

# Evaluation of Foliar Fungicides for Management of Powdery Mildew Disease of Sesamum

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**Abstract** – Powdery mildew is a devastating disease of sesamum caused by many species of fungi, which occurs in epidemic scale in areas of high rainfall and humidity coupled with low night temperature. Sesamum powdery mildew causes yield losses up to 25-50% due to defoliation. Hence, study was undertaken to test the efficacy of foliar fungicides to manage the powdery mildew disease of sesamum. Seven fungicides viz., sulphur 80WP, difenoconazole 25EC, hexaconazole 5EC, tebuconazole 250EC, myclobutanil 10WP, dinocap 48EC and potassium bicarbonate were evaluated for efficacy on powdery mildew of sesamum. Spraying was undertaken on appearance of powdery mildew disease symptoms on sesamum plants. All the fungicides resulted in significant decrease in powdery mildew disease intensity. Fungicide difenoconazole was found superior over other fungicides in reducing the per cent disease intensity followed by the treatment of hexaconazole, tebuconazole and myclobutanil. Maximum per cent disease control was recorded in the plots protected with difenoconazole (73.7%) which was at par with hexaconazole (67.3%) followed by tebuconazole (58.0%) and myclobutanil (50.4%). The fungicidal treatments also resulted in the increase in sesamum yield. Treatment with difenoconazole resulted in maximum yield (605.8 kg ha<sup>-1</sup>) which was at par with the treatments of hexaconazole (551.1 kg ha<sup>-1</sup>) and tebuconazole (507.1 kg ha<sup>-1</sup>). The sterol biosynthesis inhibiting (triazole group) fungicides were found more effective over others in management of powdery mildew disease of sesamum.

**Keywords** – Fungicides, Management, Powdery mildew, Sesamum.

## I. INTRODUCTION

Sesamum or gingelly (*Sesamum indicum* L.) commonly known as til, belongs to the family Pedaliaceae. It is regarded as the 'Queen of Oilseeds', the quality of its oil being of high nutritional and therapeutic value [5]. It is an ancient oilseed crop grown in India, and perhaps the oldest oilseed crop in the world. It is also widely cultivated as cash crop in tropical areas of Africa, Sri Lanka, West Pakistan, Nepal and East Asia [7]. The crop is grown in a wide range of environments, extending from semi-arid tropics and subtropics to temperate regions. The origin of *Sesamum indicum* is uncertain as it is widely cultivated and naturalized in tropical regions. The species are primarily African, with some species occurring in India, Sri Lanka and China. The genus is closely related to the strictly African genus *Ceratotherca* and is itself probably African in origin [2].

Sesamum is highly nutritive with medicinal value and high oil (38-54%) and protein content (18-25%). Sesamum seeds are digestive, anti-aging and rich in vitamin E,

minerals like calcium (14.5 mg g<sup>-1</sup>), phosphorus (570 mg g<sup>-1</sup>) [6], iron (white seeds), copper, magnesium, zinc and potassium. This unique composition coupled with high-unsaturated fatty acid (linolenic and tocopherols) make the sesamum nearly perfect food. Its oil contains an antioxidant called sesamol which imparts a high degree of resistance against oxidative rancidity.

Sesamum is inherently low yielding plant type. Its yield is further limited by various biotic and abiotic stresses. Sesamum is known to suffer from number of fungal, bacterial and phytoplasmal diseases which cause huge reduction in its production. Some of the diseases resulted in heavy losses if adequate and timely control measures are not taken. The Major diseases of sesamum occurring in India are powdery mildew, *Alternaria* leaf spot and phyllody [13]. Among them, powdery mildew is a devastating disease in all the sesamum growing states in general, Andhra Pradesh and Tamil Nadu in particular. It is caused by many species of fungi, viz., *Erysiphe cichoreacearum*, *Erysiphe orontii*, *Sphaerotheca fuliginea*, *Leveillula taurica*, *Oidium erysipoides*, *Oidium* spp. and *Oidium sesami*. It occurs on epidemic scale in areas of high rainfall and humidity coupled with low night temperature. Sesamum powdery mildew causes yield losses up to 25-50% due to defoliation resulting in heavy reduction in total production [14]. Sesamum cultivation has been experiencing the serious menace of powdery mildew incidence. Most of the sesamum cultivars presently under cultivation are highly susceptible to the disease. Therefore, the chemical control measure appears to be the suitable alternative for the management of powdery mildew using protective and systemic fungicides. Hence, the present study was undertaken to test the efficacy of foliar fungicides to control the powdery mildew disease of sesamum.

## II. MATERIALS AND METHODS

The present investigation was carried out at Agricultural Research Station, Niphad (Maharashtra) during *kharif* 2016. Commercial fungicides viz., Sulphur 80WP (Thiosulf), Dinocap 48 EC (Karathane), Hexaconazole 5EC (Contaf), Difenoconazole 25EC (Score), Tebuconazole 250EC (Folicur), Myclobutanil 10WP (Systhane) and Potassium bicarbonate were evaluated in the present study. The field experiment was laid out in Randomized Block Design with 8 treatments and three replications. Sesamum variety 'JLT-408' susceptible to powdery mildew (*Erysiphe cichoracearum*) was sown at 45 cm x 10cm spacing in plots of 4.50 x 2.40 m.

Recommended dose of fertilizers was applied and irrigated lightly for better seed germination. Ten days after sowing, thinning and gap filling operations were done to maintain uniform plant population. First spraying was done immediately on appearance of powdery mildew disease and subsequent second and third sprayings were given at an interval of 10 days. The plot without fungicidal spray was treated as untreated control plot.

Observations on powdery mildew disease intensity were recorded on five randomly selected and tagged plants. The first observation was taken on appearance of the disease and subsequent three observations were taken 10 days after each spray. The powdery mildew disease was graded on the basis of disease intensity observed on leaves by applying 0-9 disease rating scale [8]. Further, these observations were converted to per cent disease index (PDI) using the formula given by [9]. The percent disease intensity (PDI) and percent disease control (PDC) were calculated by using following formula:

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{No. of leaves observed} \times \text{maximum rating}} \times 100$$

$$PDC = \frac{\text{PDI in control plot} - \text{PDI in treatment plot}}{\text{PDI in control plot}} \times 100$$

Entire sesamum crop was harvested on maturity. Finally crop yield/treatment/replication was computed and final yield data was presented on hectare basis (kg ha<sup>-1</sup>). The data was analyzed statistically, as per the standard procedure [12].

### III. RESULTS AND DISCUSSION

The data on powdery mildew disease intensity recorded after first spray (50 DAS) was statistically significant (Table 1). Minimum disease intensity (10.8%) was observed in the plots sprayed with difenoconazole and was at par with hexaconazole (14.4 %) followed by tebuconazole (17.5%) and Myclobutanil (20.6%) with 69.2, 59.1, 50.2 and 41.4 per cent disease reduction over control, respectively. While, maximum disease intensity (35.1%) was recorded in untreated control plot.

The data on disease intensity recorded after second spray (60 DAS) was also statistically significant. Minimum disease intensity (16.3%) was recorded in the plots sprayed with difenoconazole which was at par with hexaconazole (19.7%) followed by tebuconazole (24.1%) and Myclobutanil (28.4%) with 71.1, 65.1, 57.2 and 49.6 per cent disease control, respectively. The maximum disease intensity (56.4%) was recorded in control plot. Similar results were found at 70 DAS i.e during final observations. Minimum disease intensity (19.4%) was recorded in the plots sprayed with difenoconazole which was at par with hexaconazole (24.1%) followed by tebuconazole (31.0%) and Myclobutanil (36.6%) with 73.7, 67.3, 58.0 and 50.4 per cent decrease over control, respectively. The maximum disease intensity (73.8%) was recorded in control plot. Similar results have been reported earlier [4], [1], [3] showing effectiveness of difenoconazole, hexaconazole, tebuconazole and

myclobutanil fungicides for controlling powdery mildew disease on different crops. The chemicals belonging to triazole group were found effective than others and are conformity with the previous results recorded [11].

All the fungicide treatments resulted in significant increase in yield as compared to control (Table 1). Among the fungicides evaluated, three spray of difenoconazole resulted in maximum yield (605.8 kg ha<sup>-1</sup>) which was at par with three foliar spray of hexaconazole (551.1 q ha<sup>-1</sup>) and tebuconazole (507.1 kg ha<sup>-1</sup>). While, The minimum yield (335.1 kg ha<sup>-1</sup> ha) was recorded in untreated control plot. Effectiveness of these fungicides on increase in yield has been previously reported [4], [1], [3] and hence, it is in conformity with the results obtained.

### IV. CONCLUSION

The chemicals belonging to triazole group interfere with the biosynthesis of fungal sterols and inhibit ergosterol biosynthesis. They also interfere in conidia and haustoria formation. They change the sterol content and saturation of the polar fatty acids leading to alterations in membrane fluidity and behavior of membrane bound. Hence, Sterol biosynthesis inhibiting (triazole group) fungicides *viz*; difenoconazole, hexaconazole, tebuconazole and myclobutanil are more effective than others in management of powdery mildew disease of sesamum.

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**Table 1. Effect of fungicidal sprays on powdery mildew disease and yield of sesamum.**

Treatment	Per cent Disease Intensity	Per cent Disease Control	Per cent Disease Intensity	Per cent Disease Control	Per cent Disease Intensity	Per cent Disease Control	Yield (kg ha <sup>-1</sup> )	Per cent Yield increase over control
	50 DAS		60 DAS		70 DAS			
1. Sulphur @ 0.2%	24.6 (29.65)	30.0	39.1 (38.62)	30.7	50.5 (45.28)	31.5	414.5	23.68
2. Dinocap @0.03%	22.8 (28.37)	35.0	31.3 (33.92)	44.6	40.7 (39.40)	44.8	446.2	33.16
3. Hexaconazole@0.1%	14.4 (22.25)	59.1	19.7 (25.95)	65.1	24.1 (29.31)	67.3	551.1	64.47
4. Difenoconazole@	10.8 (19.14)	69.2	16.3 (23.59)	71.1	19.4 (26.04)	73.7	605.8	80.79
5. Tebuconazole @0.01%	17.5 (24.53)	50.2	24.1 (29.28)	57.2	31.0 (33.70)	58.0	507.1	51.32
6. Myclobutanil @0.04%	20.6 (26.66)	41.4	28.4 (32.06)	49.6	36.6 (37.14)	50.4	481.0	43.55
7. Potassium bicarbonate @0.5%	28.6 (32.30)	18.6	45.6 (42.46)	19.2	57.3 (49.23)	22.3	389.3	16.18
8. Untreated Control	35.1 (36.28)	0.0	56.4 (47.70)	0.0	73.8 (59.56)	0.0	335.1	
S.E. (m) ±	1.29		2.09		1.97		62.29	
CD at 5%	3.97		6.42		6.06		20.34	

Figures in parenthesis are arc sin transformed values

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