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Comparitive efficacy of selected botanicals and Novaluran against spotted pod borer [*Maruca vitrata* (Fabricius)] (Lepidoptera: Crambidae) on cowpea [*Vigna unguiculata* (L.) Walp.]

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Abstract

The present field studies were conducted during *Kharif* 2016 at Central agriculture field, SHUATS (Sam Higginbottom University of Agriculture, Technology and Sciences), Allahabad, Uttar Pradesh (India). All the eight treatments Novaluran, Neem oil, Spinosad, Papaya leaf extract, Neem leaf extract, NSKE and *Beauveria bassiana* including control reduced the infestation as compared to the untreated control. The minimum per cent of infestation was observed in Spinosad 45% SC (1.41%) followed by Novaluran 10% EC (1.65%), Neem oil 3% (2.09%), *Beauveria bassiana* (2.38%), NSKE 5% (2.89%), Neem leaf extract (3.33%) and Papaya leaf extract (3.68%).

Key words: cowpea, *Maruca vitrata*, *Vigna unguiculata*, *Beauveria bassiana*, insecticides.

1. Introduction

Cowpea [*Vigna unguiculata* (L.)] is an important grain legume in the tropics and subtropics. It is a native to central Africa and belongs to the family Fabaceae and is eaten in the form of grain, green pods and leaves. Cowpea is known as vegetable meat due to high amount of protein in the grain with better biological value on dry weight basis. The grain contains 26.61 per cent protein, 3.99 per cent lipid, 56.24 per cent carbohydrates, 8.60 per cent moisture, 3.84 per cent ash, 1.38 per cent crude fibre, 1.51 per cent gross energy, and 54.85 per cent nitrogen free extract (Oyewale *et al.*, 2013) [3].

Rough estimates indicate that annual global production is around 2 mt from an area of 5m.ha. India accounts for about 0.5 mt production from around 1.5 m.ha (Reddy, 2004). In India, the major area under grain cowpea is mainly confined to the states of Uttar Pradesh, Karnataka, Tamil Nadu, Andhra Pradesh and Kerala where, it is mainly sown as a mixed crop with other pulses and cereals. In spite of its importance in food farming, the acreage and production are not being recorded in the crop census of the country as it is rarely grown as an entire crop.

Cowpea also serves as a cover crop and important in improving the soil fertility by nitrogen fixation (Asiwe *et al.*, 2009) [1]. Majority of people in the developing countries are engaged in cowpea production. In spite of all improvement brought in cultivation of cowpea, its productivity is still very low due to insect-pests attack (Singh *et al.*, 2000) [6].

Several insect-pests were recorded to attack the crop at its different stages of growth. Out of these, legume pod borer, *Maruca vitrata* Fab, Aphids, *Aphis craccivora* Koch and pod sucking bug, *Clavigralla tomentosicollis* Stal act as a major constraints in increasing its production. Among these, legume pod borer is one of the most important insect pests and causes severe yield losses up to 60 per cent (Pandey *et al.*, 1991) [4]. The larvae of legume pod borer attack on vegetative as well as reproductive parts of the plant (Taylor, 1978) [7]. The larvae web the leaves, buds, flowers and pods together and feed inside. This typical feeding habit protects the larvae from natural enemies and other adverse factors and is responsible for retarded growth of the crop.

The spotted pod borer which is also known as legume pod borer, *Maruca vitrata* Geyer. (*M. testulalis*) (Lepidoptera; Pyralidae) is a serious pest of grain legumes in the tropics and subtropics because of its extensive host range, distribution and destructiveness. Due to its destructiveness at critical stages of crop growth *viz.*, flowering and pod development stages especially to the economic plant parts such as flower buds, flowers and pods, it become as a significant constraint to attain the maximum productivity from grain legumes.

Materials and Method

The trial was conducted in *Kharif*, season 2016 the central research field, SHUATS, Allahabad (U.P.). Trial was laid out in a randomized block design consisting of seven different treatments. Each treatment was replicated thrice and Cowpea variety Kashi kanchan was used for study. After observing a sufficient level of insect population, application of treatments for the management of the stem borer was undertaken. The data were subjected to statistical analysis. The yield per plot was also recorded.

Results and Discussion

Evaluation of botanicals and Novaluran against spotted pod borer [*Maruca vitrata* (Fabricius)] on cowpea. (First spray)

The data on the per cent infestation of spotted pod borer on third day after spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (2.09%) followed by Novaluran (2.85%), Neem oil (3.26%), *Beauveria bassiana* (3.61%), NSKE (4.05%), Neem leaf extract (4.28%) and Papaya leaf extract (4.48%) are least among all the treatments.

The data on the per cent infestation of spotted pod borer on seven day after spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (1.47%) and Novaluran (1.82%), (T₂) Neem oil (2.22%), *Beauveria bassiana* (2.67%), NSKE (3.22%), Neem leaf extract (3.89%) and Papaya leaf extract (4.26%) are least among all the treatments.

The data on the per cent infestation of spotted pod borer on fourteen day after spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (2.04%) and Novaluran (2.29%), Neem oil (2.49%), *Beauveria bassiana* (2.57%), NSKE (3.42%), Neem leaf extract (3.89%) and Papaya leaf extract (4.19%) are least among all the treatments. All the treatments were found significantly differ over control.

The mean data on the per cent infestation of spotted pod borer revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (1.87%) and Novaluran (2.00%), Neem oil (2.65%), *Beauveria bassiana* (2.95%), NSKE (3.56%), Neem leaf extract (4.02%) and Papaya leaf extract (4.31%) are least among all the treatments. All the treatments were found significantly differ over control.

Evaluation of botanicals and novaluran against spotted pod borer [*Maruca vitrata* (Fabricius)] on cowpea. (Second spray)

The data on the per cent infestation of spotted pod borer on three day after second spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (1.46%) and Novaluran (1.70%), Neem oil (2.05%), *Beauveria bassiana* (2.25%), NSKE (2.97%), Neem leaf extract (3.25%) and Papaya leaf extract (3.52%) are least among all the treatments.

All the treatments were found significantly differ over control. The data on the per cent infestation of spotted pod borer on seven day after second spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (0.81%) and Novaluran (1.45%), Neem oil (1.61%), *Beauveria bassiana* (1.89%), (T₆) NSKE (2.25%), Neem leaf extract (2.58%) and Papaya leaf extract (3.22%) are least among all the treatments. All the treatments were found significantly differ over control.

The data on the per cent infestation of spotted pod borer on fourteen day after second spray revealed that chemical and botanicals treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded

in Spinosad (0.59%) and Novaluran (0.74%), Neem oil (0.91%), *Beauveria bassiana* (1.28%), NSKE (1.46%), Neem leaf extract (2.08%) and Papaya leaf extract (2.37%) are least among all the treatments. All the treatments were found significantly differ over control.

The mean data on the per cent infestation of spotted pod borer revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (0.95%) and Novaluran (1.29%), Neem oil (1.52%), *Beauveria bassiana* (1.81%), NSKE (2.22%), Neem leaf extract (2.64%) and Papaya leaf extract (3.04%) are least among all the treatments. All the treatments were found significantly differ over control.

The result on mean evaluation of insecticides reveals that all the treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (1.41%) and Novaluran (1.65%), Neem oil (2.09%), *Beauveria bassiana* (2.38%), NSKE (2.89%), Neem leaf extract (3.33%) and Papaya leaf extract (3.68%) are least among all the treatments. All the treatments were found significantly differ over control.

Evaluation of botanicals and novaluran against spotted pod borer [*Maruca vitrata* (Fabricius)] on cowpea. (First spray and Second spray overall mean)

The result represented in the above table reveals that all the treatments were significantly superior over control. Among all the treatments lowest per cent infestation of spotted pod borer was recorded in Spinosad (1.41%) and Novaluran (1.65%), Neem oil (2.09%), *Beauveria bassiana* (2.38%), NSKE (2.89%), Neem leaf extract (3.33%) and Papaya leaf extract (3.68%) are least among all the treatments. All the treatments were found significantly differ over control.

The above findings are similar to the findings of Rangarao *et al.* (2007)^[5] who's revealed that maximum reduction in larval population of *M. vitrata* (82 %) was obtained with spinosad 45 SC (0.4 ml/lit) within two days after application. Yadav and Singh (2014) revealed that the spinosad 45% SC was the most effective treatments and significantly superior to other treatments with 80.7 and 79.2 per cent larval reduction over control. Halder *et al.* (2006)^[2] revealed that novaluron 10 EC (75 g a.i ha⁻¹) was effective with lowest pod damage of 3.33 per cent and grain damage of 2.22 per cent due to lepidopteran pod borers resulting in higher grain yield of 680 kg/ha in black gram.

Table 1: Evaluation of botanicals and Novaluran against spotted pod borer [*Maruca vitrata* (Fabricius)] on cowpea.

Sl. No.	Treatments	Dosage	% Infestation							Overall mean
			First spray				Second spray			
			1 DBS	3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS	
1	Novaluran 10% EC	1ml/lit	4.76 (2.18)	2.80 ^g (1.69)	1.82 ^{fg} (1.35)	2.29 ^f (1.51)	1.70 ^g (1.30)	1.45 ^f (1.20)	0.75 ^g (0.86)	1.81 ^g (1.34)
2	Neem oil 3%	30ml/lit	5.12 (2.26)	3.26 ^f (1.80)	2.22 ^{ef} (1.49)	2.50 ^e (1.58)	2.05 ^f (1.43)	1.62 ^f (1.27)	0.92 ^f (0.95)	2.09 ^f (1.44)
3	Spinosad 45% SC	0.3ml/lit	5.02 (2.24)	2.09 ^h (1.44)	1.47 ^g (1.21)	2.04 ^g (1.42)	1.47 ^h (1.21)	0.81 ^g (0.90)	0.59 ^h (0.77)	1.41 ^h (1.19)
4	Papaya leaf extract	50ml/lit	5.00 (2.23)	4.47 ^b (2.11)	4.28 ^b (2.07)	4.19 ^b (2.04)	3.53 ^b (1.87)	3.22 ^b (1.79)	2.38 ^b (1.54)	3.68 ^b (1.91)
5	Neem leaf extract	50ml/lit	5.17 (2.27)	4.28 ^c (2.07)	3.89 ^{bc} (1.97)	3.89 ^c (1.97)	3.26 ^c (1.80)	2.58 ^c (1.60)	2.08 ^c (1.44)	3.33 ^c (1.82)
6	NSKE 5%	50ml/lit	5.10 (2.25)	4.05 ^d (2.01)	3.22 ^{cd} (1.79)	3.42 ^d (1.85)	2.97 ^d (1.72)	2.25 ^d (1.50)	1.46 ^d (1.20)	2.90 ^d (1.70)
7	<i>Beauveria bassiana</i>	1gm/lit	5.00 (2.23)	3.61 ^e (1.90)	2.67 ^{de} (1.63)	2.57 ^e (1.60)	2.25 ^e (1.50)	1.89 ^e (1.37)	1.28 ^e (1.13)	2.38 ^e (1.54)
8	Untreated	-	5.17 (2.27)	5.66 ^a (2.37)	5.90 ^a (2.43)	6.12 ^a (2.47)	7.03 ^a (2.65)	5.00 ^a (2.23)	3.44 ^a (1.85)	5.52 ^a (2.35)
F- test		-	NS	S	S	S	S	S	S	S
S. Ed. (±)		-	0.19	0.05	0.23	0.04	0.03	0.05	0.02	0.07
C. D. (P = 0.05)		-	0.59	0.19	0.05	0.23	0.04	0.03	0.05	0.22

From the analysis of the present findings it can be concluded that insecticides like Spinosad (1.41%), Novaluran (1.81%) are the best suitable for spotted pod borers. In case of botanicals Neem oil (2.09%) and *Beauveria bassiana* (2.38%) are effective in controlling spotted pod borer. Neem leaf extract (3.33%) and Papaya leaf extract (3.68%) are least among all the treatments.

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