Indian Journal of Science and Technology, *Vol 7(7), 891–896, July 2014*
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Screening of Mungbean Germplasm for Resistance to Mungbean Yellow Mosaic Virus under Natural Condition

S. Mohan[1*], A. Sheeba[1], E. Murugan[2] and S. M. Ibrahim[2]

[1]Rice Research Station, Tamil Nadu Agricultural University, Tirur, Thiruvallur-602 025, Tamil Nadu, India; mohan.xploitz@gmail.com
[2]Agriculture College Research Institute, Tamil Nadu Agricultural University, Madurai - 625 104, Tamil Nadu, India

Abstract

Mungbean Yellow Mosaic Virus (MYMV) is one of the most important diseases of Mungbean. It is transmitted through whitefly (*Bemisia tabaci*). The present investigation aimed to identify stable MYMV resistant lines through screening under natural condition. The experimental material consisted of 120 germplasm lines screened under field condition at two locations during kharif, 2013. Screening for MYMV resistance was done by planting infector rows along with the test entries. Results revealed that most of the genotypes studied were categorized as moderately susceptible to highly susceptible in both the locations. None of the test entries appeared to be immune. It was observed that the genotype shows differential response against MYMV at these locations. In spite of the variable response to MYMV, the genotypes EC 398897, TM-11-07, TM-11-34, PDM-139, IPM-02-03, IPM-02-14, Pusa-0672, Pusa-0871, CO-7 and MH-521 exhibited resistance in both the locations and these genotypes would be utilized as donors to develop MYMV resistant lines.

Keywords: Germplasm, Mungbean, Resistance, Screening, Yellow Mosaic Virus

1. Introduction

Mungbean (*Vigna radiata* L. Wilczek) is one of the important pulse crops in India and is cultivated in an area of 2.84 million ha with a production of 1.04 million tones and productivity of 386 kg/ha[1]. Among several constraints for mungbean production, Mungbean Yellow Mosaic Virus (MYMV) disease occupies prime position and is the most destructive and devastating viral disease. It was first reported in India in 1955 [2] and is transmitted by the insect vector, White fly (*Bemisia tabaci*). The virus initially develops yellow patches then progressively turn the entire leaf yellow and the affected plants flower sparsely and the pod contain shriveled seeds. Yield loss up to 80% was reported in susceptible cultivars by Ayub et al.[3]. Controlling MYMV incidence is only possible by the way of reducing the vector viz., whitefly population using insecticides which are ineffective under severe infestations. Use of virus resistant variety is the most efficient approach to alleviate the occurrence of MYMV disease. Screening mungbean germplasm against MYMV for the identification of resistant genotypes is very much essential. A number of resistant lines have been reported by several workers[4–7]. With this background knowledge, the present investigation was envisaged to screen the mungbean germplasm accessions and identify the resistant MYMV genotypes through field screening under natural condition.

*Author for correspondence

2. Materials and Methods

The experimental material in the present study consisted of 120 mungbean germplasm lines collected from various centres viz., Indian Institute of Pulses Research, Kanpur, National Pulses Research Centre, Vamban, Department of Pulses, TNAU, Coimbatore and Department of Plant Breeding and Genetics, Agriculture College and Research Institute, Madurai (Table 1). The above materials were screened under natural condition to yellow mosaic virus resistance at two locations viz., Rice Research Station, Tirur and Panboli village in Tirunelveli district (hotspot area for MYMV).

Each entry is sown in single row of three meter length with the spacing of 30 × 10 cm in two replications. One row infector line SML 1082 was raised after every five test entries. All the recommended agronomic practices were followed. No insecticidal spray was given in order to allow the whitefly population to spread the disease. Disease incidence was recorded periodically and Percentage Disease Incidence was worked out using the formula

$$\text{Percentage Disease Incidence (PDI)} = \frac{\text{Number of Plants infected in a row}}{\text{Total number of plants in a row}} \times 100$$

The genotypes were categorized using (0-5) arbitrary scale[8] as Immune (I), Resistant (RR), Moderately Resistant (MR), Susceptible (S) and Highly Susceptible (HS) based on disease severity (Table 2).

3. Result and Discussion

Evolution of resistant varieties is considered to be the most feasible and durable solution of controlling MYMV disease. Screening mungbean germplasm against MYMV disease under natural condition is the first step in identifying the resistant donors for evolving the mungbean varieties with YMV resistance and Yield.

In the present study, 120 mungbean germplasm were screened under field condition by raising infector rows in between test entries. Per cent disease incidence was worked out and it varied from 0.32 to 86. 47 per cent at Rice Research Station, Tirur and also from 0.25 to 77.78 percent at Panboli. The study revealed that maximum number of entries was grouped under moderately susceptible to highly susceptible categories in both the locations. At RRS, Tirur, among the 120 genotypes studied, the genotypes CO-7, EC 398897, IPM-02-03, IPM-02-07, IPM-02-14, KM 2241, MH 521, PDM-139, Pusa 0672, Pusa 0871, Pusa 9031, SPLM BB, TM-96-2, TM-11-07, and TM-11-34, were rated as resistant (Table 3) with less than one percent disease incidence. Eighteen genotypes i.e., ADT-1, AGG 35, HG 19A, HUM 1, IPM-205-07, K.Pudur 1, KGG 05, LM 1036, LM 14, M 986, NM 67, P 166, PLS 265, Pusa 05771, RMG 341, SP 19, VC 7960-88, VRM (Gg) were categorized as moderately resistant with PDI varying from 2.29 (HG 19A) to 9.74 (AGG 35) whereas other categories such as moderately susceptible , susceptible and highly susceptible consisted of 20, 28 and 40 genotypes (Table 3).

At Panboli, a total of twelve genotypes such as Barimung 7, EC 398897, CO-7, IPM-02-03, IPM-02-14, MH 521, PDM-139, Pusa 0672, Pusa 0871, TM-11-07,

Table 1. Source of mungbean germplasn screened against MYMV

Sl.No	SOURCE	No. of Lines
1	Indian Institute of Pulses Research (IIPR), Kanpur.	21
2	National Pulses Research Centre (NPRC), Vamban	34
3	Department of Pulses, TNAU, Coimbatore	30
4	Department of Plant Breeding and Genetics, AC & RI, Madurai	35

Table 2. Disease Scoring Scale (0-9) for MYMV based on Percentage Disease Incidence (PDI)

Disease Scale	Percent Infection	Category	Reaction group
0	No plants showing any symptoms	Immune	I
1	Less than 1% plants exhibiting symptoms	Resistant	R
3	1-10 % plants exhibiting symptoms	Moderately Resistant	MR
5	11-20 % plants exhibiting symptoms	Moderately Susceptible	MS
7	21-50% infection	Susceptible	S
9	50 % and more plants exhibiting symptoms	Highly Susceptible	HS

Table 3. Reaction of mungbean germplasm lines against MYMV in Rice Research Station, Tirur

Genotypes	Disease Score	Grade	Genotypes	Disease Score	Grade
TM-11-07	0.56	R	MH 521	0.98	R
KM 2241	0.85		PDM 139	0.63	
CO-7	0.67		Pusa 0672	0.91	
EC 398897	0.32		Pusa 0871	0.85	
IPM-02-03	0.60		TM-11-34	0.45	
IPM-02-07	0.92		Pusa 9031	0.75	
IPM-02-14	0.58		SPLM BB	0.90	
TM-96-2	0.75				
ADT-1	6.50	MR	AGG 35	9.75	MR
IPM-205-07	5.70		HG 19A	2.29	
K.Pudur 1	7.50		P 166	4.56	
KGG 05	2.69		VC 7960-88	8.54	
HUM 1	3.33		VRM (Gg) 1	3.14	
LM 1036	9.20		LM 14	6.75	
PLS 265	5.14		NM 67	5.85	
Pusa 05771	8.50		SP 19	8.50	
M 986	4.44		RMG 341	7.65	
Barimung 7	18.57	MS	ML 1451	16.67	MS
Binamung 7	15.65		NL 23	18.75	
EC 398894	13.58		EC 520011	13.50	
EC 426841	11.50		SP 17	11.54	
IPM-02-19	16.30		RMG 991	14.29	
EC 520014	17.14		T-3485	16.30	
GUNYN-1B	12.50		V 5197	14.29	
LM 702A	18.75		VC 6157B	10.80	
IPM-99-125	14.29		VG 6372	14.29	
VGG 73	15.00		EC 391178	13.50	
118895	30.77	S	K. Pudur 3	40.20	S
118897	36.58		KM-1	43.33	
AKM 9904	28.00		LGG 122	33.33	
CO-2	39.00		LGG 22	25.64	
CO-3	31.50		LM 65	39.56	
CO-6	25.25		M-1	44.25	
EC 398885	41.88		NL 61	31.25	
EC 398886	45.25		NM 65	21.43	
EC 398889	41.88		PusaRatna	27.32	
EC 398891	33.53		Pusa Vishal	32.50	
EC 496839	37.78		VGG 150	47.95	
EC 496841	28.00		Vilathikulam	33.30	
EC 520016	40.00		VKP 911-B3	36.67	
IPM-409-04	35.60				
76-43	52.63	HS	Salem 1	78.86	HS
76-46	56.98		SM 4136	63.56	
ADT-3	67.99		SML 1022	70.15	
Annur 1	77.86		SML 1074	58.89	
WGG 48	58.70		SML 171/1	61.15	
CO-4	65.22		SP 22	76.69	
CO-5	72.30		SP 32	64.17	
EC 501566	60.84		SP 35	51.20	
EC 591388	56.98		STU 26560	55.66	
K.Pudur 2	64.30		TIRUVANAMALAI	52.28	
KM-2	65.25		V 109/1	85.71	
Kovilpatty	60.27		VBN 1	63.22	
LES 14	52.34		VBN 2	51.04	
VGG 87	56.95		VBN 3	60.92	
MDU 2013/1/2	58.12		VC 6040A	58.58	
MG-55	70.53		Vellurior	54.22	
MH 318	61.72		VGG 119	57.27	
MH 565	46.54		VGG 13	69.58	
Nigerian Variety	64.02		VGG 28	52.75	
NL 7B	59.69		KANGEYAM	86.47	

Table 4. Reaction of mungbean germplasm lines against MYMV in Panboli, Tirunelveli

Genotypes	Disease Score	Grade	Genotypes	Disease Score	Grade
TM-11-07	0.56	R	MH 521	0.45	R
Barimung 7	0.87		PDM 139	0.76	
EC 398897	0.75		Pusa 0672	0.69	
IPM-02-03	0.25		Pusa 0871	0.38	
IPM-02-07	0.50		CO-7	0.97	
IPM-02-14	0.33		TM-11-34	0.66	
ADT-1	8.00	MR	Pusa 05771	4.50	MR
EC 520011	2.70		Pusa Vishal	4.44	
HG 19A	7.50		RMG 991	8.75	
KGG 05	5.35		SPLM BB	4.29	
KM 2241	6.33		TM-96-2	5.56	
LM 1036	6.20		VC 7960-88	7.69	
LM 65	7.14		VRM (Gg) 1	9.20	
Binamung 7	20.00	MS	ML 1451	16.67	MS
EC 398886	15.00		NL 23	18.75	
EC 398889	17.69		NM 67	11.60	
EC 398894	15.56		P 166	12.19	
EC 426841	11.50		Pusa 9031	11.54	
EC 496839	16.60		PusaRatna	14.29	
EC 520014	17.14		T-3485	16.30	
GUNYN-1B	12.50		V 5197	14.29	
Hum 1	18.75		VC 6157B	10.80	
IPM-99-125	14.29		VG 6372	14.29	
K.Pudur 1	12.50		WGG 48	13.50	
LGG 22	15.00				
AGG 35	38.00	S	M 986	21.11	S
AKM 9904	48.57		MH 565	27.50	
CO-2	24.60		NL 61	31.25	
CO-4	31.25		NM 65	41.43	
EC 398885	41.88		RMG 341	37.70	
EC 496841	37.78		SP 17	38.70	
EC 520016	40.00		PLS 265	24.80	
IPM-02-19	31.58		Tiruvanamalai	27.60	
IPM-205-07	38.00		VBN 1	42.22	
Kangeyam	45.80		VGG 150	35.70	
KM-1	43.33		VGG 87	33.30	
LGG 122	23.33		VKP 911-B3	26.67	
LM 14	22.30				
118895	50.77	HS	MH 318	60.00	HS
118897	56.67		Nigerian Vrty	53.67	
76-43	52.38		NL 7B	55.10	
76-46	68.89		SP 19	63.60	
ADT-3	68.18		Salem 1	68.18	
Annur 1	63.64		SM 4136	56.00	
CO-3	62.86		SML 1022	60.80	
CO-5	73.33		SML 1074	58.80	
CO-6	53.57		SML 171/1	52.11	
EC 391178	55.00		SP 22	55.00	
EC 398891	63.53		SP 32	53.33	
EC 501566	50.00		SP 35	50.00	
EC 591388	55.45		STU 26560	76.40	
IPM-409-04	57.60		V 109/1	64.00	
K. Pudur 3	54.20		VBN 2	56.00	
K.Pudur 2	66.60		VBN 3	64.00	
KM-2	61.11		VC 6040A	68.18	
Kovilpatty	55.50		Vellurior	52.63	
LES 14	51.18		VGG 119	52.94	
LM 702A	66.67		VGG 13	62.50	
M-1	56.67		VGG 28	52.17	
MDU 2013/1/2	63.00		VGG 73	55.00	
MG-55	76.50		Vilathikulam	77.78	

TM-11-34 and MH 565, were rated as resistant and fourteen genotypes i.e., ADT-1, EC 520011, HG 19A, KGG 05, KM 2241, LM 1036, LM 65, Pusa 05771, Pusa Vishal, RMG 991, SPLM BB, TM-96-2, VC 7960-88, VRM (Gg) 1 were grouped as moderately resistant. Apart from these, 23 moderately susceptible, 25 susceptible and 50 genotypes were highly susceptible in Panboli (Table 4). None of the test entries were found immune in both the locations. It is observed that the genotypes screened against yellow mosaic disease at these locations exhibited differential response to resistance i.e., the genotype found to be resistant at one location was found to be susceptible at another location. For example, the mungbean lines RMG 341 and PLS 265 grouped as moderately susceptible at RRS, Tirur, were found to be susceptible at Panboli. Similarly, the genotypes like Nigerian variety and LM 702A were highly susceptible in panboli, found moderately susceptible in RRS location. The differential response of MYMV disease severity at different locations may be the possibility of existence of different strains of the virus. The other possible causes may be vector load (Whitefly), climatic condition and genetic character of varieties. Inspite of the variable response to MYMV, some genotypes like EC 398897, CO-7, IPM-02-03, IPM-02-14, MH 521, PDM-139, Pusa 0672, Pusa 0871, TM-11-07 and TM-11-34 exhibited resistance in both the locations. It is obvious that only few genotypes appeared to be as resistant, which indicated the existence of small amount of resistance in genotypes against MYMV. The results of present screening were in accordance with several other findings. Iqbal et al.,[7] screened 100 lines of mungbean germplasm and out of which only four lines shows resistance under field condition. Salam et al.[6] found 3 lines out of 93 genotypes as resistant. Habib et al.[9] evaluated 108 germplasm lines but no resistant line was found. Shad et al.[10] 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. Results obtained by us were supported by several other workers. Datta et al.[11] also reported the resistance nature of the genotype IPM-02-03. Similarly Asthana[12] and Paul et al.[13] 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 would be utilized as donors to develop MYMV resistant lines. For additional corroboration, these genotypes will be screened through artificial screening methods like forced feeding method[14], agroinoculation method, etc., to confirm resistance against MYMV.

4. References

1. Singh BB. Project coordinators report. Indian Council of Agricultural Research, Indian Institute of Pulses Research, All India Coordinated Research Project on MULLaRP, Annual Group Meet. 2011 May 11–13.
2. Nariani TK. Yellow mosaic of mung (Phaseolus aureus). Indian Phytopathol. 1960; 13:24–29.
3. Ayub MA, Ilyas MB, Bhatti MAR. Growth responces of mungbean cultivars to mungbean yellow mosaic virus infection. Pak. J. Phytopathology, 1989; 1(1–2):38–42.
4. Ganapathy T, Kuruppiah R, Gunasekaran K. Identifying the source of resistance for mungbean yellow mosaic virus (MYMV), urd bean leaf crinkle virus and leaf curl virus disease in urd bean (Vigna mungo (L.) Hepper). Annual Meeting and Symposium on recent Developments in the diagnosis and Management of Plant Diseases for Meeting Global Challenges. 2003 Dec 18–20. University of Agricultural Sciences, Dharwad. p. 30.
5. Pathak AK, Jhamaria SL. Evaluation of mungbean (Vigna radiata L.) varieties to yellow mosaic virus. J Mycology and Plant Pathology. 2004; 34(1):64–65.
6. Salam SA, Patil MS, Salimath PM. Evaluation of Mungbean cultures against MYMV in Karnataka under natural conditions. Legume Res. 2009; 32(4):286–89.
7. Iqbal U, Iqbal SM, Afzal R, Jamal A, Farooq MA, Zahid A. Screening of Mungbean germplasm against Mungbean Yellow Mosaic Virus (MYMV) under field conditions. Pak J Phytopathol. 2011; 23(1):48–51.
8. Mayee CD, Datar VV. Phytopathometry, Department of Plant Pathology, Marathawada Agricultural University, Parbhani. Technical Bulletin No.1; 1986. p. 145–46.
9. Habib S, Shad N, Javaid A, Iqbal U. Screening of mungbean germplasm for resistance/tolerance against yellow mosaic disease. Mycopath. 2007; 5(2):89–94.
10. Shad N, Mughal SM, Farooq K, Bashir M. Evaluation of Mungbean germplasm for resistance against Mungbean Yellow Mosaic Begomovirus. Pak Bot. 2006; 38(2): 449–57.
11. Datta S, Gangwar S, Kumar S, Gupta S, Rai1 R, Kaashyap M, Singh P, Chaturvedi SK, Singh BB, Nadarajan N. Genetic diversity in selected Indian Mungbean [Vigna radiata (L.)

Wilczek] Cultivars Using RAPD Markers. American J Plant Sci. 2012; 3:1085–91.

12. Asthana AN. Pulse crops research in India. Indian J Agril Sci. 1998; 68(8):448–52.
13. Paul PC, Biswas MK, Mandal D, Pal P. Studies on host resistance of Mungbean against Mungbean Yellow Mosaic Virus in the agro-ecological condition of lateritic zone of West bengal. The Bioscan. 2013; 8(2):583–87.
14. Basak J, Kundagrami S, Ghose TK, Pal A. Development of Yellow Mosaic Virus (YMV) resistance linked DNA marker in Vigna mungo from populations segregating for YMV-reaction. Mol Breeding. 2004; 14:375–83.