

## Management of Guava Wilt by Biological Agent

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### Abstract

Guava (*Psidium guajava* L.) is an important fruit crop of subtropical countries and cultivated extensively throughout India, it is grown almost in all the states. Bihar has the largest area (24.7 thousand ha.) under guava cultivation followed by Uttar Pradesh (18.5 thousand ha.) and Maharastra (14.8 thousand ha.). Various pathogens have been reported from the wilt affected plants from guava orchards of Aligarh district, prominent among them is fungi *Fusarium oxysporum* f. sp. *Psidii*. In the present study, some biocontrol agents *T. harzianum*, *T. virens*, *A. niger* and *P. flourescens* were evaluated for their antifungal activity against guava wilt fungus (*Fusarium oxysporum* f. sp. *Psidii*).

**Keywords:** Guava; Pathogen; *Fusarium oxysporum* f. sp. *Psidii*; Disease.

### 1. Introduction

Guava (*Psidium guajava* L.) is an important fruit crop of subtropical countries and cultivated extensively throughout India, it is grown almost in all the states. Bihar has the largest area (24.7 thousand ha.) under guava cultivation followed by Uttar Pradesh (18.5 thousand ha.) and Maharastra (14.8 thousand ha.). Wilt of guava was first reported in 1935 from Allahabad (U.P.) by Das gupta and Rai Chattopadhyay and Sengupta first reported the disease from west Bengal. Recently wilt disease has emerged as a serious problem of guava and it causes huge amount of losses in guava cultivated areas in India. The losses due to this disease are of such an extent that farmers have shifted to other orchard plants. Various pathogens have been reported from the wilt affected plants from guava orchards of Aligarh district, prominent among them is fungi *Fusarium oxysporum* f. sp. *psidii* (Das Gupta and Rai, 1947, Prasad *et. al.* 1952, Edward, 1960, Pandey and Diwedi, 1985) which initially infects the finer

roots and enter into the vascular system (Edward, 1960; Chatopadhyay and Sengupta, 1955 and Chatopadhyay and Bhattacharya, 1968). There are so many methods to manage the wilt disease among them chemical methods are the most effective but due to their hazardous nature (Mishra and Pandey, 1999) its application is avoided. Biological suppression of plant diseases has been promoted as a means to achieve improved and sustainable crop production system that is less reliant on chemical inputs (Adams 1990). Successful biological control system commonly employs naturally occurring, antagonistic microorganisms that are able to reduce activities of plant pathogens. Recently bioagents have been reported the most effective alternative for chemical control as it is environmentally safe. (Bohra, B., Vyas, B.N and Mistry, K.B., 2006). In the present study, some biocontrol agents were evaluated for their antifungal activity against guava wilt fungus (*Fusarium oxysporum* f. sp. *psidii*).

## 2. Materials and Methods

### 2.1 Isolation of the test organism

The pathogen was isolated from infected guava plant parts and rhizospheric soil on Potato Dextrose Agar medium. Pure culture from single spore was maintained on PDA medium for growth. The culture was maintained at  $25\pm 2^{\circ}\text{C}$  in BOD incubator.

### 2.2 Dual culture inoculation

Three fungal biocontrol agents' viz., *Trichoderma harzianum*, *Trichoderma virens*, *Aspergillus niger* and one bacterial biocontrol agent *Pseudomonas fluoresce* were isolated from the rhizospheric soil of healthy guava plants by serial dilution method. These biocontrol agents were grown in PDA, King's B for 7 days at  $25\pm 2^{\circ}\text{C}$  respectively. All the fungal and bacterial biocontrol agents were tested *in vitro* against the guava wilt fungus, *Fusarium oxysporum* f. sp. *psidii* by dual culture method described by (Dennis and Webster, 1971) on PDA. A mycelial disc of 5mm diameter from 5 day old *Fusarium* culture and fungal bioagents were placed at 4cm apart in each Petri plates containing 20ml of PDA. 5 mm disc of pathogenic fungi (*Fusarium* sp.) was placed perpendicularly opposite to the bacterial streak in petriplate. The plates seeded only 5mm mycelial disc of *Fusarium* at one edge of petri plate served as the control. Radial growth of the biocontrol agents and the test pathogen was recorded after every 24 hours. When the growth of *Fusarium oxysporum* f. sp. *psidii* became static, the inhibition over control was calculated (Vincent 1947).

The observations were taken after every 24 hrs.

### 2.3 Observations

The radial growth (diameter) of colonies was measured seven days inoculation. Per cent inhibition was calculated in comparison to control by following formula as given below (Vincent, 1947).

$$I = \frac{C-T}{C} \times 100$$

Where,

I = Percent inhibition, C= Growth in control, T= Growth in treatment

### 3. Results and Discussion

#### 3.1 Biological management

*In vitro* evaluation of biological control agents against *Fusarium oxysporum* f. sp. *Psidii*:

The study was conducted in laboratory using the test fungi *Fusarium oxysporum* f. sp. *psidii* and biological control agents *T. harzianum*, *T. virens*, *A. niger* and *P. fluorescens*. The biological control agents (fungal as well as bacterial) restricted *Fusarium oxysporum* f.sp. *psidii* growth (Table 1). *T. harzianum* inhibited the growth of *F. oxysporum* f. sp. *psidii* by 71%. The results are in confirmation with findings of Misra *et. al.* and Prakash (2002-04) who applied 3 bioagents in which *T. harzianum* was also used for controlling the wilt disease of guava. *T. virens* was found to be effective biocontrol agent against *F. oxysporum* f.sp. *psidii*, gave maximum inhibition on the growth of *F. oxysporum* f. sp. *psidii* 73% inhibition of radial growth was recorded respectively. The results are similar to the findings of Diwedi and Shukla (2002) they reported that *T. virens* was found effective against *Fusarium oxysporum* f. sp. *psidii*. *Aspergillus niger* was also a effective against *F. oxysporum* f. sp. *psidii*. It restricted the growth and inhibition reaches up to 69%. These results are in accordance with the work done by Singh *et.al.* (2003) they reported that bioagent *A. niger* is effective against the wilt pathogen *F. oxysporum* f. sp. *psidii*. *Pseudomonas fluorescens* bacterial bioagent does not show any remarkable inhibition of the test fungi as compared to other biocontrol agents. This indicates reduction in inhibition capability of bioagent (*P. fluorescens*).

**Table 1:** Effect of biological control agents on the radial growth (cm) of *Fusarium oxysporum* f. sp. *Psidii*.

Biocontrol agent	48 hours (cm)	72 hours (cm)	96 hours (cm)	120 hours (cm)	144 hours (cm)	Average inhibition (%)
<b>1. Control</b>	2.8	4.4	6.5	8.0	8.4	
I. 2. Trichoderma	1.8 (35)	2.2 (50)	2.4 (63)	2.4 (70)	2.4 (71)	57.8
II. 3. T. virens	1.2 (57)	1.6 (63)	2.1 (67)	2.2 (72)	2.2 (73)	65.4
III. 4. A. niger	1.4 (50)	1.9 (56)	2.2 (66)	2.5 (68)	2.6 (63)	61.8
V. 5. P. fluorescens	2.1 (25)	3.2 (27)	3.9 (40)	4.2 (47)	4.6 (45)	36.8
L.S.D (P≤0.05)	0.15	0.15	0.15	0.15	0.15	

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