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Disease Indexing of Rapeseed: Mustard Cultivars against Alternaria Blight

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Authors' contributions

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

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ABSTRACT

In the investigation, 120 rapeseed-mustard genotypes were screened under in vivo conditions for resistance against the foliar disease Alternaria blight. None of the genotypes were found to be immune to the disease. However, three genotypes—JT-1, RVM-3, and Pusa Jagannath—were identified as resistant (R), with disease severity ranging from 1% to 10%. Nine genotypes were classified as moderately resistant (MR), showing disease severity between 11% and 25%. A total of 67 genotypes were rated as moderately susceptible (MS), with disease severity ranging from 26% to 50%. Additionally, 41 genotypes were categorized as susceptible (S), where disease severity was between 51% and 75%. The highly susceptible none of genotypes were found.

Keywords: Resistance; alternaria blight; disease indexing.

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1. 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 and the production of 9.26 million tones" [1]. "Among the Rapeseed-mustard group *B. juncea* (Indian mustard) is the major crops 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 ha and the production of 1.11 million tones and productivity 1422 kg/ha" [1]. 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. Rapeseed-mustard is exposed to various types of foliar diseases including Alternaria blight (*Alternaria* spp.), downy mildew (*Peronospora parasitica*), powdery mildew (*Erysiphe cruciferarum*), sclerotinia stem rot (*Sclerotinia sclerotiorum*) and white rust (*Albugo candida*) etc.

"Out of these diseases, Alternaria blight of mustard caused by *Alternaria brassicae* (Berk.) Sacc. and *A. brassicicola* (Schw.), is a very important disease as it has been reported from all the continents of the world, causing severe economic 47% yield loss" [2]. "The disease appears regularly in moderate to severe form and its infection generally occurs on leaves, stem and siliqua resulting in reduction of yield and poor seed quality brassica crops" [3].

"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" [2]. "Besides losses in yield and oil content, it also has a negative impact on seed quality, reducing seed size and producing discoloration and staining" [4].

According to Changseri and Weber [5] "the brown colored conidiosphores and conidia of *Alternaria brassicae* (Berk.) Sacc. with long beaks can easily be identified and distinguished from *Alternaria brassicicola* which has conidia with very short or no beaks. Alternaria blight disease occurs on the stems and leaves of seedlings and mature plants, as well as in siliquae at the ripening stage. Both vegetable and oleaceous brassicas produce fewer high-quality seeds due to dark stains on the leaves and siliquae that inhibit photosynthetic ability and stimulate early ripening" [6].

2. MATERIALS AND METHODS

The planting of 120 genotypes rapeseed-mustard were done under field conditions. In order to promote a severe natural epidemic of disease, the genotypes were sown in two rows each of three-meter length with spacing of 30x10 cm in randomized block design with two replications. To maintain the high humidity level in microclimate of the field, time to time irrigation was applied for favoring the development of the disease. Observations were recorded on randomly selected 10 plants from each genotype. Numerical rating grade was given on the basis of percentage of area covered by pathogen on the leaves. On the basis of disease intensity genotypes were classified into different groups viz., near immune/highly resistant, resistant, moderately resistant, moderately susceptible, susceptible, and highly susceptible.

2.1 Disease Assessment

The percent disease severity (%) of foliar diseases at each scoring was calculated by using following formula developed by Sharma and Kolte, [7].

> Disease severity (%) = Sum of all numerical ratings × 100 / Total no. of observation × maximum rating

3. RESULTS AND DISCUSSION

3.1 Screening of the Rapeseed -Mustard Genotypes

Screening of rapeseed- mustard 120 genotypes genotypes none of the entries were free from disease and three genotypes, JT-1 (8.7%), RVM-3 (9.9%), Pusa Jagannath (10%), were resistant (R). These entries were significantly superior over all the remaining 117 entries in respect of leaf infection. The 9 genotypes were placed in the category of moderately resistant (MR) with PDI *viz*., L-4 (10.1%), L-6 (12.9%), RVT -1 (13.8%), RMT-10-5-18 (14.4%), RVT-2 (14.6%), RMT-0418-18 (16.8%), RB-50 (19.5%), YSH-401 (21.5%), Pusa Jai Kisan, and (22.5%) and There

are two 67 genotypes were placed in the category of moderately susceptible (MS) remaining 41 genotypes were categorized as susceptible (S). Similarly, the finding of Anonymous [1] "screened rapeseed-mustard cultivars for resistance to Alternaria blight diseases". None of the genotype showed resistant reaction to Alternaria blight. However, EC 338997, EC 339000, EC 414293, NPJ 154 and RH 345 were found moderately resistant to Alternaria blight and Meena et al. [2] also reported that "S. Alba, GSL 1 and T-27 were highly resistant against thirteen *Alternaria brassicae* isolates". "Early sowing of well stored clean certified seeds, timely weeding, maintenance of optimum plant protection and avoidance of irrigation at flowering and pod formation stages may help to manage the disease" [1]. Earlier, Khan (2010) "studied on the common Indian mustard cultivars, Mahyco Bold, Rohini, Alankar, Swarna, Varuna, Pusa Karishma, Pusa Bold, BS-2, Kalamoti and Kranti procured from authorized dealer in Aligarh were found infected with *Alternaria brassicicola* and *A. brassicae*, former being highly dominant occurring singly and concomitantly while *A. brassicae* was found mostly in concomitant infestation. Development and progress of the blight was slower" in Alankar (15-23%) followed by Kalamoti (16-25%) and Kranti (18-28%).

Table 1. Modified 0-5 scale for rating disease intensity of in rapeseed-mustardon 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)

Table 2. Disease reaction of different Rapeseed- mustard genotypes against Alternaria blight under field condition on pooled data basis (2020-21 & 2021-2022)

Rating Scale (0-5)	Disease reaction	Number	Rapeseed-Mustard genotypes
0	Near Immune/ Highly Resistant (HR)	Nil	Nil
1	Resistant (R)	3	JT-1, RVM 3, Pusa Jagannath
2	Moderately Resistant (MR)	9	L-4, L-6, RVT -1, RMT-10-5-18, RVT-2, RMT-0418-18, RB-50, YSH-401, Pusa Jai Kisan
3	Moderately Susceptible (MS)	67	JMTA-06-1, TM-117, TM-53, RH-406, Kiran, PC-6, RVT- 3, JMM-927, RH-749, RSHE-19118, RVM-1, RSHE-1912, RMM-12-3-18, Pusa Vijay, RM 9906, RVM-2, TM-134, RSHM-1920, Vasundhara, RSHE-1900, RSHE-19107, RMX-9906, RSHM-1912, TPM-1, RSHM-1914, RSHE- 19095, GSL-1, PC-5, RSHE-19099, RSHE-19103, TM-108-1, RSHE-19110, JMM-991, TM-276, RGN-73, RMM-12-2-18, Swarn Jyoti, RSHE-19120, RS-6401, RSHE-19102, GSE-7, RH-725, PM-28, JM-2, PDZM-31, China Cabbage, PM-30, TM-273, TM-130, Bhawani, RMX-9903, TM-108, RSHE-1903, JM-3, RSHE-1902, RSHE-19111, JTC-1, Pusa Mahak, Bullet, Shraddha,

Rating Scale (0-5)	Disease reaction	Number	Rapeseed-Mustard genotypes
			Albely, Krishna, PM-27, Vardan, JM-1, TM-204, JMWR-908-1
4	Susceptible (S)	41	TM-179, TM-106, TM-218, TM-3, Rohini, Kranti, Varuna, JMWR-945-275, RSHE-1910, NRCDR-2, RM-1902, TM- 266-3, Karuna, NC-1, TJD-53, RMM-101-1, Pusha Bold, RSHE-19106, NRCHB-101, RSHE-19105, Giriraj, Sej-2, TM-172, PM-25, TJD-52, RP-9, TM-217, RMX-9303, RMM-12-1-18, TM-52, Bio-Y-SR, DMH-1, TM-277, RSHE- 19112, RSHE-19098, RS-6404, Anmol, TM-143, PM-26, NRCHB-506, TM-199
5	Highly Susceptible (HS)	0	Nil

Similarly finding by Summuna et al. (2018) "studied that twenty-seven different genotypes screened for their reaction against Alternaria blight, two genotypes *viz*., RH-8113 and PC-5 showed moderate resistance, four genotypes *viz*., GM-3, RH-1359, RH-819 and JM-1 were found to be moderately susceptible, eighteen genotypes *viz*., Geeta, Pusa Bahar, Rohini, RH-30, Shivani, RH-781, RGN-13, GM-2, RRN-505, Krishna, GM-1, Pusa Jaganath, Vaibhav, RSPN-602, DGS-1, RSPN-25, RSPN-2 and RSPR-69 recorded susceptible reaction. However, three genotypes *viz*., Kranti, Varuna and CS-54 were found to be highly susceptible" [8,9].

4. CONCLUSION

It is concluded that the productivity may be due to several biotic and abiotic stresses. Alternaria blight caused by *Alternaria brasssicae* and *Alternaria brassicola* is one of the most severe yield destabilizing factors causing a reduction in yield. The ideal and most economical means of managing the Alternaria blight diseases is the use of resistant varieties. In present findings, out of 120 genotypes screened none of the genotypes were found diseases – free or highly resistant, only against Alternaria blight however three genotypes *viz*., JT-1 (PDI 8.7%), RVM-3 (PDI 9.9%), Pusa Jagannath (PDI 10%), were resistant (R). These entries were significantly superior over all the remaining 117 entries in respect of leaf infection and 9, 67 and 41 genotypes were placed in the category of moderately resistant (MR), moderately susceptible (MS) and susceptible (S) respectively.

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 writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous. Project coordinator reports ICAR-Directorate of Rapeseed- Mustard, Bharatpur (Rajasthan). 2020;2-5.
2. Meena PD, Awasthi RP, Chattopadhyay C, Kolte SJ, Kumar A. Alternaria blight: a chronic disease in rapeseed-mustard. J. Oilseed Brassica. 2010;1:1-11.
3. Saharan GS. Disease resistance. In "Breeding Oilseed Brassicas‖. labana KS, Banga SS and Banga SK. (Eds.) Narosa Publishing House, New Delhi, India. 1992;181-205.
4. Prasad R, Lallu. Management of Alternaria blight of Mustard with combination of chemicals and botanicals. Ann. Pl. Protec. Sci. 2006;14(1):400-403.
5. Changseri W, Weber GF. Three Alternaria spp. pathogenic on certain cultivated crucifers. Phytopathology. 1963;53:643.
6. Yadav RB, Kumar A, Kumar A, Verma SK. Screening of rapeseed - mustard cultivars/genotypes lines against Alternaria

blight of mustard. Indian J. Sci. Res. 2014; 5(1):89-91.
7. Sharma SR, Kolte SJ. Effect of soil applied NPK fertilizers on severity of black spot disease (*Alternaria brassicae*) and yield of oilseed rape. Plant and Soil. 1994;167: 313-320z.
8. Saharan GS. Disease resistance. In "Breeding Oilseed Brassicasll. labana KS, Banga SS and Banga SK. (Eds.) Narosa Publishing House, New Delhi, India. 1992;181-205.
9. Yadav MS, Dhillon SS, Kaur S, Brar KS, Singh K. Screening of Indian mustard germplasm for resistance to Alternaria blight and white rust. Plant Disease Researc. 1999; 14(1):70-72.

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