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Disease reaction of Indian mustard (*Brassica juncea* L.) genotypes against foliar disease Alternaria blight

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Abstract
In the present investigation 151 Indian mustard genotypes were screened in infected field against major disease of Indian mustard (*Brassica* sp.) these screening was not found immune and resistance against Alternaria blight. Six genotypes have found moderately resistance *viz*., Consult-1, BM-2, CRL-1359-18-19 BLM-2-5, B-272, CSR-943 with disease severity of 5-10% respectively, were rated as moderately susceptible were found 38 genotypes with disease severity 11-25%.106 genotypes were marked as susceptible in which disease severity was found to be 26 to 50%. The highly susceptible only one genotypes was found to be >50 present with disease severity respectively.

Keywords: Indian mustard, *Alternaria Blight*, disease resistance

Introduction
Indian mustard (*Brassica juncea* (L.) Czern. & Coss.) Is an important *rabi* session oil seed crop which is widely grown in northern aria of country. Indian mustard is also exposed to various types of foliar diseases *viz*., white rust (*Albugo candida*), powdery mildew (*Erysiphe cruciferarum*), downy mildew (*Peronospora parasitica*) and Alternaria blight (*Alternaria* spp.). Among these, Alternaria blight caused by *Alternaria brassicae* (Berk) Sacc. Has been reported from all the continents of the world causing severe economic 47% yield loss (Meena *et al.*, 2010) [6]. There are various factors for low productivity of this crop and diseases are the major factors and estimate the 65.3 million tonnes of rapeseed-mustard produced over 34.6 million hectares acreage with the productivity of 1850 kg/ha in the world, in India rapeseed-mustard is cultivated in an area of 6.7 million hectares with a production of 7.90 million tones with productivity of 1188 kg/ha (Anonymous, 2017-18) [2]. In Uttar Pradesh, rapeseed mustard is cultivated in 1099 hectares leading to production of 8041 tonnes with a productivity of 1052 kg/ha (Anonymous, 2018) [2]. Alternaria blight is the major constraint in production of Indian mustard (Kolte, 1985, Saharan, 1984; 1992) [5, 8, 9] and also affects the quality of the seed by reducing size, causing seed discolouration and reduced oil content (Kaushik *et al.*, 1984) [3].

Materials and Methods
The planting of 151 genotypes Indian mustard were done under natural 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 Alfa Lattice Design with two replications. To maintain the high humidity level in microclimate of the field, time to time irrigation was applied for favouring the development of the disease. Observations were recorded on randomly selected five plants from each genotypes.

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.

Table 1: Modified 0-9 scale for rating disease intensity of *Alternaria blight* in Indian mustard (AICRP-RM-2011)

Rating scale	Disease Intensity (%)	Pathogen Reaction
0	0	Near immune/highly resistant (I)
1	<5	Resistant (R)
3	5-10	Moderately Resistant (MR)
5	11-25	Moderately Susceptible (MS)
7	26-50	Susceptible (S)
9	>50	Highly Susceptible (HS)

$$\text{Average severity score} = \frac{(N-1X0)+(N-2X1)+(N-3X3)+(N-4X5)+(N-5X7)+(N-6X9)}{\text{No. of leaf samples}}$$

Where

N-1 to N-6 represents frequencies of leaves in the repective score.

Table 2: Disease reaction of different *Brassica juncea* genotypes to Alternaria blight disease under field condition

Rating scale	Disease intensity	Pathogen Reaction	No. of Genotypes	Genotypes
0	0	Near immune/highly resistant (I)	Nil	
1	<5	Resistant (R)	Nil	
3	5-10	Moderately Resistant (MR)	6	Consult-1, BM-2, CRL-1359-18-19 BLM-2-5, B-272, CSR-943
5	11-25	Moderately Susceptible (MS)	38	CSR-58, MCN-06-14, MCN-13-7 DHR-9701, CM-10, CM-10-5, CSR-1202, CSR-1110, GLM-1-2, CM-51, Consult-7-5, CM-9, Giriraj, HEB-3, JGM-50, MJHD-3-2-1, PBR-423, RC-214, RK-06-1, JGM-278, HD-2, K-31-273, ISB-76, CM-21-10, HLM-403-11, PRG-906, PTJ-3-72, Bio-440, DAR-155, ELM-31-20, GLM-12, ISB-89, MCN-09-04, RB-50, CM-21-8, ELM-5, MCN-08-28, CRL-1359-18-21- 22
7	26-50	Susceptible (S)	106	ELM-7, Krishna, GLM-31-13, CSR-103, PRG-9901, SKM-508, CSR-352 NRCHB-101-DT-2, MCN-08-24, MRJ-15-6, ELM-48, Pakhnoli, CSR-764, MCN-13-13, PNB-PL-68, MCN-13-2, BPR-541-4, MCN-09-07, RRN-624, MCN-05-2, GLM-21-1, JGM-08-2, MCN-29, MCN-34, PHJ-02-402, GLM-31-10, CRL-1359-18-21, PBG-93-9716, MCN-17, NHO-2-2, HLM-39-21, ISB-80, RKL-08-2, HUJM-07-01, DAR-55, MCN-11-26, Kranti(NC), PUSA- BOLD-DT-2, KLM-119, DAR-6, RL-2106, GMCN-69,MCN-09-33, PTJ-3-79, PRG-8903, GM-1B, GM-2(LR), RGN-163, NRCDR-701, DHR-9907, RRN-604, PRG-168, MCN-08-29, NDRS-2011, NRCOR-2, Divya-33, HLM-31-22, GMCN-167, MCN-08-13, JGM-210, RK-06-2, MCN-08-10, PRG-210, MCN-09-10, PCR-7, Poru-raya, HUJM-05-03, MCN-31, CRL-1359-60-75, JGM-305, RH-0202, B-366, MCN-09-39, JGM-244, NDRC-190-8-16, GM-2,MCN-20, DAR-5, PTJ-3-64, RGN-197, CM-21-3, PTJ-3-100, PTJ-3-90, GMCN-139, NRCDR-601, NFj- 2, OR-4-2-2, JGM-993 NR-42, L-171-7-65, NR-4, MCN-09-17, DRMR-08-293, ISB-2, PTJ-3-69, RK-08-1, IC-331819, GMCN-143-13, NDRC-190-8-31, PTJ-2-85, ISB-12, MCN-08-8, JWMR-946-1-13, MCN-09-09, MSC-5,NRCHB-06-51
9	>50	Highly Susceptible (HS)	1	MCN-08-63

Results and Discussion

Screening of Indian mustard 151 genotypes, these screening was not found immune and resistance against Alternaria blight of Indian mustard (Table 2). Six genotypes have found moderately resistance *viz*., Consult-1, BM-2, CRL-1359-18-19 BLM-2-5, B-272, CSR-943with disease severity of 5-10%, respectively, were rated as moderately susceptible were found 38 genotypes with disease severity 11-25%. 106 genotypes was marked as susceptible in which disease severity was found to be 26 to 50%. The highly susceptible only one genotypes was found to be >50 % with disease severity respectively. It could be noticed that the vulnerability level was relatively quite high as compared to resistance status result suggested that Yadav *et al.*, (2014) [10] screened against Alternaria blight of the rapeseed-mustard was found highly resistant. The variety NPN- 1 was found to be resistant with 9.2% incidence of disease. Five genotypes *viz*. NPC-15, PBC-2004-1, PRQ-2004-1, NDR-03-06 and PR-2003-30 were found to be moderately resistant. Ten genotypes were found to be moderately susceptible exhibiting 26 to 50% disease incidence. Nine genotypes were categorized as susceptible (51 to 75% disease incidence) and highly susceptible group comprised of 6genotypes.Among all, genotypes NPJ-102 exhibited the highest disease incidence (79.2%). Khan *et al*., (1991) [4] conducted using 100 accessions of Rapeseed mustard for evaluation of resistance to *A. brassicae*. They reported 2 resistant, 4 moderately resistant, 16 moderately susceptible, 53susceptible and 26 highly susceptible against Alternaria blight

Yadav *et al*., (1999) [11] screened 74 Indian mustard (*Brassica juncea*) germplasm lines for resistance to Alternaria blight and found none of the genotype was completely resistant to Alternaria blight disease. PBR-176, PBR-178 and PBR-180 were found moderately resistant to Alternaria blight, 16 genotypes were highly susceptible to Alternaria blight and 4 were susceptible.

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