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INTEGRATED DISEASE MANAGEMENT OF EARLY BLIGHT OF TOMATO CAUSED BY *ALTERNARIA SOLANI* SORAUER

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ABSTRACT

A field experiment was carried out during Zaid season 2015-2016. It has been observed that foliar spray with Carbendazim + Captan (0.10+0.10%) showed significant response with respect to the inhibition of mycelial growth and disease intensity (39.97, 47.07 and 51.83%). Eight treatments viz, Carbendazim + Captan,(0.10+0.10%), Carbendazim + *Pseudomonas fluorescence* (0.10 + 0.25%), Carbendazim + *Trichoderma harzianum* (0.10 + 0.25%), Carbendazim + Neem oil (0.10 + 0.30%), Carbendazim + Mustard oil (0.10+0.30%), Carbendazim + Cow dung (0.10 + 0.30%), Carbendazim + Cow urine (0.10 + 0.30%) and control were tested where Carbendazim + Captan was most inhibitory for mycelial growth of *Alternaria solani* (2.04 mm) followed by Carbendazim + *Trichoderma harzianum* (3.74 mm) at 6000 ppm. The minimum disease intensity was observed (39.97%, 47.07% and 51.83%) at 75, 90 and 105 days after transplanting with Carbendazim + Captan (0.10+0.10%) concentration followed by Carbendazim + Neem oil (0.10 + 0.30%), with (48.64, 52.15 and 55.47%) and Carbendazim + *T. harzianum* (0.10 + 0.25%) with (51.45, 54.78 and 57.02%) disease intensity. It has been observed that Carbendazim +Captan (0.10+0.10%) is highly effective against early blight of tomato.

INTRODUCTION

Continuous use of chemicals leads to residual problems in the crops and envirmental problems considering the importance of early blight disease we have planned work on integrated disease managements. Tomato, ranking first in the world for vegetables, accounts for 14% of world vegetable production (FAO, 2010). Tomato is cultivated in 186 thousand ha area in India with annual production of 7 mil-lion tons, which are consumed either fresh or pro-cessed (Ramadan *et al*, 2008). Tomato (*Solanum lycopersicum* L.) is an important vegetable crop grown worldwide for fresh and processing due to its wider adaptability in various agro-climatic conditions. It is a rich source of vitamins A, B and C and used for different food purposes, no culinary preparation is complete without tomato (Smith, 1994). It is considered as an important cash and industrial crop in many parts of the world. Early blight is one of the most important foliar diseases of tomato it is caused by *Alternaria solani* Sorauer, is a soil inhabiting air-borne pathogen responsible for leaf blight, collar and fruit rot of tomato disseminated by fungal spores. The disease affects on all parts of the plant and causes great reduction in quantity and quality of fruit yield. Under humid conditions followed by warm and wet weather tomato plants are susceptible to the early blight disease. Average annual yield loss of tomato due this disease was approximately 80% of the total production depending upon the nature of the disease, weather condition and type of variety grown (Somappa *et al*., 2013).

The paper attempts to find out integrated management practices with objectives of *In vitro* and *In vivo* evaluation of different treatments .

MATERIALS AND METHODS

Isolation and identification

Arka vikas variety of tomato vulnerable to early blight disease was obtained from vegetable research and demonstration block Bharsar. *A. solani* was isolated from leaves and fruits showing blight symptoms by using potato dextrose agar medium. Pathogen isolated on the basis of conidia of were club, rod shaped with a beak structure and 8-9 septate brownish colour.

In vitro bioassay of treatments with their combinations

Lab experiment was conducted by using eight treatments at different doses viz, 1000, 2000, 3000, 40000, 5000 and 6000 ppm with three replication and radial growth of pathogen was calculated after 24, 48, 72 and 96 hours each were evaluated *in vitro* against the test pathogen by poisoned food method (Nene and Thapliyal, 1971) Data was analysed statistically by using design factorial CRD.

In vitro screening of fungicides against *A. solani*

The disease intensity of mycelia growth over Sorauer control was calculated by using the formula (Vincent, 1947).

$I = (C - T) / C \times 100$

I = Percent inhibition of mycelium

C = radial growth of pathogen in control

T = radial growth of pathogen in treatment.

Field experiment was conducted on during Zaid session 2015-2016 by using cultivated variety Arka vikas with three replication, Plot size: 2×1.8m, Spacing: 60 × 50cm after preparation of field transplanting was done on date 6 April 2014 and after 70, 90 and 105 days after transplanting recorded disease intensity.

Disease intensity

Diseased leaves will be categorized as per the scale given by Pandey & Pandey (2002).

Category	Grade/numerical value	Leaf area infected
I	0	Disease free
II	1	1-10
III	2	11-25
IV	3	26-50
V	4	51-75
VI	5	>76

Per cent disease intensity will be calculated as per the following formula.

PDI = Š (n×v) ÷ N × S ×100

Where, Š = Summation

N = No. of leaves in each category

V = numerical value of leaves observed

S = maximum numerical value/grade

RESULTS AND DISCUSSION

Among the treatments carbendazim + captan (0.10 + 0.10%) the results of *in vitro* assay carried out against *A. solani* revealed that maximum inhibition (2.04 mm) on growth of mycelium after 96 hours as recorded in Table (1). This was followed by carbendazim + neem oil (3.74mm) and carbendazim + *Trichoderma harzianum* (4.31 mm) was also significantly reduction in the growth of *A. solani*. In present study inhibition of *A. solani* might be due to antifungal properties present in oils. Various plant extracts were found effective against *A. solani* have been reported by several workers Dushyant *et al.* (2014) and Sail *et al.* (2010) All the treatments were found significantly effective in reducing the mycelial growth of test pathogen.

Disease intensity

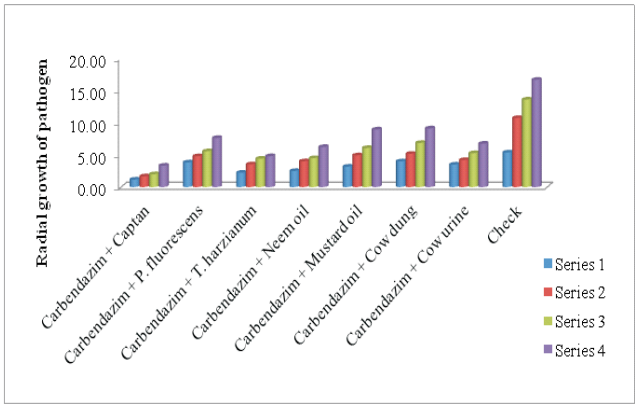
All the treatments were found significantly effective in reducing the disease intensity when compared to Check. Minimum disease intensity was observed in carbendazim + captan (39.97, 47.07 and 51.83%) with maximum fruit yield (14.02 kg/plot) at 75, 90 and 105 DAT, respectively. It was found to be most effective followed by carbendazim + neem oil (11.26 kg/plot) and carbendazim + *Trichoderma harzianum* (8.99 kg/plot) which were next best treatments. It can be concluded that carbendazim + captan was highly effective against early

Table 1: Effect o f different treatments with combination at 6000 ppm concentration on mycelial growth of *Alternaria solani* Sorauer

S.No.	Treatment	Radial growth (mm) 24 hrs	48 hrs	72 hrs	96 hrs	Mean
1.	Carbendazim + Captan	1.17	1.67	2.00	3.33	2.04
2.	Carbendazim + P. fluorescens	3.83	4.79	5.57	7.62	5.45
3.	Carbendazim + *T. harzianum*	2.23	3.53	4.41	4.80	4.31
4.	Carbendazim + Neem oil	2.50	4.01	4.50	6.23	3.74
5.	Carbendazim + Mustard oil	3.17	4.93	6.07	8.94	5.78
6.	Carbendazim + Cow dung	4.00	5.17	6.85	9.12	6.28
7.	Carbendazim + Cow urine	3.50	4.20	5.27	6.75	4.93
8.	Check	5.37	10.73	13.60	16.67	11.59
9.	Mean	3.22	4.88	6.03	7.93	
			S.Em. ±		CD (5%)	
Interval			0.10		0.30	
Treament			0.16		0.45	
Interval × Treatment			0.32		0.90	

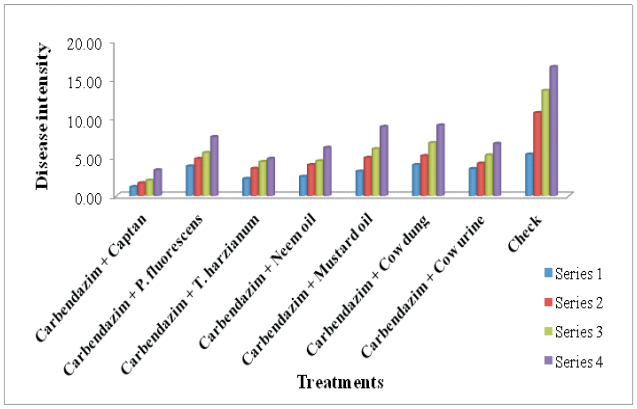
Table 2: Effect of different treatments on disease intensity at 75, 90 and 105 DAT

Treatments	Dose (%)	Disease intensity 75 DAT	90 DAT	105 DAT	Yield kg/plot
Carbendazim + Captan	0.10+0.10	39.97	47.07	51.83	14.02
Carbendazim + P. *fluorescens*	0.10+0.25	57.36	58.64	65.51	7.11
Carbendazim + *T. harzianum*	0.10+0.25	48.64	52.15	55.47	8.99
Carbendazim + Neem oil	0.10+0.30	51.45	54.78	57.02	11.26
Carbendazim + Mustard oil	0.10+0.30	61.26	60.77	67.31	6.28
Carbendazim + Cow dung	0.10+0.30	57.73	65.45	70.36	5.02
Carbendazim + Cow urine	0.10+0.30	56.62	58.02	63.43	7.2
Check	0	65.69	74.93	79.35	3.48
Mean		54.84	58.98	63.79	7.92
S.Em ±		3.19	2.82	1.99	0.86
C.D. at 5%		6.89	6.06	4.27	1.85



Where* Series 1 (24 hr), series 2 (48 hr), series 3 (72 hr) and series 4 (96 hr).

Figure 1: Effect of different treatments on radial growth of *Alternaria solani* Sorauer at 6000 ppm concentration



Where* Series 1 (24 hr), series 2 (48 hr), series 3 (72 hr) and series 4 (96 hr).

Figure 2: Effect of different treatments on radial growth of *Alternaria solani* at 6000 ppm concentration

blight of tomato.

Sahu *et al.*, 2013 reorted that increases in disease index from 45 to 105 days after planting. However, the rate of increase in PDI was slow in case of newer fungicides treated plots compared to control.

Carbendazim + mancozeb were found also effective in reducing the fruit rot intensity Chavan and Tawade (2012) and carbendazim + mancozeb have been proved effective in respect to disease control with maximum yield in tomato (Khade and Joi, 1980). It showed significant decrease in disease intensity compared to all other treatments including check. Among the treatments, non significant results were found in the treatments cow dung and mustard oil to over check.

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