P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2021; 9(1): 2344-2346

© 2021 IJCS

Received: 04-10-2020

Accepted: 15-11-2020

Vanama Sowmya

Master Scholar, Department of
Plant Pathology, Institute of
Agricultural Sciences, Banaras
Hindu University, Varanasi,
Uttar Pradesh, India

Ram Chandra

Professor, Department of Plant
Pathology, Institute of
Agricultural Sciences, Banaras
Hindu University, Varanasi,
Uttar Pradesh, India

Efficacy of botanical extracts against early blight disease of tomato incited by *Alternaria solani*

Vanama Sowmya and Ram Chandra

DOI: <https://doi.org/10.22271/chemi.2021.v9.i1ag.11575>

Abstract

Early blight is one of the most common and destructive diseases in tomatoes caused by the fungus *Alternaria solani*. Antifungal activity of six botanical extracts, namely (*Datura stramonium*) Datura, (*Polyalthia longifolia*) Ashoka, (*Clerodendrum viscosum*) wild jasmine, (*Eucalyptus globulus*) eucalyptus, (*Chromolaena odorata*), Siam weed extract, (*Lantana camera*) wild sage extract was antifungal. Each plant extract tested against *Alternaria solani*, with two concentrations, 5% and 10%, under *in vitro* and *in vivo*. The maximum decrease in the growth of mycelium of *Alternaria solani* with *Eucalyptus globulus* and *Lantana camara* (67.68% and 36.72%, respectively) and the minimum disease intensity under *in vivo* were recorded with *Eucalyptus globulus* (27.42%).

Keywords: *Alternaria solani*, botanicals, early blight, tomato

1. Introduction

The tomato (*Solanum lycopersicum* L.) belongs to the Solanaceae family and is the second most important vegetable after the potato. Tomatoes are widely consumed in everyday life and are a good source of antioxidants. Tomatoes contain 95.3% water, 0.07% calcium and niacin, which are essential for human metabolism. With its high nutritional value, it is a balanced source of vitamins A, C and E, essential for maintaining good human health. The varied climatic conditions and the high nutritional value have made tomato cultivation increasingly popular in recent years. (Chourasiya *et al.*, 2013) ^[1]. Tomato early blight caused by *Alternaria solani* is more harmful and leads to a decrease in the quantity and quality of the tomato crop. It is a serious disease in tropical and subtropical regions. The disease is more susceptible to epidemic infection if it is promoted by high temperatures and humidity (overcrowding of the plantation, heavy rains and prolonged wetting of the leaves due to dew) during fruiting. (Dipti Sadana and Nidhi didaniya 2015) ^[2]. This disease is mainly fought with the help of agrochemicals. However, recent efforts have focused on the development of sustainable and environmentally friendly biocontrol methods for treating plant diseases. Natural plant foods are important sources of new agrochemicals for the control of plant diseases (Kagale *et al.*, 2004) ^[4].

Plant extracts also have antimicrobial activity against early blight and other plant diseases both *in vitro* and *in vivo*. Also, plant biocides they are of non-phytotoxic origin, systemic and easily biodegradable (Qasem and Aau-Blan, 1996). It is now known that various natural plant products can reduce populations of foliage pathogens and control disease development, and therefore these plant extracts have the potential as environmentally friendly alternatives and components in integrated pest management programs (Nashwa and Sallam 2011) ^[3]. With this in mind, the present study was conducted to combat *Alternaria solani* blight in tomato using various botanicals.

2. Materials and Methods

In the present experiment, an *in vitro* study was designed using a (CRD) and an *in vivo* study was designed using a three-repetition randomized block design (RBD). Three sprays of all treatments were carried out with an interval of 15 days. Treatment was prescribed after the first symptoms of the disease appeared. Observations of the severity of disease in early tomatoes were recorded over a 15-day interval, and data on the physiological maturity of the crop after harvest were obtained. The treatment consisted in the application of selected botanicals,

Corresponding Author:**Vanama Sowmya**

Master Scholar, Department of
Plant Pathology, Institute of
Agricultural Sciences, Banaras
Hindu University, Varanasi,
Uttar Pradesh, India

namely (*Polyalthia longifolia*), Ashoka seed extract, (*Clerodendrum viscosum*), wild jasmine leaf extract, (*Eucalyptus globulus*), dry eucalyptus leaf extract, (*Datura stramonium*), Datura leaf extract, (*Chromolaena odorata*) Siam Weed Leaf Extract and (*Lantana camara*) Wild Sage Whole Plant Extract @ 5.0%, 10% (treated control) and untreated control. The culture was sprayed three times at 45, 60 and 75 DAS. The intensity of early blight was recorded after ten days of spraying. Plant Disease Intensity (PDI) was recorded on a scale from 0 to 5, i.e. 0-no symptoms in the leaves, 1-<10% of the surface covering the leaves, stem and fruits infected with blight, several individual spots, 3-Many spots have merged on the leaves, covering 26-50% of the plant surface, 4-51-75% of the area of infected plants, fruits, as well as affecting the peduncle, defoliation and wrinkles, 5-> 75% of the area of the damaged part of the plant, severe damage to the stem and rot of the fruit at the end of the peduncle (Datar, Mayee, 1986) [5].

3. Isolation and identification of pathogen

Leaves of infected tomato plants were harvested and isolated by transferring 2-3 leaf pieces to Petri dishes containing potato dextrose agar (PDA), which were repeated 3 times. These Petri dishes were incubated at 27 ± 2 °C, after 3 days mycelium growth was observed around the leaf fragments, and the identification of the pathogen was confirmed by observing the morphological characteristics of the colony, the characteristics of the spores, and with reference to the relevant literature (Aneja, 2010) [6].

4. Preparation of plant extracts

Healthy fresh plant parts of 5 g each (leaves/fruits/grains) at 5%, similar to 10 g at 10%, were harvested from the field, then washed with tap water and dried in water, air and boiled 100 ml of sterile water until softened. This material was then crushed with a mortar. The resulting extracts were filtered through Whatman No. 1 filter paper. 2 g of dextrose and agar were added to the clear plant extract and boiled. The plant extract was mixed thoroughly with PDA medium and sterilized at 121 °C for 20 minutes. Just before pouring, add a pinch of streptomycin sulfate to avoid bacterial contamination. 20 ml of the extracted medium was poured into each of the 90 mm petri dishes and allowed to solidify. At the same time, without plant extract was poured as a control. The actively growing periphery of a 7-day *A. solani* culture was carefully cut with a sampler and aseptically transferred to the centre of each petri dish containing poisoned/non-toxic solid medium. The plates were kept at 25 ± 2 °C in B.O.D. Each treatment was repeated three times. Make a note of the measured value using the control data. 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)

T = Growth of mycelium in treatment (mm) Vincent (1947).

5. Results and Discussion

The data obtained clearly show that *Eucalyptus globulus* was the best botanical in suppressing the pathogen at concentrations of 5% and 10% (53.11 and 67.68%,

respectively). Ashoka (*Polyalthia longifolia*) grain extract also showed an effect after eucalyptus with 29.51 and 35.85% with 5% and 10%, respectively. The minimum percentage of inhibition was recorded for wild jasmine (*Clerodendrum viscosum*) and Siam weed (*Chromolaena odorata*), which resulted in inhibitions of less than 15% and approximately 20%, respectively. A moderate rate of pathogen suppression was observed for Datura (*Datura stramonium*) and wild sage (*Lantana camara*). They also obtained similar results by Bhanage *et al.* (2019) [8], who investigated the antifungal activity of five plant extracts against *A. solani*, which causes early blight in tomatoes. Under *in vitro* conditions, the greatest decrease in the growth of *Alternaria solani* mycelium was recorded in *Eucalyptus globulus*, *Azadirachta indica* and *Lantana camara*: 46.66%, 40.00% and 32.78%, respectively. Two sprays of all selected plant compounds and fungicides were taken at 30, 45 and 60 DAS against *A. solani* under *in vivo*. (Table 2). The results showed that *Eucalyptus globulus* (26.89%) registered the lowest intensity of disease of all the analyzed plants, followed by the *Lantana camara* (31.57%).

Table 1: *In vitro* evaluation of different Botanicals on mycelial growth of *Alternaria solani*

S. No.	Botanicals	Radial growth (cm)		Percent Inhibition (%)	
		5%	10%	5%	10%
1.	Datura (<i>Datura stramonium</i>)	6.75	5.82	24.83	35.18
2.	Ashoka (<i>Polyalthia longifolia</i>)	6.33	5.76	29.51	35.85
3.	Wild Jasmine (<i>Clerodendrum viscosum</i>)	8.03	7.85	10.57	12.69
4.	Eucalyptus (<i>Eucalyptus globulus</i>)	4.20	3.10	53.11	67.68
5.	Siam weed (<i>Chromolaena odorata</i>)	7.93	7.56	11.69	15.81
6.	Wild Sage (<i>Lantana camara</i>)	6.13	5.65	31.73	36.72
7.	Control	9.00	9.00	0.00	0.00
		Botanicals	Concentration	Botanicals X Concentration	
	S.Em±	0.078	0.045	0.11	
	CD at 5%	0.228	0.132	0.323

Fig 1: *In vitro* evaluation of different Botanicals on mycelial growth of *Alternaria solani*

Table 2: Percent disease intensity at different treatments

Percent Disease Index					
S. No.	Treatments @ 5%	30DAS	45DAS	60DAS	Mean
1.	Datura	23.55	32.56	38.12	31.41
2.	Ashoka	23.22	31.11	37.31	30.54
3.	Wild Jasmine	29.32	36.53	42.73	36.19
4.	Eucalyptus	20.42	27.34	34.51	27.42
5.	Siam Weed	28.34	35.21	40.89	34.81
6.	Wild Sage	22.31	29.52	36.71	29.51
7.	Control	30.44	41.31	45.66	39.13
	SEd± C	1.41	0.85	0.60	
	CD@5%	2.76	1.73	1.31	

6. Conclusion

Hence, the present study has shown that the correct integration of more effective ecological treatments such as plant extracts and fungicides can enable better and more effective treatment of diseases. These results agree with the findings of Anamika and Sobita (2011) ^[9]; Arunkumar (2008), based on the present study, can also recommend *Eucalyptus globulus* to farmers from an environmental point of view for the effective control of *Alternaria* in tomatoes.

7. References

1. Chourasiya PK. Effect of certain fungicides and botanicals against early blight of tomato caused by *Alternaria solani* under Allahabad, Uttar Pradesh, India conditions. International Journal of Agricultural Science and Research 2013;3(3):151-156.
2. Deepti S, Nidhi D. Bio efficacy of fungicides and plant extracts against *Alternaria solani* causing early blight of tomato. International Conference on Plant, Marine and Environmental Sciences 2015;1(2):38-42.
3. Nashwa and Sallam. Control of tomato early blight disease by certain aqueous plant extracts. Plant Pathology Journal 2011;10(4):187-191.
4. Kagale S, Marimuthu T, Nandakumar R Samiyappan R. Antimicrobial activity and induction of systemic resistance in rice by leaf extract of *Datura metel* against *Rhizoctonia solani* and *Xanthomonas oryzae* pv. *oryzae*. Physiology of Molecular Plant Pathology 2004;65:91-100.
5. Datar VV, Mayee CD. Chemical management of early blight of tomato. Journal of Maharashtra Agriculture University 1986;10:278-280.
6. Aneja KR. Experiments in Microbiology, Plant Pathology and Biotechnology. 4th edn. New Age International (P) Limited, New Delhi 2010, 66-73.
7. Vincent JM. Distortion of fungal hyphae in presence of certain inhibitors. Nature 1927;159:850.
8. Bhanage S, Nithin BP, Shivam S. Effect of Selected botanicals against Early Blight (*Alternaria solani*) of Tomato (*Solanum lycopersicum* Mill.). Plant Archives 2019;19(2):2839-2842.
9. Anamika, Simon S. Inhibitory effect of botanical extracts against *Alternaria alternata* of Aloe Vera dry rot. Plant Protection 2011;44(15):1462-1466.
10. Arunakumara KT. Studies on *Alternaria solani* (Ellis and Martin) Jones and Grout causing early blight of tomato. M.Sc. (Agri) Thesis, University of Agricultural Science. Dharwad (India) 2006, 70.