Screening of genotypes against alternaria blight in rapeseed and mustard

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Abstract
The field experiments were conducted at Student’s Instruction Form, ANDUA&T, Kumarganj Ayodhya. The climate is hot and humid summer and cold winters, during the rabi crop season in the year 2017-18. One hundred genotypes of Rapeseed-mustard were used for the present investigation. The earliest appearance of disease (30 days) was noted in genotypes RAURD-09-32, RM-WR-09-5, PAB-09-07, PRB-2004-3-4, RGN-307, RH-0834, RH-0902, RH-0952, RH-0903, RHH-1101, YSWB-2012/9 (44 days) PPBJ-2, RAURD-09-78, and (45 days) PPBN-3, PT-2006-4 and lowest disease severity was recorded genotypes PHR-2, (9.5) PAB-2004-4 (20.5) PPBJ-2 (22.2), PPBN-3 (22.3) PPBN-2 (22.6) PPBJ-5 (23.3), PPBJ-3 (24.3), PPBJ-4 (24.5) PAB-2005-16 (24.5), RRM-789, (43.6), RH-0555A, (43.7). AUDPC showed more susceptible genotypes the lowest PHR-2 (214.5) was recorded and genotypes screened, none of the genotypes were found disease -free or highly resistance, only 1 genotype namely (PHR-2) were found resistance, 8 genotypes namely (PPBN-2, PPBN-3, PPBJ-3, PPBJ-2, PPBJ-5, PPBJ-4, PAB-2005-16, PAB-2004-4), were rated as moderate resistance, 37 moderated susceptible and 54 as susceptible.

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

Introduction
India is the paradise for oilseed crops accounting fourth largest oilseed producing country in the world, next to USA, China and Brazil. (Jha et al., 2012) [4]. Among different oilseeds, rapeseed-mustard alone contributes 32.00% of total oilseed production in India (Jha et al., 2012) [4]. Thus playing a pivotal role in agricultural economy of the country. A wide gap exist between the potential yield and the yield realized at the farmer’s field due to expose of number of biotic and a biotic stresses among the biotic stress, Alternaria blight is the most important disease causing both yield and quality loss up to 47.00% (Kolte, 1985) [5] with no proven source of transferable resistance in any of the host. Saharan, (1992; and Kolte, 2002) [12, 7] reported that Alternaria blight sometimes causes more severe losses (70.00%) in rapeseed (Brassica campestris). Alternaria blight severity on rapeseed-mustard differs among seasons and regions and also between individual crops within a region. This may be due to existence of variability within the isolates of Alternaria spp. (Meena et al., 2005, Verma et al., 2006) [10, 15]. The economical and environmentally safe method of controlling the disease is the use of resistant varieties. Proper information and studies are not done for resistant sources (Shah et al., 2005, Prasad et al., 2003) [13, 11]. However, there is an absence of stable, desirable and diverse source of resistance to the Alternaria blight of mustard (Chattopadhyay and Bhaggi, 1994) [3].

Material and Methods
Genotypic screening of rapeseed -mustard against Alternaria blight
The field experiments were conducted at Student’s Instruction Form, ANDUA&T, Kumarganj Ayodhya. The Climate is hot and humid summer and cold winters, during the rabi crop season in the year 2017-18. One hundred genotypes of Rapeseed-mustard were used for the present investigation. 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-RP-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) |

Area under the disease progress curve (AUDPC) was calculated for disease severity over time from 60 to 90 days after transplanting using the formulae as follows (Shaner and Finney, 1977) [14]

\[
\text{Area under disease progress curve (AUDPC)} = \frac{\text{Sum of all numerical ratings}}{\text{Number of leaves observations} \times \text{Maximum number of rating scale} \times 100}
\]

**Area under disease progress curve (AUDPC)**

\[
\text{AUDPC} = \sum_{i=1}^{n-1} \left( \frac{(y_{i+1} + y_i)}{2} \right) \times (x_{i+1} - x_i)
\]

Where

- \(y_i\) and \(y_{i+1}\) = Disease severity in the \(i^{th}\) and \((i+1)^{th}\) observations
- \(x_i\) and \(x_{i+1}\) = Time (weekly) in the \(i^{th}\) and \((i+1)^{th}\) observations
- \(n = \text{Total number of observations}\)

**Result and discussion**

**Appearance of disease**

This initial symptoms of the disease could not be between 30 to 45 days after in different genotypes and earliest appearance of disease (30 days) was noted in genotypes RARU-99-32, RM-WR-09-5, PAB-09-07, PRB-2004-3-4, RGN-307, RH-0834, RH-0902, RH-0952, RRH-1101, YSWB-2012/9 and (42 days) in genotypes PR-2008-12, PRL-2010-10, PT-2008-2, RB-57, RGN-321, RMT-10-10, SKM-815, TKM-102, with other genotypes showing (43 days) PPBJ-5, PR-2008-1, PRO-51-11, TM-117, Varuna, (44 days) PBB-2, RAURD-09-78, and (45 days) PBB-3, PT-2006-4. (Table 2) similar studies on Bal and Kumar (2014) [3] noted that the first appearance of Alternaria leaf spot symptoms from A. brassicaceae (RLM 619).

**Severity of disease**

An examination of data in table 2 revealed that lowest disease severity was recorded genotypes PHR-2, (9.5) PAB- 2004-4 (20.5) PPBJ-2 (22.2), PPBN-3 (22.3) PPBJ-2 (22.6) PPBJ-5 (23.3), PPBJ-3 (24.3), PPBJ-4 (24.5) PAB-2005-16 (24.5), RRM-789, (43.6), RH-0555A, (43.7) (Table 2) similar result reported that Kolte et al., (2001) [6] reported 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.

**Area under disease progress curve (AUDPC)**

On average basis a Area Under Disease Progress Curve (AUDPC) showed more susceptible genotypes (Table 2) the lowest AUDPC (214.5) was recorded in genotypes PHR-2 followed by PPBN-2 (428.25), PPBJ-2 (438.75), PAB- 2004-4 (446.25), PPBN-3 (457.5), PPBJ-5 (459.75), PPBJ-3 (483.75), PPBJ-4 (525.75), PAB-2005-16, (570.75), RH-0834 (635.25) (Table 1) Kumar et al., (2001) [8] also concluded that calculation for AUDPC in mustard crop sown on different dates helps in identifying the disease severity progress of Alternaria blight of mustard on leaves and pods.

**Host reaction**

Out of 100 genotypes screened, none of the genotypes were found disease-free or highly resistance, only 1 genotype namely (PHR-2) were found resistance, 8 genotypes namely (PPBN-2, PPBN-3, PPBJ-3, PPBJ-2, PPBJ-5, PBB-4, PAB-2005-16, PAB-2004-4), were rated as moderated resistance, 37 moderately susceptible and 54 as susceptible. (Table 2). Similar, several researches have also reported other genotypes resistance to this time to time (Kumar and Singh 2012) [9].

**Table 2: Screening of rapeseed mustard genotypes against Alternaria blight**

| S. No. | Name of genotypes | Appearance of disease (DAS) | Disease severity on leaves | AUDPC | Maximum grade (0-9) | Host reaction |
|--------|-------------------|----------------------------|---------------------------|-------|---------------------|---------------|
| 1      | PAB-09-07         | 30                         | 17.5, 34.7, 62.6          | 1121.25 | 9, HS               |               |
| 2      | PAB-2004-4        | 34                         | 9.8, 14.6, 20.5           | 446.25  | 5, MR               |               |
| 3      | PAB-2005-16       | 35                         | 12.4, 19.6, 24.5          | 570.75  | 5, MR               |               |
| 4      | PBR-384           | 37                         | 18.4, 36.6, 53.6          | 1089    | 7, S                |               |
| 5      | PBR-422           | 32                         | 15.3, 37.6, 55.4          | 1094.25 | 7, S                |               |
| 6      | PBR-2             | 40                         | 3.5, 7.8, 9.5             | 214.5   | 3, R                |               |
| 7      | PMH-12-1          | 40                         | 14.5, 34.5, 53.5          | 1027.5  | 9, HS               |               |
| 8      | PMH-12-2          | 32                         | 16.5, 36.6, 56.5          | 1096.5  | 7, S                |               |
| 9      | PMH-12-3          | 36                         | 17.5, 35.6, 54.6          | 1074.75 | 7, S                |               |
| 10     | PPBJ-4            | 35                         | 10.4, 17.6, 24.5          | 525.75  | 5, MR               |               |
| 11     | PPBJ-5            | 43                         | 6.6, 15.7, 23.3           | 459.75  | 5, MR               |               |
| 12     | PPBJ-2            | 44                         | 7.1, 14.6, 22.2           | 438.75  | 5, MR               |               |
| 13     | PPBJ-3            | 32                         | 9.2, 15.5, 24.3           | 483.75  | 5, MR               |               |
| 14     | PPBN-3            | 45                         | 7.1, 15.8, 22.3           | 457.5   | 5, MR               |               |
| 15     | PPBN-2            | 36                         | 9.1, 12.7, 22.6           | 428.25  | 5, MR               |               |
| 16     | PBB-2             | 34                         | 21.5, 38.5, 55.4          | 1134.25 | 9, HS               |               |
| 17     | PR-2006-14        | 35                         | 15.5, 34.6, 47.6          | 992.25  | 7, S                |               |
| 18     | PR-2008-1         | 43                         | 13.4, 23.6, 48.6          | 819     | 7, S                |               |
| 19     | PR-2008-12        | 42                         | 14.4, 26.6, 47.6          | 864     | 7, S                |               |
| 20     | PRB-2004-3-4      | 30                         | 17.6, 29.0, 44.6          | 901.5   | 7, S                |               |
| 21     | PRB-2008-5        | 35                         | 15.5, 33.4, 44.7          | 952.5   | 7, S                |               |
91. TM-117 43 14.9 34.5 54.5 1038 9 HS
92. Varuna 43 16.4 37.7 54.5 1097.25 9 HS
93. YSB-9 32 15.3 25.4 52.7 891 9 HS
94. YSKM-12-1 35 17.5 28.4 55.3 970.5 9 HS
95. YSKM-12-2 31 17.5 34.7 62.6 1121.25 9 HS
96. YSWB-2010/8 36 13.3 23.5 57.7 885 9 HS
97. YSWB-2011-10-1 34 14.5 35.5 54.5 1050 9 HS
98. YSWB-2012/9 30 13.6 38.4 55.4 1093.5 9 HS
99. YSWB-2004/3-12 31 15.3 25.4 52.7 891 9 HS
100. YSWB-20229/2-12 32 16.5 35.4 56.6 1079.25 9 HS

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