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SCREENING OF GREEN GRAMGENOTYPES AGAINST SPOTTED POD BORER *MARUCA VITRATA* (F.)

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ABSTRACT

This study evalautes twenty gentotypes of green gram greengram *Vigna radiata* (L.) Wilczekibility levels against the spotted pod borer *Maruca vitrata* (F.). The experiment was done during *kharif* 2014 and 2015 at the Agricultural Research Farm, Banaras Hindu University, Varanasi, Uttar Pradesh.The infestation was assessed at the flowering stage based on larval incidence/plant. The results revealed that the incidence was observed in 37th standard meteorological week (SMW) with a peak during the 40th SMW, and varied from 0.53 to 3.01 larva/plant.Maximum larval population was observed inIPM 306-6followed by IPM 05-3-22 and ML 1256 and the least with PM-5 followed by IPM 306-1 and ML 515. The genotype PM-5 (7.72 q/ha) closely followed by IPM 306-1 (6.96 q/ha) and HUM-16 (6.58 q/ha) gave the maximum yield.

Key words: *Maruca vitrata*, green gram, genotypes, larvae/plant, yield, resistance, susceptible, yield, seasonal incidence

Green gram, *Vigna radiata* (L.) Wilczek is one of the important legume crop with its origin in the India-Burma region, and secondary origin as Bihar, Munger district (Singh, 2001). Insect pests play an important role in the production (Swaminathan et al., 2012. Husain et al. (2002) reported that more than 150 species of insect pests, out of which 25 species inflict heavy losses. Spotted or legume pod borer *Maruca vitrata* (F.) is the most serious pest, and the low yield is attributed to its regular outbreaks. (Singh and Srivastava, 2017). It has extensive host range, is a persistent pest and cause heavy loss (Vishakanthaiah and Jagadeesh, 1980; Singh and Allen, 1980; Zahid et al., 2008).Host plant resistance (HPR) is an important IPM strategy against such pests and it is ecofriendly, and insect resistant varieties have been deployed (Dhillon and Sharma, 2012). The present study evaluates the resistance to the *M. vitrata* in some promising green gram genotypes.

MATERIALS AND METHODS

The screening experiments were conducted during kharif 2014 and 2015 at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. Twenty promising genotypes procured from ICAR-Indian Institute of Pulses Research, Kanpur were evaluated, with the recommended agronomic practices without pesticides followed, in Randomized Block Design (RBD) with 3 replications. The row to row and plant to plant distance was maintained as 30 and 10 cm, respectively, in plot sizeof 4 x 0.60 m.The population density of *M. vitrata* was estimated by randomly selecting of 5 plants/plot, at weekly intervals, and observations on pod damage made by counting a total number of pods harvested at the time of maturity. Observations were made on the characteristic *M. vitrata*entry/exit holes on the pods. For recording grain damage the pods were opened and the total number of the grain and number of damaged grain were recorded, and % worked out. Based on the pod damage, the genotypes were categorized into categories based on the 1-9 scale (Rani et al., 2008) as follows: Scale/Score: incidence: category- 1: No damage: Resistant; 3:<10% damage: Moderately resistant; 5: 11-10% damage: Tolerant; 7: 21-40% damage: Moderately susceptible; and 9: >40% damage: Highly susceptible. The data on the grain yield from all the plants and computed to plot yield and per ha yield. The larval population density and % pod and grain damage were subjected to ANOVA (p=0.05) and the treatment means compared using F-test. The data on population, % infestation, % pod and grain damage to square root ($\sqrt{x+0.5}$) and arcsine transformation, respectively before analysis.

Table 1. Screening of gramgenotypes against *M. vitrata* and its damage (*kharif* 2014 and 2015- pooled)

Tr. No.	Varieties/ genotypes	*Mean larval population of *M. vitrata*/plant						Yield (q ha^{-1})	**Pod damage (%)	**Seed damage (%)	Scale (1-9)	Reaction
		37th SMW	38th SMW	39th SMW	40th SMW	41th SMW	Overall mean					
T_1	PM-5	0.17 (0.82)	0.40 (0.95)	0.70 (1.10)	0.83 (1.15)	0.53 (1.02)	0.53 (1.01)	7.72	4.67 (12.48)	3.39 (10.61)	3	MR
T_2	IPM 2K 14-9	0.77 (1.13)	1.07 (1.25)	1.27 (1.33)	1.47 (1.40)	1.13 (1.28)	1.14 (1.28)	6.22	14.00 (21.97)	7.86 (16.29)	3	MR
T_3	HUM-1	0.67 (1.08)	0.87 (1.17)	1.10 (1.26)	1.33 (1.40)	0.93 (1.20)	0.98 (1.22)	6.40	11.83 (20.12)	7.20 (15.56)	5	Tolerant
T_4	ML 1257	1.67 (1.47)	1.97 (1.57)	2.10 (1.61)	2.33 (1.68)	1.87 (1.54)	1.99 (1.58)	4.73	22.83 (28.54)	15.76 (23.39)	5	Tolerant
T_5	Pusa 672	1.27 (1.33)	1.43 (1.39)	1.57 (1.44)	1.73 (1.49)	1.40 (1.38)	1.48 (1.41)	5.77	17.17 (24.48)	11.43 (19.76)	5	Tolerant
T_6	IPM 306-6	2.63 (1.77)	3.00 (1.87)	3.13 (1.91)	3.40 (1.97)	2.90 (1.84)	3.01 (1.87)	3.11	36.00 (36.87)	26.52 (31.00)	7	MS
T_7	SM 48	1.40 (1.38)	1.63 (1.46)	1.73 (1.49)	2.00 (1.58)	1.53 (1.43)	1.66 (1.47)	3.33	18.67 (25.60)	12.89 (21.04)	5	Tolerant
T_8	IPM 05-3-22	2.53 (1.74)	2.90 (1.84)	3.03 (1.88)	3.33 (1.96)	2.80 (1.82)	2.92 (1.85)	3.23	35.67 (36.67)	25.90 (30.59)	7	MS
T_9	Pusa Bold	1.07 (1.25)	1.30 (1.34)	1.43 (1.39)	1.60 (1.45)	1.30 (1.34)	1.34 (1.36)	5.99	15.83 (23.45)	9.59 (18.04)	5	Tolerant
T_{10}	IPM-9901-10	1.50 (1.41)	1.80 (1.52)	2.00 (1.58)	2.23 (1.65)	1.77 (1.51)	1.86 (1.54)	5.09	22.17 (28.09)	14.83 (22.65)	5	Tolerant
T_{11}	HUM-16	0.53 (1.02)	0.77 (1.13)	1.10 (1.26)	1.27 (1.33)	0.90 (1.18)	0.91 (1.19)	6.58	11.00 (19.37)	6.46 (14.73)	3	MR
T_{12}	IPM 306-1	0.33 (0.91)	0.53 (1.02)	0.80 (1.14)	0.97 (1.21)	0.63 (1.06)	0.65 (1.07)	6.96	6.33 (14.58)	4.87 (12.75)	3	MR
T_{13}	PM 4	1.67 (1.47)	2.00 (1.58)	2.20 (1.64)	2.47 (1.72)	1.97 (1.57)	2.06 (1.60)	5.26	25.17 (30.11)	17.22 (24.52)	7	MS
T_{14}	ML 5	1.83 (1.53)	2.17 (1.63)	2.30 (1.67)	2.57 (1.75)	2.13 (1.62)	2.20 (1.64)	3.30	26.33 (30.87)	19.12 (25.93)	7	MS
T_{15}	ML 1256	2.37 (1.69)	2.70 (1.79)	2.87 (1.83)	3.07 (1.89)	2.63 (1.77)	2.73 (1.80)	5.54	33.17 (35.16)	25.22 (30.15)	7	MS
T_{16}	ML 1059	2.27 (1.66)	2.53 (1.74)	2.70 (1.79)	3.00 (1.87)	2.53 (1.74)	2.61 (1.76)	4.41	31.83 (34.35)	24.05 (29.37)	7	MS
T_{17}	SML 191	2.00 (1.58)	2.33 (1.68)	2.57 (1.75)	2.77 (1.81)	2.40 (1.70)	2.41 (1.71)	4.04	27.67 (31.73)	22.22 (28.13)	7	MS
T_{18}	ML 515	0.47 (0.98)	0.70 (1.10)	0.90 (1.18)	1.10 (1.26)	0.73 (1.11)	0.78 (1.13)	4.17	7.50 (15.89)	6.06 (14.26)	3	MR
T_{19}	PDM 288	2.17 (1.63)	2.43 (1.71)	2.63 (1.77)	2.87 (1.83)	2.50 (1.73	2.52 (1.74)	3.78	30.33 (33.42)	22.84 (28.55)	7	MS
T_{20}	HUM-12	1.77 (1.51)	2.10 (1.61)	2.43 (1.71)	2.63 (1.77)	2.17 (1.63)	2.22 (1.65)	4.13	26.33 (30.87)	21.88 (21.89)	7	MS
S.E.m.±		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	0.37		(0.56)		(0.53)
CD $_{(p=0.05)}$		(0.09)	(0.08)	(0.08)	(0.03)	(0.08)	(0.07)	1.07		(1.59)		(1.51)

Figures in parentheses $\sqrt{x+0.5}$ transformed values; SMW- Standard Meteorological Week; *mean of three replications; **Figures in parentheses arcsine transformed values; *mean of three replications

Table 2. Effect of *M.vitrata* larval population on pod damage and grain damage during *kharif* 2014 and 2015 pooled)

Tr. No.	Varieties/Genotypes	*Pod damage (%)	*Seed damage (%)	Scale (1-9)	Reaction
T_{1}	PM-5	4.67 (12.48)	3.39 (10.61)	3	MR
T_{2}	IPM 2K 14-9	14.00 (21.97)	7.86 (16.29)	3	MR
T_{3}	HUM-1	11.83 (20.12)	7.20 (15.56)	5	Tolerant
T_{4}	ML 1257	22.83 (28.54)	15.76 (23.39)	5	Tolerant
T_{5}	Pusa 672	17.17 (24.48)	11.43 (19.76)	5	Tolerant
T_{6}	IPM 306-6	36.00 (36.87)	26.52 (31.00)	7	MS
T_{7}	SM 48	18.67 (25.60)	12.89 (21.04)	5	Tolerant
T_{8}	IPM 05-3-22	35.67 (36.67)	25.90 (30.59)	7	MS
T_{9}	Pusa Bold 2	15.83 (23.45)	9.59 (18.04)	5	Tolerant
T_{10}	IPM-9901-10	22.17 (28.09)	14.83 (22.65)	5	Tolerant
T_{11}	HUM-16	11.00 (19.37)	6.46 (14.73)	3	MR
T_{12}	IPM 306-1	6.33 (14.58)	4.87 (12.75)	3	MR
T_{13}	PM 4	25.17 (30.11)	17.22 (24.52)	7	MS
T_{14}	ML 5	26.33 (30.87)	19.12 (25.93)	7	MS
T_{15}	ML 1256	33.17 (35.16)	25.22 (30.15)	7	MS
T_{16}	ML 1059	31.83 (34.35)	24.05 (29.37)	7	MS
T_{17}	SML 191	27.67 (31.73)	22.22 (28.13)	7	MS
T_{18}	ML 515	7.50 (15.89)	6.06 (14.26)	3	MR
T_{19}	PDM 288	30.33 (33.42)	22.84 (28.55)	7	MS
T_{20}	HUM-12	26.33 (30.87)	21.88 (21.89)	7	MS
S.E.m.±		(0.56)	(0.53)		
CD $_{(p=0.05)}$		(1.59)	(1.51)		

RESULTS AND DISCUSSION

The incidence of *M. vitrata* was more or less alike during *kharif* 2014 and 2015. These revealed that in the 37th SMW (Standard Meteorological Week) the occurrence starts and observed from 37th to 41stSMW in all genotypes (Table 1), with peaks during 38th to 40th SMW, maximum one being during the 40th SMW. The pooled data on the mean larval population varied significantly from 0.53 to 3.01 larva/plant (Table 1) with maximum being in IPM 306-6 (3.01 larva/plant) which was at par with IPM 05-3-22 (2.92 larva/plant) and ML 1256 (2.73larva/plant); and the minimum was in PM-5 (0.53 larva/plant) followed by IPM 306-1 (0.65 larva/plant) and ML 515 (0.78 larva/plant) as compared to the 2.22larva/plantin local check cultivar, HUM-12.These findings are an agreement with Bhople et al. (2017) who reported thelowest population on PKV green gold and maximum (1.76 larva/plant) in AKM 12-14 and AKM 12-23. Mandal (2005), Sandhya et al. (2014), Choragudi et al. (2015) and Soundararajan and Chitra (2017) observed similar infestation levels.

The pooled pod and grain damage due to *M. vitrata* varied from 4.67 to 36.00% and 3.39 to 26.52%, respectively (Table 2); maximum was with IPM 306-6 (36.00% and 26.52%, respectively)followed by IPM 05-3-22 (35.67% and 25.90%, respectively) and ML 1256 (33.17% and 25.22%, respectively); the least damage was in PM-5 (4.67% and 3.39%, respectively) followed by IPM 306-1 (6.33% and 4.87%, respectively) and ML 515 (7.50% and 6.06%, respectively) as compared to the 26.33% and 21.88%, respectively in local check cultivar, HUM-12. These observations corroborate with those of Kumar and Singh (2017). The five genotypes viz., PM-5, IPM 2K 14-9, HUM-16, IPM 306-1 and ML-515 were found moderately resistant; six genotypes viz., HUM-1,ML 1257, Pusa 672, SM-48, Pusa Bold 2 and IPM-9901-10 were found tolerant; and four genotypes viz., IPM 306-6, IPM 05-3-22, PM 4, ML 5, LM 1256, SML 191, PDM 288 and HUM 12 were moderately susceptible.

The pooled data revealed that maximum yield was obtained with PM-5 (7.72 q/ha) followed by IPM 306-1

(6.96 q/ha) and HUM-16 (6.58 q/ha) and the least from IPM 306-6 (3.11 q/ha) closely followed by IPM 05-3-22 (3.23 q/ha), ML 5 (3.30 q/ha) and SM 48 (3.13 q/ha). The yield in local check cultivar, HUM-12 was 4.13 q/ha. The present findings are conformity with Kumar and Singh (2017) who observed that PM 10-18 (7.73 q/ha) produced maximum yield.

REFERENCES

Bhople S K, Dhandge S R, Aravindarajan G, Patange N R. 2017. Varietal screening of mungbean genotypes for theirresistance against pest complex of mungbean. AGRES- an International e-Journal 6(1): 123-128.

Choragudi S R, Ramachandra Rao G, Chalam M S V, Kumar P A, Srinivasa Rao V. 2015. Efficacy of leaf extracts and newer insecticides against *Maruca vitrata* in green gram. Indian Journal of Plant Protection 43(1): 12-16.

Husain Dar M, Rizvi P Q, Naqvi N A. 2002. Insect pest complex and its succession on mung bean and urd bean. Indian Journal of Pulses Research 15(2):204.

Dhillon M K, Sharma R C. 2012. Paradigm shift in host plant resistance to insect pests. Indian Journal of Plant Protection 40 (1): 1-11.

Kumar R, Singh P S. 2017. Screening of certain mungbean, *Vigna radiata* (L.) Wilczek genotypes against spotted pod borer and pod bugs. Journal of Experimental Zoology, India 20 (1): 595-597.

Mandal S M A. 2005. Field screening of greengram varieties against pod borers. Environment and Ecology 23(Special 2): 381.

Rani C S, Eswari K B, Sudarshanam A. 2008. Field screening of green gram (*Vigna radiata* L.) entries against thrips (*Thrips palmi*) and spotted pod borer (*Maruca vitrata*). Journal of Research ANGRAU 36(2/3): 17-22.

Sandhya Rani C, Rao G R, Chalam M S V, Kumar P A, Rao V S. 2014. Field screening of greengram genotypes against *Maruca vitrata* in summer. Journal of Agriculture and Crop Science 1: 18-25.

Singh D P. 2001. Genetics and breeding of pulse crops. Kalyani Publishers, New Delhi. pp. 282-347.

Singh S R, Allen D R. 1980. Pests, diseases, resistance, and protection in cowpea. Advances in legume science. Summerfield R J, Bunting AH. (eds.). Kew Richmond, Surrey, UK: Royal Botanic Gardens. pp. 419-443.

Singh S, Srivastava C P. 2017. Field screening of some green gram [*Vigna radiata* (L.) Wilczek] genotypes against spotted pod borer, *Maruca vitrata* (Fabricius). Journal of Entomology and Zoology Studies 5(4): 1161-1165.

Soundararajan R P, Chitra N. 2017. Field evaluation of mungbean (*Vigna radiata* L.) germplasm for resistance against pod borer complex. Legume Research 40(4): 768-772.

Swaminathan R, Singh K, Nepalia V. 2012. Insect pests of green gram *Vigna radiata* (L.) Wilczek and their management, Agricultural Science, Dr. Godwin Aflakpui (ed.). 252 pp.

Vishakanthaiah M, Jagadeeshbabu C S. 1980. Bionomics of the tur webworm, *Maruca testulalis* (Lepidoptera: Pyralidae). Mysore Journal of Agricultural Sciences 14: 529-532, 1980.

Zahid M A, Islam M M, Begum M R 2008. Determination of economic injury levels of *Maruca vitrata* in green gram. Journal of Agricultural Rural Development 6(1-2): 91-97.

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