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In vitro evaluation of different bioagents against *Alternaria solani*

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Abstract
Early blight is serious as well as destructive disease of the tomato crop responsible for the low production and productivity. As it is air as well as seed born pathogen it is difficult to manage by using only chemical fungicides. Hence a study was undertaken to determining the efficacy of seven biocontrol agents for management of early blight of tomato caused by *Alternaria solani* in *in vitro.* The biocontrol agent *T. harzianum* showed highest mycelial growth inhibition (75.2%). Next best were *T. asperellum, M. anisopliae, T. virens.* The least percent inhibition of pathogen was observed in treatment of *V. lacani.*

Keywords: bioagents against *Alternaria solani, T. harzianum*

Introduction
Tomato (*Lycopersicon esculentum* Mill.) belongs to family solanaceae is a weak herbaceous plant capable of perennial growth, but normally cultivated as an annual. It is an important fruit vegetable and ranks next to potato in world acreage and is first amongst processing crops. It is originated from tropical America (Bose *et al*., 1986). It was spread around the world following the Spanish colonization of the Americas and its many varieties are now widely grown round the year under field and greenhouses in controlled condition.
Alternaria solani is a seed, soil as well as air born pathogenic fungus causing early blight (foliage disease), collar rot (basal stem of seedlings) stem lesions and fruit rot of tomato (*Lycopersicon esculentum* Mill.) and early blight is most destructive disease causes complete defoliation leads to severe yield losses (35-78%) in tomato while collar rot causes 20-40% seedling losses in the field. The pathogen was managed *in vitro* by using eight bioagents. The biocontrol agents used *in vitro viz., T. asperllum, T. harzianum, T. virens, Pacilomyces lilacinus, Metarriziun anisopliae, Verticillium lacanii, Pink pigmented facultative methelotrops, Aspergillus awamori.*

Materials and Methodology
Eight fungal antagonists *viz., Trichoderma asperellum, T. harzianum, Paecilomyces lilacinus, T. virens, Metarhizium anisopliae, Verticillium lecanii, Aspergillus awamori* and one bacterial antagonist *PPFM* (*Pink pigmented facultative methylotrops*) were evaluated *in vitro* against *A. solani* applying dual culture technique. Seven days old cultures of the test bioagents and test fungus (*A. solani*) grown on (PDA) were used for the study. Discs (5 mm dia) of PDA along with culture growth of the test fungus and bioagents were cut out with sterilized cork borer. Then two culture discs, one each of the test fungus and bioagent were placed at equidistance and exactly opposite with each other on solidified PDA medium in petri plates aseptically and plates were incubated at 26 + 2ºC. PDA plates inoculated only with culture disc of the test fungus were maintained as untreated control.

Result and discussion
The results revealed in table no.1 revealed that all of the test biocontrol agents significantly inhibited mycelial growth of *Alternaria solani*, over untreated control. However, *T. harzianum* was found most effective with significantly least mycelial growth with (22.16 mm) and its highest inhibition 75.2%, followed by. *T. asperellum* (24.83 mm) with inhibition of (72.36%), *M. anisopliae* (30 mm) with inhibition of (66.43%), *T. virens* (32.5 mm) with inhibition of (63.83%), *A. awamori* (33.16mm) with inhibition of (63.1%), *P. lilacicus* (34.4mm) with inhibition of (61.73%), *PPFM* (36mm) with inhibition of (60%), *V. lacani* (42.83 mm) with inhibition of 52.66 per cent.

Table 1: *In vitro* evaluation of bioagents against *Alternaria solani*

Tr. No.	Treatments	Colony Dia.*(mm)	% Inhibition #
T_1	*Trichoderma asperellum*	24.83 (29.88)	72.36 (58.28)
T_2	*Trichoderma harzianum*	22.16 (28.08)	75.2 (60.13)
T_3	*Paecilomyces lilacinus*	34.40 (35.91)	61.73 (51.78)
T_4	*Trichoderma virens*	32.50 (34.75)	63.83 (53.02)
T_5	*Metarhizium anisopliae*	30.00 (33.21)	66.43 (54.59)
T_6	*Verticillium lecanii*	42.83(40.87)	52.66 (46.52)
T_7	*PPFM* (*Pink pigmented facultative methelotrops*)	36.00 (36.86)	59.7 (50.59)
T_8	*Aspergillus awamori*	33.16 (35.15)	63.1 (52.59)
T_9	Control	90.00 (71.56)	00.00 (00.00)
S.E.(m)±		0.62	0.52
C.D(P = 0.01)		1.88	1.58

*Mean of three replications, Dia. = Diameter,
#Figures in parenthesis are arc sine transformed value

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