

MANAGEMENT OF WILT OF FENUGREEK INCITED BY *FUSARIUM OXYSPORUM* THROUGH BIO-CONTROL AGENTS AND SOURCE OF RESISTANCE

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ABSTRACT

Wilt of fenugreek incited by Fusarium oxysporum schlecht is one of the important disease and a big constraint in successful cultivation. An investigation was made to minimise this disease by use of bio control agents. Bio-control agents are proved to be very effective especially against soil borne pathogens. Five bio-agents Trichoderma harzianum, T. viride, Pseudomonas putida, P. fluorescens and Microbacteria paraoxidens were tested against wilt of fenugreek caused by F. oxysporum under pot condition. The Trichoderma harzianum was found significantly superior with (46.11%) disease control followed by Trichoderma viride (43.05%). Pseudomonas putida and Microbacteria paraoxidens were least effective against F.oxysporum. 30 germplasm/varieties were screened against F. oxysporum under artificial conditions. None of entry was found immune or resistant to wilt. Entries UM-100, 112, 116, 118, 124, 126, 127, 134, 137, 301, 302, 304, 322, and 325 were observed moderately resistance, UM-128, 136, 140, 152, 163, 222, RMT-1 and RMT-361 were found susceptible and UM-144, 189, 193, 202, 228, 321, 353, 354 were highly susceptible.

Key words: Fenugreek, *Fusarium oxysporum*, *Trichoderma harzianum*, host resistance.

INTRODUCTION

Fenugreek (*Trigonella foenum graecum*) is a self pollinated, small seeded, annual legume which belongs to family *fabecae*. It is an important multipurpose winter season seed spice crop. In India, the major fenugreek growing states are Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, Uttar Pradesh and Punjab. Fenugreek suffers from many diseases and, wilt of fenugreek incited by *Fusarium oxysporum* schlecht is one of the important disease and a big constraint in successful cultivation of this crop. The disease was first reported from Rajasthan by Shivpuri and Bansal (1987).The wilt of fenugreek causes up to 40% losses annually (Hashmi, 1988). To circumvent pollution hazard due to injudicious use of agrochemical and also to avoid development of resistance in pathogenic fungi to commonly used fungicides, use of bio control agents for the management of plant diseases has increased in recent years. In this context an investigation was planned to isolate, identify pathogen from infected plants of fenugreek and evaluate the efficacy of bio control agents against *Fusarium oxysporum* in pot condition and 30germplasm /varieties were screened against *F.oxysporum* under artificial conditions.

MATERIAL AND METHODS

Roots of infected fenugreek plants were first washed under the tap water and then cut into small pieces along with healthy portion. These pieces were surface sterilized by dipping in 0.1 per cent hypochlorite solution for 1-1½ minute after three consecutive washing with sterilized distilled water, the pieces were transfer to autoclaved potato dextrose agar medium in Petri-plates/slants and incubated at 25±1°C in BOD incubator for 7 days. The fungal colonies emanating from bits were examined on 7 days of incubation and use for purification. Culture of the fungus isolated from roots of infected fenugreek plant was purified by single spore / hyphal tip method (Singh, 1988). The isolated fungus was identified on the basis of morphological and colony characters. The culture was send to ITCC Division of Plant Pathology; IARI, New Delhi for further confirmation of identification of fungus. The pathogenicity of *Fusarium oxysporum* Schlecht was tested under pot conditions by seed and soil inoculation techniques suggested by (Kataria and Grover, 1976), Soil inoculation technique suggested by Radhakrishnan and Sen (1985) and Sen and Kapoor (1975).

Bio-Control Agent

Apparently healthy surface sterilized seeds of fenugreek were coated with *T. harzianum*, *T.*

viride @ 4g / kg seed and *Pseudomonas fluorescens*; *Pseudomonas putida*, *Microbacteria paraoxidens* @ 8g / kg seed separately. Fifteen coated seeds were sown in each pot filled with sterilized soil and inoculated with fungus grown on sorghum grain medium. Fungus inoculated pots without treatment served as check. Each treatment was taken in 4 replication. The pots were watered as when required. Observations on wilt incidence on 7 days (pre and post emergence mortality) were recorded. Per cent wilt incidence was calculated by following formula referred under :

$$\text{Percent wilt incidence} = \frac{\text{No. of wilted plants}}{\text{Total no. of plants}} \times 100$$

Host Plant Resistance

Thirty germplasm /varieties of fenugreek received from AICRP on seed spices, SKN College of Agriculture, Jobner were evaluated against wilt under sick soil condition under field conditions during rabi 2012-13. Inoculum multiplied on sorghum medium was placed in furrow at 8-10 cm depth @ 200g / 3m row length to increase the disease pressure. Observations were recorded after 15 days of sowing and continued up to 75 days on the basis of wilt incidence. The varieties were categorized according to their reaction against the disease as per criterion.

Category	Per cent disease incidence
Free	0 or <1
Resistant	1-10
Moderately resistant	11-20
Susceptible	21-30
Highly susceptible	>30

RESULTS AND DISCUSSION

Bio-Control Agent

Efficacy of five bio-agents *Trichoderma harzianum*, *T. viride*, *Pseudomonas putida*, *P. fluorescens* and *Microbacteria paraoxidens* were tested against wilt of fenugreek caused by *F. oxysporum* under pot condition. The *Trichoderma harzianum* was found significantly superior with 46.1% disease control followed by *Trichoderma viride* (43.05%). *Pseudomonas putida* and *Microbacteria paraoxidens* were least effective against *F.oxysporum*. Our observations are in conformity to Ramezani (2010), who studied the mycoparasitism inhibitory effects of *Trichoderma harzianum*, on the growth of *Fusarium* wilt of tomato (*Fusarium oxysporum* f.sp. *lycopersici*) under green house condition. Aghnoom *et al* (1999) reported that seed dressing with *Trichoderma harzianum* was found to be more effective in reducing wilt incidence in cumin. Reis *et al.* (1995) reported the effect of *T. harzianum* for control of wilt of *Phaseolus vulgaris* caused by *F. oxysporum*

Table 1: In vivo efficacy of bio-control agents against wilt incidence caused by *Fusarium oxysporum*

Bio agents	Dose(g/kg ⁻¹)	% disease incidence	% disease control
<i>Trichoderma harzianum</i>	4 g	14.99 (22.69)*	46.11
<i>Pseudomonas fluorescens</i>	8 g	23.33 (28.82)	31.56
<i>Trichoderma viride</i>	8 g	16.66 (23.98)	43.05
<i>Pseudomonas putida</i>	4 g	31.66 (34.21)	18.76
<i>Microbacteria paraoxidens</i>	8 g	38.33 (38.23)	9.21
Check	-	44.99 (42.11)	0.00
SEm _±		1.18	
CD (P=0.05)		3.56	

Host Plant Resistance

Thirty germplasm /varieties were screened against *F. oxysporum* under artificial conditions. None of entry was found immune or resistant to wilt. Entries UM-100, 112, 116, 118, 124, 126, 127, 134, 137, 301, 302, 304, 322, and

325 were observed moderately resistance, UM-128, 136, 140, 152, 163, 222, RMT-1 and RMT-361 were found susceptible and UM-144, 189, 193, 202, 228, 321, 353, 354 were highly susceptible. Gupta *et al.* (1997) evaluated one hundred ten lines of fenugreek for resistance to

Erysiphe polygoni, *Rhizoctonia solani* and *Fusarium oxysporum* at Hisar, Haryana, India. None of the genotypes were completely resistant

to all pathogens. GP 75, GP 82, GP 94, GP and PEB were the moderately resistant lines.

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