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Screening of Mungbean Accessions against Mungbean Yellow Mosaic Virus (MYMV) under Sub-tropical Irrigated Conditions of Jammu Region, India

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A B S T R A C T

An investigation was carried out at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, during the *kharif* season of 2015, to assess the screening of 73 accessions of mungbean against mungbean yellow mosaic virus (MYMV). The data on morphological traits *viz.*, days to 50% flowering, plant height (cm), number of branches/plant, number of pods/plant, average pod weight (g), pod length (cm), pod diameter (mm), number of seeds/pod, 100-seed weight (g) and days to physiological maturity were also recorded. Among different accessions, LM-250, LM-1402, M-237 and M-131 recorded significantly highest majority of traits under study and were statistically at par with each other. Whereas IPM-0102 and LM-250 were the earliest to flower and mature pods, respectively and were at par with number of accessions. On the basis of the data recorded on disease incidence, four accessions (LM-291, M-131, M-237 and LM-1402) were found to be resistant, two accessions (LM-27 and LM-11686) were moderately resistant, twenty two accessions were moderately susceptible, thirty three accessions were susceptible and twelve were found to be highly susceptible to yellow mosaic disease.

Introduction

India has become self-sufficient with respect to production of cereals but still lags behind with respect to the production of pulses though the largest producer of pulses in the world with 35.7 per cent share in global production. Pulses are the main source of protein, particularly for vegetarians and contribute about 14 per cent of the total protein of an Indian average diet. Mungbean (*Vigna radiata* L.) is one of the most important pulse crops in India and ranks third after chickpea and pigeon pea. India ranks first in the world in area as well as production of mungbean. India is the leading producer of mungbean covering 55 per cent of total world average and 45 per cent of the total production (Rishi, 2009). Mungbean is primarily a rainy season crop but it is also suitable as a summer crop. Yellow mosaic disease (YMD) of mungbean is one of the most destructive and major constraints to productivity of grain legumes across the Indian sub-continent (Varma *et al.*, 1992; Varma and Malathi, 2003). Yellow mosaic disease affects various

legume crops in different proportions, which results in heavy field losses. The disease can reduce mungbean yield upto 100 per cent or even kill a plant (Kitsanachandee *et al.*, 2013). However, there are very few reports of resistant variety/cultivar having complete resistance against yellow mosaic. For this, identification of resistant sources is a key factor. Knowledge of the mode of inheritance to MYMV in mungbean is useful for incorporation of resistance into agronomically poor, but desirable genetic resources. So far as the Jammu region is concerned, there are reports on occurrence of yellow mosaic, but the actual causal agent is not known. Thereby, keeping in view the above facts the present study was carried out with the aim of identifying the MYMV resistant progenies under sub-tropical irrigated conditions of Jammu region.

Materials and Methods

The field experiment was carried out during the *kharif* season of 2016 at the Research Farm of Division of Plant Pathology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu which is situated at 320-40′ N latitude and 740-58′ E longitude with an altitude of 332 m above mean sea level. The experiment was laid out in randomized block design with seventy three and two replications. Seventy three genotypes of mungbean (*Vigna radiata*) were used for yellow mosaic disease (YMD) screening studies.

The seed material was collected from different sources. Sixty nine (69) accessions of mungbean were procured from Indian Institute of Pulse Research, Kanpur (IIPR, Kanpur) and other four varieties/cultivars were procured from Pulse Research Station, Samba, local market and Department of Agriculture, Jammu (Table 1).

Resistant and susceptible sources were identified based on visual yellow mosaic symptoms on the basis of disease scale (Table 2) given by Nene *et al.*, (1981).

The observations related to crop growth and contributing traits were recorded as per the established norms. Data obtained from the experiment were subjected to statistical analysis by following Analysis of variance technique as suggested by Panse and Sukhatme (1985).

Results and Discussion

Screening for yellow mosaic under natural epiphytotics

Of all the accessions under study, four accessions were found to be resistant, two moderately resistant, twenty two moderately susceptible, thirty three susceptible and the rest (twelve) were found to be highly susceptible under natural epiphitotic conditions (Table 3).

Growth and yield parameters

The data showed variation among different accessions. Mungbean accessions were also evaluated for various growth and yield parameters *viz*., days to 50 percent flowering, plant height, number of branches/plant, number of pods/plant, average pod weight, pod length, pod diameter, number of seeds/pod, 100-seed weight and days to physiological maturity to determine the effect of yellow mosaic disease in different accessions (Table 4 and 5). Of all the accessions, M-237, LM-1402, M-131 and LM-291 recorded maximum values for majority of the traits under study. However, these accessions took longer time for days to 50 percent flowering and thus also took more days to physiological maturity.

Table.1 List of mungbean accessions along with source of procurement

Source	Accession Name
IIPR (Indian Institute of Pulse Research), Kanpur	LM-12, LM-197, LM-250, LM-1494, IM-636, LM-302, LM-309, LM-328, LM-1021, LM-1, LM-257, LM-344, LM-13487, LM-220, LM-1397, LM-285,LM-27, LM-11686, LM-253, LM-274, LM-1485, LM-316, LM-34, L-4616, LM-150, LM-228, LM-1169, LM-241, LM-194, LM-1598, LM-19, LM-1029, LL-1119, LM-104, LM-1510, LM-101, LM-291, IC-8839, LM-226, LAM-66127, LM-294, LM-3, IM-250, LM-258, LM-232, LM-23, IM-259, LM-249, LM-1193, LM-1678, LM-1564, LM-16, LM-3, LM-1089, M-18, LM-303, LM-326, M-131,INN-644, M-237, LM-312, LM-1402, LM-174, LM-236, LM-1561, INBN-208, LM-159, LM-137
Department of Agriculture, Jammu	SML-668, IPM-0102
Pulse Research Station, SKUAST, Samba	MOONG-ML
Local Market, R.S. Pura	R.S PURA LOCAL

Table.2 Disease grade scale for yellow mosaic

Rating	Description
0	No symptoms on any plant
1	Yellow mottle or necrotic mottle in upto 1% plants
3	Yellow mottle or necrotic mottle in traces on 1.1-10% plants
5	Necrotic mottle/ mild mottle/ mild symptoms; 10.1-25% plants; No reduction in plant growth; No yield loss
7	Yellow mottle symptoms not covering the whole leaf lamina on 25.1-50% plants; reduction in leaf and plant growth
9	Yellow mottle symptoms on >50% plants; severe reduction in leaf and plant growth as well as pod formation and death of plant.

Table.3 Diversity in symptoms in mungbean accessions infected with *yellow mosaic virus* under natural epiphytotics

S. No.	Accession Name	Symptoms	Disease Grade	Reaction*
1.	LM-12	Severe Yellow mosaic	9	HS
2.	LM-197	Yellow spots	7	MS
3.	LM-250	Severe Yellow mosaic	9	HS
4.	LM-1494	Mild Flecks	5	S
5.	IM-636	Yellow Flecks	9	HS
6.	LM-302	Marginal Yellow mosaic	5	S
7.	LM-309	Mild Yellow mosaic	7	MS
8.	LM-328	Severe Yellow mosaic	9	HS
9.	LM-1021	Yellow flecks	7	MS

10.	LM-1	Marginal yellow mosaic	5	S
11.	LM-257	Marginal yellow mosaic	5	S
12.	LM-344	Severe Yellow mosaic	7	MS
13.	LM-13487	Mild Yellow flecks	5	S
14.	LM-220	Marginal yellow mosaic	9	HS
15.	LM-1397	Yellow mosaic	7	MS
16.	LM-285	Marginal yellow mosaic	5	S
17.	LM-27	Yellow mosaic	3	MR
18.	LM-11686	Yellow flecks	3	MR
19.	LM-253	Marginal yellow mosaic	7	MS
20.	LM-274	Severe yellow mosaic	7	MS
21.	LM-1485	Mild yellow flecks	5	S
22.	LM-316	Marginal yellow mosaic	5	S
23.	LM-34	Yellow spots	7	MS
24.	L-4616	Yellow flecks	5	S
25.	LM-150	Yellow flecks	5	S
26.	LM-228	Yellow mosaic	7	MS
27.	LM-1169	Yellow mosaic	7	MS
28.	LM-241	Yellow mosaic	7	MS
29.	LM-194	Yellow spots	7	MS
30.	LM-1598	Yellow spots	7	MS
31.	LM-19	Marginal yellow mosaic	7	MS
32.	LM-1029	Yellow spots	7	MS
33.	LL-1119	Yellow spots	5	S
34.	LM-104	Marginal yellow mosaic	5	S
35.	LM-1510	Yellow flecks	7	MS
36.	LM-1560	Yellow spots	5	S
37.	LM-101	Mild yellow mosaic	5	S
38.	LM-291	No disease	0	R
39.	IC-8839	Yellow mosaic	5	S
40.	LM-226	Yellow mosaic	5	S
41.	LAM-66127	Yellow mosaic	5	S
42.	LM-294	Yellow flecks	7	MS
43.	LM-3	Marginal yellow mosaic	5	S
44.	IM-250	Yellow flecks	5	S
45.	LM-258	Yellow flecks	5	S
46.	LM-232	Yellow mosaic	7	MS
47.	LM-23	Yellow flecks	5	S
48.	IM-259	Yellow flecks	7	MS
49.	LM-249	Yellow flecks	5	S
50.	LM-1193	Yellow flecks	5	S
51.	LM-1678	Marginal yellow mosaic	5	S
52.	LM-1564	Severe yellow mosaic	9	HS
53.	LM-16	Yellow mosaic	5	S
54.	LM-3	Severe yellow mosaic	9	HS
55.	LM-1089	Severe yellow mosaic	9	HS
56.	M-18	Yellow spots	9	HS

57.	LM-303	Yellow flecks	5	S
58.	LM-326	Marginal yellow mosaic	7	MS
59.	M-131	No disease	0	R
60.	INN-646	Marginal yellow mosaic	5	S
61.	M-237	No disease	0	R
62.	LM-312	Yellow mosaic	5	S
63.	LM-1402	No disease	0	R
64.	LM-174	Yellow mosaic	9	HS
65.	LM-236	Yellow flecks	5	S
66.	LM-1561	Yellow spots	9	HS
67.	INBN-208	Marginal Yellow mosaic	5	S
68.	LM-159	Yellow spots	7	MS
69.	LM-137	Yellow spots	7	MS
70.	SML-668	Yellow mosaic	5	S
71.	R.S PURA LOCAL	Severe yellow mosaic	9	HS
72.	IPM-01-02	Yellow flecks	5	S
73.	Moong ML-1	Yellow flecks	5	S

Note * HS= Highly susceptible, MS =Moderately susceptible, S=Susceptible, R= Resistant, MR= Moderately resistant

Table.4 Evaluation of growth and yield parameters in mungbean accessions under field conditions during *kharif* 2015

Accession name	Plant height (cm)	Days to 50% flowering	No. of branches/plant	No. of pods/plant	Avg. Pod weight (g)
LM-12	70.96	34.50	10.50	10.70	0.29
LM-197	72.46	34.17	9.50	10.75	0.28
LM-250	53.84	33.99	8.50	11.80	0.31
LM-1494	63.63	35.00	10.25	10.85	0.28
IM-636	47.38	33.91	11.92	11.10	0.27
LM-302	63.04	35.11	12.42	11.00	0.32
LM-309	56.29	33.11	10.50	8.85	0.30
LM-328	53.88	34.17	10.84	11.85	0.31
LM-1021	60.88	34.17	10.92	10.05	0.27
LM-1	64.13	33.00	11.59	12.80	0.28
LM-257	56.88	34.18	11.00	9.25	0.28
LM-344	55.79	35.67	12.00	10.70	0.33
LM-13487	69.80	34.17	11.84	9.59	0.31
LM-220	54.05	34.69	9.75	10.70	0.32
LM-1397	47.48	36.50	11.84	10.50	0.28
LM-285	57.30	36.16	10.75	10.85	0.28
LM-27	70.71	34.00	11.75	11.70	0.32
LM-11686	62.96	35.37	11.17	11.42	0.31
LM-253	65.38	38.50	12.33	11.05	0.29

LM-274	50.80	36.71	11.50	10.09	0.32
LM-1485	51.96	34.61	11.34	10.92	0.29
LM-316	59.80	34.62	12.75	9.67	0.28
LM-34	60.30	34.81	11.00	10.09	0.28
LM-4616	48.52	34.50	11.92	11.47	0.33
LM-150	57.21	33.50	12.33	10.17	0.31
LM-228	64.96	33.67	12.00	11.05	0.30
LM-1169	47.62	34.61	11.83	11.06	0.31
LM-241	43.38	34.67	10.99	10.86	0.30
LM-194	63.63	36.17	12.25	11.50	0.32
LM-1598	70.88	36.83	11.58	11.20	0.32
LM-19	57.80	36.46	11.42	11.80	0.28
LM-1029	76.96	34.17	9.92	11.00	0.29
LL-1119	43.38	35.12	11.58	10.50	0.31
LM-104	47.46	37.50	10.59	13.05	0.28
LM-1510	58.13	35.50	11.00	11.80	0.29
LM-1560	45.04	35.11	10.75	10.64	0.29
LM-101	50.80	36.12	10.67	11.56	0.33
LM-291	**82.42**	**39.50**	**14.50**	**14.84**	**0.41**
IC-8839	45.84	34.17	11.67	10.90	0.31
LM-226	42.50	35.17	11.62	11.65	0.32
LAM-66127	44.14	34.00	11.59	10.90	0.30
LM-294	45.63	36.17	12.09	11.85	0.30
LM-3	51.75	33.50	11.50	11.35	0.28
LM-250	48.24	34.64	11.84	10.80	0.29
LM-258	54.33	33.50	12.59	12.20	0.28
LM-232	52.33	33.78	10.25	14.46	0.28
LM-23	44.02	35.89	11.75	12.10	0.28
IM-259	46.75	34.83	10.82	11.50	0.29
LM-249	46.85	36.00	9.92	10.90	0.31
LM-1193	44.11	35.00	11.25	11.50	0.31
LM-1678	48.88	34.00	11.00	11.20	0.28
LM-1564	43.09	34.00	9.84	11.00	0.32
LM-16	48.80	35.50	11.17	12.65	0.29
LM-3	42.00	33.00	11.39	11.95	0.28
LM-1089	47.42	34.12	11.84	11.70	0.28
M-18	49.52	34.50	11.83	11.15	0.29
LM-303	46.62	34.69	11.67	12.10	0.26
LM-326	50.83	34.61	11.42	9.50	0.31
M-131	**80.84**	**39.53**	**14.67**	**15.50**	**0.38**

INN-646	49.67	36.50	9.25	8.67	0.28
M-237	**79.42**	**40.50**	**14.00**	**14.50**	**0.39**
LM-312	40.58	34.00	11.42	10.55	0.32
LM-1402	**81.24**	**40.00**	**14.42**	**14.67**	**0.40**
LM-174	43.39	34.00	9.75	9.75	0.28
LM-236	42.14	33.50	10.50	11.00	0.28
LM-1561	44.64	34.17	11.25	11.45	0.30
INBN-208	45.39	34.72	10.20	11.50	0.32
LM-159	41.14	33.50	11.64	11.20	0.32
LM-137	41.97	35.12	10.47	12.10	0.29
SML-668	59.09	35.17	10.39	12.10	0.30
R.S Pura Local	60.71	34.66	12.32	10.09	0.25
IPM-01	45.57	**33.00**	11.75	9.97	0.28
MOONG-ML	71.14	34.00	12.95	10.67	0.29
SEm (±)	2.02	1.26	0.80	0.49	0.02
CD (P=0.05)	5.68	3.54	2.25	1.38	0.06

Table.5 Evaluation of yield parameters in mungbean accessions under field conditions during *kharif* 2015

Accession name	Pod length (cm)	Pod diameter (mm)	No. of seeds/pod	100-seed weight (gm)	Days to physiological maturity
LM-12	5.72	5.80	7.35	2.92	65.62
LM-197	6.15	6.05	8.35	2.89	67.06
LM-250	6.60	6.20	8.80	2.88	62.56
LM-1494	6.10	5.75	8.30	3.16	67.56
IM-636	6.38	5.90	8.55	3.43	70.14
LM-302	7.01	6.00	9.15	3.26	66.18
LM-309	6.63	5.95	8.80	3.55	68.65
LM-328	7.15	5.90	9.45	3.18	69.50
LM-1021	7.13	6.05	9.30	3.65	66.73
LM-1	7.19	5.75	9.35	2.95	65.61
LM-257	6.90	6.10	9.10	3.50	67.13
LM-344	7.29	6.15	9.45	3.41	69.79
LM-13487	6.71	5.75	8.80	3.55	70.63
LM-220	7.18	5.80	9.40	3.71	70.51
LM-1397	6.16	6.05	8.37	3.65	66.45
LM-285	7.10	5.90	9.35	3.41	66.41
LM-27	5.92	6.20	6.70	3.45	65.89

LM-11686	7.00	6.10	9.15	3.32	65.50
LM-253	6.70	6.30	8.90	3.85	70.62
LM-274	6.00	6.00	8.15	3.65	69.99
LM-1485	6.60	5.95	8.80	3.55	68.57
LM-316	7.05	6.00	9.25	3.45	65.26
LM-34	6.96	6.05	9.10	3.55	65.30
LM-4616	7.02	5.75	9.25	3.40	66.30
LM-150	6.50	5.65	8.75	3.65	66.73
LM-228	7.03	5.80	9.25	3.80	69.56
LM-1169	7.14	5.90	9.35	3.65	70.50
LM-241	6.85	6.20	8.95	3.71	65.76
LM-194	6.71	6.05	8.95	3.30	65.63
LM-1598	6.91	6.25	9.15	3.00	69.72
LM-19	6.80	6.25	9.00	3.50	66.21
LM-1029	6.88	6.10	9.40	3.60	70.67
LL-1119	7.20	5.75	9.45	3.46	70.55
LM-104	6.92	5.65	9.15	3.38	66.43
LM-1510	6.82	5.70	9.05	3.28	67.88
LM-1560	6.89	6.00	9.15	3.24	67.62
LM-101	6.34	5.80	8.55	3.45	67.08
LM-291	**7.95**	6.00	**9.90**	**4.18**	**80.45**
IC-8839	6.90	5.65	9.05	3.40	70.18
LM-226	7.08	5.75	9.45	3.60	65.78
LAM-66127	6.90	6.25	9.05	3.60	70.08
LM-294	7.03	6.00	9.20	3.26	69.99
LM-3	6.79	6.00	9.10	3.40	65.87
LM-250	6.89	6.05	9.45	3.22	**66.56**
LM-258	6.74	6.10	8.80	3.51	66.64
LM-232	7.08	6.20	9.35	3.30	67.18
LM-23	6.92	6.00	9.00	3.26	66.80
IM-259	7.31	5.70	9.40	3.53	66.56
LM-249	6.77	5.85	8.95	3.60	70.06
LM-1193	6.67	5.65	8.88	3.40	70.34
LM-1678	6.49	6.20	8.75	3.46	66.39
LM-1564	7.15	6.10	9.45	3.59	68.01
LM-16	7.04	5.85	9.25	3.67	66.42
LM-3	7.04	6.05	9.25	3.45	70.14
LM-1089	6.53	6.00	9.20	3.35	66.27
M-18	6.99	5.95	9.20	3.36	66.14
LM-303	7.02	5.70	9.25	3.47	67.68
LM-326	6.85	5.90	9.15	3.22	67.05
M-131	**8.00**	6.00	**10.25**	**4.05**	**79.56**
INN-646	6.12	6.15	8.35	3.59	69.61

M-237	**8.07**	6.25	**10.30**	**4.15**	**80.27**
LM-312	7.02	6.25	9.25	3.70	70.01
LM-1402	**8.14**	6.05	**10.10**	**4.06**	**80.43**
LM-174	6.50	6.00	8.70	3.40	70.13
LM-236	6.61	5.85	8.75	3.50	66.54
LM-1561	6.91	6.05	9.40	3.30	66.52
INBN-208	7.11	5.80	9.30	3.55	65.56
LM-159	6.58	6.15	8.75	3.30	69.62
LM-137	6.77	6.00	9.25	3.20	70.01
SML-668	6.95	6.10	9.65	3.20	70.01
R.S PURA LOCAL	4.37	6.15	5.60	3.25	65.56
IPM-01	6.85	6.00	9.55	3.50	70.28
MOONG-ML	7.03	6.10	9.65	3.46	70.33
SEm (±)	0.27	0.18	0.41	0.13	2.45
CD (P=0.05)	0.76	NS	1.15	0.36	6.90

The accessions *viz.* M-237, LM-1402, M-131 and LM-291 recording significantly higher number of pods/plant, average pod weight, pod length, number of seeds/pod and 100-seed weight may be attributed to the resistance of these accessions to yellow mosaic virus. In the present set of germplasm significant level of diversity in terms of various growth and yield characters was observed, which is well evident from the significant values in all the traits studied except for pod diameter in different accessions.

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