I J P S INTERNATIONAL JOURNAL OF PLANT SCIENCES
ISSN-0973-1547 Volume 17 | Issue 2 | July, 2022 | 274-277

DOI: 10.15740/HAS/IJPS/17.2/274-277
Visit us - *www.researchjournal.co.in*

RESEARCH ARTICLE

Screening of germplasm against yellow mosaic virus disease of soybean

■ M. Swathi and Neeta Gaur

SUMMARY

The field screening of soybean germplasm against yellow mosaic virus disease was conducted at Norman E. Borlaug Crop Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar during *Kharif,* 2015 and 2016. The per cent disease incidence was varied from 0 to 58 among the tested germplasm lines. The highly resistant germplasm lines were DS 3101, PS 1550, SL 955, SL 983 and UPSM 534. Based on the disease reaction, the germplasm lines categorized as highly resistant (20.83%) relatively resistant (12.5%), moderately resistant (4.17%), moderately susceptible (12.5%), susceptible (33.33%) and highly susceptible (16.67%).

Key Words : YMD, Germplasm, Whitefly, Soybean

How to cite this article : Swathi, M. and Gaur, Neeta (2022). Screening of germplasm against yellow mosaic virus disease of soybean. *Internat. J. Plant Sci.*, **17** (2): 274-277, **DOI: 10.15740/HAS/IJPS/17.2/274-277,** Copyright@ 2022:Hind Agri-Horticultural Society.

Article chronicle : Received : 14.05.2022; **Revised :** 25.05.2022; **Accepted :** 26.06.2022

Soybean [*Glycine max* (L.) Merrill] is popularly known as "Golden bean" or "Miracle crop" of 20th century because of its oil and protein and its use in food, feed and other industrial purposes. Its oil is used in the manufacturing of paints, varnishes, lubricants, antibiotics etc. It is a rich source of minerals like calcium, iron and phosphorus along with vitamins (A, B, D and E) and essential amino acids (Mundewadikar and Deshmukh, 2014). Soybean meal is used as protein supplement for human beings, poultry and cattle.

It is growing in temperate, tropical and subtropical regions of the world. The global estimates for the soybean area, production and productivity for 2016-17 were 121.93 m ha, 342.56 m t and 2809 kg/ha, respectively. In India, it is cultivated in 11.50 m ha area with total production of 14.12 m t and productivity of 1239 kg/ha (ICAR- IISR, 2017).

The productivity of soybean in India is low (1239 kg/ha) compare to the world productivity (2809 kg/ha) due to various biotic and abiotic factors. Insect pests and diseases are causing 32 per cent yield loss and became important biotic constraints to soybean production

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
M. Swathi, Department of Entomology, Agricultural College, Acharya N. G. Ranga Agricultural University, **Bapatla (A.P.) India**

Address of the Co-authors:
Neeta Gaur, Department of Entomology, College of Agriculture, G. B. Pant University of Agriculture and Technology, **Pantnagar (Uttarakhand) India**

Table A : Disease scoring scale for yellow mosaic virus disease of soybean

Severity	Infection (%)	Infection category	Reaction group
0	All plants are free of virus symptoms	Highly resistant	HR
1	1-10% infection	Resistant	RR
2	11-20% infection	Moderately resistant	MR
3	21-30% infection	Moderately susceptible	MS
4	31-50% infection	Susceptible	S
5	>50% infection	Highly susceptible	HS

in India (Sharma and Shukla, 1997). The *Begomo virus* species *viz*., *Mungbean yellow mosaic india virus* (MYMIV) and *Mungbean yellow mosaic virus* (MYMV) are causing yellow mosaic virus disease (YMD) on soybean in India. In north India, MYMIV is causing soybean YMD whereas, MYMV is causing disease in south and west India (Usharani *et al*., 2004 and Girish and Usha, 2005).

The YMD of soybean was first reported in 1960 from India (Nariani, 1960). The YMD is major constraint to production of soybean in Uttarakhand, Punjab, Madhya Pradesh, Delhi, Haryana, Uttar Pradesh, Rajasthan and Karnataka. It accounts to 30-70 per cent yield loss and increases upto 80 per cent during severe incidence of disease (Nene, 1972).

The Gemini virus causing YMD is whitefly borne and it was not transmissible by soil, sap or seed (Nene, 1973). The whitefly as insect pest can be effectively managed through the foliar application of insecticides but the management of whitefly as vector solely with foliar application of insecticides is difficult because it concealed on the lower surface of leaf and a single viruliferous whitefly would be able to transmit the virus.

In view of existing situation and importance of soybean in Indian economy, the necessary pre-requisite is development of economically sound and environmentally safe integrated management approach for successful management of YMD in soybean. The best management practice against YMD is cultivation of resistant varieties. Hence, the present study on screening of soybean germplasm lines was conducted.

MATERIAL AND METHODS

The field screening of 24 soybean germplasm lines including two checks *i.e.* JS 335 as susceptible check and UPSM 534 as resistant check was conducted in Randomised Block Design at Norman E. Borlaug Crop Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar during *Kharif*, 2015 and 2016. The germplasm lines were sown in two rows with 3m length of each row and replicated twice with the spacing of 45 cm x 5 cm. The experiment was conducted under unprotected condition and all standard agronomic practices were followed for cultivation of crop.

The disease incidence was recorded from three weeks after sowing to crop maturity and per cent disease incidence was calculated by using the formula given by Alice and Nadarajan (2007).

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants in row}}{\text{Total number of plants in a row}} \text{x100}$$

The rating of YMD was done by using 0-5 arbitrary scale suggested by Bashir *et al.* (2005).

RESULTS AND DISCUSSION

The incidence of YMD on 24 soybean germplsam lines was recorded from 30 DAS to 103 DAS during 2015 and 2016. The data on YMD incidence among soybean germplasm lines during 2015 and 2016 was presented in Table 1.

The YMD incidence was varied from 0.00 to 59.49 per cent among 24 soybean germplasm lines during 2015. The maximum disease incidence was noticed on JS 93-05 (59.49%) followed by JS 335 (57.45%), VLS 89 (55.74%), KDS 753 (53.84%), DSb 28-3 (51.47%) and MACS 1410 (48.85%) whereas the minimum disease incidence was recorded on germplasm lines *viz*., PS 1347 (6.06%), PS 1092 (7.30%) and SL 688 (8.58%). The germplasm lines free from disease were DS 3101, SL 955, SL 983, PS 1550 and UPSM 534.

Similarly, the disease incidence was varied from 0.00 to 56.55 per cent among different germplasm lines during 2016. The disease incidence was not observed on genotypes DS 3101, SL 955, SL 983, PS 1550 and UPSM 534. The highest disease incidence was observed on JS 93-05 (56.55%) followed by JS 335 (54.54%), VLS 89 (53.12%), KDS 753 (50.68%), DSb 28-3 (48.19%) and MACS 1410 (45.29%). The lowest disease incidence was recorded on PS 1347 (6.06%) followed by PS 1092

Table 1 : Screening of soybean germplasm against yellow mosaic virus disease

Sr. No.	Germplasm line	YMD incidence (%)			Severity	Reaction
		2015	2016	Pooled mean		
1.	Bragg	23.55 (29.03)	21.61 (4.70)	22.58 (4.80)	3	MS
2.	DS 3101	0.00 (0.00)	0.00 (0.71)	0.00 (0.71)	0	HR
3.	DS 3102	21.29 (27.48)	19.00 (4.42)	20.15 (4.54)	2	MR
4.	DSb 2302	40.14 (39.32)	37.66 (6.18)	38.90 (6.28)	4	S
5.	DSb 25	33.24 (35.21)	30.64 (5.58)	31.94 (5.70)	4	S
6.	DSb 28-3	51.47 (45.84)	48.19 (6.98)	49.83 (7.09)	4	S
7.	JS 20-34	42.36 (40.61)	39.59 (6.33)	40.97 (6.44)	4	S
8.	JS 20-71	35.47 (36.55)	33.08 (5.79)	34.28 (5.90)	4	S
9.	JS 93-05	59.49 (50.47)	56.55 (7.55)	58.02 (7.65)	5	HS
10.	KDS 753	53.84 (47.20)	50.68 (7.15)	52.26 (7.26)	5	HS
11.	MACS 1370	37.76 (37.91)	34.96 (5.96)	36.36 (6.07)	4	S
12.	MACS 1410	48.85 (44.34)	45.29 (6.77)	47.07 (6.90)	4	S
13.	MACS 1460	44.70 (41.96)	41.66 (6.49)	43.18 (6.61)	4	S
14.	PS 1092	8.53 (16.99)	7.30 (2.79)	7.92 (2.90)	1	RR
15.	PS 1347	6.81 (15.12)	6.06 (2.56)	6.44 (2.63)	1	RR
16.	PS 1550	0.00 (0.00)	0.00 (0.71)	0.00 (0.71)	0	HR
17.	PS 1556	28.09 (32.01)	25.29 (5.08)	26.69 (5.21)	3	MS
18.	SL 1028	25.87 (30.57)	23.27 (4.88)	24.57 (5.01)	3	MS
19.	SL 688	10.11 (18.54)	8.58 (3.01)	9.35 (3.14)	1	RR
20.	SL 955	0.00 (0.00)	0.00 (0.71)	0.00 (0.71)	0	HR
21.	SL 983	0.00 (0.00)	0.00 (0.71)	0.00 (0.71)	0	HR
22.	VLS 89	55.74 (48.29)	53.12 (7.32)	54.43 (7.41)	5	HS
23.	JS 335	57.45 (49.29)	54.54 (7.42)	55.99 (7.52)	5	HS
24.	UPSM 534	0.0 (0.00)	0.00 (0.71)	0.00 (0.71)	0	HR
S.E.±	0.57	1.47	2.98	1.48		
C.D. (P=0.05)	1.67	4.31	8.72	4.34		

Figures in parentheses are arcsine transformed values

(7.30%) and SL 688 (8.58%).

The pooled mean per cent YMD incidence among different soybean germplasm lines during 2015 and 2016 was significantly varied from 0.00 to 58.02. The disease incidence was low during early crop growth stages *i.e.* upto 45 DAS. The disease incidence had started increasing from 52 DAS and reached 100 per cent at 95 DAS on JS 93-05 along with susceptible check JS 335 during both the seasons. The maximum disease incidence percentage of 58.02 was recorded on JS 93-05 followed by JS 335 (55.99%), VLS 89 (54.43%), KDS 753 (52.26%), DSb 28-3 (49.83%), MACS 1410 (47.07%), MACS 1460 (43.18%) and JS 20-34 (40.97%). The disease incidence was in the range of 31-39 per cent on genotypes DSb 2302 (38.90%), JS 20-71 (34.28%) and DSb 25 (31.94%). The genotype JS 93-05 was more susceptible to YMD than susceptible check JS 335. The minimum disease incidence was recorded on PS 1347 (6.44%) followed by PS 1092 (7.92%) and SL 688 (9.35%). The disease incidence was not observed on five germplasm lines *viz*., DS 3101, SL 955, SL 983, PS 1550 and resistant check UPSM 534. Based on the disease reaction, the germplasm lines categorized as highly resistant (20.83%) relatively resistant (12.5%), moderately resistant (4.17%), moderately susceptible (12.5%), susceptible (33.33%) and highly susceptible (16.67%). The varieties found highly resistant to YMD were DS 3101, PS 1550, SL 955, SL 983 and UPSM 534. The variety moderately resistant to YMD was DS 3102. The varieties highly susceptible to YMD were JS 93-05, KDS 753, VLS 89 and JS 335.

The deployment of resistant cultivars against diseases is a continuous process. Singh and Mallick (1978) observed that two recessive genes namely *rym1* and *rym2* were governing resistance against YMV in soybean cultivar UPSM-534 (PI 171443). However, Bhattacharyya *et al.* (1999) observed that a single dominant gene (*Rym*) was imparting resistance to progeny against YMV in

inter specific crossing of resistant parent, *G. soja* with three susceptible parents namely Bragg, Ankur and PK 472.

Recently, Baruah *et al*. (2014) reported that the soybean cultivar, JS 335 was highly susceptible to YMD, whereas two other genotypes *viz*., DS 9712 and DS 9814 were found resistant to YMD of soybean. Kumar *et al*. (2014) screened out 500 soybean germplasm lines against YMD resistance. They reported that 21 genotypes including DS 9712, PK 1223, SL 633, DS 9817, PK 292, SL 637, DS 9801, PS 1042, UPSM 534, PK 1347 etc. showed resistance and 31 genotypes SKAF 106, EC 472211, SKAF 750-1, SKA 2008, JS 335 etc., showed susceptible reaction to YMV. Bisht *et al*. (2015) noticed thatthe soybean germplasm lines resistant to YMD were AMS-MB-5-18, DS-12-5, AMS-MB-5-19, DSb-20, JS-2034, KS-103, JS-20-29, AMS-243, MACS-504, DS-2708, PS-1476, DSb-16, SL-900, PS-1477, KDS-8, RVS-2001-18 and MACS-1336. Pancheshwar *et al.* (2016) evaluated 72 soybean germplasm lines against YMD. They observed that 40 genotypes *viz*., JS 20-05, JS 98-79, JS 20-24, JS 20-74, JS 20-29 etc. were highly resistant and 16 genotypes *viz*., PSB 13-16, JS 20-21, JS 99-72, PK 768, NRC 56, PS 1518 etc. were moderately resistant to YMD.

REFERENCES

Alice, D. and Nadarajan, N. (2007). Pulses-screening techniques and assessment methods for disease resistance. Department of Pulses, Tamil Nadu Agricultural University, Coimbatore, 24 pp.

Baruah, S., Sarma, M.K., Baishya, D., Sharma, A.A., Borah, R. and Bhuyan, J. (2014). Genetic variation for seed yield and yellow mosaic virus resistance in soybean [*Glycine max* (L.) Merrill]. *Internat. J. Scient. & Res. Public.*, **4** (9) : 1-10.

Bashir, M. and Zubair, M. (2005). Studies on viral diseases of major pulse crops and identification of resistant sources. Technical Annual Report (April, 2004 to June. 2005) of APL Project. Crop sciences Institute, National Agricultural Research Centre, Islamabad, 169 pp.

Bhattacharyya, P.K., Ram, H. and Kole, P.C. (1999). Inheritance of resistance to yellow mosaic virus in inter-specific crosses of soybean. *Euphytica,* **108** : 157–159.

Bisht, K., Mishra, V.K. and Karnatak, A.K. (2015). Relative resistance in soybean germplasms against whitefly (*Bemisiatabaci* Gennadius) and yellow vein mosaic virus spread in field. *Internat. J. Agric., Environ. & Biotechnol*., **8** (4) : 995-998.

Girish, K.R. and Usha, R. (2005). Molecular characterization of two soybean-infecting begomo viruses from India and evidence for recombination among legume-infecting begomoviruses from South-East Asia. *Virus. Res.,* **108** : 167–176.

ICAR-IISR (2017). All India Coordinated Research Project on Soybean. Director's report and summary tables of experiments 2016-17. Indian Institute of Soybean Research, Indore, Madhya Pradesh. pp. 1-11.

Kumar, B., Talukdar, A., Verma, K., Girmilla, G., Bala, I., Lal, S.K., Singh, K.P. and Sapra, R.L. (2014). Screening of soybean [*Glycine max* (L.) Merr.] genotypes for yellow mosaic virus (YMV) disease resistance and their molecular characterization using RGA and SSRs markers. *Australian J. Crop Sci.,* **8** (1) : 27-34.

Mundewadikar, D.M. and Deshmukh, P.R. (2014). Genetic variability and diversity studies in soybean [*Glycine max* (L.) Merrill] using RAPD marker. *Internat. J. Scient. & Res. Public*., **4** (9) : 1-4.

Nariani, T.K. (1960). Yellow mosaic of mung (*Phaseolusaureus* L.). *Indian Phytopathol.*, **13** : 24-29.

Nene, Y.L. (1972). A survey of viral diseases of pulses in India. *G B Pant Univ. of Agriculture & Technol. Res. Bull.*, **4** : 191.

Nene, Y.L. (1973). Viral diseases of some warm weather pulse crops in India. *Plant Dis. Rep.,* **57** : 463-467.

Pancheshwar, D.K., Mishra, S., Kumar, S. and Singh, G. (2016). Screening of resistance soybean [*Glycine max* (L.) Merril] genotypes against the yellow mosaic virus (YMV) disease. *Internat. J. Agric. Sci.,* **8** (20) : 1362-1363.

Sharma, A.N. and Shukla, A.K. (1997). Effect of insect and disease control measure on soybean [*Glycine max* (L.) Merrill] yield in Madhya Pradesh. *J.Oilseeds Research*, **14** : 324-326.

Singh, B. B. and Malick, A. S. (1978). Inheritance of resistance to yellow mosaic in soybean. *Indian J.Genetics & Plant Breeding*, **38** (2) : 258-261.

Usharani, K. S., Surendranath, B., Haq, Q. M. R. and Malathi, V. G. (2004). Yellow mosaic virus infecting soybean in northern India is distinct from the species infecting soybean in southern and western India. *Curr. Sci.*, **86** : 845-850.