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EFFECT OF SELECTED BOTANICALS AGAINST EARLY BLIGHT (*ALTERNARIA SOLANI*) DISEASE OF TOMATO (*SOLANUM LYCOPERSICUM* MILL.)

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Abstract

Early blight is one of the most common and devastating disease of tomato plant which is caused by the fungus, *Alternaria solani*. The antifungal activity of five plants extracts *viz.*, black cumin (*Nigella sativa*), ajwain (*Trachyspermum ammi*), neem (*Azadirachta indica*), blue gum (*Eucalyptus globulus*) and wild sage (*Lantana camara*) at 5% concentration and carbendazim (0.25%) was tested against *Alternaria solani* under *in-vitro* and *in-vivo* conditions. Under *in-vitro* condition, highest reduction of mycelial growth of *Alternaria solani* was recorded with *Azadirachta indica, Eucalyptus globulus* and *Lantana camara* (46.66%, 40.00% and 32.78%, respectively) and under *in-vivo* condition, minimum disease intensity was recorded with *Azadirachta indica* and *Eucalyptus globulus* (26.99% and 27.25%, respectively).

Key words: *Alternaria solani,* botanicals, early blight, tomato

Introduction

Tomato (*Solanum lycopersicum* Mill.) belongs to the family Solanaceae and is the second most important vegetable crop after potato. Tomato is commonly consumed in our daily life and it is a good source of antioxidants. Tomato contains 95.3% of water, 0.07% calcium and niacin, all of which have great importance in metabolic activities of humans. With high nutritional value, it provides a balance source of Vitamin A, C and E needed to maintain good human health. Varied climatic adaptability and high nutritive value made the tomato cultivation more popular in the recent years. (Chourasiya *et al*., 2016).

Early blight of tomato caused by *Alternaria solani* is the worst damaging one and cause reduction in quantity and quality of the tomato crop. It is an important disease of tropical and sub-tropical areas. The disease, if favoured by high temperature and humidity (crowded plantation, high rainfall and extended period of leaf wetness from dew) and plants are more susceptible to the blight infection during fruiting period. (Deepti sadana and Nidhi didwania 2015). This disease is controlled mainly with agro chemicals. However, the recent efforts have focused on developing environmentally safe, long lasting effective bio control methods for the management of plant diseases. Natural plant products are important sources of new agrochemicals for the control of plant diseases (Kagale *et al*., 2004).

Plant extracts also have antimicrobial activity for controlling early blight and other plant diseases both *in vitro* as well as *in vivo* .Furthermore, biocides of plant origin are non-phytotoxic, systemic and easily biodegradable (Qasem and Aau-Blan, 1996). It is now known that various natural plant products can reduce populations of foliar pathogens and control disease development and then these plant extracts have potential as environmentally safe alternatives and as components in integrated pest management programs (Nashwa and Sallam 2011). Keeping this in view, present investigation has been taken for the management of early blight of

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tomato caused by *Alternaria solani* by using different botanicals.

Materials and Methods

In present experiment, *in-vitro* study was laid-out with Complete Randomized Design (CRD) and *in-vivo* study was laid-out with Randomized Block Design (RBD) with three replications. Three sprays of all treatments were given at an interval of 15 days. Treatments were imposed after appearance of the first disease symptoms. Observations on disease severity of early blight of tomato were recorded at 15 days interval and yield data were obtained after the harvest on physiological maturity.

The treatments comprised of application of selected botanicals *viz.,* black cumin (*Nigella sativa*), Ajwain (*Trachyspermum ammi*), neem (*Azadirachta indica*), blue gum (*Eucalyptus globulus*), wild sage (*Lantana camara*) @ 5.0%, carbendazim @ 0.25% (treated control) and untreated control. The crop was sprayed three times at 45, 60, and 75 DAS. The disease intensity of early leaf blight was recorded after ten days of spray. Plant disease intensity (PDI) was recorded on 0-9 scale, *i.e.* 0-no symptoms of on leaves, 1-covering 1% or less leaf area, 3-covering 1-10% of leaf area, 5-covering 11-25% of leaf area, 7-covering 26-50% of leaf area and 9-covering 51% or more of leaf area (Dubey *et al.,* 2011).

Isolation and identification of pathogen

Leaves were collected from infected potato plants and isolated by transferring 2-3 leaf bits on potato dextrose agar (PDA) containing Petri plates, which were replicated 3 times. These Petri plates were incubated at 27 ± 2°C, after 3 days mycelia growth was observed around leaf bits and identification of the pathogen were confirmed by observing the morphological features of colony, spore characteristics and referring the relevant literature (Aneja, 2010).

Preparation of plant extracts

The fresh leaves of each plant species was collected, washed with water and surface sterilized with 0.1% $HgCl_2$ solution for 30 seconds and then washed with distilled water. Aqueous plant extracts was prepared by grinding 100 g fresh leaves with 100 ml distilled water (w/v) using a blender and filtrate through a double layered muslin cloth, all the extracts obtained and finally centrifuged at 10,000 rpm for 10 minutes (Aneja, 2010). All the botanicals *viz., Nigella sativa, Trachyspermum ammi, Azadirachta indica, Eucalyptus globulus* and *Lantana* camera were tested for their efficacy in reducing the mycelia growth of *A. solani* using the poisoned food technique (Schmitz, 1930).

A5 mm diameter of actively growing mycelium disc of the pathogen of 6–7 days old culture was placed in the centre of the Petri plates. Plates containing medium with fungicide Carbendazim @ 0.1% served as a treated control and plates with medium served as untreated control. The percent inhibition of the fungus in treatments was calculated using following formula:

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

Where:

I = Per cent inhibition of mycelia growth; C = Growth of mycelium in control (mm) and T = Growth of mycelium in treatment (mm) Vincent (1947)

Results and Discussion

Results of present investigation revealed that *Azadirachta indica* was found superior in all tested botanicals. Maximum inhibition of mycelial growth of *Alternaria solani* (46.66%) was recorded with *A. indica* @ 5% followed by *E. globulus* (40%) and *L. camara* (32.78%) and minimum inhibition was recorded with *T. ammi* (20%) under *in-vitro* condition (Table 1). Except botanicals, carbendazim (@ 0.25%) was recorded best treatment in which maximum inhibition of *A. solani* (88.33%) was recorded as compared to control (0%). Similar results on antifungal activity of extracts of different plants has been reported by Abdul Sami Ariafar (2016).

Under *in-vivo* condition, two sprays of all selected botanicals and fungicide were taken up @ 45 and 60 DAS against *A. solani.* (Table 3). Results revealed that minimum disease intensity was recorded with *Azadirachta indica* (26.99%) among all tested botanicals, which was followed by *Eucalyptus globulus* (27.25%) and *lantana camera* (30.58%) and carbendazim used as treated control was found best among all treatments, in which minimum disease intensity (22.23%) was

Table 1: Percent inhibition of mycelial growth of *Alternaria solani* under *in-vitro* condition.

Sl. No.	Treatments	Concen-tration	Per cent inhibition of mycelia growth over control
T_1	*Nigella sativa*	5%	27.78
T_2	*Trachyspermum ammi*	5 %	20.00
T_3	*Eucalyptus globulus*	5 %	40.00
T_4	*Azadirachta indica*	5 %	46.66
T_5	*Lantana camera*	5%	32.78
T_6	Carbendizim	0.25%	88.33
T_7	Control(untreated)	-	0.00
S. Ed.			1.228
CD (0.05)			3.725

Table 2: Percent disease intensity at 45, 65 and 75 DAS as affected by treatments.

Sl. No.	Treatments	Dosage	PDI 1 day Before spray	15 days after spray	30 days after spray	Mean
T_1	*Nigella sativa* (FS)	5%	23.41	35.36	43.69	34.15
T_2	*Trachyspermum ammi* (FS)	5%	23.08	38.21	48.61	36.63
T_3	*Eucalyptus globulus* (FS)	5 %	20.42	27.19	34.16	27.25
T_4	*Azadirachta indica* (FS)	5%	19.33	28.41	33.24	26.99
T_5	*Lantana camera* (FS)	5%	21.48	31.92	38.35	30.58
T_6	Carbendazim (FS)	0.25%	18.86	22.43	25.40	22.23
T_0	Control	-	25.21	43.31	57.10	41.87
SEd± C			1.21	0.75	0.59	
CD@5%			2.64	1.63	1.29	

recorded (Table 2). Thus, present study indicated that suitable integration of more efficient eco-friendly treatments like plant extracts and fungicide may provide a better and effective management of the disease. These results are in accordance with the findings of Anamika and Sobita (2011); Arunkumar (2008) and Kota (2003) who found *Azadirachta indica* against *Alternaria alternata*. Ogbebor and Adekunle (2008) used different botanicals against *Drechslera heveae* and found *Azadirachta indica* as a best botanicals among all tested which inhibit the growth of the pathogen.

Similar findings have also been reported by Patni *et al*., (2005) and Shenoi (1998) who tested different botanicals against *Alternaria brassicae* and *Alternaria alternata,* respectively and recorded very good results in inhibiting the pathogen mycelial growth under *in-vitro* and *in-vivo* conditions. Mesta *et al.,* (2009) noticed that Neem leaf extract inhibited maximum (38.49%) spore germination and radial growth (43.90%) of *A. helianthi*. Babu *et al*., (2000) reported the effect of plant extracts, oils and neem products on tomato early blight in the field. Since present day economists are advising Carbendazim is good net return, but based on present study, *Azadirachta indica* can also be recommended and keeping a point view of environmental safety to the farmers for the efficient management of Alternaria blight of tomato.

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