

Short Communication

**Effect of trichomes in cowpea on infestation by spotted pod borer,
Maruca vitrata (Fab.) (Lepidoptera: Crambidae)**

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ABSTRACT

Trichomes are the morphological features present on the surface of plants, which provide resistance to several insect pests. A pot culture experiment with 48 cowpea accessions were conducted to evaluate the effect of trichomes in cowpea on infestation by spotted pod borer, *Maruca vitrata*. Significant variation in terms of damage to pods due to spotted pod borer was observed. The number of trichomes per unit area was significantly and negatively correlated (-0.441) with per cent damage. However, the length of trichomes on pods has no significant correlation with per cent damage.

Key words: Trichomes, resistant, cowpea, pod, *Maruca vitrata*

Cowpea is an important leguminous crop cultivated throughout the tropics and subtropics. The legume pod borer, *Maruca (testulalis) vitrata* (Geyer) is a serious pest of grain legumes. This insect is a major constraint in increasing the production and productivity of grain legumes. The pod borer larvae feed on buds, flowers and pods by webbing them. Trichomes are the one of the most important morphological characters associated with insect resistance across the plant kingdom. It is a special character, involving several factors such as distribution of the hairs, the density of hair cover, the length of the hairs, type of hairs etc. Ovipositional and feeding non-preference, due to the presence of simple trichomes, has been reported to be one of the mechanisms of resistance in cowpea against *M. vitrata*. Trichomes on cowpea pods can affect the activity of insects by mechanical means.

Pubescence or trichome density is one of the most important physical characters associated with insect resistance across the plant kingdom. It is a complex character, involving several factors like the distribution of the hairs, the length of the hairs, the density of hair cover, disposition of hairs and the

type of hairs (Verma and Afzal, 1940). Ovipositional non-preference, due to the presence of trichomes, has been reported to be one of the mechanisms of resistance of cowpea to *M. vitrata*.

Forty - eight accessions of cowpea comprising of twenty - nine accessions from National Bureau of Plant Genetic Resources (ICAR - NBPGR) Regional Station, Jodhpur, Rajasthan, five accessions from University of Agricultural Sciences (UAS), Bengaluru, ten varieties released from KAU and one accession each from Vegetable and Fruits Promotion Council Keralam (VFPCCK), Thiruvananthapuram, Indian Institute of Vegetable Research (ICAR - IIVR), Varanasi as well as Horticulture College and Research Institute, Periyakulam were evaluated for resistance to spotted pod borer. All agronomic practices were followed as per Package of practices recommendations (KAU, 2011). These genotypes constituted the treatments in the experiment. The experiment was laid out in Completely Randomized Design (CRD) with 48 treatments and 10 replications, with one polybag containing one plant constituting one replication.

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

| Accessions | Per cent damaged pods | Trichome length | Trichome density |
|------------------------|-----------------------|-----------------|------------------|
| IC 39922 | 1.54 | 0.06 | 74.67 |
| IC 52107 A | 2.67 | 0.05 | 185.34 |
| KM – 5 | 8.06 | 0.06 | 48.00 |
| C – 152 | 42.65 | 0.07 | 88.60 |
| Kanakamony | 8.24 | 0.07 | 235.34 |
| PKM – 1 | 15.00 | 0.07 | 16.34 |
| EC 100092 | 0.00 | 0.04 | 123.34 |
| IC 2196 | 1.25 | 0.08 | 180.67 |
| IC 39916 | 2.38 | 0.18 | 82.34 |
| IC 26029 | 5.88 | 0.12 | 113.67 |
| Palakkadanthandanpayar | 0.00 | 0.23 | 89.34 |
| IC 26048 | 0.00 | 0.11 | 96.34 |
| Anaswara | 31.90 | 0.05 | 67.34 |
| IC 2196 | 9.02 | 0.09 | 213.00 |
| IC 10810 | 13.64 | 0.06 | 185.00 |
| IC 39870 | 3.70 | 0.15 | 17.67 |
| TVX – 944 | 2.08 | 0.07 | 255.34 |
| EC 300039 | 1.12 | 0.09 | 127.34 |
| IC 52094 | 15.56 | 0.08 | 31.00 |
| IC 39945 | 0.00 | 0.08 | 108.67 |
| IT – 3895 – 1 | 16.42 | 0.25 | 72.34 |
| Vyjyanthi | 17.43 | 0.11 | 15.00 |
| IC 20431 | 5.26 | 0.04 | 33.00 |
| Sreya | 6.25 | 0.07 | 186.00 |
| IC 9883 | 1.34 | 0.07 | 114.34 |
| Hridya | 0.65 | 0.06 | 147.67 |
| IC 20720 | 2.35 | 0.07 | 91.00 |
| IC 2918 | 0.00 | 0.06 | 96.34 |
| KBC – 2 | 0.00 | 0.07 | 130.34 |
| IC 19797 | 10.34 | 0.05 | 51.00 |
| Mysore Local | 12.00 | 0.05 | 212.00 |
| IC 7832 | 10.53 | 0.08 | 96.67 |
| IC 39921 | 3.70 | 0.06 | 155.00 |
| IC 52105 | 5.83 | 0.07 | 88.67 |

| | | | |
|--------------------|--------------|----------------|--------|
| Kashikanchan | 21.84 | 0.06 | 66.00 |
| IC 52128 | 1.09 | 0.06 | 50.34 |
| EC 98668 | 0.00 | 0.13 | 123.45 |
| IC 39947 | 0.00 | 0.07 | 91.67 |
| IC 20645 | 0.00 | 0.06 | 32.00 |
| IC 19778 | 12.99 | 0.10 | 31.67 |
| VellayaniJyothika | 18.28 | 0.10 | 39.34 |
| Malika | 26.61 | 0.00 | 0.00 |
| Sharika | 35.16 | 0.09 | 21.67 |
| Bhagyalakshmy | 47.95 | 0.07 | 15.00 |
| EC 101216 | 1.03 | 0.07 | 224.34 |
| IC 52110 | 0.00 | 0.05 | 135.34 |
| IC 52118 | 0.00 | 0.07 | 154.67 |
| Lola | 47.47 | 0.25 | 18.34 |
| Correlation | 0.183 | -0.441* | |

*Correlation is significant at 0.05 level (2-tailed)

Trichome length was measured by Leica-EZ stereo microscope equipped with Leica Application Suite (LAS) image analysing software. Length of ten trichomes on pods selected at random, the average was worked out. The counts of trichomes on the pod surface was made from an area of 6.25 mm² using a Radical Stereo Zoom microscope at 35x magnification, after marking out an area of 2.5 x 2.5 mm² over the excised pod. Counts were taken from three different points on each pod and the average was worked out and presented in **Table 1**.

Based on the density of trichomes, the accessions were classified into:

1. Glabrous - 0 to 50 trichomes per 6.25 mm² unit area
2. Sparsely pubescent - 51 to 100 trichomes per 6.25 mm² unit area
3. Pubescent - 101 to 150 trichomes per 6.25 mm² unit area
4. Densely pubescent - more than 15 trichomes per 6.25 mm² unit area

The variety Lola recorded maximum trichome length of 0.25 mm and was on par with

Palakkadanthandanpayar with a mean trichome length of 0.25 mm and 0.23 mm. Both the accessions were significantly superior to the remaining accessions which recorded mean trichome length of ranging from 0.04 to 0.01mm.

The accessions varied significantly in terms of trichome density. The number of trichomes varied from 16.34 per 6.25 mm² in PKM - 1 to 288.67 per 6.25 mm² in TVX - 944. High trichome density was also observed in Kanakamony, Mysore local, Sreya and Anaswara, with 235.34, 212, 186 and 167.34 trichomes per 6.25 mm² respectively. All these accessions were statistically on par with each other but differed significantly from the remaining genotypes. PKM - 1, which recorded the lowest trichome density of 16.34 per 6.25 mm² was followed by Bhagyalakshmy, Lola, IC 52105, EC 300039, IC 20645, IC 20431, Vellayani Jyothika and Palakkadanthandanpayar with trichome density of 17.34, 18.34, 18.67, 27.34, 32, 33, 39.34 and 49.34 trichomes per 6.25 mm² respectively.

All these nine accessions were statistically on par with each other but differed significantly from the remaining genotypes. The remaining accessions except Malika had trichome density ranging from 66.00 to 147.67 per 6.25 mm². Based on the

density of trichomes, the accessions were classified into: Densely pubescent, pubescent, sparsely pubescent and glabrous.

The length of the trichomes had positive correlation (0.183) with per cent damage. However, the correlation was not significant. Number of trichomes on pods had significant negative correlation (-0.441) with per cent damage due to spotted pod borer.

The length of trichomes, which ranged from 0.04 mm in EC 100092 to 0.25 mm in Lola, did not show any significant variation among the different accessions. A significant correlation between trichome length and per cent pod damage could not be observed in the study. Sunitha *et al* (2006) however, had observed significant negative correlation (-0.097) between trichome length on pods and pod borer damage in pigeon pea.

Trichome density varied from 16.34 per 6.25 mm² in PKM-1 to 288.67 per 6.25 mm² in TVX – 944. High trichome density ranging from 167.34 to 235.34 trichomes per 6.25 mm² was also observed in Kanakamony, Mysore local, Shreya and

Anaswara. The lowest trichome density was recorded in PKM-1 (16.34/6.25 mm²), followed by Bhagyalekshmi, Lola, IC 52105, EC 300039, IC 20645, IC 20431, Vellayani Jyothika and Palakkadanthandanpayar with 17.34, 18.34, 18.67, 27.34, 32, 33, 39.34 and 49.34 trichomes per 6.25 mm², respectively. Accessions such as Kanakamony, Sreya, Hridya, Mysore local etc., with higher pubescence suffered lower pest incidence. It was also noteworthy that Bhagyalakshmy and Lola, with lowest values for trichome density also observed per cent damage 41.04 and 28.99 per cent, the highest in the present study. Trichomes are important components of plant defense against insect attack and contribute to antixenosis in crop plants such as cotton (Dhaliwal and Arora, 2001). This was observed in the present instance also, with the number of trichomes on pods being negatively correlated with total damage. Oghiakhe (1995) also had reported that pubescence in wild and cultivated cowpea adversely affected oviposition, mobility, food consumption and utilization by the legume pod borer.

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