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SURVEY AND SURVEILLANCE ON ALTERNARIA BLIGHT OF MUSTARD IN GRID REGION M.P., INDIA

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ABSTRACT

The fungus causing leaf blight of mustard was identified as *Alternaria brassicae* (Berk). Sacc. and *A. brassicicola* (Schw.) A survey was conducted to assess the Incidence of Alternaria blight mustard during the Rabi seasons of 2020–2021 and 2021–2022. The survey was conducted in three Northern Madhya Pradesh districts, namely *viz*., Morena, Bhind and Gwalior as these three districts jointly contribute more than 70% share in the total production of the state. The Alternaria blight intensity in the surveyed locations was in the range of 33.19 to 44.16% and 28.56 to 37.44 per cent in the year 2020-21 and 2021-2022 respectively. The maximum intensity during 2020-21 was recorded in Morena district (44.16) followed by Bhind (43.26), while in Gwalior, it was (33.19). The disease intensity in 2021- 22 was comparatively low but similar to 2020-21. The maximum PDI in 2021- 22 was also recorded in Morena district (37.44) followed by 36.65 in Bhind district and minimum PDI 28.56 was found in Gwalior district. The mean intensity of the disease in Morena followed by Bhind and Gwalior was 40.80,39.95 and 30.87% respectively. It is also clear that the occurrence of blight was higher in Morena and Bhind district as compared to Gwalior district.

***Key words*:** Rapeseed Mustard, Alternaria blight, Survey, disease index

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*. Oilseed constitutes the second largest Agricultural commodity in India after cereals accounting for nearly 4 per cent of gross national product and 14 percent of the gross cropped area (Rathur *et al.*, 2021). Despite the fact that India is one of the leading oilseeds producing countries in the world, we are unable to fulfill the edible oil requirements for our own country. Among the oilseeds, mustard is an important oilseed crop of India next to groundnut in terms of both area and production. India is one of the largest producers of Rapeseed – Mustard in the world and comprised 17.3 per cent and 10.3 percent of total area and production, respectively during 2017-18 (FAOSTAT, 2018). However, the average productivity remained 1511 kg/ha during 2018-19 which is far below the world average productivity of 1979 kg/ha. The total area of mustard cultivation in the country is 6.12 million hectares with production of around 9.26 million tonnes (Chauhan *et al.*, 2020).

Madhya Pradesh, being a leading state of mustard production in India after Rajasthan, Gujarat and West Bengal, encompasses nearly 11.76% to the total mustard production in the country (Sharma *et al*., 2019). In Madhya Pradesh, rape seed and mustard are grown in an area of 0.78 million hectare, with total production of 0.75 million tonnes and the average productivity of 1305 kg/ ha (Directorate of Economics and Statistics, 2019). The actual yield potential of mustard is still not achieved by the farmers because of incidence of different diseases and insect pests. The potential and actual yields of rapeseed-mustard on the farmer's land varies significantly, which may mostly relate to exposure of the rapeseed- mustard crop to numerous biotic and abiotic agents. Rapeseed-mustard is exposed to various types of foliar and stem diseases including Alternaria blight

Table 1: Disease rating scale for Alternaria blight in rapeseed-mustard on leaf.

Rating Scale for leaf	Disease Intensity (%)	Reaction
0	0	Near Immune/ /highly resistant (I)
1	1-10	Resistant (R)
2	11-25	Moderately Resistant (MR)
3	26-50	Moderately Susceptible (MS)
4	51 -75	Susceptible (S)
5	76-100	Highly Susceptible (HS)

(*Alternaria* spp.), downy mildew (*Peronospora parasitica*), powdery mildew (*Erysiphe cruciferarum*), sclerotinia stem rot (*Sclerotinia sclerotiorum*) and white rust (*Albugo candida*) etc.

The most common and damaging disease affecting rapeseed-mustard is the Alternaria blight, which causes major yield losses that may range from 15 to 71 per cent in productivity and 14 to 36 per cent in oil content (Meena *et al.*, 2010). Besides losses in yield and oil content, it also has a negative impact on seed quality, reducing seed size and producing discoloration and staining (Prasad and Lallu, 2006).

Alternaria blight, also known as black spot or leaf blight, is a widespread and destructive disease that impacts mustard crops worldwide. The disease is caused by the necrotrophic fungal pathogen Alternaria brassicae, which primarily targets the foliage of mustard plants. Alternaria brassicae exhibits a complex life cycle, with its survival stages encompassing both soil and crop debris. During conducive environmental conditions, the pathogen produces vast numbers of asexual spores (conidia), which can disperse over long distances through wind and rain splash, facilitating widespread infection. Symptoms of Alternaria blight in mustard initially appear as small, dark brown to blackish lesions with a characteristic yellow halo. As the disease progresses, these lesions enlarge and coalesce, leading to extensive defoliation, reduced photosynthetic capacity, and significant yield losses. In severe cases, the pathogen can also infect other plant parts, such as stems and pods, further impacting the overall crop quality.

Material and Methods

Disease survey

Mustard fields of Gwalior, Morena and Bhind were surveyed to find out the intensity of blight. For such a survey, eight locations from each district and three fields from each location were randomly selected. The intensity of Alternaria blight was recorded in selected fields on randomly selected 25 plants from each selected field by adopting 0-5 scale (Conn *et al.*, 1990).

The percent disease index (PDI) was calculated using the following formula:

Percent disease index (PDI):

$$PDI = \frac{\text{Total sum of individual ratings}}{\text{Number of leaves examined} \times \text{Maximum rating}} \times 100$$

The average PDI of all five locations of the district was the PDI of the district.

Results and Discussion

A total of 24 locations from three districts of Northern Madhya Pradesh *viz.*, Morena, Bhind, and Gwalior were surveyed as these three districts jointly contribute more than 70% share in the total rapeseed-mustard production of the state. The survey was carried out during 2020-21 and 2021-22. The locations were surveyed during the last week of January to first week of February at that time when the crop was approximately 90-100 days old. None of the locations was found free from Alternaria

Table 2: Status of Alternaria blight in Morena, Bhind and Gwalior districts of Madhya Pradesh.

District	Percent disease index			
	Location	2020-21	2021-22	Mean
Morena	I. Morenagoan	46.13	43.73	44.93
	II. Joura	44.53	41.86	43.19
	III. Kailarus	44.00	34.93	39.46
	IV. Sabalgarh	48.53	40.80	44.66
	V. Jigni	42.66	36.13	39.39
	VI. Ambah	45.06	37.60	41.33
	VII. Porsa	42.93	33.60	38.26
	VIII. Nurabad	39.46	30.93	35.19
Mean		**44.16**	**37.44**	**40.80**
Bhind	I. Gormi	41.06	37.86	39.46
	II. Ater	46.67	38.93	42.80
	III. Mehgoan	39.46	30.40	34.93
	IV. Raun	42.13	36.80	39.46
	V. Phuph	44.00	34.40	39.20
	VI. Bhind	42.93	39.93	41.43
	VII. Umari	44.80	35.20	40.13
	VIII. Lahar	45.06	39.73	42.39
Mean		**43.26**	**36.65**	**39.95**
Gwalior	I. Dabra	31.20	22.93	27.06
	II. Bhitarwar	28.80	25.06	26.93
	III. Morar	39.73	35.20	37.46
	IV. Bandholi	42.13	33.33	37.73
	V. Ghatigoan	25.60	23.20	24.40
	VI. Tekanpura	27.46	21.86	24.66
	VII. Chinour	30.40	32.80	31.60
	VIII. Utila	40.26	34.13	37.19
Mean		**33.19**	**28.56**	**30.87**
Mean of three districts		**40.20**	**34.21**	**37.20**

blight disease during both the surveyed years. The data were summarized in Table 1. It revealed that the PDI in the surveyed districts was in the range of 33.19 % to 44.16% and 28.56 % to 37.44 % in the year 2020-21 and 2021-22, respectively (Plate 2 and 3). The maximum PDI of Alternaria blight during 2020-21, was recorded in Morena district (44.16%) followed by Bhind (43.26%), while in Gwalior, it was (33.19%). The PDI in 2021-22 was comparatively low but similar to 2020-21, the maximum PDI in 2021-22 was also recorded in Morena district (37.44%) followed by 36.65% in Bhind district and minimum PDI 28.56 % was found in Gwalior district. The mean intensity of the disease in Morena followed by Bhind and Gwalior was 40.8%, 39.95% and 30.87%, respectively.

The data on disease intensity across surveyed locations at three districts indicated that the higher PDI *i.e.*, 40.20% was recorded during *rabi* season 2020- 21 than 2021-22 (PDI 34.21%) (Figure 4.1). It is also clear from Table 1 and Figure 1 that the occurrence of blight was higher in Morena and Bhind district as compared to Gwalior district. During *rabi* 2020-21. The Alternaria blight PDI in Morena district was observed maximum in Sabalgarh (48.53%) followed by Morenagaon (46.13%), Ambah (45.06%), Jaura (44.53%), Kailarus (44.00%), Porsa (42.93%) and Jigni (42.66%), while the minimum Alternaria blight PDI was recorded in Nurabad (39.46%).

The Alternaria blight PDI in different locations of Bhind district *viz*., Ater exhibited maximum (46.67%) PDI followed by Lahar (45.06%), Umari (44.80%), Phuph (44.00%), Bhind (42.93%), Raun (42.13%) and Gormi (41.06%), and whereas, minimum PDI (39.46%) was recorded in Mehgaon.

In Gwalior district, the observation on Alternaria blight disease revealed that Bandholi location showed maximum PDI (42.13%) followed by Utila (40.26%), Morar (39.73%), Dabra (31.20%), Chinour (30.40%), Bhitarwar (28.80%) and Tekanpur (27.46%), whereas minimum PDI (25.60%) was recorded in block Ghatigaon during 2020-21. In the surveyed locations of Morena district during *rabi* 2021-22 the maximum Alternaria blight PDI was recorded in Morenagaon (43.73%) followed by Jaura (41.86%), Sabalgarh (40.80%), Ambah (37.60%), Jigni (36.13%), Kailarus (34.93%) and Porsa (33.60%), while the minimum Alternaria blight was recorded in Nurabad (30.93%).

The maximum blight PDI in the locations of Bhind district was recorded in Bhind (39.93%) followed by Lahar (39.73%), Ater (38.93%), Gormi (37.86%), Raun (36.80%), Umari (35.20%) and Phuph (34.40%), whereas it was recorded minimum (30.40%) in Mehgaon. In Gwalior district, the maximum blight PDI was recorded in Morar (35.20%) followed by Utila (34.13%), Bardholi (33.33%), Chinour (32.80%), Bhitarwar (25.06%), Ghatigaon (23.20%) and Dabra (22.93%), whereas it was recorded minimum PDI (21.86%) in Tekanpur.

On the basis of the two years data the Alternaria blight PDI in Morena district was maximum in Morenagaon (44.93%) followed by Sabalgarh (44.66%), Jaura (43.19%), Ambah (41.33%), Kailarus (39.46%), Jigni (39.39%) and Porsa (38.26%), while the minimum Alternaria blight was recorded in Nurabad (35.19%).

In Bhind district, location Ater exhibited maximum (42.80%) PDI followed by Lahar (42.39%), Bhind (41.43%), Umari (40.13%), Raun (39.46%), Gormi (39.46%), and Phuph (39.20%), whereas it was recorded minimum PDI (34.93%) in Mehgaon. In Gwalior district, the observation on surveyed locations revealed that Bandholi showed maximum PDI (37.73%) followed by Morar (37.46%), Utila (37.19%), Chinosur (31.60%), Dabra (27.06%), Bhitarwar (26.93%) and Tekanpur (24.66%), whereas it was minimum in Ghatigaon recorded minimum PDI (24.40%).

The present finding is supported by the work of Yadav, (2008) who also observed the *Alternaria brassicae* predominant in Northern Madhya Pradesh particularly Bhind, Morena and Gwalior with the disease incidence of 86 per cent. Holkar (2014) also reported the disease intensity of *Alternaria* blight of mustard in Tikamgarh district from 28.1 to 36.6 per cent during survey. Similarly, Singh *et al*., (2008) reported the *Alternaria* blight of mustard. Khan *et al*., (2007) conducted a survey at Aligarh (Uttar Pradesh), to assess the incidence and intensity of Alternaria blight (*Alternaria brassicae*) on mustard and reported the 93.3% incidence at university farm.

Conclusion

Survey of Alternaria blight was carried out on 24 localities of three districts *viz*., Morena, Bhind and Gwalior as these three districts jointly contribute more than 70% share in the total production of the state. The Alternaria blight intensity in the surveyed locations was in the range of 33.19 to 44.16% and 28.56 to 37.44 per cent in the year 2020-21 and 2021-2022 respectively. The maximum intensity during 2020-21 was recorded in Morena district (44.16) followed by Bhind (43.26), while in Gwalior, it was (33.19). The disease intensity in 2021-22 was comparatively low but similar to 2020-21. The maximum PDI in 2021- 22 was also recorded in Morena district (37.44) followed by 36.65 in Bhind district and minimum

PDI 28.56 was found in Gwalior district. The mean intensity of the disease in Morena followed Bhind and Gwalior was 40.80,39.95 and 30.87% respectively.

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