

Full Length Research Paper

Sources of resistance in mungbean genotypes to *Cercospora* leaf spot disease and its management

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Sixty-five mungbean genotypes were screened for resistance against *Cercospora* leaf spot under disease epiphytotic condition. The disease symptoms initiated on the lower side of the old leaves of susceptible genotypes and progressively spread all over the plant. Considerable variations among the genotypes were observed with respect to disease reactions. Among the sixty-five genotypes, one genotype LGG-460 was found highly resistant while GM-02-08, GM-02-13 and GM-03-03 were categorized into resistant. However, fifty-two genotypes were found moderately resistant, while the rests of the genotypes were grouped into susceptible to highly susceptible. Minimum disease index (0.9) and Maximum disease control (70.1%) was recorded in the foliar application of Carbendazim (12%) + Mancozeb (63%) 75% WP at 0.2% concentration. However, Hexaconazole (5%) + Captan (70%) 75% WP and Mancozeb 75% WP were also found statistically at par with 1.0 and 1.2 disease index and percent disease control were 61.3 and 62.7, respectively.

Key words: Mungbean, *Vigna radiata*, *Cercospora canescens*.

INTRODUCTION

Mungbean [*Vigna radiata* (L.)] is one of the important pulse crop of India. It is widely cultivated throughout the Asia including India, Pakistan, Bangladesh, Sri Lanka, Thailand, Cambodia, Vietnam, Indonesia, Malaysia and South China. Leaf spot disease caused by *Cercospora*

canescens Ellis and Martin is a serious disease in the mungbean growing areas of the country where high humidity prevails during the growing season. The productivity of pulse crops became stagnant for the last three decades because of less success in developing

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improved varieties and moreover it is grown on marginal and sub marginal lands. Average yield of the crop is very low mainly due to low inherent yield potential and susceptibility of the crop to diseases (Thakur et al., 1977). *Cercospora* leaf spot is one of the important diseases that cause serious losses to mungbean crop and 23% losses in yield have been reported (Quebral and Cagampang, 1970). The disease starts appearing about 30 to 40 days after planting. Depending upon the temperature and humidity, it spreads rapidly in susceptible varieties causing premature defoliation and reduction in size of pods and grains (Grewal et al., 1980). Several workers had reported the effective control of the disease with the application of fungicides (Singh and Singh, 1978). The cheapest, practical and economical control of the disease can be achieved by the resistant source of the disease (Jadhav and Sharma, 1983). Therefore, it is necessary to develop resistant varieties to reduce the disease population and production cost as well as to protect the environment. The latest investigation on the sources of resistance is present need of the day.

MATERIALS AND METHODS

Evaluation of genotypes for resistance

Sixty-five mungbean genotypes obtained from Indian Institute of Pulse Research, Kanpur and Department of Plant Pathology, B. A. College of Agriculture Anand were screened against *Cercospora* leaf spot disease during the season *Kharif* 2011 and 2012 under disease epiphytotic condition. Each test entry was sown in a row of 5 m with 30 cm apart and 10 cm distance from plant to plant alone with variety IR 16 as susceptible check after every 5 test entries. This variety was confirmed to be highly susceptible to the disease during the previous seasons. Initial plant count was taken 10 to 15 days after sowing. The data on severities of *Cercospora* leaf spot on 10 randomly selected plants in each row were recorded. The severities were recorded before flowering, pod formation and at physiological maturity. The severity of disease assessing plant disease resistance reactions was recorded using an arbitrary scale 1 to 5 in terms of leaf coverage by *Cercospora* leaf spot (Park, 1978) where; 1= highly resistant, 2= resistant, 3= moderately resistant, 4= susceptible and 5= highly susceptible.

Management of *Cercospora* leaf spot disease

The experiment was conducted during *Kharif* 2011-12 and 2012-13 (Third week of July) at experimental site of Plant Pathology, B. A. College of Agriculture, Anand under disease epiphytotic condition. The susceptible variety IR 16 was sown in rows 30 cm apart and 10 cm distance from plant to plant in plot size of 5 x 3 m. The treatments were replicated thrice in a randomized block design (RBD). Standard agronomical practices were followed to raise the crop. Fungicides and botanicals were sprayed just after initiation of disease and repeated twice at 15 days interval. Plots without sprays served as check. Observations on disease reactions assessing disease development were recorded 7 days after last sprays of fungicides as well as botanicals using 0 to 5 grade (Kapadiya and Dhruj, 1999) where; 0: No spots on any of the leaf, plant green with dense foliage; 1: lesions affecting 1 to 5% of leaf surface and about

1 to 5% of the total foliage; 2: lesion usually dark brown affecting 6 to 10% of leaf surface and total foliage; 3: lesions affecting 11 to 30% of leaf surface and 11 to 35% of the total foliage; infection more severe on lower leaves; 4: lesions affecting 31 to 60% of leaf surface and about 35 to 70% of the total foliage; slight defoliation of the diseases leaves; 5: Numerous lesions covering 61 to 100% of leaf surface and 71 to 100% of the total foliage; defoliation advancing. Randomly selected five plants were assessed individually from each treatment and the mean disease index was calculated.

RESULTS AND DISCUSSION

The results presented in Table 1 showed considerable difference among the genotypes for the level of resistance against the disease. Out of sixty-five genotypes, one genotype LGG-460 was found highly resistant against the disease while GM-02-08, GM-02-13 and GM-03-03 were grouped as resistant. However, fifty-two genotypes were found moderately resistant, while seven genotypes viz. PDM-84-143, PDM-288, IPM-02-1, IPM -99-125, PDM-139, GM-02-04 and GM-03-10 were grouped into susceptible and the rest of the two genotypes, that is, IPM-02-3 RED and IR-16 were categorized into highly susceptible. The results corroborate with the earlier reports of Raje and Rao (2002) which screened 200 genotypes of mungbean against *Cercospora* leaf spot and reported 174 as resistant; whereas out of 100 diverse stock of mungbean, 18 genotypes were identified as resistant to the disease (Basandrai et al., 1999). Similarly, Haque et al. (1997) reported that twelve genotypes (NM-98, 98-cmg-003, C2/94-4-42, NM-1, NM-2, 98cmg-018, BRM-188, CO-3, Basanti, PDM-11, BARI Mung-2 and VC3960-88) with average disease score of "1", were found highly resistant. On the basis of present investigations, it can be proposed that LGG-460 genotype identified as highly resistant may be exploited in the breeding programme aimed at the development of high level resistant variety of mungbean against *Cercospora* leaf spot.

The two year pooled analysis of data indicate that all fungicides as well as botanicals tested significantly reduced the disease as compared to untreated check (Table 2). Minimum disease index (0.9) and maximum disease control (70.1%) was recorded in the foliar application of Carbendazim (12%) + Mancozeb (63%) 75% WP at 0.2% concentration. However, Hexaconazole (5%) + Captan (70%) 75% WP and Mancozeb 75% WP were also found statically at par with 1.0 and 1.2 disease index and percent disease control were 61.3 and 62.7 respectively. Among botanicals, satisfactory results were not obtained from any of the three botanicals tested. Copper oxychloride 50% WG, Chlorothalonil 75% WP and Propineb 70% WP gave moderate effectiveness against the disease and were statically at par with each other with 1.7, 1.8 and 1.9 disease index and 45.2, 41.5 and 44.5% disease control respectively. The highest mean yield of 9.9 Q/ha was recorded in Carbendazim (12%) + Mancozeb (63%) 75% WP followed by

Table 1. Reaction of mungbean genotypes against *Cercospora* leaf spot under disease epiphytotic condition during season (Mean data *kharif*- 2011 and 2012).

Disease grade	Disease reaction	Number of genotypes	Genotypes
1	Highly resistant	1	LGG-460
2	Resistant	3	GM-02-08, GM-02-13 and GM-03-03
3	Moderately resistant	52	PDM-262, PDM-11, PDM-87, IPM-02-14, BRS-2435, GM-9926, TMV-37, SAPTARI LOCAL, K-851, MEHA, GM-3, GM-4, GM-9703, GM-9705, GM-9917, GM-9918, GM-9925, GM-9926, GM-2K-5, GM-2K-14, GM-02-01, GM-02-02, GM-02-03, GM-02-05, GM-02-06, GM-02-07, GM-02-09, GM-02-10, GM-02-11, GM-02-12, GM-02-14, GM-02-15, GM-02-16, GM-02-17, GM-02-18, GM-02-19, GM-02-20, GM-02-21, GM-03-01, GM-03-02, GM-03-04, GM-03-05, GM-03-06, GM-03-07, GM-03-08, GM-03-09, GM-03-11, GM-03-12, GM-03-13, GM-03-14, GM-03-15 and GM-03-16
4	Susceptible	7	PDM-84-143, PDM-288, IPM-02-1, IPM -99-125, PDM-139, GM-02-04 and GM-03-10
5	Highly susceptible	2	IPM-02-3 RED and IR-16

Table 2. Field evaluation of different fungicides and botanicals against *Cercospora* leaf spot of mungbean in disease epiphytotic conditions

Treatments	Concentration (%)	Mean disease intensity		Pooled	Disease control (%)	Mean yield (Q/ha)		Pooled
		2010-11	2011-12			2010-11	2011-12	
T ₁ : Propineb 70%WP	0.30	1.9	1.8	1.9 ^{bc}	44.5	8.2	8.3	8.2 ^{bc}
T ₂ : Carbendazim (12%) + Mancozeb (63%)75 %WP	0.20	1.0	0.9	0.9 ^a	70.1	9.8	9.9	9.9 ^a
T ₃ : Copper Oxychloride 50% WG	0.24	1.7	1.6	1.7 ^b	45.2	7.5	7.7	7.6 ^b
T ₄ : Chlorothalonil 75% WP	0.2	1.8	1.7	1.8 ^{bc}	41.5	6.2	6.7	6.4 ^{bc}
T ₅ : Hexaconazole (5%) + Captan (70%) 75% WP	0.05	1.0	0.9	1.0 ^{ab}	61.3	9.6	9.8	9.7 ^{ab}
T ₆ : Mancozeb 75%WP	0.20	1.2	1.1	1.2 ^{ab}	62.7	9.4	9.7	9.5 ^{ab}
T ₇ : <i>Azadirachta indica</i>	10	2.4	2.2	2.3 ^c	25.4	6.3	6.3	6.3 ^{bc}
T ₈ : <i>Datura stramonium</i>	10	2.4	2.3	2.4 ^{cd}	22.3	5.9	6.1	6.0 ^c
T ₉ : <i>Catharanthus roseus</i>	10	2.7	2.6	2.6 ^{cd}	16.4	5.5	5.8	5.7 ^{cd}
T ₁₀ : Untreated check	--	3.4	2.8	3.1	--	5.1	5.7	5.4 ^{cd}
S.Em±	--	0.18	0.14	0.15	--	0.69	0.71	0.70
C.D. at 5%	--	0.37	0.29	0.32	--	1.45	1.49	1.46
C.V. %	--	11.13	9.51	10.61	--	11.57	11.50	11.42

Treatments are analysis with three replications. Treatments means with letter(s) in common are at par by DNMR.

Hexaconazole (5%) + Captan (70%) 75% WP and Mancozeb 75% WP with 9.7 and 9.5 Q/ha respectively (Table 2).

The results are in agreement with the earlier findings of Kapadiya and Dhruj (1999) which reported minimum disease intensity (36.4%) and maximum disease control (61.0%) in application of 0.0125% difenconazole while, Carbendazim and Mancozeb gave significantly results reducing the disease as compared to untreated check. These findings are supported by the results of Gangopadhyay et al. (1996) too for the management of *Cercospora* leaf spot of groundnut. In the present study, new combination of molecules viz. Carbendazim (12%) + Mancozeb (63%) 75% WP and Hexaconazole (5%) + Captan (70%) 75% WP were found superior as compared to rest of the single molecules used in the study.

Conflict of Interest

The author(s) have not declared any conflict of interest.

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