Plant Archives Vol. 26, Supplement 2, 2026 pp.3540-3545 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.450

MANAGEMENT OF ALTERNARIA LEAF SPOT OF GREENGRAM CAUSED BY *Alternaria alternata* THROUGH FUNGICIDES

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(Date of Receiving : 12-05-2026; Date of Revision : 16-07-2026; Date of Acceptance : 31-07-2026)

ABSTRACT

Alternaria leaf spot of Greengram emerged as a serious disease and known to cause wide spread damage in greengram crop. Alternaria leaf spot disease of greengram caused by *Alternaria alternata* The samples of greengram showing the symptoms of Alternaria leaf spot were collected from the experimental farm of the college (SKNAU, Jobner) and the fungal pathogen was isolated. The fungus was identified as *Alternaria alternata* on the basis of cultural and morphological characters. Six different fungicides were evaluated against the mycelia growth of *A. alternata* and found that hexaconazole 100ppm concentration were most effective with 97.77% inhibition in the mycelia growth of the fungus. The fungicides were further evaluated for the management of Alternaria leaf spot as foliar spray on the greengram plants in field condition. minimum disease intensity (7.33%) with maximum disease control (86.08%) was found in two foliar applications of hexaconazole respectively compared to 52.67 per cent disease index in un-treated control.

Keywords **:** Triazole fungicides, Alternaria, Greengram, foliar diseases

Introduction

Greengram [*Vigna radiata* (L.) Wilczek] one of the significant pulse crops grown in India also known as moong bean. It is a self-pollinating crop that is native to India and belongs to the family *Leguminaceae*, sub-family *Papilionoidae*. This versatile crop is raised for its seeds, feed, and green manure. This crop is having high nutrition value, adaptability to all seasons and suitability to various cropping system. The crop is a cheaper source to overcome protein malnutrition in human beings, greengram has been considered as a "poor men's protein". Pulses contain high percentage of quality protein nearly three times higher than cereals. Pulses are considered the "Golden Bean" since they are such wonderful natural gifts. Since the beginning of time, pulses have been grown in semi-arid regions in India. It is short duration crop with third rank among pulses in India and can be grown twice in a year. Being drought resistant, it can withstand adverse environmental conditions and is successfully cultivated in rain fed areas. Pulses can prevent a decline in the productivity of cereal systems by enhancing the physical, chemical, and biological conditions in the soil (Masood *et al.*, 2002). Greengram is well entourage to a large number of cropping system and a popular cereal-based diets due to easily digestible, plentiful in protein (25.0-28.0%), oil (1.0-1.5%), vulcanized fibre (3.5-4.5%), ash (4.5 – 5.5%) and carbohydrates (62.0–65.0%), on dry weight basis. greengram are more toothsome, nutritious, digestible and non-flatulent than other pulses (Anjum *et al.*, 2006). It fixes atmospheric nitrogen, which improves soil fertility and makes a major contribution to human nutrition (Muhammad *et al.*, 2004). For small landowners in developing nations where a large amount of grain and legume production occurs, inadequate nutritional status of the soil is a significant issue (Peter and Vance, 2003). Fungi can infect greengram plants at several phases of growth, such as emergence, seedling, vegetative, and reproductive, and can cause serious damage which may

lead to a loss of output or complete production failure. Powdery mildew, anthracnose, alternaria leaf spot, cercospora leaf spot, fusarium wilt, rhizoctonia root rot, web blight, and dry root rot are the main diseases that affect greengram (Pandey *et al.*, 2018). Alternaria leaf spot was reported from Udaipur, India causing 80 per cent incidence at the stage of 65 days and affecting about 45 per cent leaf area (Gupta, 1970). Alternaria leaf spot caused by *Alternaria tenuissima* is a major problem in greengram (Kaul and Ghani, 1990). Alternaria leaf spot a major foliar disease causes considerable qualitative and quantitative losses in the greengram. Now a days, Alternaria leaf spot disease has emerged as a serious disease and known to cause wide spread damage in greengram crop. Alternaria leaf spot disease of greengram caused by *Alternaria alternata* (Gupta, 1970) is one of the most important diseases. Patel (2003) noticed that the infection of *Alternaria alternata* in greengram started as small, light brown lesions on leaves, which later turned grayish to dark brown and dull white in centre. With the age of crop and infection time, the lesions enlarged and resulted in 'shot hole' symptoms leading to chlorosis and dropping off of leaves. Dark brownish fungal growth covering the pods is also observed. Gupta (1970) established the pathogenicity of the fungus *Alternaria alternata* on 65 days old plants of greengram and typical symptoms of the disease appeared in 3-4 days in saturated atmosphere at 20°C.

Materials and Methods

In vitro evaluation of fungicides against Alternaria alternata

In vitro evaluation of fungicides, the laboratory experiments in the present study were conducted in the Department of Plant Pathology, SKNAU, Jobner during 2023-24. six fungicides (Table 1) against mycelial growth of *Alternaria alternata* was tested by Poisoned Food Technique (PFT) suggested by Nene and Thapliyal (1979). Three different concentrations *viz*. 20, 50, and 100 ppm of each fungicide were tested. Required quantity of each fungicide was added separately to sterilized medium mixed thoroughly and poured in sterilized Petri plates. Each plate was inoculated with 5 mm disc of 7 days old culture of *Alternaria alternata* with the help of sterilized cork borer and incubated at 21± 2 ^{0}C for 7 days. A control was also maintained where medium was not supplemented with any fungicide. The mycelial growth of the test fungus was recorded and per cent growth inhibition was calculated by Vincent's (1947) formula given below. The experiment was conducted in Completely Randomized Design with three replications.

Table 1 : Fungicides tested against *Alternaria alternata* using poisoned food technique *in vitro*

Treatments	Fungicides	Concentration *in vitro* (ppm)
T_1	Hexaconazole	20, 50, 100
T_2	Tebuconazole	20, 50, 100
T_3	Mycobutanil	20, 50, 100
T_4	Metiram+Pyraclostrobin	20, 50, 100
T_5	Difenoconazole	20, 50, 100
T_6	Azoxystrobin	20, 50,100
T_7	Control	-

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

Where

C = diameter of colony in control (mm)

T = diameter of colony in treatment (mm)

Evaluation of different fungicides against Alternaria leaf spot of greengram under field conditions

The field experiment was conducted during 2022-23 in the field located Agronomy farm SKNCOA, Jobner, Jaipur in RBD design with three replications and seven treatments. Three fungicides also were tested under field conditions through foliar application either one or two spray. First foliar spray was done at disease appearance and second spray of same fungicide was applied 15 days after first spray. Observations of the disease intensity were recorded at 50 DAS by using disease rating scale (0-5 score).

Table 2 : Fungicides tested against Alternaria leaf spot of greengram (*in vivo*)

Treatment	Treatments	Concentration *in vivo* (%)
T_1	One foliar application of Hexaconazole	0.1
T_2	One foliar application of Metiram + Pyraclostrobin	0.1
T_3	One foliar application of Azoxytrobin	0.1
T_4	Two foliar application of Hexaconazole	0.1
T_5	Two foliar application of Metiram + Pyraclostrobin	0.1
T_6	Two foliar application of Azoxystrobin	0.1
T_7	Control	

Disease index on foliage was calculated using the formula of Chester (1959) as given below.

$$\text{PDI} = \frac{\text{Sum of all rating of the leaves infected}}{\text{Number of leaves} \times \text{maximum disease rating}} \times 100$$

Results and Discussion

In vitro evaluation of fungicides

Six fungicides belonging to different groups were tested for their efficacy against *A. alternata* by employing poisoned food technique. The data obtained on the effect of different fungicides on the mycelial growth of of *A. alternata in vitro* are presented in Table 3, PLATE-I and depicted in Fig. 1. The data presented in Table 3 revealed that, the mean maximum mycelial growth inhibition (88.19%) was recorded in hexaconazole (79.69, 87.11 and 97.77%) at 20, 50 and 100 ppm concentrations, respectively followed by metiram + pyraclostrobin with 82.71 per cent inhibition (73.70, 84.37 and 90.06%), azoxystrobin with 77.68 per cent (68.51, 79.73 and 84.79%), difenoconazole with 73.29 per cent (66.40, 72.21 and 81.25%). Whereas, tebuconazole showed 72.71 per cent mean growth inhibition with (65.01, 71.88 and 81.25%), while the minimum growth inhibition 65.74 per cent was recorded in fungicide mycobutanil with (55.73, 68.51 and 72.99%) at 20, 50 and 100 ppm concentrations, respectively. Our findings are accordance with the findings of Maheshwari *et al*. (2013) and Poonam *et al*. (2022).

Table 3 : Efficacy of fungicides on mycelial growth inhibition of *Alternaria alternata* (*in vitro*).

S. No.	Fungicides	Per cent mycelial growth inhibition*			Mean
		20 ppm	50 ppm	100 ppm	
1	Hexaconazole	79.69 (63.19)	87.11 (68.95)	97.77 (81.56)	88.19 (71.23)
2	Tebuconazole	65.01 (53.71)	71.88 (57.96)	81.25 (64.32)	72.71 (58.66)
3	Mycobutanil	55.73 (48.27)	68.51 (55.84)	72.99 (58.66)	65.74 (54.26)
4	Metiram+Pyraclostrobin	73.70 (59.12)	84.37 (66.69)	90.06 (71.61)	82.71 (65.81)
5	Difenoconazole	66.40 (54.55)	72.21 (58.25)	81.25 (64.32)	73.29 (59.04)
6	Azoxystrobin	68.51 (55.84)	79.73 (63.23)	84.79 (67.06)	77.68 (62.04)
7	Control	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
		SEm±	CD (p= 0.05)		
	Fungicides (F)	0.41	1.18		
	Concentration (C)	0.27	0.77		
	F×C	0.71	2.05		

* Mean of three replications (%)

Figures given in parentheses are angular transformed values

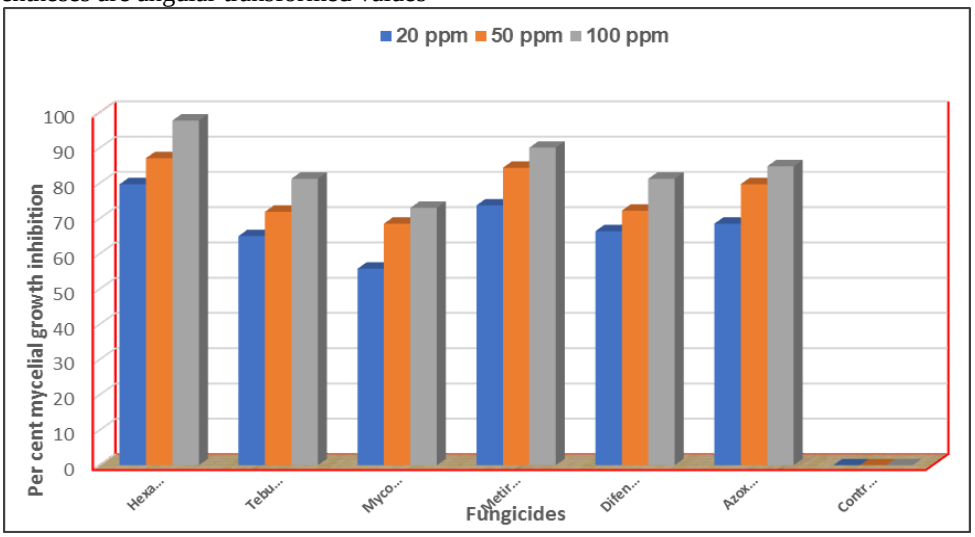

Fig. 1 : Efficacy of fungicides on mycelial growth inhibition of *Alternaria alternata* (*in vitro*)

Table 4 : Efficacy of foliar application of fungicides against Alternaria leaf spot of greengram (*in vivo*)

S. No.	Fungicides	Concentration %	PDI	PDC
1.	Hexaconazole (one spray)	0.1	20.67 (26.99)	60.76
2.	Metiram+Pyraclostrobin (one spray)	0.1	25.33 (30.18)	51.90
3.	Azoxystrobin (one spray)	0.1	31.33 (33.10)	40.51
4.	Hexaconazole (two spray)	0.1	7.33 (15.46)	86.08
5.	Metiram+Pyraclostrobin (two spray)	0.1	13.33 (21.32)	74.68
6.	Azoxystrobin (two spray)	0.1	18.67 (25.54)	64.56
7.	Control	-	52.67 (46.51)	0.00
SEm±			1.15	
CD (p=0.05)			3.59	
CV%			6.98	

* Mean of three replications PDI = Per cent disease intensity
PDC = Per cent disease control Figures given in parentheses are angular transformed values

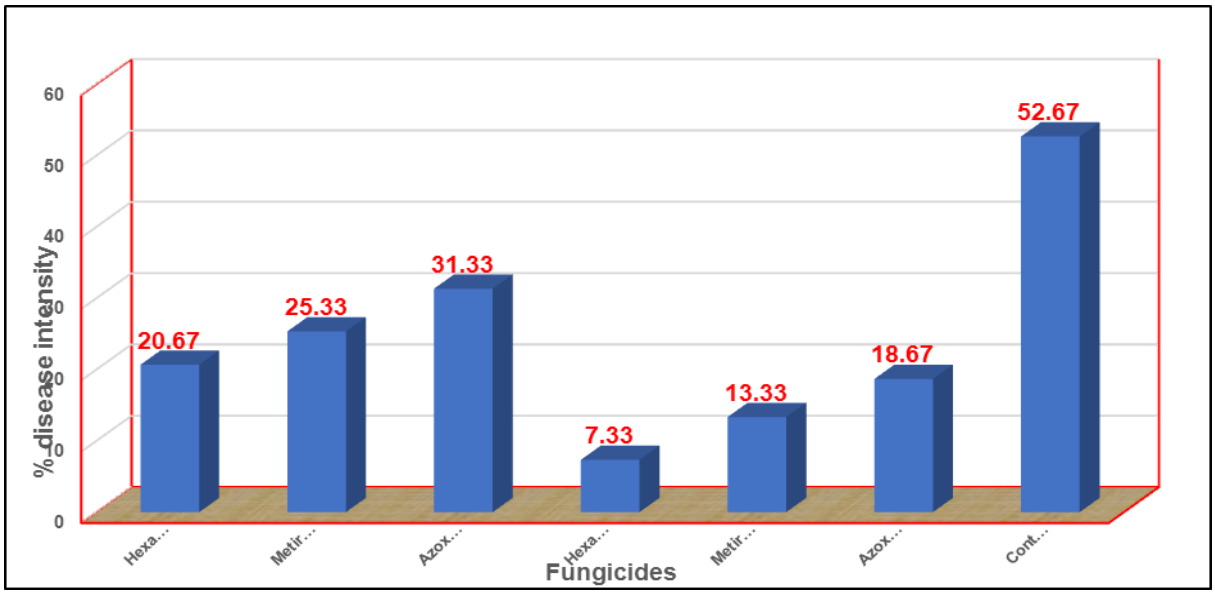

Fig. 2 : Efficacy of foliar application of fungicides against Alternaria leaf spot of greengram (*in vivo*)

Evaluation of fungicides against Alternaria leaf spot of greengram under field condition

The comparative efficacy of the fungicides was also tested under field conditions against Alternaria leaf spot of greengram at 50 DAS. On the basis of data depicted in table 4 & Fig. 2), result revealed that minimum disease intensity (7.33%) with maximum disease control (86.08%) was found in two foliar applications of hexaconazole followed by metiram + pyraclostrobin with disease intensity of 13.33 per cent and disease control 74.68 per cent. Whereas maximum disease intensity (18.67%) with minimum disease control (64.56%) was reported in azoxystrobin among two foliar applications fungicides. Similarly, among single foliar spray of fungicides, minimum disease intensity (20.67%) with disease control (60.76%) was recorded in hexaconazole followed by metiram + pyraclostrobin (25.33%) disease intensity and 51.90 per cent disease control. While, maximum disease intensity (31.33%) with minimum disease control (40.51%) was reported in single foliar application of azoxystrobin over control. Our results are similar to the findings of Singh *et al.*, (2014); Poonam (2023), Khillare (2022) and Zade *et al.* (2018).

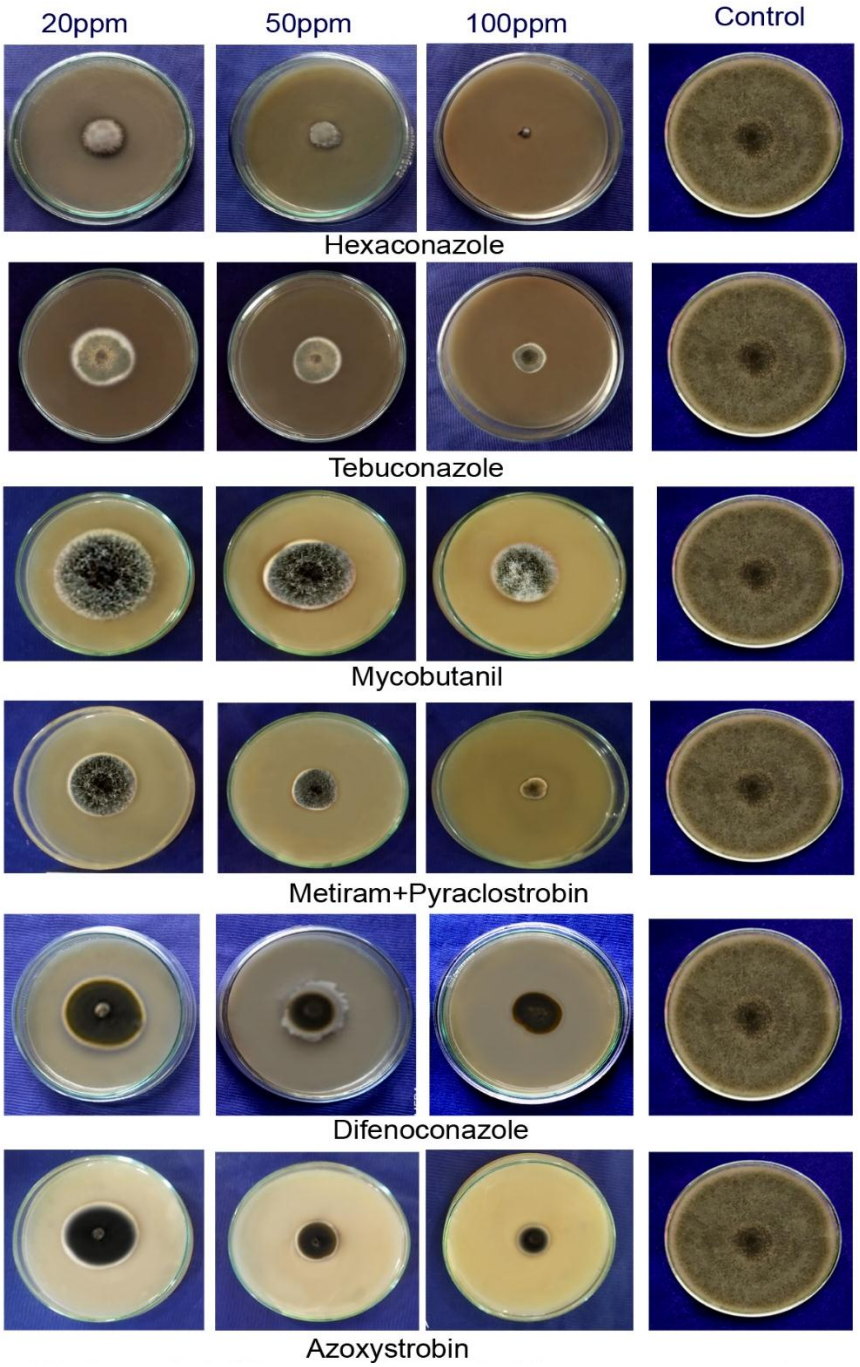

Plate 1 : *In vitro* evaluation of fungicides against *A. alternata*

Conclusion

Among the tested plant fungicides, hexaconazole was found most effective against *A. alternata* in in vitro conditions by inhibiting 97.77 per cent mycelial growth at 100 ppm concentration. Two foliar spray of hexconazole (0.1%) also found most effective in the management of the Alternaria leaf spot disease in field conditions by showing 86.08 per cent disease inhibition

References

Amina, K. and Shamim, S. (2016). *In vitro* evaluation of fungicides and plant extracts against the fungi associated with seeds of nine chickpea varieties. *Dhaka University Journal of Biological Sciences*, ***25***(1), 83–90.

Anil, G., Ashtaputre, S. R. and Laxminarayan. (2017). Studies on morphological and cultural variability of *Alternaria* spp. causing leaf blight in cotton. *International Journal of Plant Protection*, ***10***, 281–290.

Anjum, M. S., Ahmed, Z. I. and Rauf, C. A. (2006). Effect of *Rhizobium* inoculation and nitrogen fertilizer on yield and yield components of mung bean. *International Journal of Agriculture and Biology*, ***8***, 238–240.

Anupriya, Rajni, S. S. and Prahlad. (2020). Management of *Alternaria cucumerina* var. *cyamopsidis* through plant extracts, bio products and fungicides *in vitro* and *in vivo*. *International Journal of Current Microbiology and Applied Sciences*, ***9***(3), 2595–2605.

Behairy, M. H., Sobhy, H. M., Abbas, M. S., Abada, K. H. A. and Mourad, M. Y. (2014). Alternaria leaf spot disease control on faba bean in Egypt. *Journal of Plant Protection and Pathology*, ***5***(1), 119–130.

Gupta, B. M. (1970). New disease on mungbean from Udaipur, Rajasthan, India. *Plant Disease Reporter*, ***54***, 453.

Gupta, S. L., Rizvi, G. and Paijwar, M. S. (2013). *Alternaria lini* causes blight disease on linseed: Its growth response on different parameters. *Advances in Life Sciences*, ***2***(2), 64–66.

Kaul, A. K. and Ghani, M. Y. (1990). Occurrence of *Alternaria tenuissima* on mung bean in India. *Plant Disease Research*, ***5***(1), 81–82.

Khillare, P. R., Magar, S. J. and Jadhvar, J. B. (2022). *In vitro* efficacy of fungicides and bioagents against Alternaria blight of pigeonpea caused by *Alternaria alternata*. *Journal of Pharmacognosy and Phytochemistry*, ***11***(1), 120–122.

Maheshwari, S. K. and Krishna, H. (2013). Field efficacy of fungicides and bioagents against Alternaria leaf spot of mungbean.

Masood, A., Ganeshamurthy, A. N. and Srinivasarao, C. H. (2002). Role of pulses in soil health and sustainable crop production. *Indian Journal of Pulses Research*, ***15***(2), 107–117.

Muhammad, A. N., Rashid, A. and Ahmad, M. S. (2004). Effect of seed inoculation and different fertilizer levels on the growth and yield of green gram (*Vigna radiata* L.). *Journal of Agronomy*, ***3***, 40–42.

Pandey, A. K., Burlakoti, R. R., Kenyon, L. and Nair, R. M. (2018). Perspectives and challenges for sustainable management.

Peter, H. and Vance, C. P. (2003). Legumes: Importance and constraints to greater use. *Journal of Plant Physiology*, ***131***, 872.

Poonam, K. (2023). Efficacy of botanicals and fungicides against Alternaria leaf spot of black gram. *Journal of Eco-friendly Agriculture*, ***18***(1), 165–170.

Poonam, K., Kumar, L., Yadav, P. D. and Meena, M. (2022). Management of Alternaria leaf spot disease on asalio through fungicides, botanicals and combi products. *The Pharma Innovation Journal*, ***11***(2), 3020–3024.

Singh, S. A., Sinha and Mishra, J. (2014). Evaluation of different treatment on the occurrences of seed borne fungi of mungbean *Vigna radiata* (L.) Wilczek seed. *African Journal of Agricultural Research*, ***9***(44), 3300–3304.

Zade, S. B., Ingle, Y. V. and Ingle, R. W. (2018). Evaluation of fungicides, botanicals and bio-agents against *Alternaria alternata* incitant of leaf spot of soybean. *Journal of Pharmacognosy and Phytochemistry*, ***7***(5), 1687–1690.