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# Screening of Mungbean [*Vigna radiata* (L.) Wilczek] Genotypes against Web Blight Caused by (*Rhizoctonia solani* Kühn) 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

Mungbean [*Vigna radiata* (L.) Wilczek] is the important source of proteins, minerals, and vitamins of the predominantly vegetarian Indian diet. Web blight caused by *Rhizoctonia solani* (Kuhn) is one of the most important fungal diseases which appear every year in varying intensity and causes heavy reduction in yield. The present investigations were carried out at the Student's Instructional Farm (S.I.F.) A.N.D.U.A. &T., Kumarganj, Ayodhya to test the resistance of 100 genotypes against *Rhizoctonia solani* Kühn under natural conditions (*In vivo*).Genotypes were placed in different

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grades according to the rating scale which is based on disease severity. Out of total test entries nine genotypes viz., DGGV-2, OUM11-5, RMG1030, IPM9901-8, DGG1, SML10-82, MH2-15, LGG450 and CGG945 were found free from infection, twelve genotypes viz., RMG-975, CGG-973, AKM -8802, IPM -02-3, MH-4, Pusa -0672, AKM-4, CO-5 Check, Bbara S. check, Asha, BPMR 145 and IPM 02-14 were recorded highly resistant, twenty four genotypes were noticed susceptible and only nine genotypes were found highly susceptible.

*Keywords: Screening; Vigna radiate; Rhizoctonia solani; web blight.*

## 1. INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is the important source of protein in vegetarian Indian diet. It belongs to the family Leguminaceae. Among the pulses mungbean also called as green gram or golden gram. Mungbean is primarily a rainy-season crop, but with the development of early maturing varieties, it has also proved to be an ideal crop for the spring and summer seasons. It is mainly grown in Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Bihar, Tamil Nadu, Madhya Pradesh, and Uttar Pradesh [1]. Mung bean is native to Asia particularly North Eastern Indo Burma region. The progenitor of mung bean is *Vigna radiata* var. sublobata (Roxb), which can be seen growing wild in wasteland in Central India.In Uttar Pradesh, it is cultivated on 93000 ha, with a production of 9480 tonnes. Compared, the productivity of mung bean in India and the U.P. is 567 kg/ha and 536 kg/ha, respectively, which is very low compared to the genetic potential of 1500–2000 kg/ha [1]. The main factors that limit its low productivity are the attack of various biotic and abiotic stresses. Among them, diseases caused by fungi, bacteria, and viruses are major potential threats that damage green bean productivity. In 1924, leaf blight was first reported in Philippine green beans [2].In India, Dwivedi and Saksena [3] first reported this disease in green beans in Kanpur, Uttar Pradesh. Additionally, it has also been reported from Assam [4], Punjab [5], Madhya Pradesh [6], Bihar, Rajasthan, Haryana, Himachal Pradesh and Jammu and Kashmir [7]. Web blight caused by *Rhizoctonia solani* (Kuhn) is one of the most important fungal diseases which appear every year in varying intensity and causes heavy reduction in yield. The losses in grain yield is more when the plants get infected earlier i.e. after 25 days after sowing (DAS) than 35 and 40 DAS. Gupta *et al.* [8] yield and weight loss of 33.40 to 37.80% and 23.12 to 28.60%, respectively, in different green bean varieties K 851, T44 and Pusa Baisakhi. Although leaf blight can be overcome using fungicides, problems such as environmental pollution, residual effects on grains and destruction of non-target organisms arise. Therefore, the use of this medicine is not recommended. Therefore, to minimize losses caused by blight disease, low-cost and environmentally friendly management measures are needed. Many genotypes have been found resistant against web blight disease of mungbean and urdbean for effective management of different crops caused by *Rhizoctonia solani,* therefore keeping in view the importance of the crop and seriousness of diseases present research work carried to find out resistant genotypes against web blight disease.

## 2. MATERIALS AND METHODS

The experiment was carried out at Student's Instructional Farm (S.I.F.) A.N.D.U.A. &T., Kumarganj, Ayodhya (located at $26^0$ 4''N, $81^0$ 28''E) to test the resistance of 100 genotypes against *Rhizoctonia solani* Kühn under natural conditions (*In vivo*). The Indian Institute of Pulses Research in Kanpur and the Pulse Section department of Genetics and Plant Breeding at the A.N.D.U.A. &T, Kumarganj Ayodhya provided the mungbean genotypes. During Kharif in 2022, a total of 100 genotypes were assessed in two rows of 4 m length, 45 cm between rows, and 15 cm between plants. To ensure uniform disease spread, K-851 (a highly susceptible variety of mungbean) as a check was planted in two rows around the experimental plot and one row after each genotype. Observations regarding disease severity were recorded according to 1-9 rating scale of Mayee and Datar [9] on 05 randomly selected plants in each genotypes on the basis of per cent infected leaf area**.** Beginning with the first appearance of symptoms and ending with crop maturity, observations on disease severity was made every 15 days and recorded using a 1-9 rating scale.

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

$$\%\ disease\ index = \frac{Sum\ of\ all\ numerical\ ratings}{Total\ \text{no. of leaves examined x Maximum grade}} \times 100$$

**Table 1. Varietal screening of mungbean genotypes against *Rhizoctonia solani* name of genotypes**

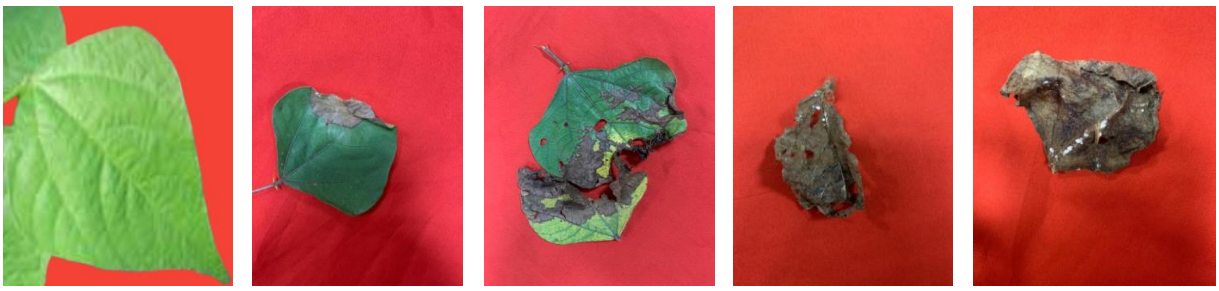
| |
|---|
| DGGV-2, Kopergaon, DGG-5, COGG912, OUM11-5, Selection-4, Pant M6, RMG1030, IPM9901-8, DGG1, SML10-82, MH2-15, LGG450, SGC-20, KM 23-42, NVL516, IGKM 0 -26-30, DDG3, GM04-02, IPM 410-3, IPM 2K15-4, VGG 05-006, TRAM 1, PM 09-11, GM 11-02, MH 810, Pusa 1472, HUM 27, DGG 6, COGG 10-10, LGG 460, IPM 2-3, HUM-1, MH 2-15, TMB -17, RMG -976, MH-729, AKM -4, NDM -10-30, GM -06-08, IPM-302-2, IPM-2K14-9, IPM-0209-3, RMG-989, NDM 10-35, RMG-977, MH-709, NDM-9-18, RMG-975, CGG-975, CGG-973, AKM -8802, IPM -02-3, MH-2-15, MH-4, HUM -1, ML -131, M 2 -818, Pusa -0672, AKM-4, CO-5 Check, K-851, Bbara S. check, Asha , Basanti, BM 2002-1, BM 2003-2, BPMR 145, IPM 02-14, TMB -36, CO -6, BMU, LBG 407, MH 805, MH 2-15, MH 421, MVSKAN, Pairy Moong, Pusa 0672, Pusa Baisakhi, Pusa Ratna, Pusa Vishal, Pusa 9531, RMG 268, RMG 344, RMG 492, RMG 62, RMG 991, SML 1082, LGG 450, LBB 623, CO -5, LGB 450, ML -818, ML -1628, ML -1666, ML -1464, K -851, DGGS -4, ML -1907 |

**Table 2. Disease rating scale for Web blight [9]**

| S.N. | 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 |

## 3. RESULTS AND DISCUSSION

The use of resistant cultivars is beneficial in preventing all plant diseases including web blight. To assess the disease reaction against web blight of mung bean caused by *Rhizoctonia solani***.**One hundred genotypes were screened for their reaction against web blight (*Rhizoctonia solani*) in field condition. It is clear from table (3) that out of total test entries, nine genotypes viz., DGGV-2, OUM11-5, RMG1030, IPM9901-8, DGG1, SML10-82, MH2-15, LGG450 and CGG945 were found free from infection, twelve genotypes viz., RMG-975, CGG-973, AKM -8802, IPM -02-3, MH-4, Pusa -0672, AKM-4, CO-5 Check, Bbara S. check, Asha, BPMR 145 and IPM 02-14 were recorded highly resistant, twelve viz., BM 2002-1, BM 2003-2, Pairy Moong, RMG268, DGGS -4, RMG 991, LBB 623, CO -5, LGB 450, ML -1628, ML -1666 and ML -1907 were noticed resistant, while only nine genotypes K -851, NDM -10-30, IPM-302-2, NDM 10-35, MH-709, NDM-9-18, MH-2-15, ML -818 and ML -1464 found highly susceptible. Similar findings were reported by Singh et al. [10].



**1a. Healthy plant leaf** | **1b. Moderately infected leaf** | **1c. Highly infected leaf** | **1d. Severely infected leaf** | **1e. Infected leaf with sclerotial formation**

**Fig. 1(a-e). Healthy plant leaf and infected leaf with various aspects**

**Table 3. Reaction of mungbean genotypes against *Rhizoctonia solani***

| Rating scale | Reaction | No. of germplasm | Name of germplasm |
|---|---|---|---|
| **1** | Healthy Plant | 09 | DGGV-2, OUM11-5, RMG1030, IPM9901-8, DGG1, SML10-82, MH2- 15, LGG450, CGG945 |
| **2** | Highly Resistant | 12 | RMG-975, CGG-973, AKM -8802, IPM -02-3, MH-4, Pusa -0672, AKM-4, CO5 Check, Bbara S. check, Asha, BPMR 145, IPM 02-14 |
| **3** | Resistant | 12 | BM 2002-1, BM 2003-2, Pairy Moong, RMG268, DGGS -4, RMG 991, LBB 623, CO -5, LGB 450, ML -1628, ML - 1666, ML - 1907 |
| **4** | Moderately Resistant | 14 | Kopergaon, COGG912, HUM 27, COGG 10-10, LGG 460, RMG-977, ML -131, M 2 - 818, Basanti, LBG 407, Pusha Vishal, RMG 492, SML 1082, LGG 450 |
| **5-6** | Moderately Susceptible | 20 | PM 09-11, GM 11-02, CGG-975, HUM -1, KM 23-42, IGKM 05-26-30, DDG3, VGG 05-006, TRAM 1, DGG 6, MH 810, IPM 2-3, HUM-1, TMB -17, RMG -976, AKM -4, GM-06-08, IPM-2K14- 9, IPM-0209-3, RMG-989 |
| **7-8** | Susceptible | 24 | DGG-5, Selection-4, Pant M6, SGC-20, NVL516, GM04-02, IPM 410-3, IPM 2K15-4, Pusa 1472, MH 2-15, MH-729, TMB -36, CO -6, BMU, MH 805, MH 2-15, MH 421, MVSKAN, Pusa 0672, Pusa Baisakhi, Pusa Ratna, Pusa 9531, RMG 344, RMG 62 |
| **9** | Highly Susceptible | 09 | K -851, NDM -10-30, IPM-302-2, NDM 10-35, MH-709, NDM-9-18, MH2-15, ML -818, ML -1464 |

## 4. CONCLUSION

Our study very well demonstrated the screening of mungbean genotypes against web blight disease. From our result we found that 12 genotypes were highly resistant, farmer can use these genotypes to get rid from web blight 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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