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**Original Research Article**

# Study on Incidence and Screening of Genotypes of Rape-Seed and Mustard (*Brassica juncea* L) against the Alternaria Blight

**Prince Kumar Singh[1], Abhishek Singh[2], Rajendra Prasad[3] and Praveen Kumar[4]**

[1]Department of Plant Pathology, [3]Department of Plant Pathology, CSA University of Agriculture & Technology, Kanpur, India
[2]Department of Mycology & Plant Pathology, I.Ag.Sc, Banaras Hindu University, India
[4]Directorate of Plant Protection Quarantine & Storage Faridabad, Haryana, India

**Corresponding author*

**A B S T R A C T**

Alternaria blight of Rapeseed and Mustard have found serious problem in Uttar Pradesh for a long time. Survey conducted in Kanpur district during Rabi season revealed that a maximum 44.2 per cent disease incidence at Oilseed Research Farm, Kalyanpur. There were thirty one genotype screened for their reaction against Alternaria blight, none of the genotypes revealed Immune or Resistant reaction. Amongst these only four genotype two o genotype viz., SBG- 12-28 and SBG-12-27 on leaves and two genotype viz., SBG-12-28 and SBG-12-26 resistant on pod were observed to be moderately resistant to this disease.

**Keywords**

Incidence of Alternaria blight, Screening of genotype against Alternaria

## Introduction

Cruciferous crop plants suffer from a number of diseases caused by fungi, bacteria, nematodes and viruses, which result in deterioration of quality and reduction in quantity of the produce of crops and thus cause great damage to the crop in field. Neergaard (1945) made a monographic study of genus *Alternaria*, in which the description of *A. brassicae* has been made in greater detail. Mehrotra and Narain (1969) in a survey of Alternaria disease in India, collected 55 host plants belonging to 26 families infected by *Alternaria* spp. Twenty of the plants were new host records from India. Detailed studies have been made by Changsri and Weber (1963) on the pathogen, *A. brassicae* causing blight of rapeseed-mustard. The characters and classification of *Alternaria* spp. from India have also been described by Subramanian (1971) in his monograph of Hyphomycetes. Prasad *et al.*, (1970) reported *Alternaria brassicae* on taramira and studied morphological and cultural characters of the pathogen.

The species of *Alternaria* frequently found as saprophytic and parasitic on flowering plants as well as associated with seeds are very important from mycological and pathological point of view. Husain and Thakur (1963) observed that *B. compestris* (Brown sarson) and *B. chinesis* as highly susceptible whereas

some strains of *B. juncea*, *B. nigra* and *B. alba* were moderately resistant. *B. carinata, B. napus* and *B. alba* were found to be resistant as compared to *B. campestris* (Degenhardt *et al.,* 1974; Kadian and Saharan, 1983, Banga *et al.,* 1984; Anand *et al.,* 1985, Kolte, 1986a). Bhander and Maini (1965) worked on relative resistance of some oilseed crucifers to Alternaria blight over four successive seasons. They found *B. napus* and *B. alba* to be resistant, *B. juncea* to be fairly resistant and toria and *B. chinensis* to be moderately resistant in the reaction to the pathogen. Rai *et al.,* (1977) reported that *B. napus* and *B. juncea* were resistant as compared to *B. campestris.* P. Mathpal *et al.,* (2011) selected three genotypes viz. *Brassica juncea* cv. Varuna (susceptible), *B. juncea* cv. PAB-9534 (moderately resistant) and *B. alba* (tolerant). The results revealed that all the genotypes showed variable disease severity. It was observed that in all stages of pathogen infection, disease severity and characteristic symptoms were more prominent in susceptible genotype than the other two. The biochemical analysis of leaves of different varieties of mustard revealed that total phenol, o-dihydroxy phenol, total sugar, reducing sugar, chlorophyll content and flavonol contents were observed to be more in resistant genotype (*B. alba*) than others. With progress of infection total phenol, o-dihydroxy phenol and protein content increased in all three genotypes while the chlorophyll, total sugar, reducing sugar and flavonol content decreased. The results indicated that factors conditioning the host response to *A. brassicae* might be the outcome of complex biochemical changes operated in host genotypes. Brun *et al.,* (1989) observed that varieties of *B. napus, B. carinata* and sinapsis alba were highly resistant to *A. brassicae.* Khan *et al.,* (1991) reported from a field trial conducted on 100 accessions of sarson for evaluating moderately resistant, 16 moderately susceptible, 53 susceptible and 26 highly susceptible lines but resistance was unstable under field condition. Chahal and Jaura (1994) reported that out of 288 lines/strains of different Brassica species tested none was found free from *A. brassicae* under field condition. However, three lines/strains of *B. juncea* one each of *B. napus* and *B. carinata* and strains of wild species were considered resistant. Thirty-six cruciferae (Brassicacreae) genotypes belonging to different Brassicas were evaluated by Dang *et al.,* (2000) for resistance to Alternaria leaf blight. The stability of resistance of individual genotypes for each disease was established by calculating mean disease score identification of genotypes with multiple disease resistance was done using these two parameters over the combined data. Seven varieties/genotypes (*B. alba, B. carinata B.juncea, B. napus*) had stable and multiple disease resistance. In addition, h 13 genotypes belonging to different species possessed a fair degree of stable multiple disease resistance but to a lesser extent. Sudheer *et al.,* (2005) Fourty germplasm lines of different *Brassica* spp. (*B. juncea, B. napus, B. carinata and B. campestris*) were evaluated for resistance to Alternaria blight (*Alternaria brassicae*) during 2002-03 and 2003-04 in Jammu, India at the leaf and siliqua phases (for blight). Analysis of variance showed a narrow genetic base for Alternaria blight resistance. None of the genotypes were resistant to blight. Saharan *et al.,* (2005) Rapseed-mustard (*Brassica campestris var. sorson, B. campestris var. dichotoma, B. campestris var. toria, B. juncea and Eruca sativa*) are severely affected by many fungal foliar diseases including Alternaria blight (caused by *Alternaria brassicae*). The strategies and methods of screening rapeseed-mustard cultivars for disease resistance and the methods of testing the resistance are discussed.

## Materials and Methods

A regular and constant observation of mustard crop grown at Oilseed Farm of the University and other adjoining areas of Kanpur Nagar such as Bhaga, Chaubepur, Sarsaul was made during the month of December to February March during 2011-2012 season. During the survey, the affected leaves of mustard showing characteristics symptoms of *Alternaria* blight were brought into the laboratory of plant pathology Department for detection and isolation of the pathogen responsible for the disease.

Fifty leaves were randomly selected from each one sq meter plot of each field during the course of survey. These leaves were arranged into six groups from zero to five on the basis of the percentage leaf area affected. Disease intensity was recorded at the maturity stage as per the scale suggested by (Conn *et al.,* 1990). The percentage disease index was calculated by the following formula.

$$\text{Disease index (\%)} = \frac{\text{Sum of numerical ratings}}{\text{Total number of leaves examined} \times 5} \times 100$$

Thirty-one cultivar/genotype of rapeseed-mustard group (*Brassica juncea, Brassica campestris, Brassica carinata, Brassica napus, Eruca sativa* and *B. rapa*) were carried out during the rabi 2011-12 under artificial conditions. In order to promote a serve natural epidemic of disease, the planting of single line of highly susceptible variety Varuna was incorporated after each five rows. The genotypes were sown in two rows each of 3 m length with a spacing of 40 × 10 cm in R.B.D. The recommended agronomic practices were adopted for raising a good crop. To maintain high humidity level in micro climate of the field, time-to-time irrigation were applied for favouring the development of disease. The inoculum of *A. brassicae* was prepared by mycelial mat grown on Czapek's nutrient solution for 10 days at 24 ± $1^0$C. It was homogenized in warring blender for 3 minutes in sterilized water and sprayed at branching and siliqua formation stages. After 15 days of inoculation the number of affected leaves was counted and the in 0-5 point grade of the recommended by Hussain and Thakur (1963) of the varietal infection as follows:

## Results and Discussion

In order to ascertain the severity and distribution of Alternaria blight, a survey was conducted at different locations of Kanpur district. For this purpose, 6 fields were surveyed from December-February during 2012-13. In general the disease presence was moderate to severe at the farmer's field. Timely sown crop generally escaped Alternaria blight at pod stage. The observations in respect to severity of the disease at different locations are summarized in Table 3.

The observations recorded in the Table 3 revealed that Alternaria blight was prevalent in all the areas where this crop was grown. The maximum disease intensity (44.2%) was recorded at Oilseed Research Farm, Kalyanpur of the University and minimum (24.4%) was recorded at farmer's field, Chaubepur, Kanpur. The intensity of disease varied from 24.4 to 44.2% at all the surveyed fields. At the farmer's field, the maximum disease intensity was recorded at Bilhore (37.4%) and lowest disease intensity was recorded at Chaubepur (24.4%). Prasad *et al.,* (2003) also reported that the early sowing reduced the disease intensity. Tripathi *et al.,* (1980) and Kolte (1986) reported that Alternaria blight was more prevalent in temperate zone and in the central parts of India.

**Table.1** Details for different samples of cruciferous plants

| S.No. | Name of host | Botanical Name | Locality |
|---|---|---|---|
| 1. | Yellow sarson | *Brassica campestris* var. dichotoma | Oilseed Research Farm, Kalyanpur, C.S.A.U.A.T., Kanpur |
| 2. | Black toria | *B. campestris* var. toria | Students Instrumental Farm, C.S.A.U.A.T., Kanpur |
| 3. | Rai | *B. juncea* | Nawabganj Farm, C.S.A.U.A.T., Kanpur |
| 4. | Cabbage | *B. oleracea* var. capitata | Farmer's field Shobhan, Kanpur |
| 5. | Radish | *Raphanus sativum* | Farmer's field Chaubepur, Kanpur |
| 6. | Taramira | *Eruca sativa* | Farmer's field Sarsaul, Kanpur |

**Table.2** Gradation for disease reaction

| Grade | % infection | Reaction |
|---|---|---|
| 0 | Nil | Immune (I) |
| 1 | Upto 5% infection | Resistant (R) |
| 2 | Upto 10% infection | Moderately resistant (MR) |
| 3 | Upto 20% infection | Moderately susceptible (MS) |
| 4 | Upto 30% infection | Susceptible (S) |
| 5 | 40% or more | Highly susceptible (HS) |

**Table.3** Disease intensity of Alternaria blight of rapeseed mustard at the University Farm and farmer's field

| S. No. | Location | Disease incidence (%) |
|---|---|---|
| 1. | Oilseed Research Farm, Kalyanpur, C.S.A.U.A.T., Kanpur | 44.2 |
| 2. | Farmers field, Bidhnu, Kanpur | 36.8 |
| 3. | Nawabganj Farm, C.S.A.U.A.T., Kanpur | 34.5 |
| 4. | Farmer's Field Bagha, Kanpur | 30.0 |
| 5. | Farmer's Field Chaubepur, Kanpur | 24.4 |
| 6. | Farmer's Field Bilhore, Kanpur Dehat | 37.4 |

**Table.4** Screening of Brassica germplasm against *Alternaria brasicae*

| S. No. | Entries | On leaves | On pod |
|---|---|---|---|
| 1 | **LES-45** | 60(50.7) | 14.7(22.4) |
| 2 | **LES-53** | 66.8(54.8) | 20.4(26.8) |
| 3 | **SKM-815** | 53.8(47.1) | 19.4(26.1) |
| 4 | **SKM-301** | 48.0(43.8) | 33.5(35.3) |
| 5 | **RMT-08-2** | 49.7(44.8) | 33.8(35.5) |
| 6 | **PTE-2008-02** | 52.5(46.3) | 30.4(33.4) |
| 7 | **RMT-08-6** | 52.2(46.2) | 53.5(46.9) |
| 8 | **DRMRIJ-31** | 38.3(38.1) | 23.5(28.9) |
| 9 | **GSC-101** | 44.5(41.8) | 12.7(20.8) |
| 10 | **NPJ-162** | 35.7(36.6) | 17.8(24.9) |
| 11 | **DRMR-150-35** | 58.3(49.7) | 20.1(26.6) |
| 12 | **RGN303** | 58.3(49.7) | 19.4(26.1) |
| 13 | **NPJ-161** | 45.4(42.3) | 11.8(23.3) |
| 14 | **PR-2006-14** | 38.5(38.3) | 11.6(19.8) |
| 15 | **RH-748** | 51.7(45.9) | 5.8(13.9) |
| 16 | **NPJ-156** | 39.5(38.8) | 6.2(14.3) |
| 17 | **DRMR-659-49** | 45.3(42.2) | 14.5(22.3) |
| 18 | **RGN-298** | 41.2(39.9) | 21.3(27.4) |
| 19 | **PR-2008-1** | 37.6(37.7) | 16.4(23.8) |
| 20 | **SKM-818** | 44.5(41.8) | 11.4(19.7) |
| 21 | **MCP-633** | 52.5(46.4) | 28.8(32.4) |
| 22 | **SKM-904** | 53.3(46.8) | 22.4(28.1) |
| 23 | **Albeli-1** | 49.6(44.7) | 23.6(29.0) |
| 24 | **RTM-1355** | 48.5(44.1) | 25.5(30.8) |
| 25 | **EC-399301** | 38.4(38.2) | 15.6(23.2) |
| 26 | **PHR-2** | 38.7(38.4) | 7.3(15.6) |
| 27 | **EC-399299** | 17.3(24.5) | 9.1(17.5) |
| 28 | **EC-339000** | 11.5(19.6) | 7.1(15.4) |
| 29 | **DLSC-1** | 21.2(27.4) | 11.8(20.0) |
| 30 | **Rohini** | 38.5(38.3) | 16.2(23.6) |
| 31 | **DRMR-2011-1** | 40.7(39.6) | 20.5(26.8) |
| | **CV** | 7.468 | 9.311 |
| | **CD at 5%** | 6.28 | 4.791 |

Angular transformed values are given in parenthesis

Among the disease management approaches, the use of resistant varieties is considered to be the best and cheapest method of managing the plant disease. the present study was therefore, carried out for finding out the source of resistance against Alternaria leaf blight of rapeseed- mustard caused by *Alternaria barassicae*, under artificial conditions and results are presented in Table 4.

It is clear from the table-4 that out of tested 31 genotype cultivars none were found free from this disease. Two genotype viz., SBG-12-28 and SBG-12-27 on leaves and two genotype viz., SBG-12-28 and SBG-12-26 resistant on pod were observed to be moderately resistant to this disease. Remaining genotypes were found as moderately susceptible, susceptible and highly susceptible, against the Alternaria blight.

## References


Anand, I.J., Singh, J.P. and Malik, R.S. (1985). *Brassica carinata,* a potential oilseed crop for rainfed agriculture. *Cruciferae News* 1: (10): 76-77.

Banga, S.S., Labana, K.S. and Mehdi, B.N. (1884). *Alternaria* incidence in some alio plasmic lines of Indian mustard, *Brassica juncea* (L) Coss. *Theoritical & Applied Genetics*, 67: 195-196.

Bhander, D.S. and Maini, N.S. (1965). Studies on resistance of oleiferous *Brassica* to Alternaria blight. *Indian Oilseeds J.,* 9:58.

Brun, H., Renard, M., Tribodet, M, Plessis, J. and Tangny, S. (1989). Contribution to the genetic control of rapeseed disease. *Phytoma No.* 404 : 40-11.

Chahal, A.S. and Jaura, N.S. (1994). Sources for Alternaria blight resistance in *Brassica. Indian Phytopath,* 47: 5- 306.

Changsri, W. and Weber, G.P. (1963). Three *Alternaria* species pathogenic on certain cultivated crucifers. *Phytopathology,* 53: 643-648.

Conn, K.L., Tewari, J.P. and Awasthi, R.P. (1990). A disease assessment key for Alternaria black spot in rapeseed and mustard. *Can. PI. Dis. Surv*., 70 :19 - 22.

Dang, J. K. Sangwan, M. S., Mehta, N. and Kaushik, C. D. (2000). Multiple disease resistance against four fungal foliar disease of rapeseed-mustard. *Indian Phytopath.,*. 53:4, 455-458. 20ref.

Degenhaudt, K.J., Skoropad, W.P. and Kondra, Z.P, (1974). Effect of Alternaria black spot on yield, oil content and protein of rapeseed. *Can. J.Plant Sci.,* 54: *795-799.*

Hussain, A. and Thakur, R.N. (1963). Some sources of resistance to Alternaria blight of rapeseed and mustard. *Indian Oilseed J.,* 7: 259-261.

Kaddian, A.K. and Saharan, G.S. (1983). Symptomatology, host-range and assessment of yield loss due to *Alternaria brassicae* infection in rapeseed and mustard. *Indian J. Pl. Patho.,* 13 : 319-323.

Khan, M.W. Ansari, N.A. and Muheet, A. (1991). Response of some accessions of rapeseed yellow sarson *(Brassica campestris* var. *yellow sarson* Prain) against Alternaria blight. *Intern. J.Trop. Plant Dis.,* 9: 111-113.

Kolte, S.J. (1986). Important diseases of rapeseed and mustard in India: present Recent research progress and future research needs in oil crops, Niger and rapeseed mustard. Proceeding of the third oil crops network workshop held in Addis Ababa, Ethiopia, 6-10 October, 1986. pp. 91-96.

Mathpal, P., Punetha, H., Tewari, A.K. and Agrawal, S. (2011). Biochemical defense mechanism in rapeseed-mustard genotypes against Alternaria blight disease. *Journal of Oilseed Brassica*,2 (2): 87-94.

Mehrotra, B.S. and Narain, U. (1969). Studies on genus *Alternaria.* Some new records and a new species. *Indian Phytopath. Soc. Bull.,* 5:1-7.

Neergaard, P. (1945). *Danish species of Alternaria and Stemphylium*: Taxonomy, Parasitism, and

economical significance. Humphry millford, Oxford Univ.press, London, 560 pp.

Prasad, R. Khandelwal, G.L. and Jain, J.P. (1970). Morphology, physiology and control of *Alternaria brassicae* on taramira. *Indian Phytopath.*, 23 : 105-110.

Prasad, R., Saxena, Deepa and Dixit, R.K. (2003). Effect of sowing dates, verities and fungicides on the incidence of Alternaria blight of mustard. *J. Oilseeds Res.*, 20 (2): 310-311.

Saharan,G.S., Mehta, N. and Sangwan, M. S.(2005). Development of disease resistance in rapeseed- mustard. *Diseases of oilseed crops*.516-617.

Subramaniam, C.V. (1971). *Hyphomycetes.* I.C.A.R. New Delhi.

Sudheer Kumar and Kalha, C. S. (2005).Evaiuation of rapeseed-mustard germplasm against white rust and Alternaria blight. *Annals of Biology*, 21:1, 73-77.

Tripathi, N.N., Kaushik. C.D., Yadav, T.P. and Yadav, A.K. (1980). Alternaria leaf spot resistance in raya. *Haryana Agric. Univ. J. Res.*, 10:166-168.