

Effect of botanicals on the management of *Alternaria* blight of tomato in Odisha

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The efficacy of 9 plant products such as ginger (*Gingiber officinale*), neem (*Azadirachta indica*), tulsi (*Ocimum sanctum*), karanj (*Pongamia pinnata*), onion (*Allium cepa*), garlic (*Allium sativum*), bel (*Aegle marmelos*), patalgaruda (*Rauwolfia serpentina*) and kochila (*Strychnus nuxvomica*) were studied for the management of *Alternaria* leaf blight disease of tomato (*Lycopersicon esculentum* Mill.). Field trials were conducted for three consecutive *rabi* season 2010-11, 2011-12 and 2012-13 in the farmers field at Tirtol (Jagatsinghpur) of Odisha with the variety Utkal Kumari (BT-10). The trial was laid out in randomized block design with three replications. The row to row spacing of 60 cm and plant to plant spacing of 40 cm was adopted in plot size of 8.1 sq.m (3.0 x 2.7 m) with a fertilizer dose of 125:60:100 kg N₂:P₂O₅:K₂O/ha. Among the different treatments, two sprays of neem leaf extract (20%) at 10 days intervals after the disease appearance proved to be very effective against *Alternaria solani* with mean PDI of 5.5% corresponding to maximum mean tomato fruit yield of 341.8q/ha which registered 90.9% disease reduction and 60.9% increase in fruit yield over control. The same treatment also recorded maximum cost benefit ratio of 1:21.1. Foliar spraying with *Gingiber officinale*, *Strychnus noxvomica* and *Rauwolfia serpentina* also found promising accounting for 86.0%, 82.7% and 76.6% disease reduction giving rise to 53.6%, 46.8% and 39.3% increase in fruit yield with benefit cost ratio of 11.9, 15.9 and 13.2 respectively. However the control plot recorded maximum mean disease incidence of 60.6% with minimum fruit yield of 212.4 q/ha.

Key words: Tomato, Early blight, plant extracts

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is said to be the native of tropical America (Thompson and Kelly, 1957). From tropical America, it has spread to other parts of the world and becomes popular in India within the last six decades. It is one of the most popular vegetables grown all over India for its fleshy fruits. Tomato is known as productive as well as protective food. It has outstanding vitamin contents like vitamin-C (ascorbic acid), vitamin-A, vitamin-B₁ (thiamine) and vitamin B₂ (riboflavin). It also contains minerals like iron, phosphorus, ly-

copene and β -carotene pigments. The estimated area and production of tomato in India are about 3,50,000 ha and 53,00,000 tons respectively. About 200 diseases have been reported on tomato. Among these early blight (*Alternaria solani*), late blight (*Phytophthora infestans*), bacterial wilt & brown rot (*Ralstonia solanacearum*) and leaf curl complex are the most common and serious diseases of tomato worldwide including India.

Early blight caused by *Alternaria solani* is a major production constraint in tomato wherever the crop is grown. Early blight is wide spread throughout the tropics and temperate zones. In India this dis-

ease occurs in all parts of the country which causes major loss in fruit yield (Waals *et. al.* 2001). As high as 86% yield loss has been reported (50-86%) in tomato (Mathur and Shekhawat, 1986). In Odisha the disease occurs in severe form and for management of the disease by chemicals involves high cost. Therefore an attempt has been made to manage the disease with botanicals as foliar application to get rid of chemical and environmental hazards.

MATERIALS AND METHODS

In order to study the efficacy of 9 botanicals on the management of *Alternaria* blight, the field trials were conducted for three consecutive years during *rabi* 2010-11, 2011-12 and 2012-13 in the farmers field at Tirtol (Jagatsinghpur) of Odisha with the variety Utkal Kumari (BT-10).

The trial was laid out in randomized block design with three replications. Twenty per cent concentrations were taken as standard for all the plant products included under study eg. T₁-ginger (*Gingiber officinale*), T₂-neem (*Azadirachta indica*), T₃-tulsi (*Ocimum sanctum*); T₄-karanj (*Pongamia pinnata*); T₅-onion (*Allium cepa*); T₆-garlic (*Allium sativum*); T₇-bel (*Aegle marmelos*); T₈-patalgaruda (*Rauwolfia serpentina*) T₉-kochila (*Strychnos nuxvomica*) and T₁₀-control (without any plant products).

The crop was planted with a row to row spacing of 60 cm and plant to plant spacing of 40 cm, being adopted in a plot size of 8.1 sq. mt. (3.0 m x 2.7 m). All the agronomical practices as generally recommended were followed with the fertilizer dose of 125:60:100:kg N₂:P₂O₅:K₂O/ha. Two sprayings were given at an interval of 10 days after appearance of the disease in the field. Observations were recorded on 4 days after first spraying and final observation were recorded after 7 days of second spraying. The per cent disease incidence (PDI) and per cent disease control (PDC) were calculated.

RESULTS AND DISCUSSION

It appears from Tables 1 to 3 and Fig.1; that all the plant products were found to be significantly superior over control in reducing the *Alternaria* blight incidence. Among the treatments, the lowest incidence of leaf blight was recorded from the plots where neem leaf extract (T₂) spraying was

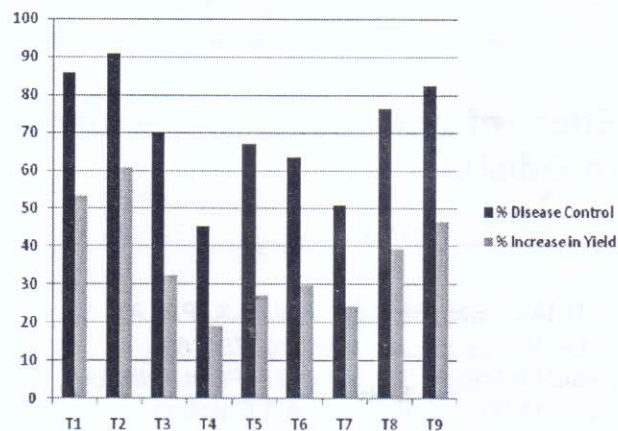


Fig. 1 : Percent disease control and per cent increase in yield of tomato against *Alternaria* blight as influenced by different botanicals.

done resulting in 90.9% disease control and 60.9% increase in fruit yield over control. The same treatment also recorded maximum cost benefit ratio of 1:21.1 accounting for a net return of Rs. 98,830/-. Spraying with ginger bulb extract (T₁) was found to be next best botanical with respect to management of the disease which recorded 86.0% reduction in disease incidence, 53.6% increase in fruit yield over the check plots with corresponding cost benefit ratio of 1:11.9 and with net return of Rs. 83,990/-. However more cost benefit ratio 1:15.9 has been obtained from T₉ (spraying with kochila) as this input involves less cost as compared to ginger. The other treatments like spraying with leaf extracts of kochila, patalgaruda, bulb extract of onion and garlic and leaf extract of tulsi were also found effective for control of leaf blight disease.

The efficacy of neem leaf extract for control of *Alternaria* has also been demonstrated by different workers in different crops. Meena *et al* (2010) reported 10% leaf extracts of neem was found highly effective against *Alternaria* blight of Cluster bean. The similar results were also obtained by Verma and Gandhi (2007), while studying the *Alternaria solani* in tomato and reported that neem leaf extract was found highly effective for management of *Alternaria* blight in tomato, which corroborated with our findings. In addition to neem leaf extract, garlic extract was also found efficacious as reported by Panchal and Patil (2009) which also supports our findings. Prasad and Naik (2003) reported garlic bulb extract (7.5%) was found effective against *A. solani* causing early blight of tomato *in vitro*.

As evident from the present investigation, the *Alternaria* blight and fruit rot of tomato incited by *Al-*

Table 1 : Effect of foliar application of plant extracts on *Alternaria* blight incidence in tomato.

Treatment	Mean Per cent Disease Index (PDI)			Mean	% disease reduction
	2010-11	2011-12	2012-13		
T ₁ -Spraying with ginger	6.5 (14.74)	10.6 (18.96)	8.4 (16.83)	8.5 (16.84)	86.0
T ₂ - Spraying with neem	4.5 (12.20)	6.8 (15.10)	5.2 (13.16)	5.5 (13.49)	90.9
T ₃ - Spraying with tulsi	20.6 (26.97)	15.4 (23.06)	18.2 (25.24)	18.1 (25.09)	70.1
T ₄ - Spraying with karanj	32.5 (34.75)	36.8 (37.34)	30.0 (33.18)	33.1 (35.09)	45.4
T ₅ - Spraying with onion	18.2 (25.22)	20.6 (26.96)	20.8 (27.06)	19.9 (26.41)	67.2
T ₆ - Spraying with garlic	22.8 (28.50)	19.5 (26.15)	23.6 (29.01)	22.0 (27.89)	63.7
T ₇ - Spraying with bel	27.1 (31.37)	31.2 (33.94)	30.8 (30.04)	29.7 (31.78)	51.0
T ₈ - Spraying with patalgaruda	12.4 (20.61)	16.2 (23.71)	14.0 (21.72)	14.2 (22.01)	76.6
T ₉ - Spraying with kochila	10.8 (19.18)	8.2 (16.53)	12.6 (20.76)	10.5 (18.82)	82.7
T ₁₀ - Control	61.5 (51.67)	55.2 (48.06)	65.1 (53.81)	60.6 (51.18)	
SE(m) ±	0.87	1.01	0.66	1.17	
CD (0.05)	2.58	2.99	1.96	3.47	

Table 2 : Effect of foliar application of plant extracts on fruit yield of tomato

Treatment	Fruit yield (q/ha)			Mean	% yield increase over control
	2010-11	2011-12	2012-13		
T ₁ -Spraying with ginger	332.4	323.8	322.4	326.2	53.6
T ₂ - Spraying with neem	338.6	345.2	341.6	341.8	60.9
T ₃ - Spraying with tulsi	280.6	277.5	286.4	281.5	32.5
T ₄ - Spraying with karanj	247.3	256.7	254.4	252.8	19.0
T ₅ - Spraying with onion	271.4	271.1	267.8	270.1	27.2
T ₆ - Spraying with garlic	280.5	269.9	276.4	275.6	29.8
T ₇ - Spraying with bel	272.5	259.4	259.2	263.7	24.2
T ₈ - Spraying with patalgaruda	303.8	292.5	291.4	295.9	39.3
T ₉ - Spraying with kochila	320.1	303.0	312.6	311.9	46.8
T ₁₀ - Control	218.8	201.6	216.8	212.4	-
SE(m) ±	3.45	3.91	2.77	3.20	
CD (0.05)	10.26	11.62	8.22	9.52	

Table 3 :Economics of the foliar application of plant extracts on *Alternaria* blight of tomato.

Treatment	Excess produce over control	Gross expenditure over control	Gross return over control	Net return over control	BC ratio
T ₁ -Spraying with ginger	113.8	7050	91,040	83,990	11.9
T ₂ - Spraying with neem	129.4	4690	1,03,520	98830	21.1
T ₃ - Spraying with tulsi	69.1	4690	55,280	50590	10.8
T ₄ - Spraying with karanj	40.4	4690	32,320	27630	5.9
T ₅ - Spraying with onion	57.7	7545	46,160	38615	5.1
T ₆ - Spraying with garlic	63.2	6985	50,560	43575	6.2
T ₇ - Spraying with bel	51.3	4690	41,040	36350	7.8
T ₈ - Spraying with patalgaruda	83.5	4690	66,800	62110	13.2
T ₉ - Spraying with Kochila	99.5	4690	79,600	74910	15.9
T ₁₀ - Control					

N.B.: Price of tomato @ Rs. 800/- per qtl.

ternaria solani can be successfully managed by two sprays of leaf extracts of neem (20%) or rhizome extract of ginger (20%) at 10 days intervals after appearance of the disease in the field under Odisha condition.

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