

## Screening for Resistance in Cowpea against Spotted Pod Borer, *Maruca vitrata* (Fab.) (Lepidoptera: Crambidae)

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**Abstract** Forty eight accession of cowpea were evaluated for resistance to the spotted pod borer, *Maruca vitrata* during 2014-2015. Significant variation was observed between the genotypes in terms of pod borer damage. The bud, flower and pod damage varied from zero to 32.5%, zero to 50.39% and zero to 47.95% respectively. Five accessions, viz., EC 100092, IC 39945, IC 2918, EC 98668 and IC 52110 recorded zero per cent damage at all the three stages. All the five accessions could serve as valuable sources of resistance in further breeding program, along with other accessions which recorded remarkably low levels of infestation. The accessions were

grouped as resistant, moderately resistant, susceptible and highly susceptible based on per cent mean damage. Twenty three accessions with, zero to five per cent damage were categorized as resistant. Eight accessions with infestation ranging from 5–10% were classified as moderately resistant. Five accession with infestation ranging from 10 to 15% were grouped as susceptible and twelve accessions with more than 15% damage were categorized as highly susceptible.

**Keywords** Cowpea, Pod borer, *Maruca vitrata*, Screening, Resistance.

### Introduction

Cowpea, *Vigna unguiculata* (L.), is an important legume of the tropical area. It is used as a grain legume, vegetable and also as a fodder. However the productivity of cowpea, at 9–10 kg ha<sup>-1</sup> is very low, one of the reasons being infestation by a number of pests and diseases. Among the different insect pests, the legume pod borer, *Maruca vitrata* (Fab.) is the most important one causing loss of up to 60% in cowpea.

The legume pod borer, *Maruca vitrata* (Fab.) (Crambidae: Lepidoptera) is an important pest of legumes. It enjoys wide geographical distribution, broad host range and is able to infest the young growing tips of plants, flower buds, flowers, pods and seeds of the plant. *Maruca vitrata* attacks cowpea

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during the reproductive phase. The female moth lays eggs on or near the flower buds [1]. The larvae feed on buds, flowers and pods. Flowers, pods and leaves are other webbed together and the infestation is indicated by the presence of frass. The study was undertaken to screen the resistant accessions against spotted pod borer in selected accession of cowpea.

### Materials and Methods

The materials for the study comprised of 48 cultivars of cowpea, of which 29 accessions were collected from NBPGR, ten KAU released varieties, five accessions from UAS Bengaluru, one accession each from IIHR Bengaluru, IIVR Varanasi, HC and RI Periyakulam and VFPCCK. The cultivars were raised in polybags in a completely randomized design with ten replications. Spacing was 30 cm × 15 cm for bush cowpea, 45 cm × 30 cm for semi trailing and 150 cm × 45 cm for trailing. The crop was raised following the agronomic practices recommended by the Kerala Agricultural University [2]. Two weeks prior to planting, the variety Lola was sown along the border around the plot to serve as multiplication foci for the test insect, *M. vitrata*. Further, neonate larvae of *M. vitrata* were collected in large numbers from infested cowpea fields and released on the border plants at early flowering phase to ensure adequate pest population.

Observations on the pod borer incidence were recorded at three days interval starting from first flowering. Five plants were selected at random from each accession and pod borer incidence on buds, flowers and pods were recorded. The per cent of damage was calculated.

$$\text{Total damage (\%)} = \frac{\text{Number of damaged buds, flowers and pods per plant}}{\text{Total number of buds, flowers and pods per plant}} \times 100$$

Based on the ratio of infested buds, flowers and pods to the total number of buds, flowers and pods respectively. Flower buds, flowers and pods once counted were tagged to avoid recounting.

**Table 1.** Extent of damage by *Maruca vitrata* in cowpea accessions.

Sl. No.	Accessions	Mean no. of damaged buds	Mean no. of damaged flowers	Mean no. of damaged pods	Total damage (%)
1	IC 39922	0.00	0.00	0.20	0.34 (0.95)
2	IC 52107 A	0.60	0.80	0.40	2.47 (1.73)
3	KM-5	3.40	4.00	1.00	16.15 (3.92)
4	C-152	8.00	7.60	5.80	33.54 (5.98)
5	Kanakamony	0.40	0.40	1.40	3.58 (1.99)
6	PKM-1	6.60	4.60	6.00	12.06 (3.55)
7	EC 100092	0.00	0.00	0.00	0.00 (0.71)
8	IC 2815	0.00	0.40	0.20	1.10 (1.25)
9	IC 39916	0.00	0.00	0.40	0.52 (1.04)
10	IC 26029	0.60	0.80	1.20	3.16 (1.9)
11	P. thandan payar	0.80	0.80	0.00	3.16 (1.85)
12	IC 26048	0.20	0.40	0.00	1.74 (1.36)
13	Anaswara	6.40	12.90	7.40	26.13 (5.22)
14	IC 2196	3.60	2.60	2.40	9.29 (3.2)
15	IC 10810	2.00	3.00	1.80	13.03 (3.69)
16	IC 39870	2.20	2.20	1.00	5.78 (2.47)
17	TVX -944	0.20	0.80	0.20	3.05 (1.81)
18	EC 300039	0.00	0.40	0.20	0.99 (1.18)
19	IC 52094	5.00	3.60	2.80	16.29 (4.08)
20	IC 39945	0.00	0.00	0.00	0.00 (0.71)
21	IT-3895-1	3.00	2.60	2.20	14.61 (3.92)
22	Vyjayanthi	4.40	8.60	3.80	17.76 (4.26)
23	IC 20431	3.40	3.20	1.40	8.25 (2.90)
24	Sreya	1.80	1.20	0.80	7.17 (2.74)
25	IC 9883	0.80	2.80	0.20	6.74 (2.41)
26	Hridya	0.40	0.40	0.20	0.95 (1.19)
27	IC 20720	1.80	0.40	0.40	4.13 (2.00)
28	IC 2918	0.00	0.00	0.00	0.00 (0.71)
29	KBC-2	3.60	1.60	0.00	8.47 (2.44)
30	IC 19797	4.80	4.00	1.80	15.59 (3.92)
31	Mysore local	1.00	2.00	1.80	8.86 (3.07)
32	IC 7832	6.00	4.60	1.60	19.18 (4.26)
33	IC 39921	0.80	0.40	0.60	3.11 (1.89)
34	IC 52105	1.60	2.40	1.20	6.55 (2.64)
35	Kashikanchan	4.60	6.60	3.80	22.46 (4.80)
36	IC 52128	1.20	0.60	0.40	1.78 (1.46)
37	EC 98668	0.00	0.00	0.00	0.00 (0.71)
38	IC 39947	0.40	1.20	0.00	2.58 (1.54)
39	IC 20645	0.60	0.20	0.00	1.39 (1.25)
40	IC 19778	1.60	3.40	2.00	11.15 (3.42)
41	V. Jyothika	3.40	5.80	3.40	12.78 (3.75)
42	Malika	9.60	8.60	6.60	20.43 (4.68)
43	Sharika	4.80	8.60	6.40	24.75 (5.13)
44	Bhagyalakshmy	13.00	13.00	7.00	41.04 (6.61)
45	EC 101216	0.00	0.60	0.20	0.98 (1.19)
46	IC 52110	0.00	0.00	0.00	0.00 (0.71)
47	IC 52118	0.20	0.40	0.00	0.45 (0.94)
48	Lola	7.80	10.80	9.40	28.99 (5.65)
CD value					1.06

## Results and Discussion

Forty - eight accessions of cowpea were evaluated for their reaction to spotted pod borer, *M. vitrata* in the pot culture studies based on per cent damage to buds, flower and pods. The results are presented in Table 1.

### Per cent infestation

The accessions evaluated differed significantly in terms of borer infestation to buds, flowers and pods. Five accessions, viz. EC 100092, IC 39945, IC 2918, EC 98668 and EC 101216 recorded zero damage. Twenty six accessions suffered damage between 0.34 and 9.29% and were on par with each other. Among these, the lowest damage of 0.34% was observed in case of IC 39922, while IC 2196 had 9.29% infestation. The highest damage of 41.04% was registered in case of Bhagyalakshmy, C-152, Lola, Anaswara and Sharika, with 33.54, 28.99, 26.13 and 24.75% damage respectively and were at par with each other. Remaining twelve accessions had infestation ranging from 9.29 to 24.95%.

Variation was also observed in infestation levels at different stages of the same accession. Ten accessions had zero bud damage. Among the remaining accessions, lowest bud damage of 0.37% was observed in case of IC 52118. Seven accessions had zero flower damage. IC 52118 had the lowest mean flower damage of 0.85% among the other accessions. Similarly, ten accessions had zero pod damage and among the remaining accessions, the lowest mean fruit infestation of 0.65% was observed in case of Hridya. The variety Bhagyalakshmy recorded highest infestation for all the three stages, viz., bud, flower and fruit, with 32.5, 50.39 and 47.95% damage respectively. In all, six accessions suffered highest damage during bud stage while 21 and 16 accessions had highest infestation during flower and pod stages respectively.

The grain type accessions were found to suffer lesser infestation from the pod borer, as against the vegetable type genotypes. All the 24 accessions from ICAR - NBPGR, TVX-944 and KBC-2 from UAS Bengaluru as well as Shreya, Hridya and Kanakamony

**Table 2.** Classification of cowpea accessions based on extent of damage by *M. vitrata*.

Susceptibility rating	Extent of damage (%)	Accessions
Resistant	0-5%	EC 100092, IC 39945, IC 2918, EC 98668, IC 52110, IC 39922, IC 52118, IC 39916, Hridya, EC 101216, EC 300039, IC 2196, IC 20645, IC 26048, IC 52128, IC 52107 A, IC 39947, TVX-944, IC 39921, IC 26029, Palakkadan thandan, Kanakamony, IC 20720
Moderately resistant	5-10%	IC 39870, IC 52105, IC 9883, Sreya, IC 20431, KBC-2, Mysore local, IC 2196
Susceptible	10-15%	IC 198778, PKM-1, Vellayani Jyothika, IC 10810, IT-3895- I
Highly susceptible	>15%	IC 19797, KM-5, IC 52094, Vyjayanthi, IC 7832, Malika Kashi-kanchan, Sharika, Anaswara, Lola, C-152, Bhagyalakshmy

from KAU recorded consistently low values for bud, flower and pod damage, underscoring the above observation. Nine out of the 11 accessions which suffered highest bud, flower and pod damage belonged to vegetable type, with infestation levels varying from 3.16 to 41.04%. Palakkadan thandan payar, with 3.16% damage proved to be the lone exception among the vegetable type accessions with low borer infestation.

The existence of high variability for total per cent damage among cowpea accessions had been earlier reported. Barad et al. [2] conducted a field experiment involving 20 genotypes of cowpea during *khariif* 2010. GC-706 recorded the lowest spotted pod borer population (0.06 larvae/plant) and pod damage (8.89%), while maximum larval population (1.96 larvae/plant) and pod damage (24.30%) was recorded in GC-12 [2, 3].

Five accessions, namely, EC 100092, IC 39945, IC 2918, EC 98668 and IC 52110 had no damage to bud, flower or pod, suggesting very high resistance, which need to be established through further studies. Once

resistance has been confirmed, all the five accessions could serve as valuable sources of resistance in further breeding programs, along with other accessions which suffered remarkably low levels of infestation.

Variation in infestation levels during different stages of the same accession was observed in the present study. Among the 43 accessions that had damage during any of the three stages, highest number of accessions suffered greater damage during flowering stage, followed by sixteen accessions, with highest damage to pods. Highest incidence during flowering stage followed by fruiting stage observed in the present study is in agreement with the earlier reports [4]. Expression of resistance is influence of the stage of the host plant on expression of resistance to insect pests have been well documented. The findings of the present study lead to similar conclusions in case of cowpea, though the exact mechanisms involved need to be elucidated.

#### Categorization of accessions based on extent of damage

The forty eight accessions were subjected to Duncan's Multiple Range Test (DMRT), based on per cent damage to buds, flowers and pods and were grouped as resistant, moderately resistant, susceptible and highly susceptible (Table 2). Twenty-six accessions recorded damage varying from 0.1 to 9.29%

and were at par with each other. All the above accessions were rated as resistant. Seventeen accessions with borer damage ranging from 11.15 to 41.04% were rated as susceptible.

The extent of borer infestation varied from zero to 41.04%. Five accessions viz., EC 100092, IC 39945, IC 2918, EC 98668 and IC 52110 recorded zero per cent damage at all the three stages. The variety Bhagyalakshmy recorded the highest damage of 32.5, 50.39 and 47.95% for bud, flower and pod respectively. Once resistance has been confirmed, all the five accessions could serve as valuable sources of resistance in further breeding programs, along with other accessions which suffered remarkably low levels of infestation.

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