



Screening of Mungbean [*Vigna radiata* (L.) Wilczek] Genotypes against Cercospora Leaf Spot Caused by (*Cercospora canescens*) for Disease Resistance

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In India, where vegetarianism is the norm, mungbean [*Vigna radiata* (L.) Wilczek] is a significant source of proteins, minerals, and vitamins. One of the most significant fungal diseases, Cercospora leaf spot caused by *Cercospora canescens*, appears every year with varying intensity and significantly reduces yield. The objective of the current studies was to test 100 genotypes for resistance to *Cercospora canescens* *in vivo* at the Student's Instructional Farm (S.I.F.) A.N.D.U.A. &T., Kumarganj, Ayodhya. According to the rating system, which is based on the severity of the disease, different genotypes were assigned to different grades. Out of total test entries 13 genotypes LGG 607, PM 14- 3, AKM 12-28, VGG 16- 036, Pusa 171, Pusa 172, RMG 1092, RMG 1097, JLM 302-46, IPM 312-19, IPM 312-20, MGG 387 were found free from infection, 18 genotypes SKNM 1502, COGG 13-39 , PM 1511, Type 44, , DDG3, VGG 05-006, TRAM 1, Asha ,BPMR 145, IPM 02-14, TMB -36, CO -6, BMU, MH 805, MH 2-15, MH 421, MVSKAN, Pusa 0672, were found highly resistant 14 genotypes were noticed susceptible and only 3 genotypes were recorded highly susceptible.

Keywords: Screening; *Vigna radiata*; *Cercospora canescens*; leaf spot.

1. INTRODUCTION

The mungbean, sometimes called the green gram or mudga in Sanskrit, is a plant species belonging to the family Legume [1]. "Its scientific name is *Vigna radiata* L., R. Wilczek. One species that was recently removed from the genus Phaseolus to *Vigna* is mungbean. East Asia, Southeast Asia, and the Indian subcontinent are where the mungbean is primarily grown. Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Bihar, Tamil Nadu, Madhya Pradesh, and Uttar Pradesh are the primary regions where it is grown" [2]. "The Indian subcontinent is where the mungbean is believed to have come from, where it was domesticated as early as 1500 BC. Southern and eastern Asia, Africa, Austronesia, the Americas, and the West Indies all received cultivation of mungbean. It is currently common across the Tropics and may be found anywhere from sea level to the Himalayas, where it reaches an elevation of 1850 m". (Lambrides et al., 2006; Mogotsi, 2006). The mungbean may grow in a soil types, but well-drained loams a pH of 5 to 8. It can tolerate some saline soils (Mogotsi, 2006). It also contains 26% protein, 51% carbohydrate, 4% minerals and 3% vitamins [3]. The crop is also utilized as a green manure. Even the husk of the mungbean seed can be utilized as cattle fodder after being soaked in water. These crops are grown in India during the three distinct seasons of *kharif*. After the harvest of pea, gramme, potato, mustard, and linseed, summer mungbean can be produced. In regions where paddy-wheat crop rotation is practiced, *zaid* Moong cultivation is crucial to boosting soil fertility. Mungbean cultivation spanned 43.0 lakh

ha in Uttar Pradesh, producing 28.2 million tons at a yield of 671 kg/ha [4]. Numerous pathogens, including fungi, bacteria, viruses, and nematodes, damage the mungbean crop, and mungbean Cercospora leaf spot is one of the most devastating diseases. In various regions of the country, many diseases harm the mungbean crop. Depending on the temperature throughout the day and night and the relative humidity, the disease begins to evident around 30 days after sowing. These diseases primary symptom is the development of angular lesions on leaves with reddish - coloured margins that range in colour from grey to brown. On branches and pods, similar dots can be seen as well. When compared to *Cercospora cruenta*, *Cercospora canescens* has more but smaller leaf dots. In extreme cases, the patches cluster and take on a burnt appearance. At the time of flowering and pod production, the fungus severely spots and defoliates leaves. Disease also reduces the size of the pods and the production of the grain [5,6]. Mungbean Cercospora Leaf Spot, which is more commonly caused by *Cercospora canescens* is a significant disease in the country's mungbean growing regions. It has been reported that this disease alone causes annual yield losses of up to 58% [7] and 23% losses in yield have been reported [8].

2.MATERIALS AND METHODS

At Student's Instructional Farm (S.I.F.) A.N.D.U.A. &T., Kumarganj, Ayodhya (260 4"N, 810 28"E), the experiment was conducted to evaluate 100 genotypes resistance to *Cercospora canescens* in an *in vivo* condition.

The mungbean genotypes were provided by the Indian Institute of Pulses Research in Kanpur and the Pulse Unit department of Genetics and Plant Breeding at the A.N.D.U.A.&T, Kumarganj, Ayodhya. 100 genotypes in two rows of four metres in length, with 45 centimetres between rows and 15 centimetres between plants, were evaluated during *Kharif-2022*. Kopergoan, a highly susceptible variety of mungbean, was planted as a check in two rows surrounding the experimental plot and one row after each genotype to guarantee uniform disease spread. On the basis of the percentage of infected leaf area, observations concerning the severity of the disease were documented on five randomly selected plants in each genotype using the Mayee and Datar (1986) 1–9 rating system. Every 15 days, the severity of the disease was observed and recorded using a 1–9 rating scale, starting with the onset of symptoms and ending with crop maturity.

The Per cent Disease Index (PDI) was calculated by using formulas as described below [9]:

$$\text{Per cent disease index} = (\text{sum of all numerical rating} / \text{Total no.of leaves examined} \times \text{Maximum grade}) \times 100$$

3. RESULTS AND DISCUSSION

The use of resistant cultivars is beneficial in preventing plant diseases including *Cercospora* leaf spot. To assess the disease reaction against *Cercospora* leaf spot of mung bean caused by *Cercospora canescens*. One hundred genotypes were screened for their reaction against

Cercospora leaf spot (*Cercospora canescens*) in field condition.

Out of hundred genotypes where 13 genotypes viz. LGG 607, PM 14- 3, AKM 12-28, VGG 16-036, Pusa 171, Pusa 172, RMG 1092, RMG 1097, JLM 302-46, IPM 312-19, IPM 312-20, MGG 387 were found free from infection, 18 genotypes viz SKNM 1502, COGG 13-39 , PM 1511, Type 44, , DDG3, VGG 05-006, TRAM 1, Asha ,BPMR 145, IPM 02-14, TMB -36, CO -6, BMU, MH 805, MH 2-15, MH 421, MVSKAN, Pusa 0672, were recorded highly resistant, 6 genotypes viz. AKM 12-24, IPM 02-3, IPM 04-1, PM 14-11, IGKM 2016-1, MDGGV noticed resistant, 20 genotypes viz. IGKM 5-6-27, IPM 02-14, IPM 410-9, JLM 707-5, K 851, KM 2241,KM 2355, LGG 450, LGG 630, MGG 399, MH 2- 15, ML 818, OBG 101, Pusa 171, VGG – 17009, VGG 16-055, SVM 6133, NMK 15-08, JAUM 0936, IPM 14-7 were found moderately resistant, 26 genotypes viz. COGG 912, DGGV 59, IPM 512-1, JAUM 936, LGG 450, MH 1323, MH 1344, ML 2479, ML 2483, NDMK 16-324, NVL 855, OBG 56, OBG 58, Pant M-6, PKVAKM 4, Pusa M1871, Pusa 1872, SKAU M-365, SKNM 1504, SML 1808, SML 1901, SVM 6262, TRCM 171-B-B-12-6, VG 17002, VGG 16-036, Barabanki Local were noticed moderately susceptible, 14 genotypes viz. AKM 1604, AKM 8802, IGKM 06-18-3, MH 1142, OBG 102, Pant M-4, RMB 12-07, SKNM 1514, SKNM 1516, T 44, TMB 126, LBG 450, DGG 7, RMG 1087 were recorded susceptible and 3 genotype kopergoan, PM 1522, and Pusa 0672 recorded highly susceptible. Similar findings were reported by Gupta et al. [10], Singh and Gurha [11], Iqbal et al. [12] and Singh et al. [13,14].

Table 1. List of mungbean genotypes for against screening of *Cercospora* leaf spot disease:

PKVAKM 4, Pusa M1871, Pusa 1872, SKAU M-365, LGG 607, PM 14- 3, AKM 12-28, VGG 16-036, Pusa 171, Pusa 172, RMG 1092, RMG 1097, JLM 302-46, IPM 312-19, IPM 312-20, MGG 387, IGKM 5-6-27, IPM 02-14, IPM 410-9, JLM 707-5, K 851, KM 2241,KM 2355, LGG 450, LGG 630, MGG 399, MH 2- 15, ML 818, OBG 101, Pusa 171, VGG – 17009, VGG 16-055, SVM 6133, NMK 15-08, JAUM 0936, IPM 14-7, SKNM 1502, COGG 13-39 , PM 1511, Type 44, DDG3, VGG 05-006, TRAM 1, MH 805, MH 2-15, MH 421, MVSKAN, Pusa 0672, AKM 12-24, IPM 02-3, IPM 04-1, PM 14-11, IGKM 2016-1, MDGGV 18, AKM 1604, AKM 8802, IGKM 06-18-3, MH 1142, OBG 102, Pant M-4, RMB 12-07, SKNM 1514, SKNM 1516, T 44, TMB 126, LBG 450, DGG 7 , RMG 1087, COGG 912, DGGV 59, IPM 512-1, JAUM 936, Asha ,BPMR 145, IPM 02-14, TMB -36, CO -6, BMU, LGG 450, MH 1323, MH 1344, ML 2479, ML 2483, NDMK 16-324, NVL 855, OBG 56, OBG 58, Pant M-6, SKNM 1504, SML 1808, SML 1901, SVM 6262, TRCM 171-B-B-12-6, VG 17002, VGG 16-036, Barabanki Local, Kopergaon, PM 1522, Pusa 0672.
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Table 2. Disease rating scale for *Cercospora canescens*

S. No.	Grade	% Foliage affected	Reaction
1	1	0	Healthy Plants
2	2	1.1-5	Highly Resistant
3	3	5-10	Resistant
4	4	11-15	Moderately Resistant
5	5-6	16-30	Moderately Susceptible
6	7-8	31-75	Susceptible
7	9	Above 75	Highly Susceptible



1.1. Healthy plant leaf



1.2. Moderately infected leaf



1.3. Highly infected leaf



1.4. Severely infected leaf

Fig. 1. Symptoms showing different level of infection

Table 3. Reaction of mungbean genotypes against *Cercospora canescens*

Rating scale	Reaction	No. of germplasm	Name of germplasm
1	Healthy Plant	13	LGG 607, PM 14- 3, AKM 12-28, VGG 16- 036, Pusa 171, Pusa 172, RMG 1092, RMG 1097, JLM 302-46, IPM 312-19, IPM 312-20, MGG 387.
2	Highly Resistant	18	SKNM 1502, COGG 13-39 , PM 1511, Type 44, , DDG3, VGG 05-006, TRAM 1, Asha ,BPMR 145, IPM 02-14, TMB -36, CO -6, BMU, MH 805, MH 2-15, MH 421, MVSKAN, Pusa 0672.
3	Resistant	06	AKM 12-24, IPM 02-3, IPM 04-1, PM 14-11, IGKM 2016-1, MDGGV 18.
4	Moderately resistant	20	IGKM 5-6-27, IPM 02-14, IPM 410-9, JLM 707-5, K 851, KM 2241, KM 2355, LGG 450, LGG 630, MGG 399, MH 2- 15, ML 818, OBG 101, Pusa 171, VGG – 17009, VGG 16- 055, SVM 6133, NMK 15-08, JAUM 0936, IPM 14-7.
5-6	Moderately susceptible	26	COGG 912, DGGV 59, IPM 512-1, JAUM 936, LGG 450, MH 1323, MH 1344, ML 2479, ML 2483, NDMK 16-324, NVL 855, OBG 56, OBG 58, Pant M-6, PKVAKM 4, Pusa M1871, Pusa 1872, SKAU M-365, SKNM 1504, SML 1808, SML 1901, SVM 6262, TRCM 171-B-B-12-6, VG 17002, VGG 16- 036, Barabanki Local.
7-8	Susceptible	14	AKM 1604, AKM 8802, IGKM 06-18-3, MH 1142, OBG 102, Pant M-4, RMB 12-07, SKNM 1514, SKNM 1516, T 44, TMB 126, LBG 450, DGG 7 , RMG 1087.
9	Highly Susceptible	03	Kopergaon, PM 1522, Pusa 0672.

4. CONCLUSION

This study very well demonstrated the screening of mungbean genotypes against *Cercospora* leaf spot disease. From result we found that 18 genotypes were highly resistant, farmer can use these genotypes to get rid from *Cercospora leaf spot* of mungbean, instead of the chemical management which is highly toxic to environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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