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## Occurrence of *Alternaria brassicae* and *A. brassicicola* of Mustard in Gird Region of Madhya Pradesh

**Babli, R. K. Pandya, Arvinder Kour and Sushma Tiwari**

**Abstract**

Rapeseed-mustard group of crops are most important *Rabi* oilseed crops cultivated in Northern region of Madhya Pradesh. Indian mustard [*Brassica juncea* (L.) Czern and Coss] is the dominating crop occupying >80% share of the total area of rapeseed-mustard in the region. *Alternaria* blight caused by *Alternaria brassicae* and *A. brassicicola* singly or by mixed infection is one of the most widespread and destructive disease of oilseed brassicas in all the continents. These pathogens are necrotrophs. The disease appears as black spot but later on enlarge and develops into prominent round spots with concentric rings. Many spots coalesce to form large patches showing blight and cause defoliation in severe cases. The spots on the mid-ribs of the leaves are linear and sunken. Circular to linear lesions also develop on stem and pods, which elongate at later stages. Infected pods produce small, discoloured and shrivelled seeds. This disease causes substantial yield losses as a result of several factors including reduced photosynthetic potential, early defoliation, flower bud abortion, premature ripening, siliquae dehiscence, seed shrivelling and reduced seed size, impairs seed colour and reduced oil content. The present studies were on percent distribution of *Alternaria brassicae* and *A. brassicicola*, which responsible for *Alternaria* leaf blight in Northern region of Madhya Pradesh. In the year 2020-21, the occurrence of *Alternaria brassicae* and *Alternaria brassicicola* in Morena, Bhind and Gwalior was 79.33% of *Alternaria brassicae*. While the occurrence of *Alternaria brassicicola* was 20.66%. Similarly, in 2021-22 the occurrence the *Alternaria brassicae* and *Alternaria brassicicola* in Morena, Bhind and Gwalior was 75.33% of *Alternaria brassicae* while the remaining 24.66 percent samples were infected by *Alternaria brassicicola*.

**Keywords:** *Alternaria brassicae*, *A. brassicicola*, distribution, rapeseed-mustard

**Introduction**

Rapeseed-mustard group of crops are the major *Rabi* oilseed crops of India. The group is mainly constituted by *Brassica juncea*, *B. napus*, *B. Rapa* and *B. carinata*. In India, rapeseed-mustard crops are cultivated on an area of 6.12 million ha with the production of 9.26 million tones (Anon., 2020) [3]. Major mustard growing states of the country are Rajasthan, Haryana, Gujarat, Maharashtra, Madhya Pradesh, Karnataka, Telangana and Andhra Pradesh. Among the Rapeseed-mustard group, *B. Juncea* (Indian mustard) is the major crop of the country, contributing more than 70% out of the total rapeseed-mustard area and production of the country. *B. juncea* is mainly cultivated in the Northern region of the state in Madhya Pradesh rapeseed-mustard crops are cultivated in an area of about 0.78 million hectares with the production of 1.11 million tones and productivity of 1422 kg/ha (Anon., 2020) [3]. Major Rapeseed-mustard growing districts of the state are Morena, Bhind, Gwalior and Sheopur as these four districts jointly contributing more than 75% share in area and production of this crops in the state. In which, *B. Juncea* is the dominant crop. Oil and fats are the vital components of human diet as these are good sources of energy and act as carrier of fat-soluble vitamins, oil cake have a high nutritional value for animals. The green, succulent leaves of young plants are used as a green vegetable in human diet. The oilseed brassicas generally contain 38 to 57% of erucic acid 4.7 to 13% linolenic acid and 27% of oleic acid and linolenic acid, which are of high nutritive value required for human health. (Kumar *et al.*, 2012) [5]. There is a significant difference between potential yield and actual yield in the farmer's field, which may largely due to various biotic and abiotic stresses with reference to exposure of rapeseed- mustard crop.

Rapeseed-mustard is exposed to various types of foliar diseases including white rust (*Albugo candida*), powdery mildew (*Erysiphe cruciferarum*), downy mildew (*Peronospora parasitica*) and *Alternaria* blight (*Alternaria* spp.). Among these diseases, *Alternaria* blight caused by *Alternaria brassicae* (Berk.) Sacc. And *A. brassicicola* (Schw.) have been reported from all

the continents of the world and causing considerable losses in yield (Meena *et al.*, 2010) [7]. The disease occurs regularly in moderate to severe form and its infection generally occurs on leaves, stem and siliqua resulting reduction in yield and poor seed quality of brassica crops (Saharan, 1992) [10]

*Alternaria* blight of mustard caused by *Alternaria brassicae* and *Alternaria brassicicola* are most widespread and destructive diseases of rapeseed-mustard causing major yield losses that may range from 15 to 71 percent in productivity and 14 to 36 percent in oil content (Meena *et al.*, 2010) [7]. Besides losses in yield and oil content, it also adversely affects seed quality causing reduction in seed size and leading to discoloration (Prasad and Lallu, 2006) [9]. *Alternaria* blight disease is one of the most damaging diseases among the important diseases of Indian mustard causing up to 70 percent yield losses with no proven source of resistance against the disease reported till date in any of the hosts (Meena *et al.*, 2010 and Meena *et al.*, 2012) [7, 8].

## Morphology

### *Alternaria brassicae*

Hyphae of *A. brassicae* are branched, septate, hyaline, smooth, 4 to 8 µm thick. Conidiophores arising from the hyphae are in groups of 2 to 10 or more. Conidia are solitary or occasionally in chains of up to four, with 16 to 19 (usually 11 to 15) transverse septa and 0 to 8 (usually 0 to 3) longitudinal or oblique septa, pale or very pale olive or grayish olive, 75 to 350 µm long and usually 20 to 30 µm (sometimes 40 µm) thick in the broadest part. The beak is 1/3 to 1/2 the length of the conidium (Anon., 1968a) [1]. According to Kolte (1985) [4] mycelium of *A. brassicae* is septate, brown to brownish gray. Conidiophores are dark, septate measuring 14 to 74 X 4 to 8 µm. Each of the conidia has 10 to 11 transverse septation and 0 to 6 longitudinal septation, often obclavate, muriform with long beak, 148 to 184 µm long and 17 to 24 µm thick. Singh (1998) [11] reported conidia of *A. brassicae* as dark, obclavate, muriform, borne singly or in short chains measuring 125 to 225 X 16 to 28 µm.

### *Alternaria brassicicola*

Initially the hyphae of *A. brassicicola* are branched, septate, hyaline which later turn to brown or olivaceous brown, smooth, and 1.5 to 7 µm thick. Conidiophores arise singly or in groups of 2 to 12 or more through leaf stomata. Conidia are produced mostly in chains of up to 20 or more, arising through small pores in the conidiophore wall. Conidia usually show tapering slightly towards the apex or obclavate without beak. Each conidium has 1 to 11, mostly less than 6 transverse septa. Conidia often are constricted at the septa and pale to dark olivaceous brown, smooth and become slightly warty with the age, with 18 to 130 µm length and 8 to 30 µm thickness (Anon., 1968b) [2].

Kolte (1985) [4] observed that characteristic of *A. brassicicola* are similar to *A. brassicae* but conidia are cylindrical to

oblong, muriform without beak, 45 to 55 µm long and nearby 11 to 16 µm thick. Conidia possess 5 to 8 transverse septation and 0 to 4 longitudinal septation. According to Singh (1998) [11] conidiophores of *A. brassicicola* are olivaceous, septate, branched and measure 35 to 45 X 5.75 µm. Conidia are linear to obclavate, borne in chains of 8 to 10, septate, muriform and measure 50 to 75 X 11 to 17 µm.

## Materials and Methods

The survey of *Alternaria* blight was carried out at 24 localities of three districts *viz.*, Morena, Bhind, and Gwalior, as these three districts jointly contribute more than 70% share in the total mustard production of the state. Hence, a well-planned block wise survey of *Alternaria* blight was carried out in the above three districts during *Rabi* season of 2020-21 and 2021-22. The data was collected during the last week of January to 1<sup>st</sup> week of February at that time the crop was approximately 90-100 days old. None of the location was found completely free from blight disease during both the surveyed years. During the survey, the 100 disease samples of *Alternaria* blight were randomly collected from the three districts of Madhya Pradesh *viz.*, Morena, Bhind and Gwalior. The samples were examined under the microscope to find out the relative occurrence of *Alternaria* species in the major rapeseed-mustard growing region of Madhya Pradesh.

## Results and Discussion

During the survey in 2020-21 and 2021-22, only two species which *Alternaria brassicae* and *Alternaria brassicicola* were observed in the region and their relative distribution in the year 2020-21 was 84%, 78% and 76% in Morena, Bhind and Gwalior respectively and the sample showed *Alternaria brassicae*. While the occurrence of *Alternaria brassicicola* in the above three districts was 16, 22 and 24 percent in Morena, Bhind and Gwalior respectively. While 2021-22, their comparative occurrence was 76%, 68% and 82% in Morena, Bhind and Gwalior respectively and the sample showed *Alternaria brassicae*. While the occurrence of *Alternaria brassicicola* in the above three districts was 24, 32 and 18 percent in Morena, Bhind and Gwalior respectively. As overall mean in 2020-21, the occurrence of *Alternaria brassicae* and *Alternaria brassicicola* in Morena, Bhind and Gwalior with 79.33% of *Alternaria brassicae*. While the occurrence of *Alternaria brassicicola* was 20.66%. Similarly, in 2021-22 the occurrence the *Alternaria brassicae* and *Alternaria brassicicola* in Morena, Bhind and Gwalior was 75.33% of *Alternaria brassicae* while the remaining 24.66 percent samples were infected by *Alternaria brassicicola*. The data presented in table (1) which clearly indicate that the *Alternaria brassicae* is the dominating species in northern Madhya Pradesh (Figure- A, B). Similarly finding by Yadav (2008) [12] was also observed the *Alternaria brassicae* was predominant in Northern Madhya Pradesh particularly Bhind, Morena and Gwalior.

**Table 1:** Relative distribution of *Alternaria brassicae* and *Alternaria brassicicola* in surveyed districts.

District	Percent distribution of <i>Alternaria</i> species			
	2020-21		2021-22	
	<i>A. brassicae</i>	<i>A. brassicicola</i>	<i>A. brassicae</i>	<i>A. brassicicola</i>
Morena	84	16	76	24
Bhind	78	22	68	32
Gwalior	76	24	82	18
Overall%	79.33	20.66	75.33	24.66

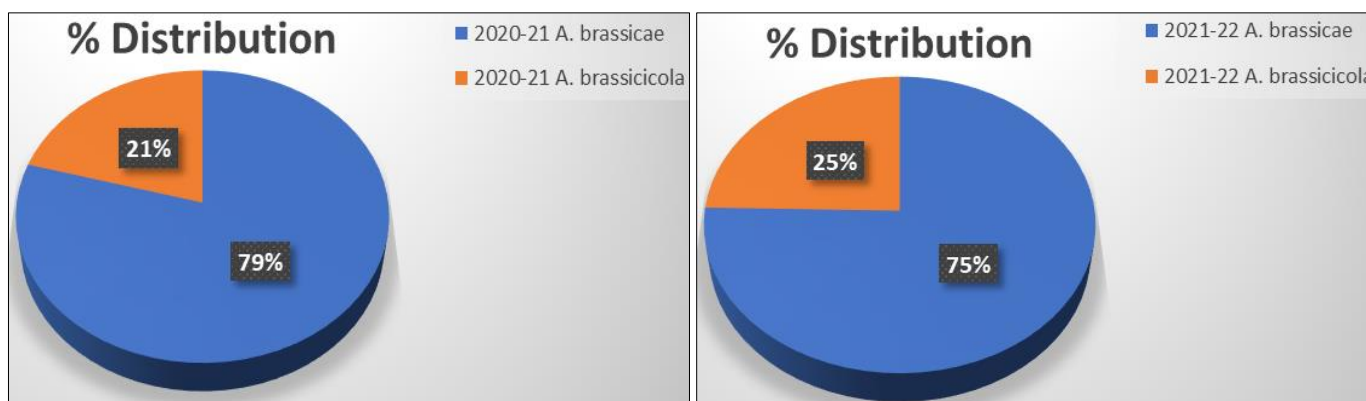


Fig (A)

Fig (B)

**Fig A, B:** Percent distribution of *Alternaria* species in Morena, Bhind, and Gwalior.

### Conclusion

*A. brassicae* is the dominating species in Northern M.P. for causing *Alternaria* blight of mustard. As overall, 79.33 percent in 2020-21 and 75.33 percent distribution in 2021-22 was from mean samples of all the three districts that were infected by *Alternaria brassicae* and remaining 20.66 percent in 2020-21 and 24.66 percent in 2021-22 occurrence on mustard were infected with *A. brassicicola*.

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