

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.906.056>

Efficacy of New Fungicides in Management of *Alternaria solani* in Tomato

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ABSTRACT

Keywords

Alternaria solani,
early blight, PDI.,
Azoxystrobin,
Tebuconazole,
Pyraclostrobin,
Hexaconazole

Article Info

Accepted:

15 May 2020

Available Online:

10 June 2020

Tomato crop is affected by different fungal pathogens and most devastating pathogen is *Alternaria solani* causing early blight disease and reducing the yield. Among different new chemical combinations, Azoxystrobin (11%) + Tebuconazole (18.3%) found effective in lowering the disease severity throughout the growing period of the crop. Carbendazim (25%) + Mancozeb (50%), Metiram (55%) + Pyraclostrobin (5%) and Hexaconazole (4%) + Zineb (68%) had got the second rank in controlling the early blight disease by recording PDI.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) has become one of the most widely grown vegetables in the world and is regarded as a top priority vegetable. Different fungal diseases like early blight, late blight, *Fusarium* wilt, leaf spot, anthracnose is found to be very common in tomato.

These fungal diseases are destructive worldwide. Yield reduction may vary from 15-20% and sometimes 89.5% depending

upon the location, season, weather, growth stage of crop and cultivator. Among all these fungal diseases early blight is one of the deadly diseases of tomato and other solanaceous plants.

In recent year, early blight has assumed serious problematic disease in India. Spraying of broad-spectrum fungicides like Mancozeb and Captan has been recommended for the control of early blight of tomato by several workers (Ramakrishnan *et al.*, 1971 and Stevenson 1977).

In the present study, it is thought worthwhile to test the efficacy of new combination chemicals like Azoxystrobin (11%) + Tebuconazole (18.3%), Trifloxystrobin (25%) + Tebuconazole (50%), Hexaconazole (4%) + Zineb (68%), Metiram (55%) + Pyraclostrobin (5%) along with single Azoxystrobin and a compound with the proven chemical Carbendazim (25%) + Mancozeb (50%) combination against early blight disease.

Materials and Methods

The field experiment was conducted at instructional farm of Odisha University of Agriculture and Technology in the early Rabi season of 2018-19 with the tomato variety Utkal Kumari (BT-10). The tomato seedlings were grown in the plastic trays inside the green house. Seed treatment was done with Thiram @ 1g per kg of seed following dry seed dressing method and sown.

25days old seedlings were transplanted in the main field Recommended cultural practices were uniformly followed to raise the crop successfully. Tomato leaves showing typical early blight symptoms were collected from the field and examined microscopically to confirm the presence of the fungus *Alternaria solani*.

After first appearance of the symptoms of early blight disease in the leaves, the fungicides were sprayed. The spraying were repeated at fifteen days interval. A total of 4 spraying were done. The observation on severity of the disease on the foliage was recorded by using 0-5 scale and percent disease index (PDI) was calculated.

Percent Disease Index =

$$\frac{\text{Sum of individual ratings}}{\text{No. of leaves examined} \times \text{Max disease scale}} \times 100$$

Results and Discussion

The disease scoring before spray were varied from 0 to 1 and the percent disease index was recorded 2.00% to 3.33%. After 7 days of 1st foliar spray of chemical, in all the chemical sprayed plots the disease score varied from 0 to 2. But in case of untreated control plot the maximum disease score recorded was 5.

The percent disease index calculated from the disease score was found to be highest in case of untreated control plot (24.67%). Azoxystrobin (11%) + Tebuconazole (18.3%) was found to be most effective in controlling the disease by recording the lowest PDI as 2.67% followed by Carbendazim (25%) + Mancozeb (50%) having PDI 5.33%.

It was also found that there was no disease spread in that plot after the first spray, where the chemical Azoxystrobin (11%) + Tebuconazole (18.3%) was sprayed, as the PDI was 2.67% before the spray.

At the time of harvest, maximum PDI was recorded in the control plot i.e. 45.33%. The plants treated with Azoxystrobin (11%) + Tebuconazole (18.3%) had (PDI-8.00%) and was found the most effective on early blight followed by the PDI of 12.66%, 13.3% and 14.66% in the plots sprayed with Carbendazim (25%) + Mancozeb (50%), Metiram (55%) + Pyraclostrobin (5%) and Hexaconazole (4%) + Zineb (68%).

There is no significant different in PDI recorded in Carbendazim (25%) + Mancozeb (50%), Hexaconazole (4%) + Zineb (68%) and Metiram (55%) + Pyraclostrobin (5%). Least control of disease was recorded in Azoxystrobin (PDI=21.33%) treated plots.

Total fruit yield was significantly higher in all the treatments i.e. sprayed with chemicals as compared to control.

Table.1 Efficacy of new chemicals against early blight disease and fruit yield of tomato under field condition

Sl. No.	Name of fungicides	Trade name	Conc. (%)	PDI before 1 st spray (%)	PDI at 7 days after 1 st spray (%)	PDI at 7 days after 2 nd spray (%)	PDI at harvest (%)	Fruit yield (kg/ha)
1	T1-Carbendazim (25%) + Mancozeb (50%)	Sprint	0.15	2.67 (1.61)	5.33 (2.30)	6.00 (2.43)	12.66 (20.66)	31676
2	T2-Azoxystrobin (11%) + Tebuconazole (18.3%)	Custodia	0.03	2.67 (1.61)	2.67 (1.61)	3.33 (1.80)	8.00 (16.35)	35080
3	T3-Hexaconazole (4%) + Zineb (68%)	Avtar	0.075	2.00 (1.41)	9.33 (3.05)	10.00 (3.15)	14.66 (22.45)	28149
4	T4-Trifloxystrobin (25%) + Tebuconazole (50%)	Nativo	0.075	2.67 (1.61)	8.00 (2.81)	8.67 (2.94)	16.66 (24.04)	27626
5	T5-Metiram (55%) + Pyraclostrobin (5%)	Clutch	0.06	3.33 (1.80)	11.33 (3.36)	12.67 (3.55)	13.33 (21.40)	28104
6	T6-Azoxystrobin	Arrivo	0.025	2.67 (1.61)	14.67 (3.82)	18.67 (4.32)	21.33 (27.44)	22049
7	T7-Untreated	-	-	2.67 (1.61)	24.67 (4.92)	28.00 (5.29)	45.33 (42.32)	16162
	SE(m)±			NS	0.144	0.147	0.86	909.99
	CD			NS	0.44	0.45	2.65	2803.79

However, the maximum yield (35.08 t/ha) was obtained in plots sprayed with Azoxystrobin (11%) + Tebuconazole (18.3%) and least yield (20.72t/ha) was recorded in Azoxystrobin. However, Azoxystrobin had significantly higher fruit yield as compared to untreated control plots (16.16 t/ha).

Among the fungal diseases early blight caused by *Alternaria solani* is one of the most destructive disease of tomato in tropical and subtropical regions (Raina *et al.*, 2018, Adhikari, 2017 and Thippeswami *et al.*, 2017). The causal organism is seed borne as well as air borne, causing infection in seedling stage and producing disease in plant leaves. The severe disease cause direct loss by infection on fruits resulting fruit rot. To effectively control the early blight disease, chemical management is the only way to

reduce the disease severity. From the present investigation it was found that application of strobilurin groups of fungicides (Azoxystrobin and Trifloxystrobin) combined with Tebuconazole, a triazole fungicide had better control on the early blight disease severity.

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How to cite this article:

Pallabi Pattanaik and Anita Priyadarsini. 2020. Efficacy of New Fungicides in Management of *Alternaria Solani* in Tomato. *Int.J.Curr.Microbiol.App.Sci.* 9(06): 427-430.
doi: <https://doi.org/10.20546/ijcmas.2020.906.056>