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Documentation variation for Alternaria blight resistance in varieties of Rapeseed mustard

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Abstract
The study was conducted with the objective to assess the resistance source against blight in rapeseed-mustard at Student's Instruction Farm, Acharya Narender Deva University of Agriculture and Technology Kumarganj Ayodhya (U.P.) during *Rabi* 2018-19. Screening of Indian mustard 47 genotypes, these screening was not found highly resistant, resistant and moderately resistance against Alternaria blight of rapeseed mustard six genotypes *viz*., Kiran, TMR-14-6, TMR-14-1, TMR-14-5, TMR-14-3, TMR-14-4 with disease severity of 5-10 per cent respectively were rated as moderately susceptible were found nine genotypes with disease severity 11-25 percent. 31genotypes 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. It could be noticed that the vulnerability level was relatively quite high as compared to resistance status.

Keywords: Rapeseed- mustard, Alternaria blight, disease reaction, screening

Introduction
Brassica species are the largest oilseed crop in the world oilseed production followed by peanut (*Arachis hypogaea* L.) and sunflower (*Helianthus annus* L.). In India, rapeseed-mustard is grown over in diverse agroclimatic conditions ranging from north-eastern/north-western hills to down south. These crops require cool growing season and moderate temperature throughout, hence are sown in the month of 1 November to 15 November in northern India (Das *et al.*, 2009) [4].

Brassica juncea (L.) Czern & Coss., also known by the name of Indian mustard, belongs to the plant family *Brassiceae* (*Cruciferae*) or the mustard family. It is commonly referred to as Rapeseed-mustard along with four other closely related cultivated oilseed species *viz*. *B. rapa*, *B. napus*, *B. carinata* and *Eruca sativa*. Indian mustard is largely self pollinated. Indian mustered (*B. juncea* L. czern and coss). popularly known as rai, raya or laha is one of the most important oil seed crop of the country. *Brassica juncea* (n = 18) is an amphidiploid species derived from interspecific crosses between *B. nigra* (n = 9) and *B. rapa* (n = 10).

Rapeseed mustard are the world's third most important sources of vegetable edible oil. It also contains adequate amounts of the two essential fatty acids, linoleic and linolenic, which are not present in many of the other edible oils. The oil is also used as hair oil and as lubricant. A peculiar use of mustard oil is to retard the fermentation process when making cider from apples. Vegetable oils and fats are valuable food ingredients in human diet. They contain saturated and unsaturated fatty acids. The Indian mustard have nutritional value *viz*., carbohydrates 4.51g, sugar 1.41g, dietary fiber 2g, fat 0.47g and protein 2.56g per 100 g (3.5 oz). It is a good source of protein (28-36%).

The tender leaves of these cultivars serve as vegetable, while the seeds as a source of lubricating and cooking oil. The residue left after oil extraction being rich in protein (Durrani and Khalil, 1990; Chattopadhyay *et al*., 2005) [6, 3] can be used as livestock feed. It produces 9 k cal energy from 1gm of oil per unit in comparison with other diets (carbohydrate and Protein). Mustard seeds have relatively high protein content (28-36%). Until now mustard seeds have been used mainly for condiment production. (Gadei *et al.*, 2012) Mustard oil contains a high amount of selenium and magnesium, which gives it anti-inflammatory properties.

It also helps stimulating sweat glands and helps lowering body temperature. In traditional medicines, it is used to relieve the pain associated with arthritis, muscle sprains and strains. (Chattopadhyay *et al*., 2005) [3].

It is second largest indigenous oilseed crop, In India, rapeseed-mustard is grown over in diverse agro- largest indigenous oilseed crop which contributing 32 per cent of total oilseed production in India (Gupta *et al.*, 2017) [9]. Out of 65.55 million tonnes of estimated rapeseed-mustard produced over 34.69 million hectares in the world, India produces 8.03 million tonnes from 6.36 million hectares with 1262 kg/ha productivity, Alternaria blight disease of rapeseed mustard caused by *brassicae* (Berk.) Sacc. has been reported from all the continents of the world which affects most cruciferous crops. It is one among the important diseases of rapeseed-mustard causing yield losses up to 47% (Kolte, 1985) [12]. Alternaria is a very destructive pathogen causing a widespread destruction in vegetables and other economically important crops. The ideal and most economical mean of managing the Alternaria blight disease of rapeseed-mustard would be the use of resistant varieties. (Mamgain *et al*., 2013) [13]. *Alternaria brassicae* species have the ability to survive in seeds for several months at different temperatures and relative humidity (Abul-Fazal *et al*., 1994) [1]. Morphological characteristics of conidia and conidiophores and sometimes host plant association, provide the major taxonomic criteria for delimitation of fungal species (David, 1991) [5]. However, the classification of small spored species, including host-specific toxin producing fungi, has been particularly confused, because of the simple and convergent morphology of conidia and facultative parasitism, resulting in an ambiguous host range (Simmons, 1999) [17]. However, according to the study of Pattanamahakul and Strange (1999) [15], the taxonomy of Alternaria on brassicas has been based principally on morphology and sometimes host plant association of each of the species occurring (*A. brassicicola*, *A. brassicae* and *A. raphani*) has a distinct morphology considering the diversity of conidium shapes and sizes among Alternaria spp. All commercial cultivars of brassicas are susceptible to this pathogen (Tewari, 1991) [19]. Till now no resistance are found among the crucifers against *Alternaria brassicae*. Development of resistant cultivars requires knowledge of pathogen variation present in different regions where these crucifers are grown. Severity of Alternaria blight on Brassicas differs among seasons and regions as also between individual crops within a region. This may be due to existence of variability among isolates of Alternaria species. Many reports on the existence of morphological variability within the isolates of other Alternaria species (Varma *et al*., 2006) [20]. Variability in the morphological characteristics in *A. brassicae* isolates of different regions of India (Goyal *et al*., 2011) [8].

Materials and Methods

The experiment was conducted at the Student's Instruction Farm, Acharya Narendra Deva University of Agriculture and Technology Kumarganj Ayodhya (U.P.) during *rabi* 2018-19. The planting 47 Rapeseed mustard genotypes 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 Augmentaed design with Three 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 severity of *Alternaria* blight in rapeseed mustard (AICARP-R&M 2011)

Rating scale	Disease severity (%)	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)

Formula for calculating disease severity

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

Result and Discussion

Screening of Indian mustard 47 genotypes, these screening was not found highly resistant, resistant and moderately resistance against Alternaria blight of rapeseed mustard six genotypes *viz*., Kiran, TMR-14-6, TMR-14-1, TMR-14-5, TMR-14-3, TMR-14-4 with disease severity of 5-10 per cent respectively were rated as moderately susceptible were found nine genotypes with disease severity 11-25 percent. 31genotypes 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. It could be noticed that the vulnerability level was relatively quite high as compared to resistance status.

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	Kiran, TMR-14-6, TMR-14-1, TMR-14-5, TMR-14-3, TMR-14-4
5	11-25	Moderately Susceptible (MS)	9	T-27, Jagrity, GSL-1, Shetal, GSL-5, GSL-2, NRCDR-02, Varuna
7	26-50	Susceptible (S)	31	NRCDH-101, Patan sarso, KBS-3, Maya, NDRE- 4, Parvati, Ashirwad, Uravasi, Jumaka, NDR-8501, RH-406, NDRS-2009-1-2, Pitambary, Pusa gold, Giriraj, NDYR-2, Kranti, NDYR-7, Rohani, T-9, Anuradha, Pusa musatrd -24, RGN-13, Rh-479, Bhawani, NDRS-

				17, NDYR-8, Vardan, Pusa -Mustard -25, Pusha -Mustard -26, Pusha -Mustard -27
9	>50	Highly Susceptible (HS)	1	PT-305

Different workers evaluated that 81genotypes Indian mustard were screened against blight under natural epiphytotic conditions and reported that none of the genotype was found to be completely free from visible symptoms of disease. Only one YET-25 was fairly resistant against leaf blight, however, 10 and 61 lines were reported moderately resistant and moderately susceptible, respectively (Singh *et al.*, 2009) [18]. Rahman *et al.* 2010 [16] found of disease severity while evaluating 26 genotype so rapeseed-mustard during their extensive research on Alternaria blight. On the basis of disease severity index, none was found highly resistant or resistant. While six among them appeared to be moderately resistant against the blight.

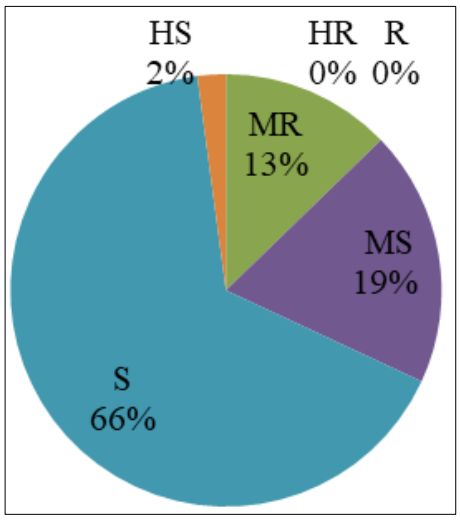

Fig 1: Pai chart showing disease reaction of rapeseed mustard Against Alternaria blight.

The present finding is supported by many authors such as Khan *et al*. (1991) [10] who conducted field trial using 100 accessions of sarson for evaluation of resistance to *A. brassicae* by artificial inoculation. They reported 2 resistant,4 moderately resistant, 16 moderately susceptible, 53susceptible and 26 highly susceptible against Alternaria blight; Yadav *et al.* (1999) [21] 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; Kolte *et al*. (2001) [11] report0ed that genotypes PR-8988 and PR-9024 showed high degree of resistance to Alternaria blight and genotypes PR-9301 and PR-9650 showed high degree of susceptibility.

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