Screening of Mungbean [*Vigna radiata* (L.) Wilczek] genotypes against Web blight caused by (*Rhizoctonia solani* Kühn) for disease resistance

Abstract:

Mungbean [*Vigna radiata* (L.) Wilczek] is the important source of proteins, minerals, and vitamins of the predominantly vegetarian Indian diet. It belongs to the family Leguminaceae. 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.* 25 days after sowing (DAS) than 35 and 40 DAS. It causes losses in yield and weight 33.40 to 37.80 per cent and 23.12 to 28.60 per cent in different varieties. 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 grades according to the rating scale (Mayee and Datar, 1986) which is based on disease severity. Out of total test entries nine genotypes were found free from infection, twelve genotypes were recorded highly resistant, twelve were noticed resistant, fourteen genotypes were found moderately resistant, twenty genotypes were recorded moderately susceptible, twenty four genotypes were noticed susceptible and only nine genotypes were found highly susceptible.

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Keywords: Screening, *Vigna radiata*, *Rhizoctonia solani*, Web blight

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 (Anonymous, 2019). 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 (Anonymous, 2019). The major limiting factors for its poor yield are the attacks of various biotic and abiotic stresses. Among them, diseases caused by fungi, bacteria, and viruses are major potential threats that adversely affect the productivity of mung bean. In 1924, web blight was reported for the first time on mung bean from the Philippines (Nacien, 1924). While in India, Dwivedi and Saksena (1974) first reported it on mung beans from Kanpur, Uttar Pradesh. Further, it has also been reported from Assam (Saikia, 1976), Punjab (Bains *et al.*, 1988), Madhya Pradesh (Tiwari and Khare, 1998), Bihar, Rajasthan, Haryana, Himachal Pradesh, and Jammu & Kashmir (Anonymous, 2004). 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.* (2010) reported losses in yield and lost weight were 33.40 to 37.80 per cent and 23.12 to 28.60 per cent respectively in different varieties of mung bean *i.e.* K 851, T44 and Pusa Baisakhi. Though, the web blight could be managed by the use of fungicide but due to the emergence of several problems like environmental pollution, residual effect in grains, killing non targeted organisms its use should be discouraged. Hence, for minimizing the losses caused by web blight need in-expensive and environmentally safe management practices. 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.

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 (1986) 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.

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, Pusha 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 (Mayee and Datar, 1986).

S.N.	Grade	% Foliage affected	Reaction
1	1	No infection	Free from infection
2	2	0.1-5	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

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

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

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, fourteen genotypes viz., Kopergaon, COGG912, HUM 27, COGG 10-10, LGG 460, RMG-977, ML -131, M 2 -818, Basanti, LBG 407, Pusha Vishal, RMG 492, SML1082 and LGG 450 were found moderately resistant, twenty genotypes viz., 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 and RMG-989, were recorded moderately susceptible, twenty four genotypes viz., 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 and RMG 62 were noticed susceptible 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.*, (2021).

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

Rating scale	Reaction	No. of germplasm	Name of germplasm
1	Free from infection	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

Year 2022

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