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In vitro evaluation of fungicidal efficacy against *Colletotrichum acutatum* causing anthracnose in chilli

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Abstract

The *Colletotrichum acutatum* was isolated from green chilli anthracnose samples. According to tissue segment approach and pathogen was purified by single spore isolation. The fungitoxicity of 14 fungicides, comprising one contact, four systemic and nine combi fungicides were assessed against *C. acutatum* at three concentrations viz., 25.00, 50.00 and 100.00 ppm by adopting poison food method. Among three concentrations Prochloraz 24.4% + Tebuconazole 12.1%, Carbendazim 12% + Mancozeb, and Flusilazole 12.5% + Carbendazim 25% SE 63 WP shown 100 percent mycelial inhibition compare to all other fungicides, even at least concentration 25 ppm. Which was followed by Fluxapyroxad 250 g/L + Pyraclostrobin 250 g/L SC, Tebuconazole 50% + Trifloxystrobin 25% w/w, Azoxystrobin 11% + Tebuconazole 18.3 SC and least inhibition was noticed in Zineb 68 + Hexaconazole 4 WP and Mancozeb 75% WP in all the concentrations.

Keywords: Green chilli anthracnose, *in vitro*, fungicide and evaluation

Introduction

Chilli (*Capsicum annum* L.), a member of the Solanaceae family, is cultivated worldwide and used both as a green vegetable and as a spice. Its richness in vitamins, along with its characteristic pungency and flavour, makes it a staple ingredient in households across the globe in various forms. India is the world's largest producer, consumer and exporter of chilli, contributing 43 per cent of global production (Kiruthika *et al.*, 2024) [4]. According to 2023-2024 estimates, green chillies are cultivated on 416.53 thousand hectares, producing 4.49 million metric tons (MT). Madhya Pradesh and Karnataka are leading producers with high productivity rates (Anon., 2024).

The crop is affected by numerous insect pests and diseases at different stages of its growth. Several fungal species are known to cause diseases such as damping-off or seedling rot during the early stage, as well as leaf spots, dieback, fruit rot and anthracnose during the fruiting stage. These diseases reduce the market quality of the produce and lead to significant economic losses for growers. Among them, anthracnose is one of the most serious fungal diseases affecting chilli crops.

It is characterized by the appearance of small, circular lesions on mature fruits. Leaf infections result in spots that may lead to premature leaf fall under severe conditions. Dieback symptoms are also observed, where the infection spreads backward along the growing branches, eventually killing the entire plant (Abeygunawardhana, 1969; Kumar and Bhaskaran, 2007) [1, 5]. At later stages, black dots (acervuli) develop on the necrotic tissues, forming concentric rings with masses of conidia. Under high humidity, the disease spreads rapidly, making its control difficult within a short period. The disease can result in yield losses ranging from 12 to 50 percent.

Due to the limited availability of disease-resistant chilli cultivars, farmers largely depend on fungicides for disease management. However, the indiscriminate use of these chemicals leads to the accumulation of residues in soil, water, and plant systems and disrupts ecological balance. Therefore, it is essential to know the effective fungicide for disease management. This study investigates the *In vitro* efficacy of Fungicides against chilli anthracnose associated *Colletotrichum acutatum*.

Materials and Methods

Isolation of pathogen

The infected plant parts including leaves and leaf sheaths, were cut into small pieces, ensuring some healthy portions were included using a sterile blade. These tissue segments were then surface sterilized by immersing them in a 0.1% sodium hypochlorite (NaOCl) solution for 50-60 seconds followed by rinsing three times with sterile water in a Petri plate. The sterilized tissue pieces were placed on sterile blotting paper to dry. Once dried, the tissues were aseptically transferred on to 90 mm Petri plates containing potato dextrose agar (PDA).

Purification of pathogen

The Pure culture of pathogen was obtained using a single spore isolation technique derived from sporulated culture, following the serial dilution method. One milli litter of spore suspension from 10^{-6} dilutions was dispensed into sterilized Petri dishes, into which 1.5 per cent sterilized water agar was then added. The plates were incubated at room temperature for eight hours. Subsequently the underside of the plates was examined using a stereo binocular or compound microscope to locate single germinated spores, which were marked then transferred into the Petri plates containing potato dextrose agar (PDA).

In vitro evaluation of different fungicides against pathogen

The fungitoxicity of 14 fungicides, comprising contact, systemic and combi fungicides was assessed by poisoned food method against *Colletotrichum acutatum* under lab condition. The quantity of fungicides required was estimated based on formulation of the fungicide product and applied to the PDA medium @ 25, 50 and 100PPM concentration. In sterile Petri plates 20 ml of PDA medium mixed with fungicide was added, followed by placing 5 mm mycelial disc of the pathogen at the center of plate. Untreated plates served as controls. The radial growth and percent inhibition at each concentration were calculated using the formula from given by Vincent (1947) [7].

$$\text{Per cent inhibition} = \frac{(C-T)}{C} \times 100$$

Where, C = Growth of pathogens in control plates

T = Growth of pathogens in treated plates

Results and Discussion

Isolation and purification of pathogen

The *Colletotrichum acutatum* was isolated and purified from samples collected according to tissue segment approach. Pathogen was isolated on PDA medium and good growth was observed. The sporulation observed 10-12 days after incubation and pathogen was purified by single spore isolation as mentioned in material and methods.

In vitro evaluation of different fungicides against *Colletotrichum acutatum*

The fungitoxicity of 14 fungicides, comprising one contact, four systemic and nine combi fungicides were assessed against *C. acutatum* at three concentrations viz., 25, 50 and 100 PPM by adopting poisoned food method and results were revealed below. The fungitoxicity of fungicides at 25 ppm was tested against *Colletotrichum acutatum* the results revealed that, among the 14 fungitoxic chemical maximum inhibition was observed in Prochloraz 24.4% + Tebuconazole 12.1%, Carbendazim 12+ Mancozeb, and Flusilazole 12.5% + Carbendazim 25% SE 63 WP with 100 per cent compare to all other fungicides tested followed by Tebuconazole 50%+ Trifloxystrobin 25% w/w (77.41%), Fluxapyroxad 250 g/L + Pyraclostrobin 250 g/L SC (78.15%), and least inhibition was noticed in Zineb 68 + Hexaconazole 4 WP (3.70%). The results were presented in Table 01.

At 50.00 ppm maximum inhibition was observed in Prochloraz 24.4% + Tebuconazole 12.1%, Carbendazim 12+ Mancozeb, and Flusilazole 12.5% + Carbendazim 25% SE 63 WP with 100 per cent compare to all other fungicides tested followed by Tebuconazole 50%+ Trifloxystrobin 25% w/w (82.59%), Azoxystrobin 11 + Tebuconazole 18.3 SC (84.81%) and least inhibition was noticed in Mancozeb 75 WP (20.37%). The results were presented in Table 01.

At 100.00 ppm maximum inhibition was observed in Prochloraz 24.4% + Tebuconazole 12.1%, Carbendazim 12+ Mancozeb, and Flusilazole 12.5% + Carbendazim 25% SE 63 WP with 100 per cent compare to all other fungicides tested followed by Azoxystrobin 11 + Tebuconazole 18.3 SC (88.15%), Tebuconazole 50%+ Trifloxystrobin 25% w/w (83.70%), Propiconazole 13.9% + Difenconazole 13.9% EC (83.33%), Fluxapyroxad 250 g/L + Pyraclostrobin 250 g/L SC (80.74%) and least inhibition was noticed in Zineb 68 + Hexaconazole 4 WP. The results were presented in Table 01. The similar results were reported by Apurv Kumar M Patel *et al.*, (2022) [3] Among non-systemic fungicides, 95.83 per cent growth inhibition over control was recorded in copper oxychloride at four different concentrations (1000, 1500, 2000 and 2500 ppm). Among systemic fungicides, at 500 and 1000 ppm concentration significantly highest per cent growth inhibition over control was recorded in propiconazole 96.21 per cent and 96.59 per cent, respectively. Among combination fungicides carbendazim (12%) + mancozeb (63%) and captan (70%) + hexaconazole (5%) recorded significantly highest 97.35 per cent growth inhibition over control at 1000 ppm concentration. Veerendra Gupta *et al.*, 2018 [6] reported that Thiophanate methyl and Copper oxychloride were the best toxic fungicides inhibiting the mycelial growth *in vitro* at all the six concentrations. In fungicides, Thiophanate methyl inhibited highest mycelial growth, which was at par with Copper oxychloride against *Colletotrichum capsici*.

Table 1: In vitro evaluation of fungicides against *Colletotrichum acutatum*

Sl. No.	Fungicides	Per cent inhibition of mycelia growth		
		25 PPM	50 PPM	100 PPM
1	Mancozeb 75 WP	10.00 (18.42)*	20.37(26.83)	26.67(31.09)
2	Tebuconazole 25 EC	46.67(43.08)	59.63(50.55)	72.59(58.45)
3	Propiconazole 25EC	57.78(49.48)	74.44(59.66)	78.89(62.65)
4	Hexaconazole 5 SC	18.52(25.47)	26.30 (30.82)	58.52(49.91)
5	Difenconazole 25 EC	56.67(48.83)	67.78(55.42)	77.78(61.88)
6	Tebuconazole 50%+ Trifloxystrobin 25% w/w	77.41(61.63)	82.59(65.36)	83.70 (66.19)
7	Propiconazole 13.9% + Difenconazole 13.9% EC	63.70(52.96)	74.81(59.94)	83.33(65.96)
8	Zineb 68 + Hexaconazole 4 WP	3.70(10.91)	22.96(28.63)	24.81(29.88)

9	Carbendazim 12+ Mancozeb 63 WP	100.00 (89.75)	100.00 (89.75)	100.00(89.75)
10	Captan 70 + Hexaconazole 5 WP	32.59(34.8)	51.11(45.64)	64.81(53.62)
11	Flusilazole 12.5% + Carbendazim 25% SE	100.00 (89.75)	100.00 (89.75)	100.00(89.75)
12	Azoxystrobin 11 + Tebuconazole 18.3 SC	77.04(61.39)	84.81(67.07)	88.15(69.9)
13	Fluxapyroxad 250 g/L + Pyraclostrobin 250 g/L SC	78.15(62.13)	79.63 (63.20)	80.74(64.00)
14	Prochloraz 24.4% + Tebuconazole 12.1%	100.00 (89.75)	100.00 (89.75)	100.00(89.75)
		Fungicides	Concentration	F×C
	S. Em ±	0.54	0.23	1.12
	CD (P=0.01)	1.772	0.82	3.069

Conclusion

Based on the results of the *in vitro* studies of contact, systemic, and combination fungicides, it can be concluded that Prochloraz 24.4% + Tebuconazole 12.1%, Carbendazim 12% + Mancozeb, and Flusilazole 12.5% + Carbendazim 25% (SE/63 WP) exhibited complete (100%) inhibition of fungal mycelial growth compared to all other fungicides tested, even at the lowest concentration of 25 ppm.

References

1. Abeygunawardhana VW. Diseases of cultivated plants. Colombo: Colombo Apothecaries Ltd; 1969. p. 167-169.
2. Anonymous. 2023-24 (second advance estimates) of area and production of horticulture crops category-wise: all India. New Delhi: Ministry of Agriculture and Farmers Welfare, Government of India; 2024.
3. Patel AM, Rakholiya KB, Panara KN, Paladiya SH. *In vitro* evaluation of fungicides against *Colletotrichum capsici* (Sydow) Butler and Bisby causing anthracnose disease of chilli. The Pharma Innovation Journal. 2022;11(6):404-406.
4. Kiruthika N. Economics of Mundu chilli cultivation in Ramanathapuram district of Tamil Nadu, India. Asian Journal of Agricultural Extension, Economics & Sociology. 2024;42(1):44-48.
5. Kumar MA, Bhaskaran R. Tactics to manage disease problem in chilli. Spice India. 2007:24-27.
6. Gupta V, Kaur A, Singh A, Shekhar H, Singh R, Bobde A, Sasode RS. *In vitro* evaluation of fungicides against *Colletotrichum capsici* causal organism of anthracnose disease of chilli. International Journal of Chemical Studies. 2018;6(2):1592-1596.
7. Vincent JM. Distortion of fungal hyphae in the presence of certain inhibitors. Nature. 1947;150:850-850.