



# Effect of Selected Botanicals and Carbendazim on Alternaria Blight Disease (*Alternaria brassicae*) of Mustard (*Brassica juncea* L.)

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

## Article Information

DOI: <https://doi.org/10.9734/arja/2024/v17i4556>

## 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://www.sdiarticle5.com/review-history/124467>

Original Research Article

Received: 03/08/2024  
Accepted: 05/10/2024  
Published: 17/10/2024

## ABSTRACT

Mustard is an important oilseed crop in India. Alternaria leaf blight caused by *Alternaria brassicae* is an economically important disease of oilseeds. It reduces the quality and quantity of the seeds. To evaluate selected botanicals and carbendazim for the management of Alternaria blight (*Alternaria brassicae*) of Indian mustard (*Brassica juncea* L.) by applying of foliar spray of botanical and seed treatment of carbendazim. The disease intensity (%), yield (q/ha), and cost benefit ratio were recorded. The minimum disease intensity (%) at 75 and 90 day after sowing was recorded on neem leaf extract + carbendazim (31.72) and (35.63) followed by lantana leaf extract+ carbendazim

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**Cite as:** Kumar, Vikash, and Abhilasha A. Lal. 2024. "Effect of Selected Botanicals and Carbendazim on Alternaria Blight Disease (*Alternaria Brassicae*) of Mustard (*Brassica Juncea* L.)". Asian Research Journal of Agriculture 17 (4):518-23. <https://doi.org/10.9734/arja/2024/v17i4556>.

(33.54) and (38.72) as compared with the control ( $T_0$ ). The maximum yield (q/ha) was recorded (13.07q/ha) and cost benefit (1:1.85) neem leaf extract followed by lantana leaf extract + carbendazim as compared to untreated check ( $T_0$ ). This study will helpful for farmers those are shifting to organic farming as well as researchers to find out potent natural fungicides.

**Keywords:** *Alternaria brassicae*; botanicals; carbendazim; mustard.

## 1. INTRODUCTION

“Mustard [*Brassica juncea* (L.) Czern and Cross] is important Rabi oilseed crop which belongs to family “Cruciferae”. It is also growing in certain tropical and subtropical regions as cold weather crop. Indian mustard required annual temperature of 6 to 27°C, and pH of 4.3 to 8.3” [1]. “The seed and oil of mustard have a peculiar pungency due to presence of glucosinolate and its hydrolysis products such as Allyl Isothiocyanate (0.30-0.35%). Mustard seed in general, contains 30- 33% oil, 17-25% proteins, 8-10% fibres, 6-10% moisture, and 10-12% extractable substances” [2].

The productivity saw 7% jump from 1331 to 1419 kg/ha. The area under rapeseed & mustard increased by 28% from 68.56 in 2019-20 to 88.06 lakh ha in 2022-23 (Source: DA&FW National Conference for Rabi Campaign 2023-24).

The evaluation of selected botanical extracts along with the carbendazim against this important disease of mustard which causes losses. The approach was aimed to come up with alternative as the indiscriminate use of fungicides is hazardous to the environment and affect human health. So, the present study was conducted to with a motive to come up with an eco-friendly management strategy which could be at par with the conventional fungicides used (Mahapatra, 2013; Bisht, 2013).

## 2. MATERIALS AND METHODS

A field experiment was conducted at the research plot of the Department of Plant Pathology, SHIATS, Allahabad, U.P. during the Rabi season of 2023-24. The application of botanicals and carbendazim, such as neem leaf extract @ 10% (Foliar Spray) + carbendazim (Seed Treatment), lantana leaf extract @ 10% (Foliar Spray) + carbendazim (Seed Treatment), eucalyptus leaf extract @ 10% (Foliar Spray) + carbendazim (Seed Treatment), datura leaf extract @ 10% (Foliar Spray) + carbendazim (Seed Treatment), chenopodium leaf extract @

10% (Foliar Spray) + carbendazim (Seed Treatment), mancozeb 75% WP (0.2%) + carbendazim (Treated check) and untreated control (water spray).

### 2.1 Isolation

Potato Dextrose Agar (PDA) was prepared and 80 mg of streptomycin, an antibiotic was added to each 500 ml preparation of the PDA to inhibit probable bacterial growth. The infected leaf parts were cut into small pieces of 2-3 mm dimension in a manner so that pieces may have some green portion also. Such leaf bits were surface sterilized with 0.1 per cent sodium hypochlorite (NaOCl) solution for 30 seconds and washed three times with sterile distilled water to remove any traces of sodium hypochlorite adhered with leaf bits [3]. Two to three leaf bits were transferred on PDA medium contained in petri plates aseptically with the help of sterilized forceps. These petri plates were incubated at 27±2°C.

### 2.2 Morphological Characters of *Alternaria brassicae*

The mycelium of *Alternaria brassicae* is septate and it becomes brown to brownish grey in colour. The conidiophores are dark septate, measuring 14-74µ×4-8µ. The structure of conidia is brownish black, singly borne or sparingly in chains with 2-4, Muriform along with beak [4].

### 2.3 Preparation of Plant Extracts

The fresh leaves of five selected plants viz., neem, lantana, eucalyptus, datura and chenopodium were gently washed under running tap water and finally in sterile distilled water. They were separately grinded in sterile water at the rate 1 ml/g of plant material in pestle and mortar. Then were filtered through double layer of muslin cloth and finally through sterilized Whatman no.1 filter paper. This forms 100% standard plant extract solution. Further dilutions were performed of required concentration with sterilized water. By grinding 10 g of leaves in 100 ml of sterile water 10% of leaf extract can be obtained.

## 2.4 Per cent Disease Intensity

Per cent disease intensity was recorded at 45, 60, 75 and 90 days after sowing. The disease intensity was calculated using the following formula [5]:

$$\text{Disease intensity (\%)} = \frac{\text{Sum all disease ratings}}{\text{Total number of ratings} \times \text{Maximum disease grade}} \times 100$$

## 2.5 Disease Intensity Scale

Five plants were randomly selected as grades in each plot at the interval of 15 days as per the scale given by Mayee and Datar [6] which is given below:

**List 1. Disease intensity scale**

Grade	Leaf area infected
0	No symptoms on the leaves
1	Small spots covering 1% or less area
3	Small spots (up to 5 mm in size) covering 1-10% of leaf area
5	Spots enlarging and covering 26-50% of leaf area
7	Spot coalesce to form big patches covering 26-50% of leaf area
9	Big spot covering 51% or more of leaf area

## 2.6 Cost Benefit Ratio

“Gross return was calculated by multiplying total yield with the market price of the produce. Cost of cultivation and cost of treatment imposition will be deducted from the gross returns, to find out net returns and cost benefit ratio by following formula” [7].

$$C : B \text{ ratio} = \frac{\text{Gross return}}{\text{Total cost of cultivation}}$$

## 3. RESULTS AND DISCUSSION

The results revealed that the application of botanicals and seed treatment with carbendazim, showed minimum disease intensity (%) @ 75 DAS was recorded with neem leaf extract + carbendazim (31.72%) followed by lantana leaf extract + carbendazim (33.54%) as compared to treated check mancozeb + carbendazim (26.76%) and control (47.59%). Minimum disease intensity (%) @ 90 DAS was recorded with neem leaf extract + carbendazim (35.63%) followed by lantana leaf extract + carbendazim (38.72%) as compared to treated check mancozeb + carbendazim (29.54%) and control (53.53%).

In the present study, the minimum disease intensity at 45, 60, 75 and 90 DAS was recorded with neem leaf extract + carbendazim followed by lantana leaf extract + carbendazim and found to be effective over other treatments. The probable reason for such a finding may be that neem possess fungicidal property. It might be

due to the presence of azadirachtin, nimbin, and salannin that are the most important biologically active substances of neem, which exhibit antimicrobial, insecticidal, and antifungal properties. The antifungal properties of neem extract are may be attributed to its ability to inhibit the fungal growth through mechanisms disruption of fungal cell membranes, causing leakage of cellular contents. Inhibition of spore germination and mycelial growth, may reduce the spread of the pathogen and enhance the plant health Moslem and El-Kholie [8]. Similar findings have been reported by Shrivastava and Swarnkar [9] and Thakur and Zacharia [10].

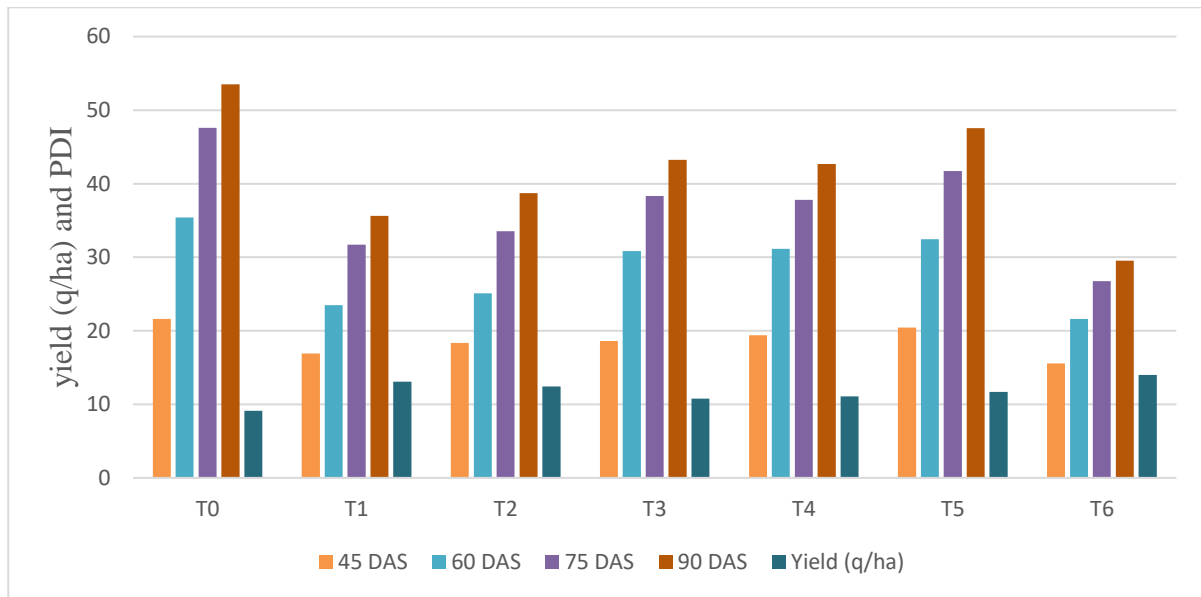
Maximum yield (q/ha) was recorded with neem leaf extract + carbendazim (13.07q) followed by lantana leaf extract + carbendazim (12.42q) as compared to treated check mancozeb + carbendazim (14.00q) and control (9.14q). Maximum cost benefit ratio was recorded with neem leaf extract + carbendazim (1:1.85) followed by lantana leaf extract + carbendazim (1:1.76) as compared to treated check mancozeb + carbendazim (1:2.04) and control (1:1.43).

In this study, the increases in yield (q/ha) could potentially be attributed to the presence of neem leaf extract + carbendazim followed by lantana leaf extract + carbendazim and found to be effective over other treatments. It may have released growth-regulating substances and aided in the control of pathogen, also leading to the observed enhancement of yield.

**Table 1. Effect of selected treatments on yield (q/ha), cost benefit ratio and per cent disease intensity (%) of alternaria leaf blight on mustard**

Tr. No.	Treatment	Per cent disease intensity (%)				Yield (q/ha)	C:B ratio
		45 DAS	60 DAS	75 DAS	90 DAS		
T <sub>0</sub>	Control	21.61	35.41	47.59	53.53	9.14	1:1.43
T <sub>1</sub>	Neem leaf extract @10% (F.S.) + Carbendazim 2 g (S.T.)	16.89	23.50	31.72	35.63	13.07	1:1.85
T <sub>2</sub>	Lantana leaf extract @10% (F.S.) + Carbendazim 2 g (S.T.)	18.36	25.10	33.54	38.72	12.42	1:1.76
T <sub>3</sub>	Eucalyptus leaf extract @10% (F.S.) + Carbendazim 2 g (S.T.)	18.62	30.82	38.34	43.26	10.76	1:1.53
T <sub>4</sub>	Datura leaf extract @ 10% (F.S.) + Carbendazim 2 g (S.T.)	19.41	31.16	37.82	42.69	11.10	1:1.58
T <sub>5</sub>	Chenopodium leaf extract @ 10% (F.S.) + Carbendazim 2 g (S.T.)	20.42	32.47	41.73	47.53	11.70	1:1.66
T <sub>6</sub>	Mancozeb 75 % WP (0.2%) (F.S.) + Carbendazim 2 g (S.T.)	15.56	21.60	26.76	29.54	14.00	1:2.04
	C.D. (5%)	0.554	0.538	0.526	0.588	0.498	
	C.V. (%)	1.664	1.058	0.804	0.795	2.386	

\*F.S. Foliar Spray and \*S.T. Seed Treatment



**Fig. 1. Effect of selected treatments on yield (q/ha), cost benefit ratio and per cent disease intensity (%) of alternaria leaf blight on mustard**

The antifungal properties of neem have suppressed fungal growth and increased in yield. Similar findings have been reported by Sailaja et al. [11], Sharma et al. [12] and Ravella et al. [13].

#### 4. CONCLUSIONS

This study “Effect of selected botanical and carbendazim on Alternaria blight disease (*Alternaria brassicae*) of mustard (*Brassica juncea* L.)”. found that plant extracts can help manage the disease alternaria blight in mustard plants. It was found that botanical neem leaf extract significantly managed *Alternaria brassicae* which causes Alternaria blight disease on mustard. The findings also indicate that neem leaf extract (Foliar Spray) + carbendazim (Seed Treatment) to observe the minimum disease intensity (%), yield (q/ha) and cost benefit ratio. The study concludes that plant extracts play a key role to manage alternaria blight in mustard. This experiment proves that farmers can manage alternaria blight in mustard without chemicals by using various plant extracts. However, these findings are from just one growing season. To confirm these results, researchers should run more trials in the future.

#### 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.

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Peer-review history:  
The peer review history for this paper can be accessed here:  
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