre-inoculation and post-inoculation treatment. In pot culture experiment, pre-inoculation spray of *P. fluorescens* I_{18} recorded the lowest PDI of 20.89 as against 68.22 in control. Studies were conducted on the mechanisms of induced resistance in bhendi against powdery mildew disease by foliar spray with biotic inducer like *P. fluorescens* I_{18}) as pre-inoculation spray and post-inoculation spray. In pre-inoculation treatment of inducer, there was an increase in the total phenol and the activities of PAL, PPO, PO, â-1,3-glucanase and chitinase as compared with post-inoculation spray. The accumulation of phenol and the activity of the above enzymes started to increase at first day and reached the peak levels on fourth day (phenol & PAL), second day (PPO, PO and b-1,3-glucanase) and sixth day (chitinase) after treatment and decreased subsequently. However, the levels were always higher than the initial level.

Key words: *P. fluorescens* $I_{18,}$ *Erysiphe cichoracearum,* Induced resistance, Phenol, Enzymes

INTRODUCTION

The productivity of bhendi in India is very low due to many constraints including diseases. Diseases cause heavy losses in vegetable production. Diseases are inherent components of agro ecosystem that must be dealt with continuously and on knowledge basis. At different stages of vegetable production, disease management requires several approaches and it is more successful if it is integrated into crop production system. Since bhendi is grown throughout the year, management of the disease is important to get profitable yield. At present, for the management of vegetable diseases, fungicides are the first choice for the farmers' even though there are several inherent disadvantages in this method. Emphasis on developing or improving alternative disease management tactics (biological, cultural and host resistance) has in recent years fostered a new philosophy concerning the management of diseases elsewhere but in India, it has not picked up in most of the cases (Sokhi, 1994).Blakeman and Fokkema (1982) are of the opinion that it is unlikely that a perfect antagonist for the control of a particular pathogen will be found in nature, but it will be more effective, if these biocontrol agents have increased antagonism against the pathogens, increased competitiveness against the existing microflora, increased ability to multiply under favourable conditions and persist under unfavourable condition on host surfaces. Studies were carried out to isolate phylloplane biological control agent if any, and to obtain information that could be useful in managing the powdery mildew pathogen.

MATERIALS AND METHODS

Bhendi leaf samples were collected from five different locations in three different varieties and at three different stages and *P. fluorescens* was isolated by serial dilution using selective medium and identified.

Identification of Pseudomonas fluorescens

P.fluorescens was identified by the colony characters, gram staining, growth at 4°C, fluorescence test and gelatin liquefaction.

Gram staining

Gram staining was done as per the procedure described by Claus (1992)

Growth at 4°C

A loopful of the bacterial culture was streaked from bottom to top on the slants containing King's B medium under aseptic condition, incubated at 4°C for three days and observed for growth (Laskin and Lechevalier, 1977). Creamy white colonies appeared on King's B medium (*P. fluorescens*).

Fluorescence test

A loopful of the bacterial culture was streaked horizontally at the center of the Petri dish containing King'B medium under aseptic condition; incubated at room temperature for 48 hours and observed for the production of pigments that showed fluorescence under ultraviolet light of short wave length (Ca.254nm) (Laskin and Lechevalier, 1977).

Gelatin liquefaction (Seelay and Vandemark,1981)

Gelatin medium (3g yeast extract, 5g peptone and 120 g gelatin in 11itre of distilled water) was prepared, sterilized and allowed to set as cylinders in test tubes. The medium was vertically stabbed by means of a sterile platinum wire dipped in the bacterial suspension, incubated for three to seven days and examined. Liquefaction of gelatin indicated the positive result.

Effect of phylloplane P. fluorescens on conidial germination and germ tube growth of Erysiphe cichoracearum(Cavity slide technique)

The culture filtrates of *P. fluorescens* isolates were obtained by growing these organisms in King's B at room temperature for 48 hours. The culture filtrates were centrifuged at 5000 rpm for 20 minutes at 4°C for clarification. The efficacy of culture filtrates of the antagonistic organisms against *E. cichoracearum* was tested by the cavity slide technique.

Screening of Pseudomonas fluorescens isolates against bhendi powdery mildew in glass house

P. fluorescens isolates found effective (I_9, I_{38}, I_{87}, I_{36}, I_{45}) *in vitro* were tested in pot culture experiments along with carbendazim (0.1%) and existing commercial formulation of *P. fluorescens*1 for the control of bhendi powdery mildew in pot culture experiment. Bhendi plants of 30 days age were sprayed with bacterial suspension (10^9 cfu /ml) as pre-inoculation and post-inoculation treatment. The plants were first

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