Biological Forum – An International Journal **16(10): 94-96(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Evaluate Efficacy of Different Systemic Fungicides Against Tomato Wilt Caused by *Fusarium Oxysporum* f.sp. *Lycopersici* (Sacc.) in Laboratory condition

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(Received: 17 July 2024; Revised: 19 August 2024; Accepted: 12 September 2024; Published: 15 October 2024)
(Published by Research Trend)

ABSTRACT: Tomato (*Lycopersicon esculentum* L.) is one of the vegetable crops grown in all parts of world for its fleshy fruits but it is affected by wilting. The Wilt of Tomato one of the most serious diseases of tomato caused by *Fusarium oxysporum* f.sp. *lycopersici*. Therefore, present study was undertaken during, *kharif*, 2021-22 in the Department of Plant Pathology, VNMKV, Parbhani by using poisoned food technique. The experiment was laid with three replications and Eight treatments using Completely Randomized Design (CRD). Treatments were evaluated *viz*., Propiconazole 25% EC, Pyraclostrobin 20% WG, Hexaconazole 5% EC, Thiophanate methyl 70% WP, Difenoconazole 25% EC, Azoxystrobin 25% EC, Tebuconazole 25.9% EC and Control. Among seven systemic fungicides tested, Carbendazim and Hexaconazole at all two different concentrations (@ 500 and 1000 ppm) showed complete (100%) mycelial inhibition, followed by Tebuconazole (95.06%), Difenoconazole (92.65%), Propiconazole (89.94%) and Thiophanate methyl (62.28%), respectively. The Pyraclostrobin was found less effective with 44.93% mycelial inhibition over Untreated Control *in vitro* condition against *Fusarium oxysporum* f.sp. *lycopersici*.

Keywords: *Fusarium oxysporum* f.sp. *lycopersici*, Poisoned Food Technique, Systemic Fungicides, Tomato, Wilt.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the important vegetable crops grown all over the India belongs to the family solanaceae and genus *solanum* (Hassan, 2020). It is self-pollinated crop, which is grown throughout the world and considered as most important tropical vegetable crop.

In Indian Tomato was cultivated around 27.48 million ha area with a yearly production of 334.60 million tonnes during 2020-21 (FAO STAT, 2020). In India highest producing state MP, Orissa, KN, WB, Chhattisgarh, AP, Telangana, Gujarat, Bihar, Maharashtra and TN which accounted for 91 per cent of the total production of the country (NHB, 2017). In Maharashtra tomato was cultivated over area of 0.43 million ha with 9.57 million tonnes of yearly production and productivity of 21.93 million tonnes per hectares (Shreejana, 2021). The fruit is rich in lycopene which has beneficial health effects (Gadhave *et al.,* 2020) and it is a nutritive source of minerals, vit A and vit C and carotenoids.

The crop is susceptible to large number of diseases such as Late blight (*Phytophthora infestans*), Bacterial wilt (*Ralstonia solanacearum*), Fusarium wilt (*Fusarium oxysporum),* Damping off (*Pythium and Rhizoctonia*), Early blight (*Alternaria solani*) and yellow leaf curl. Among all the diseases, *Fusarium* wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* is the most destructive fungal disease. Joshi *et al*. (2013) reported that the soil borne fungus *F. oxysporum* is the causal agent of vascular wilt, the disease that affects a large variety of economically important crops worldwide considering such problem, this experiment was conducted with the aim to Evaluate efficacy of different systemic fungicides against tomato wilt caused by *Fusarium oxysporum* f.sp. *lycopersici*

MATERIAL AND METHODS

The experiment was performed during 2021-22 under the laboratory condition at Department of Plant Pathology, VNMKV, Parbhani, Maharashtra, India, in Complete Randomized Design with three replications and eight treatments, using Seven systemic fungicides and untreated control were evaluated *in vitro* condition using Potato dextrose agar as basal culture medium and applying Poisoned food technique (Nene and Thapliyal 1993). Seven systemic fungicides *viz.,* Propiconazole 25% EC, Pyraclostrobin 20% WG, Hexaconazole 5% EC, Thiophanate methyl 70% WP, Difenoconazole 25% EC, Azoxystrobin 25% EC, Tebuconazole 25.9% EC were tested each at two concentrations (each @ 500 and 1000 ppm).

The poisoned food technique was used (Shravelle, 1961) to evaluate the efficacy of seven different systemic fungicides in inhibiting the mycelial growth of

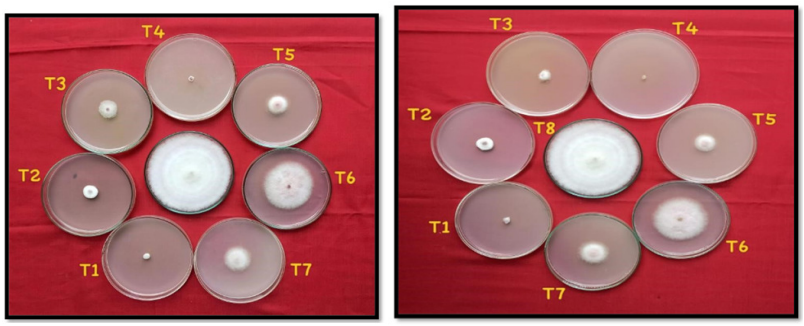
Fusarium oxysporum f.sp. *lycopersici*. The pathogen was grown on PDA medium for nine days before performing of the experiment. The PDA media was prepared and melted. The fungicidal suspension was added to the melted PDA medium to obtain the required concentrations (50 ppm, 100 ppm). 20ml of poisoned medium was poured in each sterilized Petri plate. Suitable control was maintained without addition of fungicide. Mycelial disc of 5 mm was taken from the periphery of nine days old colony and was placed at the centre of the poisoned plates and incubated at 28±2˚C (Harshita *et al*., 2019) and radial growth of the pathogen was measured in mm Observations on radial mycelial growth/colony diameter of the test pathogen was recorded at 24 hrs interval and continued till untreated control plate was fully covered with mycelial growth of the test pathogen. Per cent inhibition of the test pathogen was calculated by applying following formula (Vincent, 1927).

$$\text{Percent Inhibition (R)} = \frac{C - T}{C} \times 100$$

Where,

C = Growth of the test fungus in untreated control plates.

T = Growth of the test fungus in treated plates.



(A) @500 ppm (B) @1000 ppm

T1-Propiconazole 25% EC; T2 -Hexaconazole 5% EC ; T3-Difenoconazole 25% EC ; T4-Tebuconazole 25.9% EC; T5-Pyraclostrobin 20% WG; T6-Thiophanate methyl 70% WP; T7-Azoxystrobin 25% EC; T8-Control

Fig. 1. *In vitro* efficacy of systemic fungicides against radial mycelial growth and inhibition of *Fusarium oxysporum* f.sp. *lycopersici.*

RESULTS AND DISCUSSION

Results noticed that all the seven systemic fungicides tested (each @500 and 1000 ppm) inhibited a wide range of radial mycelial growth of *Fusarium oxysporum* f.sp. *lycopersici* over untreated control and its inhibition decreased drastically with increase in their concentrations. As represented in Table 1 and Graphical representation.

Radial Mycelial Growth. The radial mycelial growth of the *Fusarium oxysporum* f.sp. *lycopersici* was inhibited in the range of 00.00 mm to 58.89 mm at 500 ppm concentration. Among these, Tebuconazole 25.9% EC was recorded minimum radial mycelial growth and it was superior over all the treatments followed by Propiconazole 25% EC (8.09 mm), Difenoconazole 25% EC (17.15mm), Hexaconazole 5% EC (25.04 mm), Pyraclostrobin 20% WG (26.22 mm) and Azoxystrobin 25% EC (31.29 mm). The least effective fungicide was found Thiophanate methyl 70% WP with maximum mycelial growth 58.89 mm.

While At 1000 ppm similar results was obtained as that of 500 ppm was noticed and radial mycelial growth of the *Fusarium oxysporum* f.sp. *lycopersici* was inhibited in the range of 00.00 mm to 56.94 mm. Among these, Tebuconazole 25.9% EC was most effective with complete (100%) inhibition of the mycelial growth and superior over all the treatments followed by Propiconazole 25% EC (7.04 mm), Difenoconazole 25% EC (15.03 mm), Hexaconazole 5% EC (24.05 mm) and Pyraclostrobin 20% WG (24.10 mm). The systemic fungicide Thiophanate methyl 70% WP was least effective with maximum mycelial growth 56.94 mm.

Percent mycelial inhibition. Results (Table 1) showed that all the seven different systemic fungicides tested (each @ 500 and 1000 ppm) significantly inhibited mycelial growth of *Fusarium oxysporum* f.sp. *lycopersici*, over untreated control. Further, per cent mycelial growth inhibition was increased with increase in concentrations. The per cent mycelial growth inhibition was ranged from 35.15% to 100% at 500 ppm. Among these, Tebuconazole 25.9% EC was recorded maximum mycelial inhibition (95.96%), which was significant over all the treatments followed by Propiconazole 25% EC (91.71%), Difenoconazole 25% EC (81.71%), Hexaconazole 5% EC (73.22%) and Pyraclostrobin 20% WG (71.88%). The least per cent mycelial inhibition was recorded with fungicide Thiophanate methyl 70% WP (35.15%) over control.

The per cent radial mycelial growth inhibition was ranged from 00.00% to 100% at 1000 ppm concentration. Among these, Tebuconazole 25.9% EC was recorded complete (100%) mycelial growth inhibition which was significant over all the treatments followed by Propiconazole 25% EC (97.63%), Difenoconazole 25% EC (84.22%) and Hexaconazole 5% EC (73.85%), Pyraclostrobin 20% WG (71.88%). The least per cent mycelial inhibition was recorded with fungicide Thiophanate methyl 70% WP (40.63%). Thus, many workers finding was conformity with systemic fungicide studies of Khan *et al.* (2017).

Table 1: *In vitro* efficacy of systemic fungicides against radial mycelial growth/colony diameter of *Fusarium oxysporum* f.sp. *lycopersici.*

Tr. No.	Treatments	Radial mycelial growth/colony diameter (mm)*		Inhibition (%) #	
		500 ppm	1000 ppm	500 ppm	1000 ppm
T_1	Propiconazole 25% EC	8.09	7.04	91.71 (73.22)	92.17 (73.72)
T_2	Hexaconazole 5% EC	25.04	24.05	73.22 (58.81)	73.27 (58.84)
T_3	Difenoconazole 25% EC	17.15	15.03	81.71 (64.65)	83.30 (65.86)
T_4	Tebuconazole 25.9 % EC	4.22	00.00	95.31 (78.37)	100.00 (90.00)
T_5	Pyraclostrobin 20% WG	26.22	24.10	71.88 (57.95)	73.22 (58.84)
T_6	Thiophanate methyl 70% WP	58.89	56.94	35.15 (36.34)	46.73 (37.28)
T_7	Azoxystrobin 25% EC	31.29	30.07	65.88 (54.23)	66.58 (54.65)
T_8	Control (untreated)	90.00	90.00	00.00 (00.00)	00.00 (00.00)
S.E.(m) ±		**0.29**	**0.29**	**0.08**	**0.22**
CD at 1%		**1.23**	**1.21**	**0.25**	**0.68**

*Mean of three replications ; # Figures in parentheses are angular transformed values

CONCLUSIONS

Seven different systemic fungicides tested *in vitro* against *Fusarium oxysporum f.sp. lycopersici*, among this Carbendazim and Hexaconazole at two different concentrations (@ 500 and 1000 ppm) showed complete (100%) mycelial inhibition, followed by Tebuconazole (95.06%), Difenoconazole (92.65%), Propiconazole (89.94%) and Thiophanate methyl (62.28%), respectively.

FUTURE SCOPE

The promising systemic fungicide *viz.,* carbendazim and Hexaconazole which shows 100% mycelial growth inhibition under the laboratory condition, which can be used further in future for controlling devastation of *Fusarium* wilt of tomato.

Acknowledgement. The authors are thankful to all the members who supported during research work.

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How to cite this article: Barhate P.P., Gholve V.M., Sisodia A.S. and Jadhav V.K. (2024). Evaluate Efficacy of Different Systemic Fungicides Against Tomato Wilt Caused by *Fusarium Oxysporum* f.sp. *Lycopersici* (Sacc.) in Laboratory condition. *Biological Forum – An International Journal, 16*(10): 94-96.