

Original Research Article

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Fungicides in the Management of Foliar Diseases of Sesame

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ABSTRACT

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Sesame (*Sesamum indicum* L.) is an important oilseed crop. Foliar diseases viz., *Alternaria* leaf spot and powdery mildew cause major threat in sesame cultivation. The effect of various fungicides in managing foliar diseases of sesame was studied under field conditions. Seed treatment with *Trichoderma asperellum* @ 10 g/kg seed and furrow application of *T. asperellum* (2.5 kg/ha mixed in 100 kg of FYM) @ 250 kg/ha is common for all the treatments. Spraying with various systemic fungicides was taken first at the time of initiation of the disease and second at 15 days after first spraying. Among the fungicides tested, spraying of myclobutanil @ 1 g/l twice was effective in managing the foliar diseases of sesame and also increasing the seed yield.

Introduction

Among the oilseed field crops, sesame (*Sesamum indicum* L.) is one of the most important ancient oil-yielding crop in the world for edible oil production. Sesame seed is a rich source of protein (20%), edible oil (50%), oleic acid (47%) and linolenic acid (39%) (Kumaraswamy *et al.*, 2015). It is also a rich source of natural antioxidants viz., sesamol, sesamin and sesamol (Shyu and Hwang, 2002). Although sesame is widely used for different purposes, it has low productivity due to non-availability of high-yielding varieties, resistant variety to biotic and abiotic stresses, low harvest index, seed shattering and indeterminate growth habit.

Many diseases attack sesame, but only a few of them such as Fusarium wilt, charcoal rot, stem and root rot, bacterial blight, bacterial leaf spot, *Cercospora* leaf spot, *Alternaria* leaf spot, powdery mildew, leaf curl and phyllody were considered to be the important diseases of sesame in the world and it occurs wherever sesame is cultivated. Among the foliar diseases, leaf blight and powdery mildew were the major disease of sesame in Tamil Nadu. Leaf blight pathogen of sesame, *Alternaria sesami* attacked all parts of the plant at all stages. Small, dark brown water soaked, round to irregular lesions, with concentric rings, 1-8 mm in diameter appeared on the leaves. Under excessive atmospheric and soil humidity, the spot increased in size and number. The lesions

may also appear on the midrib and veins of the leaves. Milder attack caused only defoliation, in severe cases the plants may die. The pathogen is seed borne. Temperature of 20-30° C and high humid conditions favoured the disease. Powdery mildew disease of sesame incited by fungus *Erysiphe* sp. attacked all parts of the plant. Small cottony spots appeared on the infected leaves which gradually spread on the lamina. Defoliation of severely infected plant occurred before maturity.

About one per cent increase in disease intensity reduces its yield by 8.36 kg/ha (Maiti *et al.*, 1988). Singh (1987) reported 5-85 per cent yield losses due to *Alternaria* leaf spot and fruit rot disease of chilli. Hence, present investigation was undertaken for the management of foliar diseases of sesame using foliar application of fungicides.

Materials and Methods

Field studies

The field experiment was conducted in a plot size of 2.4 x 3.0 m with eight treatments and three replications in RBD using the susceptible variety VRI-1 for the management of foliar diseases of sesame. Seed treatment (ST) with *Trichoderma asperellum* @ 10 g/kg of seed and furrow application of *T. asperellum* (2.5 kg/ha enriched in 100 kg of FYM) @ 250 kg/ha is common for all the treatments T₁- T₆. Five systemic fungicides were selected for the field experiment. The fungicides *viz.*, Myclobutanil, hexaconazole 4% + zineb 68%, cymoxanil 8% + mancozeb 64%, trifloxistrobin 25%+tebuconazole 50%, hexaconazole 5% + captan 70% were evaluated against foliar diseases of sesame under field condition. Two spraying of the fungicides were carried out, first at the time of initiation of the disease and second at 15 days after first spraying. In control plots, only water was sprayed. The disease rating was

done by 0-5 scale and average disease severity index based on percentage leaf area affected was calculated. The per cent disease intensity (PDI) was worked out.

Scale	Per cent leaf area infection
0	No visible symptoms
1	1 to 10% leaf area infected
2	11 to 20% leaf area infected
3	21 to 30% leaf area infected
4	31 to 40% leaf area infected
5	More than 40% leaf area infected

Disease intensity of foliar diseases *viz.*, *Alternaria* leaf spot and powdery mildew was observed at 75 days after sowing using 0-5 disease rating scale by random selection of 25 plants per plot.

Per cent disease index (PDI) was calculated using the formula

$$PDI = \frac{\text{Sum of numerical ratings}}{\text{Number of plants observed} \times \text{Maximum grade}} \times 100$$

The seed yield was also recorded for each treatment and the data were statistically analyzed.

Results and Discussion

Several systemic fungicides were evaluated for the management of foliar diseases of sesame under field conditions. The results of the field experiment revealed that seed treatment with *T. asperellum* @ 10 g/kg, furrow application of *T. asperellum* (2.5 kg/ha mixed in 100 kg of FYM) @ 250 kg/ha followed by foliar spray of myclobutanil @ 1 g/l was effective in managing the foliar diseases of sesame which recorded minimum *Alternaria* leaf spot (13.6 PDI) and powdery mildew (17.2 PDI). This was followed by foliar spray of trifloxistrobin 25% + tebuconazole 50% @ 0.5 g/l which recorded

Alternaria leaf spot (14.9 PDI) and powdery mildew (18.6 PDI). In control, the maximum *Alternaria* leaf spot (28.6 PDI) and powdery mildew (33.4 PDI) disease intensity was recorded (Table 1). Pethybridge *et al.*, (2007) reported that berries from the cyprodinil + fludioxonil treatment had the lowest incidence of *Botrytis* fruit rot of strawberry incited by

Botrytis cinerea. Maximum disease control of chilli leaf spot caused by *Alternaria alternata* under field conditions by fungicide propiconazole 0.1% was reported by Gohel and Solanky (2011). Singh and Majumdar (2002) reported propiconazole was the most effective fungicide in controlling fruit rot of pomegranate caused by *Alternaria alternata*.

Table.1 Integrated management of foliar diseases of sesame (Pooled mean of 2017 and 2018)

S. No	Treatments	<i>Alternaria</i> leaf spot (PDI)	Powdery mildew (PDI)	Yield (kg/ha)
T ₁	Spray of Myclobutanil @ 1 g/l	13.6 (21.7)	17.2 (24.5)	621
T ₂	Spray of hexaconazole 4% + zineb 68% @ 2 g/l	19.8 (26.2)	23.5 (28.7)	518
T ₃	Spray of cymoxanil 8%+ mancozeb 64% @ 2g/l	16.2 (23.5)	21.3 (27.5)	527
T ₄	Spray of trifloxistrobin 25% + tebuconazole 50% @ 0.5 g/l	14.9 (22.5)	18.6 (25.1)	592
T ₅	Spray of hexaconazole 5%+ captan 70% @ 2g/l	21.4 (27.6)	26.7 (30.4)	494
T ₆	Spray of <i>Trichoderma asperellum</i> @ 0.4%	23.7 (28.8)	28.6 (32.3)	486
T ₇	Spray of carbendazim 12% + mancozeb 63 % 75WP @ 2g/l (Treated check)	15.3 (22.8)	20.9 (26.6)	554
T ₈	Untreated check	28.6 (32.3)	33.4 (35.8)	473
SEd		1.32	1.44	7.39
CD(P=0.05)		2.8	3.1	15.6

*Mean of three replications

Note: Seed treatment (ST) with *T. asperellum* @ 10 g/kg + furrow application of *T. asperellum* (2.5 kg/ha mixed in 100 kg of FYM) @ 250 kg/ha is common for T₁- T₆.

Gholve *et al.*, 2014 highlighted that among the different fungicides tested, thiram was found most effective against *A. macrospora*, with maximum growth inhibition. Meena and Ratnoo, 2014 observed that mancozeb and hexaconazole were the best fungicides for control of all the three species of *A. alternata*, *A. macrospora* and *A. gossypina*. Wedge *et al.*, (2007) reported that fungicides from seven groups were effective for control of

strawberry fruit rot diseases, and the commercial combination fungicides were often the most effective. Total fruit rot was less on berries from the pyraclostrobin + boscalid treatment; anthracnose fruit rot was less on berries from the cyprodinil + fludioxonil treatment; and stem-end rot was less on berries from the cyprodinil + fludioxonil treatment. The significant reduction of the growth of *Alternaria solani*

by fungicide mancozeb was reported by Ghazanfar *et al.*, 2016. Sanjeev *et al.*, (2017) documented that among different fungicides, tebuconazole showed significant reduction in mycelial growth of *A. alternata* *in vitro*. Rao *et al.*, (2009) documented that among the different integrated seed treatment options tested for the management of Alternaria blight of sunflower, highest benefit was obtained in the seed treatment with Carbendazim + Iprodione (Quintal) at 0.3% in water along with hexaconazole foliar spray (0.1%).

In addition to disease reduction, the seed yield was also found to be increased in the effective treatment. The maximum seed yield of 621 kg/ha was recorded in seed treatment with *T. asperellum* @ 10 g/kg, furrow application of *T. asperellum* (2.5 kg/ha mixed in 100 kg of FYM) @ 250 kg/ha followed by foliar spray of myclobutanil @ 1 g/l. Foliar spray of trifloxistrobin 25% + tebuconazole 50% @ 0.5 g/l ranked next in increasing seed yield which recorded 592 kg/ha. In control, the minimum yield of 473 kg/ha was observed (Table 1). Jayalakshmi *et al.*, (2013) highlighted that soil application of neem cake (250 kg/ha) along with seed treatment and soil application (2.5 kg/ha) of *Trichoderma viride* followed by foliar spray of azadirachtin @ 3 ml/l on 30 and 45 DAS was effective in managing major sesame diseases by recording minimum disease incidence coupled with maximum seed yield with higher cost benefit (C: B) ratio.

Hence, it was concluded that foliar diseases of sesame can be effectively managed by foliar application of systemic fungicides.

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