



SCREENING OF MUNGBEAN GENOTYPES AGAINST WHITEFLY *BEMISIA TABACI* (GENN.) AND THRIPS *MEGALUROTHRIPS DISTALIS* (KARNY)

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ABSTRACT

Ten green gram genotypes (K 851, GM 4, Meha, VMS 6 (GM-5), IPM 205-7 (Virat), Vaibhav, AKM-6802, CO-5, AKM-8803 and PM-2) were screened for their resistance to the sucking pests. The field experiment was conducted at the Instructional Farm, JAU, Junagadh during summer 2018. None of the varieties proved highly resistant to the whitefly *Bemisia tabaci* (Genn.) and thrips *Megalurothrips distalis* (Karny); however, Meha, IPM 205-7 (Virat), and VMS 6 (GM-5) were found resistant. The varieties Vaibhav, CO-5 and PM-2 have been classified as moderately resistant (MR) to *B. tabaci* and AKM-6802 was moderately susceptible (MS) to both the pests. The susceptible (S) category included the AKM-8803, GM-4, and K-851 varieties.

Key words: Genotypes, summer, green gram, screening, sucking pests, *Megalurothrips distalis*, *Bemisia tabaci*, resistant, susceptible, population, infestation

Green gram *Vigna radiata* (L.) Wilczek is grown primarily for its grains, particularly in Asia and Africa (Nair et al., 2013), and it is grown in tropical and subtropical regions. Globally, the production of green gram is limited by incidence of diseases, pest infestations, use of unsuitable varieties and adaptation of inappropriate agronomic practices (Rao et al., 2000), and insect pests are the major ones (Davies and Lateef, 1975; Saxena, 1978; Seif et al., 2001) accounting for 54.9% loss (Chhabra and Kooner, 1998). The whitefly *Bemisia tabaci* (Gennadius) has been a significant sucking pest, and also by spreading the yellow mosaic viral disease (Taggar and Gill, 2016). The avoidable losses due to *B. tabaci* have been reported to range from 25 to 78% (Sharma and Verma, 1984). Thrips *Megalurothrips distalis* (Karny) is a major sucking pest in green gram (Chhabra and Kooner, 1998). Thrips attack the crop at the flowering stage, causing flower deformity and sometimes leads crop failure. Thrips not only cause direct damage by feeding, but also serve as a vector for various plant viruses (Ananthakrishnan, 1980). Different strategies, mainly with insecticides have been recommended against such sucking insect pests, but many times these are ineffective, necessitating development of alternative tactics. Host plant resistance (HPR) and use of natural enemies, including predators and parasitoids are such ecofriendly measures. Host plant resistance offers solution for maintaining whitefly and thrips populations and reducing crop losses (Bellotti

and Arias 2001; Mouden and Leiss, 2020). Identifying suitable resistant varieties under field conditions is required for this, and in the present study, some green gram genotypes have been screened for resistance to *B. tabaci* and *M. distalis*.

MATERIALS AND METHODS

The experiment was conducted at Instructional Farm, Department of Agronomy, COA, JAU, Junagadh during summer 2018. The recommended agronomic practices were followed, with the seeds sown in a randomized block design (RBD) plots (4.00x 0.90 m²) with ten treatments and three replications; the genotypes evaluated include- K 851, GM 4, Meha, VMS 6 (GM-5), IPM 205-7 (Virat), Vaibhav, AKM-6802, CO-5, AKM-8803 and PM-2 usually grown in the Junagadh region. The varieties were allowed natural infestation, with incidence of pests recorded from ten randomly selected plants. Mature and immature stages were counted at 15-day intervals from the first week after sowing until crop maturity. Incidence of *B. tabaci* and *M. distalis* was counted from three leaves representing each from top, middle and bottom canopy of each plant. These counts were subjected to square root transformation before statistical analysis. The genotypes were categorized into six groups of resistance as: highly resistant, resistant, moderately resistant, moderately susceptible, susceptible, and highly susceptible (Kansagara, 2017).

The mean value of each variety (\bar{X}_i) was compared to the mean value of all varieties (\bar{X}) and the standard deviation was calculated (SD). The retransformed data was used to compute \bar{X} , \bar{X}_i and SD.

RESULTS AND DISCUSSION

The data on the incidence of *B. tabaci* revealed that all the genotypes were infested, of which Meha recorded the least counts (1.44/ leaf), which was comparable to IPM 205-7 (Virat; 1.48/ leaf) and VMS-6 (GM-5; 1.53/ leaf), which can be considered as the least susceptible; maximum counts were observed with the genotype K-851 (3.88 /leaf), which in turn was at par with GM-4 (3.83/ leaf) and AKM-8803 (3.76/ leaf) which can be considered as highly susceptible. None of the genotypes was highly resistant (HR) to

B. tabaci; Meha, IPM 205-7 and VMS 6 (GM-5) were found resistant (R); Vaibhav, PM-2, and CO-5 were observed to be moderately resistant (MR). None of the varieties was found highly susceptible (HS) (Table 1). Kingsly *et al.* (2015) reported the resistance level of genotypes to *B. tabaci* and identified CO-5 and K-851 as the highly susceptible. Suman *et al.* (2015) documented Meha, PM-2 and AKM-8803 as resistant, moderately susceptible and susceptible, while Mohan *et al.* (2014) amongst 120 germplasm against MYMV and reported ten genotypes including IPM 205-7 as resistant, and 46 genotypes as susceptible.

As regards *M. distalis* none of the genotypes were free of infestation, with a minimum of 1.01 thrips/ leaves being with IPM 205-7 (Virat) and which was at par with Meha (1.04 thrips/ leaves) and VMS-6 (GM-

Table 1. Resistance to *B. tabaci* and *M. distalis* in green gram

<i>B. tabaci</i>			
Category of resistance	Scale	Genotypes \bar{X}_i	
1	2	3	
Based on three leaves upper, middle and lower (whitefly /leaf): $\bar{X} = 2.54$ and SD = 0.99			
Highly resistant	$\bar{X}_i < (0.56)$	-	
Resistant	$\bar{X}_i > (0.56) < (1.55)$	Meha	(1.44)
		IPM 205-7	(1.48)
		VMS 6	(1.53)
Moderately resistant	$\bar{X}_i > (1.55) < (2.54)$	Vaibhav	(2.05)
		PM- 2	(2.24)
Moderately susceptible	$\bar{X}_i > (2.54) < (3.53)$	CO-5	(2.31)
		AKM- 6802	(2.87)
Susceptible	$\bar{X}_i > (3.53) < (4.52)$	AKM- 8803	(3.76)
		GM- 4	(3.83)
Highly susceptible	$\bar{X}_i > (4.52)$	K- 851	(3.88)
		-	
<i>M. distalis</i>			
Highly resistant	$\bar{X}_i < (0.03)$	-	
Resistant	$\bar{X}_i > (0.03) < (1.16)$	IPM 205-7	(1.01)
		Meha	(1.04)
		VMS 6	(1.11)
Moderately resistant	$\bar{X}_i > (1.16) < (2.29)$	Vaibhav	(1.49)
		PM- 2	(2.02)
Moderately susceptible	$\bar{X}_i > (2.29) < (3.42)$	CO-5	(2.32)
		AKM- 6802	(2.82)
Susceptible	$\bar{X}_i > (3.42) < (4.55)$	AKM- 8803	(3.59)
		GM- 4	(3.71)
Highly susceptible	$\bar{X}_i > (4.55)$	K- 851	(3.78)
		-	

(contd.)

Categorization	
Category	Scale of resistance
Highly resistant	$\bar{X}_i < (\bar{X} - 2SD)$
Resistant	$\bar{X}_i > (\bar{X} - 2SD) < (\bar{X} - SD)$
Moderately resistant	$\bar{X}_i > (\bar{X} - SD) < \bar{X}$
Moderately susceptible	$\bar{X}_i > \bar{X} < (\bar{X} + SD)$
Susceptible	$\bar{X}_i > (\bar{X} + SD) < (\bar{X} + 2SD)$
Highly susceptible	$\bar{X}_i > (\bar{X} + 2SD)$

Incidence			
S. No.	Genotypes	No. of insect pests/leaf/plant ^{&}	
		Whitefly	Thrips
1	K 851	1.97* (3.88)	1.94 (3.78)
2	GM 4	1.96 (3.83)	1.92 (3.71)
3	Meha	1.20 (1.44)	1.02 (1.04)
4	VMS 6 (GM-5)	1.24 (1.53)	1.05 (1.11)
5	IPM 205-7 (Virat)	1.22 (1.48)	1.01 (1.01)
6	Vaibhav	1.43 (2.05)	1.22 (1.49)
7	AKM-6802	1.69 (2.87)	1.68 (2.82)
8	CO-5	1.52 (2.31)	1.52 (2.32)
9	AKM-8803	1.94 (3.76)	1.90 (3.59)
10	PM-2	1.50 (2.24)	1.42 (2.02)
	S.Em.±	0.07	0.07
	CD (p=0.05)	0.21	0.21
	CV %	8.51	8.70

Figures in parentheses whitefly /leaf; \bar{X}_i = Mean value of individual variety; \bar{X} = Mean value of infestation of all varieties; SD= Standard deviation; *Square root transformed values; &Figures in parentheses retransformed values

5) (1.11 thrips/ leaves); K-851 harboured a maximum incidence (3.78 thrips/ leaves), which was at par with GM-4 (3.71 thrips/ leaves); the rest of the varieties, Vaibhav, PM-2, CO-5, AKM-6802 and AKM-8803 can be considered as moderately susceptible; thus, IPM 205-7, Meha, and VMS-6 were found comparatively resistant. None of the genotypes could be classified as highly resistant (HR)- IPM 205-7, Meha and VMS 6 were all found resistant (R); Vaibhav and PM-2 were moderately resistant (MR), while CO-5 and AKM-6802 were moderately susceptible (MS); and AKM-8803, GM-4 and K-851 were classified as susceptible (S) category, with none as highly susceptible (HS) group (Table 1). Similar conclusions were drawn by Ghose and Chatterjee (2016), while Kansagara (2017) observed IPM 205-7 (Virat) as least susceptible, and K-851 and GM-4 as susceptible.

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AUTHOR CONTRIBUTION STATEMENT

GRH and BBK conceived and designed research. GRH and BBK conducted experiments. GRH and MCK analyzed the data and wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

- Ananthkrishnan T N. 1980. Thrips as vectors of plant pathogens. K F Harris, K Maromrosch (eds.). Academic press, New York. pp.149-164.
- Bellotti A C, Arias B. 2001. Host plant resistance to whiteflies with emphasis on cassava as a case study. *Crop Protection* 20: 813-823.
- Chhabra K S, Kooner B S. 1998. Insect pest management in mungbean and blackgram status and strategies (eds. R. K. Upadhyay, K. G. Mukerji and R. L. Rajak), Aditya Books Private Limited, New Delhi. pp. 233-310.
- Davies J C, Lateef S S. 1975. Insect pests of pigeonpea and chickpea in India and prospects for control. *Proceedings. International workshop on grain legumes.* p. 331.

- Ghose M, Chatterjee S. 2016. Sucking insect-pest complex in different summer green gram, *Vigna radiata* (L.) Wilczek varieties in West Bengal. Proceedings. International conference on agriculture, food science, natural resource management and environmental dynamics- the technology, people and sustainable development. p.57.
- Kansagara S. 2017. Population dynamics, varietal screening and management of thrips infesting green gram M Sc (Ag.) Thesis. Junagadh Agricultural University, Junagadh.
- Kingsly N B, Pandiyan M, Natesan S. 2015. Screening of mungbean (*Vigna radiata* (L.) Wilczek) genotypes for resistance to Yellow Mosaic Virus. Trends in Biosciences 8(8): 2043-2046.
- Mehta T R. 1970. Pulse could play a larger role in Indian Agriculture. Indian Farming 17(11): 23-25.
- Mohan S, Sheeba A, Murugan E, Ibrahim S M. 2014. Screening of mungbean germplasm for resistance to mungbean yellow mosaic virus under natural condition. Indian Journal of Science and Technology 7: 891-896.
- Mouden S, Leiss K A. 2020. Host plant resistance to thrips (Thysanoptera: Thripidae)- current state of art and future research avenues. Current Opinion in Insect Science 45: 28-34.
- Nair R M, Yang R Y, Easdown W J, Thavarajah D, Thavarajah P, Hughes J D A, Keatinge J D H. 2013. Biofortification of mungbean (*Vigna radiata*) as a whole food to enhance human health. Journal of the Science of Food and Agriculture 93(8): 1805-1813.
- Rao M R, Singh M P, Day R. 2000. Insect pest problem in tropical agroforestry systems: Contributory factors and strategies for management. Agroforestry Systems 50: 243-277.
- Saxena H P. 1978. Pests of grain legumes and their control in India. Indian Agricultural Research Institute, New Delhi, India. pp. 15-23.
- Sehrawat N, Bhat K V, Sairam R K, Jaiwal P K. 2013. Identification of salt resistant wild relatives of mungbean (*Vigna radiata* (L.) Wilczek). Asian Journal of Plant Science and Research 5: 41-49.
- Seif A, Varela A M, Michalik S, Lohr B. 2001. A guide to IPM in French beans production with emphasis on Kenya. 99 pp.
- Sharma S R, Verma A. 1984. Control of yellow mosaic of mung bean through chemicals. Journal of Entomology Research 6(2): 130-136.
- Suman S, Sharma V K, Kumar H, Shahi V K. 2015. Screening of mungbean [*Vigna radiata* (L.) Wilczek] genotypes for resistance to mungbean yellow mosaic virus (MYMV). Environment and Ecology 33: 855-859.
- Taggar G K, Gill R S. 2016. Host plant resistance in *Vigna* sp. towards whitefly, *Bemisia tabaci* (Gennadius): a review. Entomologia Generalis 36(1): 1-24.
- Thakur C. 1979. Scientific crop production Vol-1. Metropolitan Book Private Limited. Netaji Subhas Marg, New Delhi. pp. 307-313.

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