International Journal of Plant & Soil Science

Volume 38, Issue 2, Page 120-127, 2026; Article no.IJPSS.153058
ISSN: 2320-7035

Evaluation of Fungicides and Biocontrol Agents for Managing Powdery Mildew Disease in Okra

Abhishekh Barala [a++*], J K Babele [a#], Saurabh Singh [b†] and Ajay Gora [a++]

[a] Department of Plant Pathology, Institute of Agricultural Science, Bundelkhand University, Jhansi (U.P.), India.
[b] Department of Entomology, Institute of Agricultural Science, Bundelkhand University, Jhansi (U.P.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijpss/2026/v38i25969

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://pr.sdiarticle5.com/review-history/153058

Original Research Article

Received: 30/11/2025
Published: 11/02/2026

Abstract

A field experiment was conducted during the *Kharif* season of 2024 at the Chemical Agriculture Research Farm, Narayan Bagh, Bundelkhand University, Jhansi (U.P.), to evaluate the efficacy of various fungicidal, botanical, and biological treatments against powdery mildew (*Erysiphe cichoracearum*) in okra (*Abelmoschus esculentus* L.). The study was laid out in a Randomized Block Design with nine treatments and three replications, using the susceptible variety UPRI-900. Disease incidence and severity were recorded at four intervals: initial appearance and after three successive spray applications. Results revealed that Sulphur 0.3% (T_1) was the most effective treatment, achieving the lowest mean disease incidence (17.80%) and highest per cent disease

---

[++] M.Sc. Research Scholar; [#] Assistant Professor; [†] Teaching Assistant;
**Corresponding author: E-mail: baralaabhi5345@gamil.com;*

***Cite as:** Barala, Abhishekh, J K Babele, Saurabh Singh, and Ajay Gora. 2026. "Evaluation of Fungicides and Biocontrol Agents for Managing Powdery Mildew Disease in Okra". International Journal of Plant & Soil Science 38 (2):120-27. https://doi.org/10.9734/ijpss/2026/v38i25969.*

control (63.94%), followed by Hexaconazole 0.1% (T_2) and Propiconazole 0.1% (T_3). Biopesticides like Neem oil (T_5) and *Trichoderma* spp. (T_6, T_7) showed moderate efficacy but were less effective under high disease pressure. Dinocap 4% (T_8) performed poorly, recording the highest disease severity among treated plots. The untreated control (T_9) exhibited maximum disease progression, underlining the need for timely disease management. The study concludes that Sulphur, Hexaconazole, and Propiconazole can be effectively integrated into powdery mildew management strategies in okra, while biocontrol agents offer sustainable alternatives under low to moderate disease pressure.

Keywords: Okra, powdery mildew; Erysiphe cichoracearum; disease control; fungicide efficacy; biopesticides.

1. Introduction

Okra (*Abelmoschus esculentus* L.) is an important vegetable crop cultivated extensively in tropical and subtropical regions of the world, including India. It is a rich source of vitamins, minerals, and dietary fibre, and contributes significantly to nutritional security and income generation, especially for small and marginal farmers (Lamont, 1999; Kumar et al., 2010). However, its productivity and quality are adversely affected by various biotic stresses, among which fungal diseases are particularly damaging (Fajinmi & Fajinmi, 2010). Among the foliar diseases, powdery mildew, caused primarily by *Erysiphe cichoracearum*, is considered one of the most destructive diseases of okra (Saharan & Mehta, 2005). The disease typically appears as white powdery growth on leaves, stems, and occasionally fruits, leading to reduced photosynthesis, premature leaf drop, poor fruit development, and considerable yield losses (Agrios, 2005). Warm and dry weather conditions favour the development and spread of this disease, making it a recurring problem in many okra-growing regions.

The conventional management of powdery mildew primarily involves the application of chemical fungicides such as sulfur, carbendazim, and hexaconazole, which have shown high efficacy. However, excessive and indiscriminate use of these chemicals has led to various issues, including the development of fungicide-resistant strains of pathogens, accumulation of toxic residues, environmental pollution, and negative effects on beneficial organisms (Brent & Hollomon, 2007; Lucas et al., 2015). In recent years, there has been a growing shift toward integrated disease management approaches that combine chemical treatments with environmentally safe alternatives like biocontrol agents and botanicals. Biological control agents such as *Trichoderma harzianum*, *Trichoderma viride*, and *Pseudomonas fluorescens* have shown promise in suppressing several plant diseases, including powdery mildew, through mechanisms such as competition, antibiosis, and induction of systemic resistance (Harman et al., 2004; Vinale et al., 2008; Compant et al., 2005). In this context, the present investigation was undertaken to evaluate and compare the efficacy of selected fungicides and biocontrol agents for the management of powdery mildew of okra under field conditions. The goal is to identify effective, economical, and environmentally safe treatment options that can be recommended for sustainable okra cultivation.

2. Materials and Methods

The present field experiment was conducted during the *Kharif* 2024 at the Chemical Agriculture Research Farm, Narayan Bagh, Institute of Agricultural Science, Bundelkhand University, Jhansi, Uttar Pradesh. The study aimed to assess the efficacy of various treatments against powdery mildew (*Erysiphe cichoracearum*) in okra (*Abelmoschus esculentus* L.). The experiment was laid out in a Randomized Block Design (RBD) comprising nine treatments with three replications. The crop variety used was UPRI-900, which is known to be susceptible to powdery mildew. Each plot measured 2.40 × 2.0 meters with a spacing of 45 cm between rows and 30 cm between plants. The total number of plots was 27, and sowing was carried out on 30th July 2024. Recommended doses of fertilizers were applied uniformly across all the plots. Light irrigation was provided to facilitate proper seed germination. Ten days after sowing, thinning and gap filling were performed to ensure a uniform plant population. Intercultural operations such as weeding and hoeing were carried out as needed throughout the crop growth period. Regular observations were made to monitor the onset and development of powdery mildew symptoms.

Observations on powdery mildew incidence and severity were recorded on five randomly selected plants from each plot. The first observation was taken at the initial appearance of the disease, followed by three more observations taken after each spray application. The percentage disease incidence was calculated using the formula:

$$\text{Per cent disease incidence} = \frac{\text{No. of plants affected}}{\text{Total number of plants observed}} \times 100$$

Based on numerical ratings observed, the percentage disease control was calculated by applying the formula as given below:

Per cent disease control (PDC) was worked out by applying the formula:

$$\text{Per cent disease control} = \frac{\text{Control plot} - \text{Treatment plot}}{\text{Control plot}} \times 100$$

3. Results

Powdery mildew, caused by *Erysiphe cichoracearum*, is one of the most important fungal diseases affecting okra, leading to significant yield and quality losses. To evaluate the effectiveness of different fungicides and biocontrol agents in managing this disease, a field experiment was conducted with nine treatments, including a control, during the cropping season. The disease incidence was recorded at the first appearance and after each of the three fungicidal sprayings. The observations are presented in Table 1 and Fig. 1, discussed below.

3.1 First Appearance of Disease

At the time of first appearance, the Per cent Disease Incidence (PDI) was observed to range from 8.89% to 12.22%. The lowest initial PDI (8.89%) was recorded in (T_5) Neem oil 4%, followed by (T_3) Propiconazole 0.1% and (T_7) *Trichoderma harzianum* 4%, both recording 10.56%. The highest PDI at this stage (12.22%) was observed in (T_6) *Trichoderma asperellum* 3%. These early observations suggest that neem oil has some preventive properties, potentially acting as an early deterrent to fungal infection. However, differences in disease development in the later stages indicate the varying curative and systemic properties of the fungicides.

3.2 Per cent Disease Incidence after Spraying

3.2.1 50 DAS

After the first spraying, a significant reduction in disease progression was noted in most treatments. (T_1) Sulphur 0.3% recorded the lowest PDI of 13.56%, followed closely by (T_2) Hexaconazole 0.1% at 13.11 % and (T_3) Propiconazole 0.1% at 14.47%. The highest PDI was noted in (T_9) Control (Water Spray) at 29.07%, clearly indicating the effectiveness of chemical and biological treatments in suppressing disease progression post-treatment.

3.2.2 60 DAS

Following the second spray, the PDI continued to rise in most treatments, but at a significantly lower rate in treated plots compared to the control. The lowest incidence was observed in (T_1) Sulphur 0.3% at 17.68%, followed by (T_2) Hexaconazole and (T_3) Propiconazole with PDIs of 21.81% and 25.00%, respectively. Biological agents such as (T_6) *T. asperellum* and (T_7) *T. harzianum* recorded higher PDIs of 27.61% and 29.50%, respectively, suggesting their relatively slower mode of action and lower efficacy under field conditions.

3.2.3 70 DAS

After the third and final spraying, the trend of disease suppression became more apparent. The lowest PDI was again observed in (T_1) Sulphur 0.3% with 18.43%, followed by (T_2) Hexaconazole at 20.60% and (T_4) Potassium bicarbonate at 20.60%. (T_9) Control showed a drastic increase in disease incidence, reaching 66.70%, demonstrating the unchecked spread of powdery mildew in the absence of any disease management practices.

3.3 Mean Per Cent Disease Incidence (Mean PDI)

The cumulative mean PDI across all three observations revealed clear differences in the efficacy of the treatments. The most effective treatment in reducing disease incidence was (T_1) Sulphur 0.3%, recording the lowest mean PDI of 17.8%, followed by (T_2) Hexaconazole 0.1% with 20.16%, and (T_3) Propiconazole 0.1% with 23.20%. These treatments significantly suppressed powdery mildew incidence and were

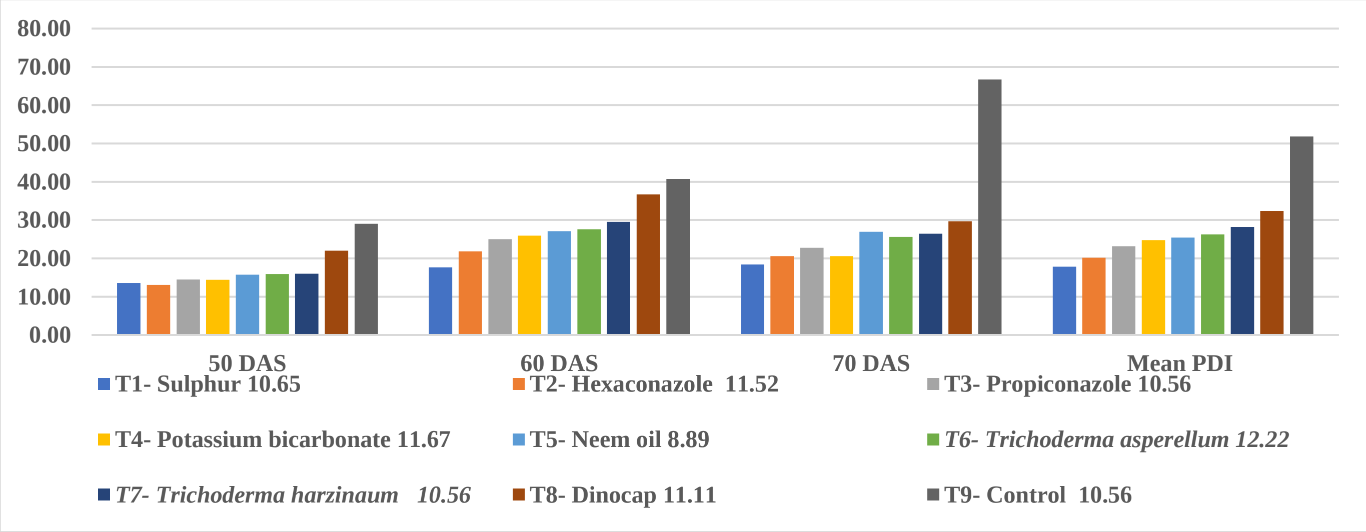

Fig. 1. Effect of fungicides on powdery mildew incidence in okra

Table 1. Effect of fungicides on powdery mildew incidence in okra

S. No.	Treatment	Conc. (%)	PDI at first appearance	Per cent disease incidence after spraying			Mean PDI (%)	ROC (%)
				50 DAS	60 DAS	70 DAS		
T_1	Sulphur	0.3%	10.65 (3.34) *	13.54 (3.75)	17.68 (4.19)	18.43 (4.27)	17.8 (4.21)	65.55
T_2	Hexaconazole	0.1%	11.52 (3.41)	13.11 (3.63)	21.81 (4.72)	20.60 (4.59)	20.16 (4.55)	61.11
T_3	Propiconazole	0.1 %	10.56 (3.33)	14.47 (3.87)	25.00 (5.05)	22.73 (4.82)	23.20 (4.87)	55.24
T_4	Potassium bicarbonate	1.6 %	11.67 (3.49)	14.41 (3.86)	25.93 (5.14)	20.60 (4.59)	24.76 (5.03)	52.23
T_5	Neem oil	4 %	8.89 (3.06)	15.74 (4.03)	27.07 (5.25)	26.95 (5.24)	25.41 (5.09)	50.98
T_6	*Trichoderma asperellum*	3 %	12.22 (3.57)	15.90 (4.05)	27.61 (5.30)	25.63 (5.11)	26.30 (5.18)	49.26
T_7	*Trichoderma harzianum*	4 %	10.56 (3.33)	16.01 (4.06)	29.50 (5.48)	26.46 (5.19)	28.20 (5.36)	45.60
T_8	Dinocap	0.1 %	11.11 (3.41)	21.98 (4.74)	36.70 (6.10)	29.67 (5.49)	32.37 (5.73)	37.55
T_9	Control (Water spray)	-	10.56 (3.33)	29.07 (5.44)	40.70 (6.42)	66.70 (8.20)	51.83 (7.23)	-
	S.Em. ±	-	0.13	0.16	0.18	0.19	0.19	-
	C.D at 5%	-	0.39	0.47	0.55	0.58	0.56	-
	CV	-	6.78	6.57	6.01	6.32	6.14	-

*PDI- Per cent Disease Incidence. *Figures in parentheses are arcsine-transformed values* statistically superior to the control. Other treatments, such as (T_4) Potassium bicarbonate and (T_5) Neem oil, recorded moderate efficacy with mean PDIs of 24.76% and 25.41%, respectively. These treatments may be considered for integrated disease management, especially under low disease pressure or organic farming systems. Biological treatments, namely (T_6) *T. asperellum* and (T_7) *T. harzianum*, although environmentally safe and suitable for organic cultivation, recorded higher disease incidences with mean PDIs of 26.30% and 28.20%, respectively. These agents work more slowly and are generally less effective than chemical fungicides, especially under high disease pressure. Interestingly, (T_8) Dinocap 0.1%, a chemical fungicide, was found to be less effective than sulphur, propiconazole, and hexaconazole, with a mean PDI of 32.37%, suggesting that it may not be the best choice for controlling powdery mildew in okra under current conditions. The untreated control (T_9) showed the highest mean PDI of 51.83%, highlighting the severe impact of powdery mildew in the absence of disease management. This underscores the necessity of employing effective fungicidal treatments to ensure healthy crop growth and optimal yields.

3.4 Reduction Over Control (ROC%)

Among all treatments, sulphur (T_1) recorded the highest ROC value of 65.55%, indicating its superior efficacy in reducing disease incidence. This was followed by hexaconazole (T_2) and propiconazole (T_3), which showed ROC values of 61.11% and 55.24%, respectively. These systemic fungicides were highly effective in suppressing disease progression after spraying, as evidenced by their consistently lower PDI values across all intervals. Potassium bicarbonate (T_4) and neem oil (T_5) exhibited moderate efficacy with ROC values of 52.23% and 50.98%, respectively. Although neem oil recorded the lowest PDI (8.89%) at the first appearance of disease, its protective effect diminished in later stages. The biological control agents, *T. asperellum* (T_6) and *T. harzianum* (T_7), were less effective than chemical treatments, showing ROC values of 49.26% and 45.60%, respectively. However, they still provided a significant reduction in disease compared to the untreated control. Dinocap (T_8) recorded a lower ROC value of 37.55%, indicating reduced efficacy in disease control compared to other fungicides tested. The untreated control (T_9) exhibited the highest mean PDI of 51.83%, emphasizing the importance of effective disease management practices.

3.5 Effect on the Reduction of Powdery Mildew Severity of Okra

The results about the effectiveness of various treatments on the management of powdery mildew disease of okra are presented in Table: 2 and Fig. 2. The efficacy was measured in terms of per cent disease control (PDC) recorded after each spray namely the first, second, and third sprays and the mean disease control across all three observations.

Among the treatments evaluated, (T_1) Sulphur 0.3% proved to be the most effective with a mean disease control of 63.94%, followed closely by (T_2) Hexaconazole 0.1% which recorded 61.10% mean disease control. The highest per cent disease control at the third spray was observed with Sulphur (73.96%), which suggests its strong residual effect in controlling the disease even at the later stage of infection. Hexaconazole also performed well, showing 69.12% control after the third spray.

Propiconazole 0.1% (T_3) and Potassium bicarbonate 0.1% (T_4) recorded moderate efficacy, with mean disease control values of 55.24% and 52.23%, respectively. These fungicides showed an increasing trend in disease control with successive sprays, indicating their potential in integrated disease management programs when used repeatedly.

Biopesticides such as Neem oil 4% (T_5), *T. asperellum* 3% (T_6), and *T. harzianum* 4% (T_7) demonstrated lower levels of disease control in comparison to synthetic fungicides. Neem oil recorded a mean disease control of 50.97%, while *T. asperellum* and *T. harzianum* showed 49.26% and 45.59%, respectively. Although these treatments were relatively less effective, they offer eco-friendly alternatives with the potential for integration into organic farming systems or resistance management strategies.

The treatment with Dinocap 4% (T_8) resulted in the least effective disease control, with a mean of 37.55%. Its performance across the three observations was consistently lower than that of other treatments, particularly after the second spray, where the disease control was only 9.83%. This indicates poor systemic action or limited efficacy under the given field conditions.

Table 2. Effect on the reduction of powdery mildew severity of okra

S. No.	Treatment	Conc. (%)	Per cent disease control after spraying			Mean PDC
			First	Second	Third	
T_1	Sulphur	0.3%	54.15	52.36	73.96	63.94
T_2	Hexaconazole	0.1%	55.59	46.41	69.12	61.10
T_3	Propiconazole	0.1 %	50.22	38.57	65.92	55.24
T_4	Potassium bicarbonate	0.1 %	50.43	36.29	69.12	52.23
T_5	Neem oil	4 %	45.85	33.49	59.60	50.97
T_6	*Trichoderma asperellum*	3 %	45.30	32.16	61.57	49.26
T_7	*Trichoderma harzianum*	4 %	44.93	27.52	60.33	45.59
T_8	Dinocap	4 %	24.39	9.83	55.52	37.55
T_9	Control (Water spray)	-	29.07	40.7	66.7	51.83
S.Em. ±		-	0.03	0.02	0.02	-
C.D		-	0.08	0.05	0.05	-

**PDC- Per cent disease control*

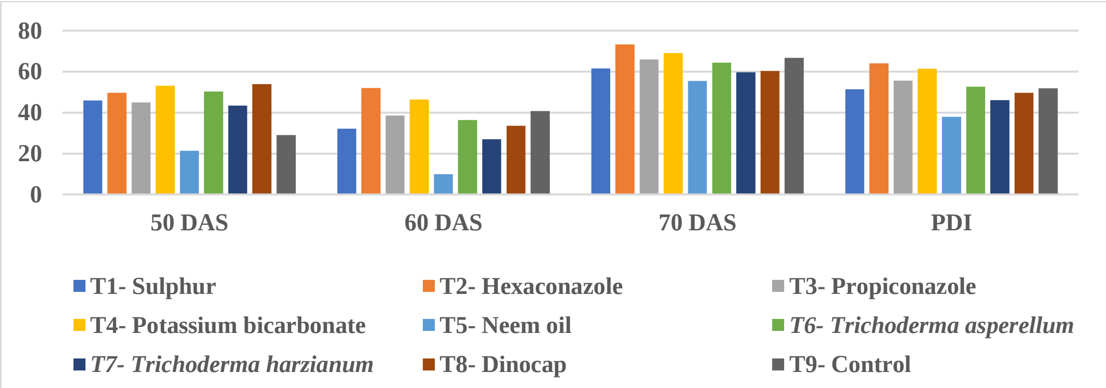

Fig. 2. Effect on the reduction of powdery mildew severity of okra

Interestingly, the control plot (T_9), which was sprayed with water only, recorded a mean disease control of 51.83%, which is unexpectedly higher than some of the treatments, such as Dinocap, *T. harzianum*, and even Neem oil to some extent. However, the apparent high disease control in control plots might be attributed to natural environmental factors, varietal resistance, or inconsistencies in initial disease pressure, and hence, needs cautious interpretation.

Overall, the data suggest that Sulphur 0.3% and Hexaconazole 0.1% were significantly superior in reducing powdery mildew severity, and hence, can be recommended for effective disease management in okra. The effectiveness of these fungicides, especially after the third spray, highlights their potential as reliable components in fungicidal schedules. On the other hand, biopesticides and botanicals, though less effective, provide a sustainable alternative that may be useful in integrated disease management approaches aimed at reducing chemical load and minimizing environmental risks.

4. Discussion

The results of this study highlight the significant role of fungicidal treatments in managing powdery mildew disease in okra. The efficacy of sulphur (T1) was found to be the highest across all observations, reaffirming its long-established role as an effective contact fungicide against powdery mildew (McGrath, 2001; Agrios, 2005). Its mode of action involves the disruption of fungal respiration and interference with cell wall integrity, which inhibits fungal colonization on the leaf surface. Moreover, sulphur is considered a low-cost, broad-spectrum fungicide, and its residual toxicity is minimal when used properly, making it a sustainable choice for smallholder farmers. Hexaconazole and propiconazole, both systemic triazole fungicides, also provided substantial control of the disease. Their mode of action involves inhibition of the C14-demethylase enzyme (CYP51) in fungal sterol biosynthesis, which leads to impaired ergosterol production and disruption of fungal cell membrane integrity (Brent & Hollomon, 2007; Lucas et al., 2015).

Systemic movement within plant tissues allows for extended protection and curative action, which likely contributed to their consistent efficacy throughout the spraying schedule. These findings are in agreement with earlier studies, which reported significant suppression of powdery mildew in cucurbitaceous crops following application of triazole fungicides such as hexaconazole and propiconazole under field conditions (McGrath, 2001; Brent & Hollomon, 2007).

The use of neem oil (T5) demonstrated promising initial results, suggesting its potential as a preventive agent. Neem-based products contain azadirachtin and other limonoids, which are known to possess antifungal, antifeedant, and insect-repellent properties (Isman, 2006). However, its curative and residual effects were inferior compared to synthetic fungicides, which is consistent with previous reports indicating limited persistence and variable efficacy of botanical formulations under field conditions (Copping & Duke, 2007). Biological control agents such as *T. asperellum* (T6) and *T. harzianum* (T7) showed relatively higher disease incidences, indicating slower action. *Trichoderma* spp. are known to suppress plant pathogens through mechanisms including competition, mycoparasitism, production of antifungal metabolites, and induction of systemic resistance in host plants (Harman et al., 2004). However, their performance is often influenced by environmental factors, inoculum density, and crop growth stage. The relatively high percent disease index (PDI) recorded in these treatments suggests that under high disease pressure or insufficient rhizosphere or phyllosphere colonization, their impact may remain limited. Nevertheless, their environmental safety, residue-free nature, and compatibility with organic farming systems continue to be their major advantages.

The performance of potassium bicarbonate (T4) was moderate in the present study. This compound acts by disrupting fungal hyphal cell structure and altering surface pH, thereby inhibiting conidial germination and mycelial growth (Palmer et al., 1997). Its efficacy observed in this trial suggests potential for its inclusion in integrated disease management (IDM) strategies, particularly in combination with other fungicides or biocontrol agents. Interestingly, dinocap (T8), a chemical fungicide commonly recommended for powdery mildew management, exhibited a comparatively higher mean PDI (32.37%). This reduced efficacy may be attributed to factors such as development of pathogen tolerance, variation in environmental suitability, or reduced residual activity. The untreated control (T9) provided a clear contrast, with disease progression reaching 66.70% by the third observation and a mean PDI of 51.83%. This highlights the destructive potential of powdery mildew under favourable conditions in the absence of any disease management intervention and underscores the importance of timely fungicide application. Overall, the findings of the present investigation are consistent with previous studies emphasizing the effectiveness of integrated fungicide-based approaches in managing foliar fungal diseases in vegetable crops (Agrios, 2005; Lucas et al., 2015). The superior performance of sulphur and triazole fungicides over botanical and biological treatments suggests that although biopesticides have an important role in sustainable agriculture, chemical control remains indispensable under moderate to severe disease pressure.

5. Conclusion

The study's findings indicate that Sulphur 0.3% was the top performer in controlling powdery mildew in okra, achieving the lowest disease incidence (17.80%) and highest disease control (63.94%). Hexaconazole 0.1% and Propiconazole 0.1% were also highly effective, making them suitable options for managing the disease. Biocontrol agents like Neem oil and Trichoderma spp. showed moderate efficacy, offering sustainable alternatives, though they were less effective under high disease pressure. Dinocap 4% was the least effective treatment. These results suggest that integrating Sulphur, Hexaconazole, and Propiconazole into management strategies can help control powdery mildew in okra, while biocontrol agents can be used in combination or in low-pressure situations.

Disclaimer (Artificial Intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Competing Interests

Authors have declared that no competing interests exist.

References

Agrios, G. N. (2005). *Plant pathology* (5th ed.). Elsevier Academic Press. https://www.elsevier.com/books/plant-pathology/agrios/978-0-12-044565-3

Brent, K. J., & Hollomon, D. W. (2007). *Fungicide resistance in crop pathogens: How can it be managed?* (FRAC Monograph No. 1). Fungicide Resistance Action Committee. https://www.frac.info

Compant, S., Duffy, B., Nowak, J., Clément, C., & Barka, E. A. (2005). Use of plant growth-promoting bacteria for biocontrol of plant diseases: Principles, mechanisms of action, and future prospects. *Applied and Environmental Microbiology, 71*(9), 4951–4959. https://doi.org/10.1128/AEM.71.9.4951-4959.2005

Copping, L. G., & Duke, S. O. (2007). Natural products that have been used commercially as crop protection agents. *Pest Management Science, 63*(6), 524–554. https://doi.org/10.1002/ps.1378

Fajinmi, A. A., & Fajinmi, O. B. (2010). Incidence of okra mosaic virus at different growth stages of okra plants (*Abelmoschus esculentus* (L.) Moench) under tropical condition. *Journal of General and Molecular Virology, 2*(1), 28–31. https://doi.org/10.5897/JGMV.9000011

Harman, G. E., Howell, C. R., Viterbo, A., Chet, I., & Lorito, M. (2004). *Trichoderma* species—Opportunistic, avirulent plant symbionts. *Nature Reviews Microbiology, 2*(1), 43–56. https://doi.org/10.1038/nrmicro797

Isman, M. B. (2006). Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. *Annual Review of Entomology, 51*, 45–66. https://doi.org/10.1146/annurev.ento.51.110104.151146

Kumar, S., Dagnoko, S., Haougui, A., Ratnadass, A., Pasternak, D., & Kouame, C. (2010). Okra (*Abelmoschus* spp.) in West and Central Africa: Potential and progress on its improvement. *African Journal of Agricultural Research, 5*(25), 3590–3598. https://doi.org/10.5897/AJAR.82E8DE731255

Lamont, W. J. (1999). Okra—A versatile vegetable crop. *HortTechnology, 9*(2), 179–184. https://doi.org/10.21273/HORTTECH.9.2.179

Lucas, J. A., Hawkins, N. J., & Fraaije, B. A. (2015). The evolution of fungicide resistance. *Advances in Applied Microbiology, 90*, 29–92. https://doi.org/10.1016/bs.aambs.2014.09.001

McGrath, M. T. (2001). Fungicide resistance in cucurbit powdery mildew: Experiences and challenges. *Plant Disease, 85*(3), 236–245. https://doi.org/10.1094/PDIS.2001.85.3.236

Palmer, C. L., Horst, R. K., & Langhans, R. W. (1997). Use of bicarbonates to inhibit in vitro colony growth of *Botrytis cinerea*. *Plant Disease, 81*(12), 1432–1438. https://doi.org/10.1094/PDIS.1997.81.12.1432

Saharan, G. S., & Mehta, N. (2005). *Diseases of oilseed crops*. Indus Publishing Company. https://books.google.com/books?hl=en&lr=&id=CNHoRfS0e04C&oi=fnd&pg=PA3&dq=Saharan,+G.+S.,+%26+Mehta,+N.+(2005).+Diseases+of+oilseed+crops.+Indus+Publishing+Company&ots=le3ZlsVTBc&sig=iQs-7lWk33mXLraa2iOigl4lYdc

Vinale, F., Sivasithamparam, K., Ghisalberti, E. L., Marra, R., Woo, S. L., & Lorito, M. (2008). *Trichoderma*–plant–pathogen interactions. *Soil Biology and Biochemistry, 40*(1), 1–10. https://doi.org/10.1016/j.soilbio.2007.07.002

Peer-review history:
The peer review history for this paper can be accessed here:
https://pr.sdiarticle5.com/review-history/153058