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Evaluation of greengram genotypes for resistance against thrips, *Megalurothrips distalis* (Karny) and spotted pod borer, *Maruca vitrata* (Fabricius)

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Abstract
Greengram has long been used as a source of protein in human and animal diets. Despite its importance, greengram is affected by broad range of insect pests. Among these, thrips and spotted pod borer are most predominant and also cause significant yield losses. Therefore, a safe and effective pest management strategy is to explore and exploit the host plant resistance through the deployment of resistant cultivars. Considering the above, ten promising genotypes of greengram were chosen from preliminary trial that was conducted to identify the sources of resistance to the thrips *Megalurothrips distalis* (Karny) and the spotted pod borer *Maruca vitrata* (Fabricius). These ten genotypes were then screened at the research yard of the Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalainagar, Chidambaram, Tamil Nadu, India. The observations revealed that, the total mean population of thrips per terminal or flower was lowest in genotype IC-329039-1 and highest in genotype IC-103862. Concurrently, for pod borer, IC-39301-1 had the lowest per cent pod damage but the highest in IC-39317. The genotypes IC-329039-1 and IC-39301-1 were chosen for further testing in order to develop elite varieties.

Keywords: greengram (*Vigna radiata*), genotypes, thrips, spotted pod borer, resistance

Introduction

Greengram, *Vigna radiata* (L.) R. Wilczek is an essential legume crop that provides farmers with a source of income and it is commonly cultivated in tropical and subtropical countries, primarily as part of a cereal-based cropping system. Greengram is popular among people since it may be consumed as dry seeds or sprouts, both of which provide an excellent source of easily digested protein with minimal flatulence (War *et al.*, 2017) [13]. Despite its significance, its production is hampered by a variety of insect pests. Among these, the thrips *Megalurothrips distalis* (Karny) and the spotted pod borer *Maruca vitrata* (Fabricius) are of particular importance. The most frequent sap-feeding insects are thrips from the genus *Megalurothrips*, which live in flowers and tender, unopened leaves, cause damage resulting in flowers shedding before opening. Additionally, the plant develops a bushy growth with a very dark green appearance and 100% of the yield will be lost in cases of severe occurrence (Kooner *et al.*, 1983) [4].

The spotted pod borer, *M. vitrata* is a concealed pest that occurs from bud initiation to crop maturity and the larva do the damage by webbing of leaf, peduncle, buds, flowers and pods and feeds inside by hiding themselves. Furthermore, due to fungal infestation, the webs quickly turn black and dry (Revathi and Selvanarayanan, 2022) [6]. Under field condition, *M. vitrata* inflicts considerable damage to greengram and its frequent infestation causes poor yield performance (Singh and Srivastava, 2017) [7]. It is reported to result in economic losses of 20–25%, yield losses of 2–84% and pod damage of 20–60% (Vishakantaiah and Babu, 1980; Zahid *et al.*, 2008) [12, 14].

Synthetic insecticides are widely used to minimize the infestation of thrips and spotted pod borer on greengram. But, its use is restricted because of ecological repercussions such as toxic residues in the food web, resistance development in the target insects, and resurgence of pests. To avoid these problems, exploring and exploiting host plant resistance in greengram germplasm is the ideal strategy. Therefore, the present study was undertaken to identify greengram genotypes resistant or tolerant to thrips and spotted pod borer.

Materials and Methods

Studies on infestation of thrips (*M. distalis*) and spotted pod borer (*M. vitrata*) were undertaken with 10 cultivars viz., IC-329039-1, IC-325782, IC-39380, IC-39430, IC-103862, IC-39301-1, IC-103833, IC-39272-1, IC-39454 and IC-39317 which were selected based on preliminary screening conducted during *Rabi* 2020 and *Kharif* 2021 (Revathi and Selvanarayanan, 2022) [6] at Research yard, Department of Entomology, Faculty of Agriculture, Annamalainagar, Chidambaram, Tamil Nadu, India. The screening trial was laid out in Randomized Block Design with four replications keeping plot size of 2×2 m and the greengram genotypes were sown in each plot with the spacing of 30×10 cm. Throughout the crop period, all the suggested agronomical practices were followed except plant protection measures.

The observation on thrips population was recorded at weekly interval on five randomly selected plants during morning hours. The number of thrips was counted during vegetative stage by collection of five terminals (Sreekanth *et al.*, 2002) [11] and during flowering stage by collection of five flowers (Singh and Singh, 2014) [8] per replication. The collected terminals and flowers were immediately kept in polythene bag having cotton bolls soaked with ethyl acetate to kill the thrips which permit easy counting. With the help of 10X magnification hand lens, thrips population was counted. Based on these data, the average number of thrips per terminal or flower was computed. Further the genotypes were divided into six different categories to thrips viz., highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible. For the purpose, the mean value of individual genotype ($\bar{x}_i$) was compared with mean value of all genotypes ($\bar{x}$) and standard deviation (SD) (Kansagara, 2017) [2].

Table 1: The rating scale used for categorizing greengram genotypes

S. No.	Category of Resistance	Scale for Resistance
1	Highly resistant	$\bar{x}_i < (\bar{x}-2SD)$
2	Resistant	$\bar{x}_i > (\bar{x}-2SD) < (\bar{x}-SD)$
3	Moderately resistant	$\bar{x}_i > (\bar{x}-SD) < \bar{x}$
4	Moderately susceptible	$\bar{x}_i > \bar{x} < (\bar{x}+SD)$
5	Susceptible	$\bar{x}_i > (\bar{x}+SD) < (\bar{x}+2SD)$
6	Highly susceptible	$\bar{x}_i > (\bar{x}+2SD)$

For *M. vitrata*, the pod damage was recorded at harvest by identifying the characteristic symptom (Soundararajan and Chitra, 2011). Total number of pods and number of damaged pods was recorded for five plants per replication and the mean damage was worked out by using the following formula:

$$\text{Per cent pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

Based on the per cent pod damage, the damage score for each genotype was calculated and the resistance rating in a scale of 1-9 as suggested by Rani *et al.* (2008) [5] with minor modifications was followed.

Table 2: Pest infestation and reaction details

Score	Pest infestation	Reaction
1	0 % pod damage	Resistant
3	1-10% pod damage	Moderately resistant
5	11-20% pod damage	Tolerant
7	21-40% pod damage	Moderately susceptible
9	>40% pod damage	Highly susceptible

The data on thrips population was transferred to square root transformation (√x) and per cent pod damage was transferred to arc sine transformation and the statistical analysis was done. Critical Difference values were calculated at five per cent probability level and treatment mean values were compared using Least Square Design (LSD). All analyses were carried out in AGRES version 3.01.

Results and discussion

Two preliminary screenings were conducted to assess the resistance of 333 greengram genotypes to the thrips (*M. distalis*) and the spotted pod borer (*M. vitrata*) during *Rabi* 2020 and *Kharif* 2021. On the basis of preliminary evaluation, four genotypes (IC-329039-1, IC-325782, IC-39380 and IC-39430) were identified as promising against thrips in contrast to one susceptible genotype (IC-103862). Similarly, four genotypes (IC-39301-1, IC-103833, IC-39272-1 and IC-39454) were found effective against spotted pod borer, with one susceptible genotype (IC-39317). In the current investigation, a total of 10 genotypes were assessed to determine their potential for resistance against the corresponding pests. The thrips, *M. distalis* infestation began on 14 days after sowing (DAS) and reached a peak on 56 DAS (Fig. 1). In the following weeks, the incidence dropped until it was nil. Starting with incidence, the thrips population demonstrated a steady tendency of growing and then decreasing after reaching its peak. The similar tread was noticed in greengram earlier by Sinha (2013) [9]. When compared to the vegetative stage, the blooming stage had a higher number of thrips population, which is consistent with the findings of Kasina *et al.* (2009) [3], who found that the thrips population peaked during the flowering stage in French bean.

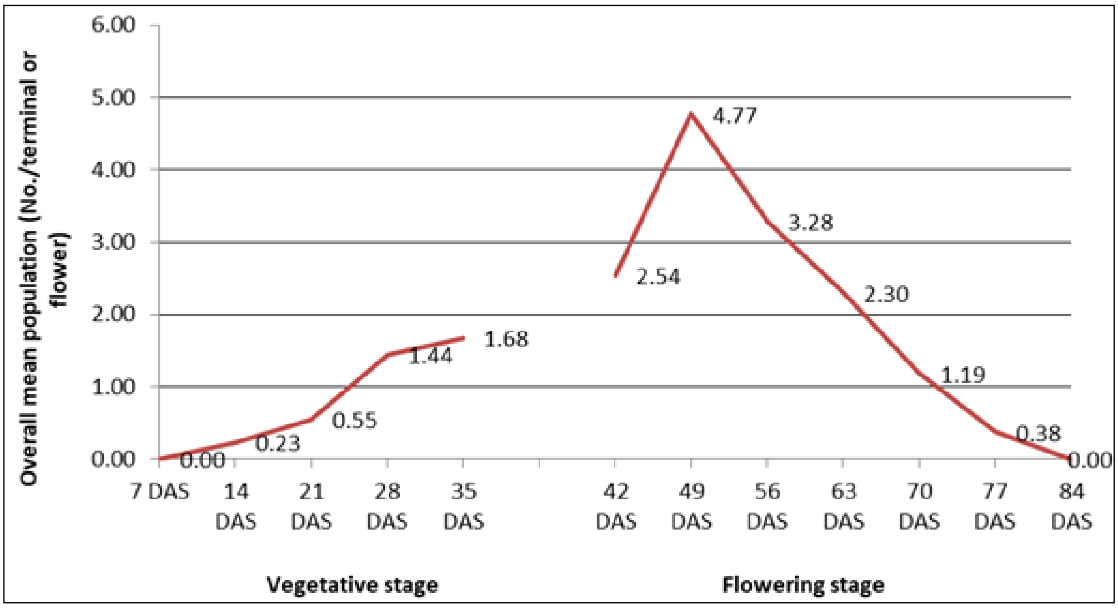

Fig 1: Incidence of thrips, *Megalurothrips distalis* population on greengram genotypes

The data collected on greengram genotypes against thrips indicated that the thrips population among the genotypes was statistically distinct (Table 3) and that, among the five tested genotypes, IC-329039-1 and IC-325782 were resistant, two were tolerant and one was highly susceptible. These findings are consistent with those of Chakraborty *et al.* (2014) [1], who found that of the 26 genotypes tested for *M. distalis*, 9 had the minimum thrips population and 4 had the maximum population. Furthermore, Rani *et al.* (2008) [5] observed that the five genotypes MGG 362, MGG 365, MGG 359, MGG 360 and MGG 361 had a much lower number of thrips and were significantly more tolerant.

Table 3: Screening of greengram genotypes against thrips, *Megalurothrips distalis*

S. No.	Genotypes	Mean thrips population (No./terminal or flower)	Category of resistance
1	IC-329039-1	0.76 (0.87)	Resistant
2	IC-325782	0.84 (0.91)	Resistant
3	IC-39380	1.50 (1.22)	Moderately resistant
4	IC-39430	1.95 (1.38)	Moderately susceptible
5	IC-103862	2.60 (1.60)	Susceptible
S. Ed.		0.14	
C.D. (p=0.05)		0.31	

Each value is mean of four replications @five plants per replication
Values in parentheses are square root transformed

The results obtained for *M. vitrata* revealed that the per cent pod damage was statistically different among the genotypes (Table.4) and that, among the five tested genotypes, IC-39301-1 and IC-103833were resistant, two were tolerant and one was highly susceptible. These findings are in concurrence with the reports of Rani *et al.* (2008) [5] who reported that, among the 12 entries tested, the genotype MGG 366 performed best irrespective of the season but, MGG 357 was highly susceptible with more pod damage per cent (40.5 %). Similarly, Singh and Srivastava (2017) [7] discovered that the genotype VGG 10-008 was the least susceptible to *M. vitrata*, but KM 2348 was found to be highly susceptible with increased pod damage.

Table 4: Screening of greengram genotypes against spotted pod borer, *Maruca vitrata*

S. No.	Genotypes	Per cent pod damage	Category of resistance
1	IC-39301-1	0.00 (2.02)	Resistant
2	IC-103833	0.00 (2.02)	Resistant
3	IC-39272-1	11.50 (19.80)	Tolerant
4	IC-39454	12.81 (20.93)	Tolerant
5	IC-39317	52.00 (46.15)	Highly susceptible
S. Ed.		1.04	
C.D. (p=0.05)		2.26	

Each value is mean of four replications @five plants per replication
Values in parentheses are arc sine transformed

Conclusion

The greengram genotypes IC-329039-1 and IC-39301-1 with the lowest thrips population and lowest pod damage respectively were chosen for further field evaluation at different locations and the promising genotypes may be employed in future breeding programmes or recommended for large-scale cultivation.

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References

1. Chakraborty S, Chaudhuri N, Senapati SK. Evaluation of mungbean genotypes against thrips (Megaleurothrips distalis) in Terai region of West Bengal, India. Ecology, Environment and Conservation,2014:20:149-154.
2. Kansagara S. Population dynamics, varietal screening and management of thrips (Thripidae: Thysanoptera) infesting greengram. M. Sc. (Agri.) Thesis submitted to Junagadh Agricultural University, Junagadh, India, 2017, 11-12.
3. Kasina M, Nderitu J, Nyamasyo G, Waturu C, Olubayo F, Obudho E, *et al*. Within plant distribution and seasonal population dynamics of flower thrips (Thysanoptera: Thripidae) infesting french beans (Phaseolus vulgaris L.) in Kenya. Spanish Journal of Agricultural Research,2009:7(3):652-659.
4. Kooner BS, Chhabra KS, Sekhon HS, Dhingra KK, Cheema HS. A new deformity in summer mungbean, Vigna radiata (L.) Wilczek. Pulse Newsletter,1983:3:40-42.
5. Rani CS, Eswari KB, Sudarshanam A. Field screening of greengram (Vigna radiata L.) entries against thrips (Thrips palmi) and spotted pod borer (Maruca vitrata). Journal of Research ANGRAU,2008:36(2/3):17-22.
6. Revathi M, Selvanarayanan V. Seasonal incidence and reaction of greengram genotypes against spotted pod borer, Maruca vitrata (Fabricius). Uttar Pradesh Journal of Zoology,2022:43(10):67-74.
7. Singh S, Srivastava CP. Field screening of some green gram [Vigna radiata (L.) Wilczek] genotypes against spotted pod borer, Maruca vitrata (Fabricius). Journal of Entomology and zoology studies,2017:5(4):1161-1165.
8. Singh SK, Singh PS. Screening of mungbean (Vigna radiata) genotypes against major insects. Current Advances in Agricultural Sciences,2014:6(1):85-87.
9. Sinha, S. Studies on comparative performance of summer green gram (Vigna radiata, (L.) Wilczek) varieties against insect pest complex. M. Sc. (Agri.) Thesis submitted to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India, 2014, 37-40.
10. Soundararajan RP, Chitra N. Effect of bioinoculants on sucking pests and pod borer complex in urdbean. Journal of Biopesticides,2011:4(1):7-11.
11. Sreekanth M, Sreeramulu M, Rao RD, Babu BS, Babu TR. Evaluation of Greengram Genotypes (Vigna radiata L. Wilczek) for Resistance to Thrips Palmi Karny and Peanut Bud Necrosis Virus. Indian Journal of Plant Protection,2002:30(2):109-114.
12. Vishakantaiah M, Babu J. Bionomics of the tur webworm, Maruca testulalis (Lepidoptera: Pyralidae). Mysore Journal of Agricultural sciences,1980:1(4):529-532.
13. War AR, Murugesan S, Boddepalli VN, Srinivasan R, Nair RM. Mechanism of Resistance in Mungbean [Vigna radiata (L.) R. Wilczek var. radiata] to bruchids, Callosobruchus spp. (Coleoptera: Bruchidae). Frontiers in plant science,2017:20(8):1031.
14. Zahid MA, Islam M, Begum MR. Determination of economic injury levels of Maruca vitrata in green gram. Journal of Agriculture and Rural Development,2008:6(1-2):91-97.