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Identifying of Mungbean Resistance Genotypes against Mungbean Yellow Mosaic Virus, Anthracnose and Cercospora Diseases under Natural Condition in Tripura

Debashre Bhattacharjee[1*] and Jayashree Bhattacharjee[2]

[1]MULLaRP, ICAR RC for NEH Region, Tripura Centre, Lambucherra-799210
[2]Department of Plant Pathology, Bidhan Chandra KrishiViswavidyalaya, Mohanpur, Nadia, West Bengal – 741252

**Corresponding author*

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A B S T R A C T

One hundred one genotypes/lines of mungbean germplasm were screened against MYMV, cercospora and anthracnose under natural field conditions at Tripura centre lembucherra. The germplasm was categorized in to resistant and susceptible depending upon severity of disease. The present investigation aimed to identify stable both MYMV, cercospora and anthracnose resistant lines with high yielding through screening under natural condition. The experimental material consisted of 101germplasm lines screened under field condition. Results revealed that most of the genotypes studied were categorized as resistant to moderately resistant. In spite of the variable response to MYMV, Cercospora and Anthracnose TRCM131-1, TRCM83-2-3, TRCM1-9-3, TRCM3-1-6, TRCM2-4-2, TRCM5-6-2, TRCM3-6-1, TRCM2-4-3, TRCM81-2-1, TRCM1-8-2, TRCM7-1-3, TRCM3-5-1, TRCM13-4-3, TRCM13-4-1, TRCM2-1-2, TRCM83-2-10 best genotypes with higher yield would be utilized as donors to develop resistant lines and these will be advanced for multilocational yield trial for selection as promising variety.

Introduction

Mungbean (*Vigna radiate* L. Wilczek) is one of the important pulse crops in India. Among several constraints for mungbean production, Mungbean Yellow Mosaic Virus (MYMV), anthracnose and cercospora diseases are occupies prime position and the most destructive and devastating viral disease. MYMV transmitted through whitefly (*Bemisia tabaci*). Spread of MYMV incidence is only possible by way of controlling the vector viz., whitefly population using insecticides which are ineffective under severe infestations. Yield loss up to 80% was reported in susceptible cultivars by Ayub *et al.*, (1989). Mungbean is affected with different fungal, bacterial and viral diseases. (Singh, 2011) but viral diseases are serious threat to crop and among them, yellow mosaic disease caused by mungbean

yellow mosaic virus (MYMV) appeared to be serious and widely spread in Pakistan, Bangladesh, India, Srilanka, Thailand, Philippines (Bakar 1981; Honda *et al.*, 1983; Chenulu and Verma, 1988; Malik 1991; Malik and Bashir, 1992). Mungbean anthracnose caused by a fungal pathogen *Colletotrichum lindemuthianum* (sacc. and magns.).

Use of virus resistant variety is the only solution to avoid occurrence of MYMV disease.As well as Cercospora leaf spot and anthracnose disease of mungbean is a destructive and widespread fungal disease. The present investigation aimed to identify stable MYMV anthracnose and cercospora resistant lines through screening under natural condition. The experimental material consisted of 101 stable advanced breeding lines developed at ICAR Research Complex for NEH Region, Tripura Centre, following pedigree selection from different crosses. The screening was carried out under normal field condition at two locations during kharif, 2015. Infected rows with most susceptible variety were planted along with the test entries. Results revealed that most of the developed breeding lines were moderately resistant to resistant in reaction to MYMV. In spite of the variable response to MYMV, the genotypes TRCM 415-1-1, TRCM 2-4-2, TRCM 86-2-3, TRCM 1-3-1, TRCM 1-6-5-4, TRCM 7-8-12, TRCM 3-5-1, TRCM 3-3-5, TRCM 7-1-1exhibited resistance in both the locations and gives highest yield. These genotypes would be utilized as donors to develop MYMV resistant lines.

Materials and Methods

The experimental material in the present study consisted of 101 mungbean germplasm lines collected from ICAR Tripura centre. The above materials were screened under natural condition to yellow mosaic virus anthracnose and cercospora disease. Each entry is sown in two lines of three meter length with the spacing of 25× 10 cm in two replications. All the recommended agronomic practices were followed. No insecticidal and fungicidal spray was given in order to allow the whitefly and fungal population to spread the diseases. Disease incidence was recorded periodically.

Disease severity	Percent infection	Infection category	Reaction group
1	No infection	Resistant	RR
3	11-20%infection	Moderately resistant	MR
5	21-30%infetion	Moderately Susceptible	MS
7	30 -50%infection	susceptible	S
9	Morethan 50%infection	Highly susceptible	HS

Breeding lines were graded as no Infection/ highly resistant (1/R), 11-20% plants tissue infection (3/MR), highly moderately resistant (5/MS), susceptible (7/S) and highly susceptible (9/HS) reaction, respectively.

Resistant category with higher yield will be advanced for multilocational yield trial for selection as promising variety. Other lines with resistant reaction to MYMV anthracnose and cercospora will be utilized in further improvement.

Results and Discussion

Evolution of resistant varieties is considered to be the most feasible and durable solution of controlling of MYMV diseases and as well as cercospora and anthracnose diseases under natural condition without spraying any insecticidal and fungicidal spray (Table 1).

Table.1 *Per se* performance of the advanced breeding lines of mung for yield and yield attributing characters

Grade	YMV disease score	Genotypes	Grade	Cercospora disease scoring	Genotypes	Grade	Anthracnose	Genotypes
R	1	TRCM131-1	R	1	TRCM131-1	R	1	TRCM131-1
R	1	TRCM85-2-1	R	1	TRCM1-7-60	R	1	TRCM85-2-1
R	1	TRCM415-1-1	R	1	TRCM5-1-1	R	1	TRCM83-2-3
R	1	TRCM403-1-1	R	1	TRCM407-1	R	1	TRCM1-9-4
R	1	TRCM2-3-1	R	1	TRCM104-4-3	R	1	TRCM1-9-3
R	1	TRCM1-1-1	R	1	TRCM83-2-3	R	1	TRCM3-1-6
R	1	TRCM1-8-5	R	1	TRCM1-9-3	R	1	TRCM1-9-1
R	1	TRCM1-7-3	R	1	TRCM1-2-1(4 lines)	R	1	TRCM2-7-1
R	1	TRCM1-7-4	R	1	TRCM103-1	R	1	TRCM1-6-2
R	1	TRCM9-3-3	R	1	TRCM3-1-6	R	1	TRCM88-3-3
R	1	TRCM1-7-60	R	1	TRCM1-9-1	R	1	TRCM2-4-2
R	1	TRCM5-1-1	R	1	TRCM2-7-1	R	1	TRCM86-2-3 (4line
R	1	TRCM407-1	R	1	TRCM88-3-3	R	1	TRCM1-3-5
R	1	TRCM104-4-3	R	1	TRCM2-4-2	R	1	TRCM5-6-2
R	1	TRCM83-2-3	R	1	TRCM86-2-3(4line	R	1	TRCM3-1-1
R	1	TRCM1-9-3	R	1	TRCM1-3-1	R	1	TRCM2-7-7
R	1	TRCM1-2-1	R	1	TRCM5-6-2	R	1	TRCM3-6-1
R	1	TRCM103-1	R	1	TRCM1-6-5-4	R	1	TRCM2-4-3
R		TRCM3-1-6	R	1	TRCM1-3-3	R	1	TRCM5-4-2
R	1	TRCM1-9-1	R		TRCM1-1-2	R	1	TRCM81-2-1
R	1	TRCM2-7-1	R	1	TRCM74-2-3	R	1	TRCM1-8-2
R	1	TRCM88-3-3	R	1	TRCM2-2-1	R	1	TRCM151-1
R	1	TRCM2-4-2	R	1	TRCM3-1-1	R	1	TRCM2-3-5
R	1	TRCM86-2-3	R	1	TRCM7-8-12	R	1	TRCM7-1-3(4 line)
R	1	TRCM1-3-1	R	1	TRCM1-6-3	R	1	TRCM3-5-1
R		TRCM5-6-2	R	1	TRCM3-4-4	R	1	TRCM13-4-3
R	1	TRCM1-6-5-4	R	1	TRCM2-7-7	R	1	TRCM1-8-4
R	1	TRCM1-3-3	R	1	TRCM3-6-1	R	1	TRCM2-7-2
R	1	TRCM74-2-3	R	1	TRCM1-4-2	R	1	TRCM9-4-7
R	1	TRCM7-8-12	R	1	TRCM2-7-5	R	1	TRCM3-1-2
R	1	TRCM3-6-1	R	1	TRCM2-4-3	R	1	TRCM2-1-3
R	1	TRCM2-4-3	R	1	TRCM7-2-1(4line)	R	1	TRCM5-1-2(4line)
R	1	TRCM1-9-5	R	1	TRCM5-4-2	R	1	TRCM303-4-1
R	1	TRCM88-3-2	R	1	TRCM81-2-1	R	1	TRCM2-3-1
R	1	TRCM5-4-2	R	1	TRCM1-8-2	R	1	TRCM13-4-1
R	1	TRCM81-2-1	R	1	TRCM1-7-60	R	1	TRCM4-4-3
R	1	TRCM1-8-2	R	1	TRCM151-1	R	1	TRCM7-2-2
R	1	TRCM1-7-60	R	1	TRCM1-5-1	R	1	TRCM1-6-4
R	1	TRCM1-5-1	R	1	TRCM2-3-5	R	1	TRCM83-2-10
R	1	TRCM2-8-2	R	1	TRCM3-4-2	R	1	TRCM2-1-2
R	1	TRCM7-1-3	R	1	TRCM2-8-2	R	1	TRCM7-1-1
R	1	TRCM3-5-1	R	1	TRCM7-1-3	R	1	TRCM100-5-2

					(4 line)			
R	1	TRCM2-6-3	R	1	TRCM3-5-1	MR	3	TRCM415-1-1(6 lines)
R	1	TRCM5-2-2	R	1	TRCM1-1-4(4 line)	MR	3	TRCM403-1-1
R	1	TRCM1-5-3	R	1	TRCM2-6-3	MR	3	TRCM2-3-1
R	1	TRCM3-6-5	R	1	TRCM5-2-2	MR	3	TRCM1-1-1
R	1	TRCM13-4-3	R	1	TRCM1-5-3	MR	3	TRCM1-8-5
R	1	TRCM3-5-1	R	1	TRCM3-6-5	MR	3	TRCM1-7-3
R	1	TRCM2-7-2	R	1	TRCM13-4-3	MR	3	TRCM1-2-1(4 lines)
R	1	TRCM2-7-9	R	1	TRCM1-4-1	MR	3	TRCM103-1
R	1	TRCM9-4-7	R	1	TRCM2-7-4	MR	3	TRCM1-2-2
R	1	TRCM3-6-3	R	1	TRCM7-4-8(6 lines)	MR	3	TRCM1-3-1
R	1	TRCM3-1-2	R	1	TRCM1-8-4	MR	3	TRCM1-6-5-4
R	1	TRCM303-4-1	R	1	TRCM3-5-1	MR	3	TRCM1-1-2
R	1	TRCM2-3-1	R	1	TRCM2-7-2	MR	3	TRCM74-2-3
R	1	TRCM13-4-1	R	1	TRCM2-7-9	MR	3	TRCM2-2-1
R	1	TRCM4-4-3	R	1	TRCM9-4-7	MR	3	TRCM7-8-12
R	1	TRCM303-3-2	R	1	TRCM3-6-3	MR	3	TRCM1-6-3
R	1	TRCM8-2-10	R	1	TRCM3-1-2	MR	3	TRCM3-4-4
R	1	TRCM3-3-5	R	1	TRCM2-1-3	MR	3	TRCM1-4-2
R	1	TRCM7-2-2	R	1	TRCM5-1-2(4line)	MR	3	TRCM2-7-5
R	1	TRCM1-6-4	R	1	TRCM303-4-1	MR	3	TRCM7-2-1(4line)
R	1	TRCM3-1-5	R	1	TRCM2-3-1	MR	3	TRCM7-3-1
R	1	TRCM7-1-2	R	1	TRCM13-4-1	MR	3	TRCM1-9-5
R	1	TRCM83-2-10	R	1	TRCM4-4-3	MR	3	TRCM88-3-2
R	1	TRCM2-1-2	R	1	TRCM303-3-2	MR	3	TRCM1-5-1
R	1	TRCM7-1-1	R	1	TRCM8-2-10	MR	3	TRCM2-8-2
R	1	TRCM8-2-5	R	1	TRCM3-3-5	MR	3	TRCM1-1-4(4 line)
R	1	TRCM100-5-2	R		TRCM1-6-4	MR	3	TRCM1-5-3
MR	3	TRCM1-4-4	R	1	TRCM1-9-1	MR	3	TRCM1-4-1
MR	3	TRCM1-8-3	R	1	TRCM7-1-2	MR	3	TRCM2-7-4
MR	3	TRCM4-7-1	R	1	TRCM8-2-6	MR	3	TRCM7-4-8(6 lines)
MR	3	TRCM1-9-4	R	1	TRCM83-2-10	MR	3	TRCM3-5-1
MR	3	TRCM1-6-2	R	1	TRCM2-1-2	MR	3	TRCM2-7-9
MR	3	TRCM1-2-2	R	1	TRCM100-5-2	MR	3	TRCM3-6-3
MR	3	TRCM1-3-5	R	1	TRCM5-2-5	MR	3	TRCM8-2-10
MR	3	TRCM1-1-2	MR	3	TRCM85-2-1	MR	3	TRCM3-3-5
MR	3	TRCM2-2-1	MR	3	TRCM415-1-1(6 lines)	MR	3	TRCM86-2-9
MR	3	TRCM3-1-1	MR	3	TRCM403-1-1	MR	3	TRCM3-1-5
MR	3	TRCM1-6-3	MR	3	TRCM1-1-1	MR	3	TRCM1-9-1
MR	3	TRCM3-4-4	MR	3	TRCM1-8-5	MR	3	TRCM7-1-2
MR	3	TRCM2-7-5	MR	3	TRCM1-8-3	MR	3	TRCM5-2-5
MR	3	TRCM7-2-1	MR	3	TRCM4-7-1	MS	5	TRCM1-7-4
MR	3	TRCM7-3-1	MR	3	TRCM1-9-4	MS	5	TRCM9-3-3
MR	3	TRCM151-1	MR	3	TRCM1-6-2	MS	5	TRCM1-4-4
MR	3	TRCM3-4-2	MR	3	TRCM1-2-2	MS	5	TRCM1-7-60
MR	3	TRCM1-1-4	MR	3	TRCM1-3-5	MS	5	TRCM407-1

MR	3	TRCM1-4-1	MR	3	TRCM7-3-1	MS	5	TRCM1-8-3
MR	3	TRCM2-7-4	MR	3	TRCM86-2-9	MS	5	TRCM4-7-1
MR	3	TRCM7-4-8	MR	3	TRCM7-2-2	MS	5	TRCM104-4-3
MR	3	TRCM1-8-4	MR	3	TRCM3-1-5	MS	5	TRCM1-7-60
MR	3	TRCM2-1-3	MS	5	TRCM2-3-1	MS	5	TRCM1-3-3
MR	3	TRCM5-1-2	MS	5	TRCM1-7-3	MS	5	TRCM3-4-2
MR	3	TRCM86-2-9	MS	5	TRCM9-3-3	MS	5	TRCM5-2-2
MR	3	TRCM1-9-1	MS	5	TRCM1-4-4	MS	5	TRCM3-6-5
MR	3	TRCM8-2-6	MS	5	TRCM88-3-2	MS	5	TRCM8-2-6
MR	3	TRCM5-2-5	MS	5	TRCM7-1-1	MS	5	TRCM8-2-5
MS	5	TRCM2-7-7	MS	5	TRCM8-2-5	S	7	TRCM2-6-3
MS	5	TRCM1-4-2	S	7	TRCM1-7-4	S	7	TRCM303-3-2
MS	5	TRCM2-3-5	S	7	TRCM1-9-5	HS	9	TRCM5-1-1

Screening mungbean germplasm against these diseases under natural condition is the first step in identifying the resistant donors for evolving the mungbean varieties with YMV, anthracnose and cercospora resistance.

The study revealed that maximum number of entries was grouped under Resistant to Moderately resistant categories in both the locations. Out of 101breeding lines tested, 72 exhibited resistant, 26 moderately resistant, and only 3moderately susceptible disease reaction in case of ymv disease. Naqvi *et al.*, (1995) studied that out of 10 tested lines, there was no resistant line to MYMV. Shad *et al* (2006) found that there was no resistant line against MYMV and identification of seven susceptible and 247 as highly susceptible lines exhibited meager resistance in mungbean. Iqbal *et al.,* (2011) screened 100 lines of mungbean germplasm and out of which only four lines shows resistance under field condition. Salam *et al.,* (2009) found 3 lines out of 93 genotypes as resistant.

Habib *et al.*, (2007) evaluated 108 germplasm lines but no resistant line was found. In our study while screening of cercospora disease 78 lines exhibited to cercospora15 germplasm exhibited moderately resistant, 7 lines moderately susceptible. While anthracnose disease scoring 41 lines showed, 40 moderately resistant and 15. moderately susceptible 1 susceptible and 1 highly susceptible. According to this study 29 lines resistant to ymv as well as cercospora and anthracnose diseases as considered as best promising lines, these lines are TRCM131-1, TRCM83-2-3, TRCM1-9-3, TRCM3-1-6, TRCM1-9-1, TRCM2-7-1, TRCM88-3-3, TRCM2-4-2, TRCM86-2-3, TRCM5-6-2, TRCM2-4-3, TRCM3-6-1, TRCM5-4-2, TRCM81-2-1, TRCM1-8-2, TRCM7-1-3, TRCM3-5-1, TRCM13-4-3, TRCM2-7-2, TRCM9-4-7, TRCM3-1-2, TRCM303-4-1, TRCM2-3-1, TRCM13-4-1, TRCM4-4-3, TRCM1-6-4, TRCM83-2-10, TRCM2-1-2, TRCM2-1-2 are showing resistant to YMV, cercospora, anthracnose diseases. Datta *et al.*, (2012) also reported the resistance nature of the genotype IPM-02-03. Similarly Paul *et al.*, (2013) reported PDM-139 (Samrat) as variety resistant to yellow mosaic and recommended for use in disease resistance breeding programmes. The genotypes grouped under resistant category with higher yield germplasms are TRCM131-1, TRCM83-2-3, TRCM1-9-3, TRCM3-1-6, TRCM2-4-2, TRCM5-6-2, TRCM3-6-1, TRCM2-4-3, TRCM81-2-1, TRCM1-8-2, TRCM7-1-3, TRCM3-5-1, TRCM13-4-3, TRCM13-4-1, TRCM2-1-2, TRCM83-2-10. These will be advanced for multi-locational yield trial for selection as promising variety. Other lines with resistant reaction to MYMV will be utilized in further improvement. For additional collaboration, these genotypes will be screened through artificial screening

methods like forced feeding method, agroinoculation method, etc., to confirm resistance against MYMV.

In conclusion, this study identified some resistant the lines. TRCM131-1, TRCM83-2-3, TRCM1-9-3, TRCM3-1-6, TRCM1-9-1, TRCM2-7-1, TRCM88-3-3, TRCM2-4-2, TRCM86-2-3, TRCM5-6-2, TRCM2-4-3, TRCM3-6-1, TRCM5-4-2, TRCM81-2-1, TRCM1-8-2, TRCM7-1-3, TRCM3-5-1, TRCM13-4-3, TRCM2-7-2, TRCM9-4-7, TRCM3-1-2, TRCM303-4-1, TRCM2-3-1, TRCM13-4-1, TRCM4-4-3, TRCM1-6-4, TRCM83-2-10, TRCM2-1-2, TRCM2-1-2, which may be useful in breeding programs aimed at development of diseases free resistant cultivars. These resistant lines performed well and so can be used for development of ymv cercospora as well as anthacnose resistant moongbean cultivars without fear of losing agronomic performance. In this study, disease symptoms, disease effect on some important plant traits, and morphology of the pathogen were characterized; these traits may serve as a reference for future studies regarding moongbean and its reaction to *ymv cercospora and anthracnose diseases.*

The genotypes grouped under resistant category would be utilized as donors to develop MYMV cercospora n anthracnose resistant lines. For additional corroboration, these genotypes will be screened through artificial screening methods like forced feeding method14, agroinoculation method, etc., to confirm resistance against MYMV.

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