Screening of Soybean Genotypes Against Mungbean Yellow Mosaic Virus Disease Under Field Conditions.

ABSTRACT

Glycine max (L.) is a nutrionally enrich leguminous crop, playing a pivotal part in food, feed and industrial sectors. In India it has been escalated owing to high adaptability, nitrogen fixing capability economic returns. However, production is significantly constrained by Mungbean Yellow Mosaic Virus (MYMV), a major viral disease transmitted by whitefly (*Bemisia tabaci),* leading to chlorosis, stunted growth and severe yield losses. The present investigation aimed to evaluate twelve soybean genotypes for speckled resistance to MYMV under epiphytotic field conditions during the *kharif* 2024. The experiment was laid out by using RBD, with 2 replications, Disease severity was scored based on a standardized 0-5, wherein lower scores indicated higher resistance. Sustained variability was evident in disease response, with genotypes categorized as highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible. Genotypes such as these exhibited moderately susceptible. MAUS 81, MAUS 162 showed susceptible against the yellow mosaic virus. The identification of genotypes with moderate resistance to susceptible. These findings provide a valuable foundation for the development of MYMV-resistant soybean cultivators in future. Future efforts for integrating molecular markers and genomic tools with phenotypic selection may be instrumental in accelerating the development of resilient soybean varieties for sustainable production in MYMV-endemic areas.

Keywords: Disease resistant; epiphytic screening; soybean genotypes; soybean (Glycine max); yellow mosaic virus (MYMV); whitefly (Bemisia tabaci).

1. INTRODUCTION

Glycine max (l.) is a self- pollinated crop belonging to the leguminosae family and subfamily Papilionaceae genus Glycine. Soybean is an important oil seed crop with a high protein content (40-42%), high lysine content and oil (20-22%) rich in vital fatty acids. It is a major oil seed crop of world growing in an area of 134.55 mha and

production of 370.42 million mt with average yield of 2750 kg/ha in the world. Soybean is more susceptible to several diseases, among all the diseases, Mungbean Yellow Mosaic Virus is a major one distributed in India. Mungbean Yellow Mosaic Disease in soybean is caused by Mungbean Yellow Mosaic Virus (MYMV) and exclusively transmitted by whitefly (*Bemisia tabaci* Genn.) in a persistant manner.

2. MATERIAL AND METHODS

A total of 12 genotypes of soybean were screened for the reaction against Mungbean Yellow Mosaic Virus on soybean. The field study was carried out in year 2024 at Department of Plant Pathology, College of Agriculture, Latur. The experiment was undertaken under natural epiphytic conditions. Available soybean genotypes were grown, at spacing of 45x 5 cm^2 by maintaining 2 replications and the entire set of recommended techniques were followed. No insecticidal spray was done in the experimental plot or in the vicinity during the crop season. Plants were exposed to natural infection. Based on ratings of the disease, the percentage of YMV disease incidence was estimated in each genotype. Later these were also categorized as highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible, respectively.

Table 1: List of genotypes of soybean used in screening against MYMV

Sr. No	Genotypes	Sr. No.	Genotypes
1	MAUS -47	7	MAUS-81
2	KDS 726	8	MAUS-158
3	KDS-753	9	MAUS-725
4	MAUS -731	10	MAUS-71
5	KDS-992	11	MAUS-61
6	MAUS-612	12	MAUS-162

Table 2: Disease rating scale of soybean genotypes against Mungbean yellow mosaic virus (Mayee and Datar, 1986)

Disease scale	Description	Category
0	No Plants showing in any symptom	Immune (I)
1	Less than 1% plants showing symptoms	Resistant (R)
3	1-10% plants showing mottling symptom	Moderately Resistant (MR)
5	11-20% plants showing mottling and yellow discoloration of leaves	Moderately Susceptible (MS)
7	21-50% plants showing mottling and yellow discoloration of leaves; stunting of plants	Susceptible (S)
9	51% of more plants are affected, stunting of plants pronounced flower and fruit set reduced. Yellow mosaic severe.	Highly Susceptible (HS)

Observations

The soybean Mungbean Yellow Mosaic Virus disease affected plants were monitored for every 7 days and the Per cent disease incidence was estimated by using the following formula, given by Wheeler in (1969).

$$\text{Percent disease incidence} = \frac{\text{Number of infected plants in the plot}}{\text{Total number of plants in plot}} \times 100$$

The observations on plant growth and yield contributing characters, such as plant height, number of pods/plant and Pods lengths were recorded for all the genotypes at 45 days after sowing. Mature and dried Soybean pods were harvested. Grain yield data was calculated on a hectare basis after the pods were harvested separately according to their genotypes.

3. RESULTS AND DISCUSSION

Table 3: Screening of soybean genotypes against Mungbean Yellow Mosaic Virus

Sr. No.	Name of Genotypes	No. of Whiteflies/ leaf*	Disease Incidence (%)	First appearance of disease on plants (Days after Sowing)	Reaction
1	MAUS 47	0.60	8.5 %	36	MR
2	KDS 726	1.67	16.17%	26	MS
3	KDS753	1.73	39.86 %	24	S
4	MAUS 731	1.30	9.86%	29	MR
5	KDS992	1.54	15.45 %	28	MS
6	MAUS612	1.78	36.60 %	21	S
7	MAUS81	1.85	41.4 %	19	S
8	MAUS158	0.80	9.5 %	32	MR
9	MAUS725	0.66	9.32 %	34	MR
10	MAUS71	1.20	9.8 %	30	MR
11	MAUS61	1.80	39.7 %	20	S
12	MAUS162	1.46	13.3 %	27	MS

*= Average of five plants

Results (Table 3, Fig. 1) showed that all the soybean genotypes, revealed that, minimum whitefly population (0.60 % whitefly/ leaf) was recorded in MAUS 47 and maximum whitefly population in (1.85% whitefly / leaf) was recorded in

MAUS 81. MAUS 47 showed less disease incidence (8.5%) and MAUS 81 showed high disease incidence (41.4%). The maximum yield was recorded in MAUS 47 (7.06 q/ ha) and least grain yield was found in MAUS 81 (3.68 q/ha), respectively.

Typically, the infected genotypes exhibited the symptoms as yellow spots along the veins, areas of yellowish green on the leaves, a bright yellow leaf surface, deformed leaves and stunted plants.

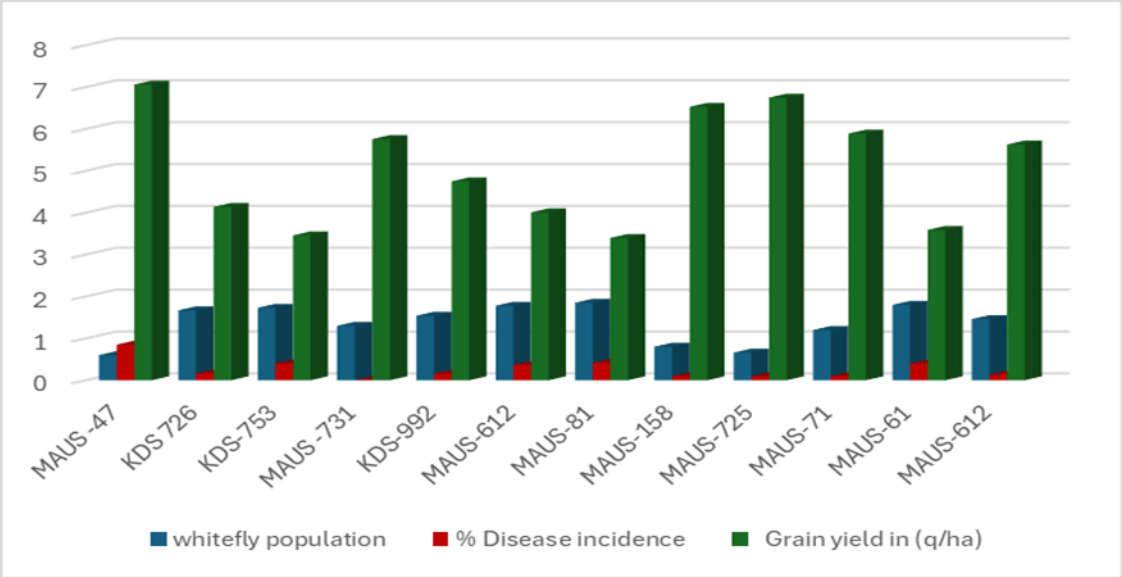

Fig. 1: Evaluation of whitefly, % disease incidence and grain yield

Table 4: Categorization of soybean genotype varieties on the basis of their reaction to Mungbean Yellow Mosaic Virus disease

Sr. No.	Scale	Reaction	Genotypes
1	**0**	Highly Resistant (HR)	----
2	**1**	Resistant (R)	----
3	**2**	Moderately Resistant (MR)	MAUS47, MAUS 731, MAUS 158. MAUS 725, MAUS 71
4	**3**	Moderately Susceptible (MS)	KDS 726, KDS 992, MAUS 162
5	**4**	Susceptible (S)	KDS 753, MAUS 61, MAUS 612, MAUS 81
6	**5**	Highly Susceptible (HS)	----

Based on the per cent disease incidence on soybean genotypes, they were classified as Highly resistant (HR), Resistant (R), Moderately Resistant (MR), Moderately Susceptible (MS), Susceptible (S) and Highly Susceptible (HS) and they were presented in Table 4. MAUS 47, MAUS 731, MAUS 158, MAUS 725 and MAUS 71 are shown Moderately Resistant. KDS 726, KDS 992, MAUS 162 are Moderately Susceptible. KDS 753, MAUS 61, MAUS 612, MAUS 81 are Susceptible. There are no genotypes showing Highly Resistant, Resistant and Highly Susceptible.

Several researchers had recorded earlier mungbean yellow mosaic disease reactions in soybean such as Ramesh *et al.* (2019); Yadav and Dahiya (2000); in mungbean, Mandhare and Suryawanshi (2008); Salam*et al*. (2009); Suman *et al.* (2015); Bhanu *et al*. (2017); Deepa *et al*. (2017); Khaliq *et al*. (2017); Dharajiya*et al*. (2018); Mahalingam *et al*. (2018) andYadav *et al.* (2021), respectively.

Table 5. Yield and yield parameters of different genotypes of soybean

Sr. No.	Name of the Genotypes	Plant height (30 days)*	Plant height (90 days)*	Germination (%)*	No. of pods/plant*	Pod length (cm)*	Yield (q/ha)
1	**MAUS -47**	33.53	47.78	55.98	28.99	4.1	7.06
2	**KDS 726**	35.6	42.8	36.21	16.59	3.0	4.14
3	**KDS-753**	26.4	30.01	20.56	14.87	2.4	3.46
4	**MAUS -731**	31.23	39.45	44.51	19.67	3.4	5.76
5	**KDS- 992**	31.5	37.85	38.98	19.10	3.0	4.75
6	**MAUS-612**	28.06	35.26	33.69	15.11	2.9	4.01
7	**MAUS-81**	21.26	29.88	19.89	11.10	2.0	3.40
8	**MAUS-158**	35.39	42.36	51.21	21.98	3.8	6.53
9	**MAUS-725**	31.54	44.56	52.98	24.24	3.9	6.75
10	**MAUS-71**	32.76	40.22	46.69	20.29	3.7	5.89
11	**MAUS-61**	29.46	32.26	24.21	13.23	2.7	3.59
12	**MAUS-162**	29.65	38.98	40.45	19.79	3.2	5.63

*****Average no. of plants =5

The results in (Table 5) on the effect of MYMV on plant growth and yield contributing parameters revealed that MYMD incidence had a profound influence on the number of pods/plant, number of seeds/pod and seed yield in twelve soybean

genotypes. Soybean plant height was found to be influenced by MYMD and was ranged from MAUS 47 (47.78cm) to MAUS 81 (29.88 cm). The number of pods /plant ranged from 29 (MAUS 47) to 11 (MAUS 81). The pod length of soybean genotypes that were screened ranged from 4.1cm (MAUS 47) and 2.0 cm in MAUS 81. The grain yield (q/ha) was distinctly influenced due to per cent MYMD incidence. The grain yield was highly influenced due to MYMD incidence and was ranged from 7.06 q/ha (MAUS 47) to 3.40 q/ha (MAUS 81), respectively.

Several researchers had reported earlier the effect of MYMV disease on plant growth and yield contributing parameters of soybean, such as Khattak *et al.* (2000) and Alam*et al.* (2014), respectively.

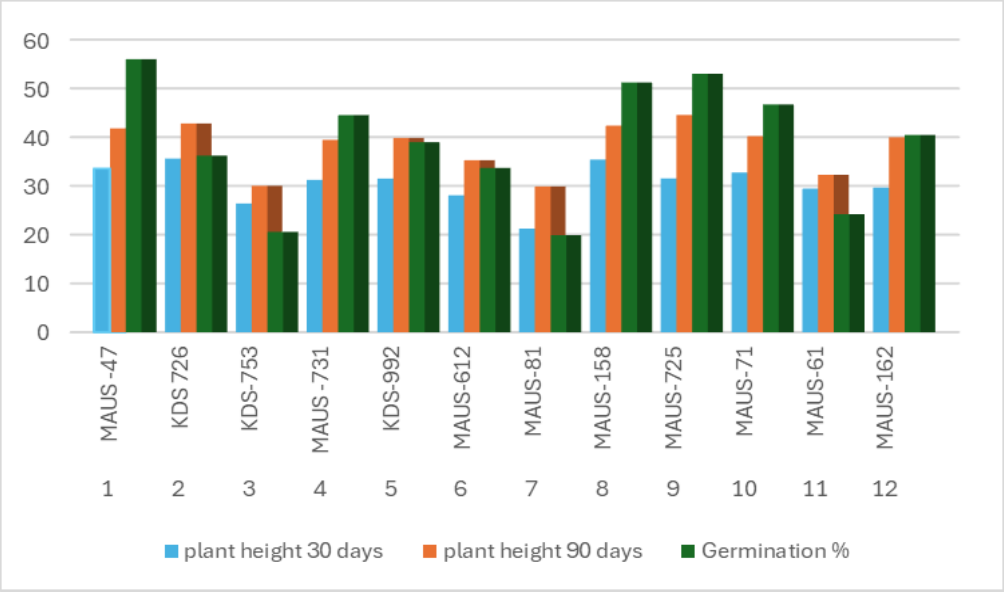

Fig. 2: Plant height and Germination % are shown in this graph

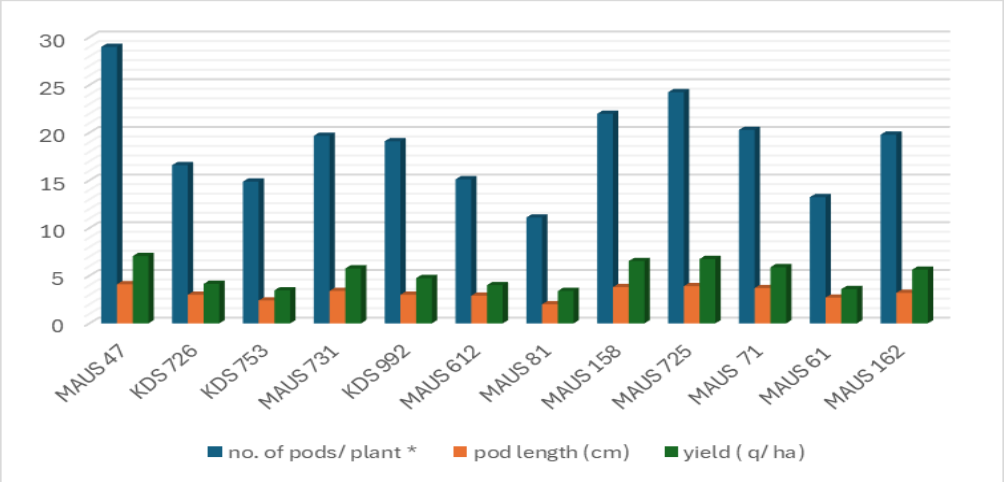

Fig 3: No. of pods, pod length and yield per plants are shown in this graph

Conclusion

A total of twelve genotype varieties of soybean were screened against MYMV, among which, none of them were found to be immune and results revealed that some of the genotypes were susceptible. Among all of them, five genotype varieties, *viz*., MAUS 47, MAUS 725, MAUS 158, MAUS 731 and MAUS 71with a mean whitefly population of 0.60, 0.66, 0.80, 1.20 and mean disease incidence of 8.5%, 9.32%,9.5% and 9.8% were found to be moderately resistant genotype varieties. Three genotypes *viz*., MAUS 162, KDS 992 and KDS 726 with mean whitefly population of 1.46, 1.67,1.54 and whiteflies/leaf and mean disease incidence of 13,3%, 15.45% and 16.17%, respectively, were found to be moderately susceptible genotypes and remaining genotypes *viz*., KDS 753, MAUS 612, MAUS 61, MAUS 81 with mean whitefly population of 1.73, 1.78,1.80 and 1.85 whiteflies/leaf and mean disease incidence of 39.86%, 36.60%, 39.8% and 41.4% respectively, were found to be susceptible. The susceptible genotypes *i.e*., KDS 753, MAUS 612, MAUS 61, MAUS 81 were less in height, less number of pods/plant and less number of seeds/pod, when compared to moderately resistant genotypes *viz*., MAUS 47, MAUS 725, MAUS 158, MAUS 731 and MAUS 71.

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