J. Indian Agric. & Weed Sci.
Vol. 1, No. 1, Sep. 2001, pp. 45-46

EFFECT OF PHENOLS AND NITROGEN IN THE EXPRESSION OF ALTERNARIA LEAF BLIGHT IN INDIAN MUSTARD (*Brassica juncea*)

LAKSHMI KANT* and S.C. GULATI

Cummings Laboratory, Division of Genetics, Indian Agricultural Research Institute, New Delhi-110012

Abstract

Five plants each from P_1, P_2 and F_1, forty plants from F_2 and, twenty plants each from B_1 and B_2 for total nitrogen estimation and five plants each from P_1, P_2 and F_1, twenty plants from F_2 and ten plants each from B_1 and B_2 for total phenols estimation were randomly selected in a cross Pusa Basant/Bio 8(3). Leaves were collected and analyzed for total phenols and nitrogen content. Higher amount of total phenols were found to be associated with relatively resistant parent Bio 8(3) and the crosses involving Bio 8(3) as a parent. However, discrepancies in the results regarding total nitrogen percentage calls for further investigations

INTRODUCTION

Role of biochemicals in disease resistance has been well recognized in recent past. Among the leaf surface constituents, phenolic compounds and other biochemicals play important role in disease resistance mechanism in various crops. Alternaria blight caused by *Alternaria brassicae* (Berk) Sacc. is the most common and destructive disease of Indian mustard causing 10-70 per cent yeild losses in different species of Brassicas (Kolte 1985; Saharan and Chand 1988). Information available on the role of biochemical compounds with respect to Alternaria blight in Indian mustard (*Brassica juncea* (L) Zern. & Coss) is meager. The present investigation was undertaken to study the role of total phenols and nitrogen in mustard leaves on Alternaria leaf blight.

MATERIALS AND METHODS

Six generations (P_1, P_2, F_1, F_2, B_1 and B_2) of Indian mustard cross Pusa Basant (Susceptible)/Bio 8(3) (relatively resistant) were evaluated in a randomized block design with two replications during rabi season at the experimental farm of Indian Agricultural Research Institute, New Delhi. The crop was planted on October 22 in rows 40 cm apart. Thinning was done 15 days after sowing (DAS) by maintaining plant-to-plant distance 15 cm. Crop was fertilized with N: P_2O_5: K_2O @ 60, 40 and 40 kg/ha respectively. Nitrogen was applied in two splits doses; half at sowing and the remaining half at the first irragation. Other recommended package of practices was also followed to raise healthy crop. Artificial epiphytotic of Alternaria blight was created in various plant populations to facilitate the expression of resistance and susceptibility. The inoculum consisted of spore suspension in water made from freshly infected leaves obtained from the neighboring mustard fields. The infected leaves were collected and the tissue with lesions was cut. These were put in a moist chamber at 24± 2°C for 4 days, blended with water in a waring blender and then sprayed with the help of a 'Ganesh' sprayer. Besides, infector rows of 4 highly susceptible lines of Indian mustard were planted in and around the experimental plots. Inoculum was sprayed twice first 65 DAS and second 95 DAS during the late evening, to create an epiphytotic of disease. The conditions for the development of Alternaria spots were congenial as the prevailing temperature ranged from 6.5 to 24.4°C and the average relative humidity was 68 per cent. The optimum range of maximum and minimum temperature for disease spread has been worked out be 20-23°C and 7 to 10°C respectively with an average relative humidity between 67-73 per cent (Kolte, 1991). Humidity in the experimental plots was maintained by two additional irrigation. Five plants each from P_1, P_2

* Corresponding author Scientist, Crop Improvement Division, Vivekananda Parvatiya Krishi Anusandhan Sansthan (ICAR), Almora-263 601, UTTARANCHAL, India.

and F_1, 40 plants from F_2 and 20 plants each from B_1 and B_2 were selected for total nitrogen estimation, while 5 plants each from P_1, P_2 and F_1, 20 plants from F_2 and 10 plants each from B_1 and B_2 were selected for total phenols estimation. Micro-kjeldhal method was used for estimating total nitrogen and phenol content as per the method of Swain and Hills (1959).

Two leaves almost in similar size from labeled plants of each generation, were sampled at three stages. First sample was taken 58 DAS for completely disease free, second 78 DAS for initial infection and third 98 DAS for severe infection from two replications.

RESULTS AND DISCUSSION

Total phenol content Table 1 shows that Pusa Basant (P_1) and Bio 8(3) [P_2] both had similar phenol content (398.06 and 373.75 mg/g respectively) at 58 days stage (disease free stage). However, both P_1 and P_2 had marked differences in phenol contents at initial infection stage, 78 DAS (387.50 and 452.50 mg/g respectively) and at severe infection 98 DAS (285.00 and 330.00 mg/g respectively). It is also evident that P_2 had higher total phenol content than P_1. Among the backcrosses, B_2 (578.00, 623.88 and 497.88 mg/g) had higher total phenol content than B_1 (444.90, 483.00 and 419.50 mg/g) at all the three stages. F_1 had higher total phenol content than parents at 78 days stage (522.00 mg/g), however reverse was true 98 DAS (288.00 mg/g). B_2 recorded highest total phenol content at all stages.

Phenol content in different generations (P_1, P_2, F_1, F_2, B_1 and B_2) and at three evaluation stages (58, 78 and 98 DAS) was in general, lower at 58 days stage while increased considerably at 78 DAS and again decreased at 98 DAS. Total phenol content in relatively resistant parent P_2 (452.5 mg/g) was much higher than susceptible parent P_1 (387.5 mg/g). Phenol content in F_1 (522.0 mg/g) at 78 days stage was higher than resistant parent P_2 (452.50 mg/g) indicating the role of over dominance for this trait. Since Phenol content in F_2 (398.50 mg/g) at 78 DAS was declined considerably, thereby indicating inbreeding depression. The B_1 mean total phenol content at 78 DAS was lower than F_1 whereas B_2 mean total phenol content was higher than F_1 and B_1, indicating the accumulation of alleles for higher phenol content from Bio 8(3). Therefore, it could be inferred that accumulation of higher phenols was associated with relatively resistant 'Bio 8(3)' and was transmitted favourably to off-springs as evidenced by the mean total phenol content of different generations of cross 'Pusa Basant'/'Bio 8(3)'. Gupta *et al.*, (1990), Chattopadhyay, (1989) and Begum *et al.*, (1993) also reported similar results.

Table 1: Total phenols and nitrogen contents in different generations of cross
Pusa Basant/ Bio 8 (3)

Gene-rations	Total phenol (mg/g)			Total nitrogen (%)		
	58 DAS	78 DAS	98 DAS	58 DAS	78 DAS	98 DAS
P_1	398.06	387.50	285.00	2.115	4.725	3.785
P_2	373.75	452.50	330.00	2.225	4.810	4.220
F_1	328.00	522.00	288.00	2.775	5.110	4.590
F_2	337.75	398.50	284.38	2.265	5.210	4.975
B_1	444.90	483.00	419.50	1.955	5.025	5.135

Total N content in different generations of cross 'Pusa Basant'/'Bio 8(3)' was higher in P2 (2.225, 4.810 and 4.220, % respectively) than P_1 (2.115, 4, 725 and 3.785 % respectively) at all the stages. The total N content in the plants increased at 78 days stage as compared to 58 DAS thereafter decreased at 98 days stage except in B_1 and B_2, wherein N content remain un 'fected. F_1 means were also higher than parents at all the stages. Mean values of B_1 were higher than B_2 at 78 and 98 days stages.

Total nitrogen content showed consistency in different dates. N content was increased at 78 days stage as compared to 58 days stage and then decreased at 98 days stage in all the generations. N content in the resistant parent was numerically higher than susceptible parent. This may probably be due to green manuring in the preceding *kharif* season.

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