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# Field efficacy of new generation insecticides for the management of spotted pod borer, *Maruca vitrata* (Fab.) in cowpea

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**A**BSTRACT

The spotted pod borer, *Maruca vitrata* (Fab.) causes significant damage by attacking pods in cowpea. The aim of this study was to evaluate the field efficacy of new generation insecticides against spotted pod borer. Field experiments were conducted at Regional Research Station, Nasik (Maharashtra) on cowpea during *Kharif*, 2009 and 2010. Among the new generations tested, flubendiamide 20 WG @ 1.0 g/l (4.79%) was observed significantly higher, in reducing the damage caused by the spotted pod borer in cowpea, on number basis followed by indoxacarb 14.5SC @ 0.5 ml/l (7.99%) and spinosad 45 SC @ 0.3 ml/l (8.70%). The highest marketable yield (91.49 q/ha) was recorded in flubendiamide 20 WG @ 1.0 g/l followed by spinosad 45 SC @ 0.3 ml/l (91.39 q/ha). However, the maximum cost benefit ratio (1:3.2) was recorded in thiodicarb 75 WP @ 1 g/l followed by indoxacarb 14.5 SC @ 0.5 ml/l (1:2.3), spinosad 45 SC @ 0.3 ml/l (1:1.9), emamectin benzoate 5 SG @ 0.5 g/l (1:1.3), flubendiamide 20 WG @ 1.0 g/l (1:1.1). On the basis of efficacy, flubendiamide 20 WG @ 1.0 g/l was observed to be very effective against *Maruca vitrata* in cowpea followed by indoxacarb 14.5 SC @ 0.5 ml/l and spinosad 45 SC @ 0.3 ml/l.

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## INTRODUCTION

Pulses are the important sources of proteins, vitamins and minerals for the predominantly vegetarian population and are popularly known as “Poor man’s meat” and “Rich man’s vegetable” (Singh and Singh, 1992). The important grain legumes grown in India are Bengal gram, lentil, green gram, black gram, cowpea, red gram, peas etc. Among grain legumes cowpea [*Vigna unguiculata* (L.) Walp.] is one of the important pulses crop also known as black eyes bean or southern pea in English, while chola or choli, chavli, lobia in various vernacular languages in India. Cowpea is grown on about 0.5 million ha with an average productivity of 600 to 750 kg grains/ha in India (Ahlawat and Shivakumar, 2005 and Rajput and Rana, 2016).

As many as 21 insect pests of different groups have been recorded damaging the cowpea crop from germination to maturity. The avoidable losses in yield due to insect-pests have been recorded in the range of 66 to 100 per cent in cowpea (Pandey *et al.*, 1991). The major insect species attack cowpea include aphid (*Aphis craccivora* Koch), leafhopper (*Empoasca kerri* Pruthi), thrips (*Megaleurothrips* spp.), whitefly (*Bemisia tabaci*, Genn.), leaf miner (*Acrocercops caerulea* Meyrick), spotted pod borer (*Maruca vitrata* Fab.) tobacco leaf eating caterpillar (*Spodoptera litura* Fab.) and blue butterfly (*Euchrysops cnejus* Cnidus), of which spotted pod borer (*Maruca vitrata*) is the most important and prevalent in growing areas of cowpea. The reasonable grain yield can not be obtained without their management (Jackai and Daoust, 1986 and Suh *et al.*, 1986). Several control measures are available (Jackai, 1985) but chemicals are the most effective, giving several folds' increase in grain yield (Jackai, 1993). Chemicals could be judiciously used in consonance with other control measures so as to minimise the large number of sprays in farms. Hence, the present study was carried out to evaluate the new generation insecticides for the management of spotted pod borer which would be helpful to develop management strategies for suppressing the pest population.

## MATERIAL AND METHODS

The field experiments were conducted on cowpea variety Kashi Kanchan (CP-4) crop grown during *Kharif*, 2009 and 2010 at Regional Research Station, Nasik (Maharashtra). The trials were laid out in Randomized Block Design with three replications, each in 5.0 x 3.0 m plot keeping 10 cm plant to plant and 60 cm row to row distance. The test insecticides were emamectin benzoate 5 SG @ 0.5 g/l, indoxacarb 14.5 SC @ 0.5 ml/l, spinosad 45 SC @ 0.3 ml/l, thiodicarb 75 WP @ 1.0 g/l, flubendiamide 20 WG @ 1.0 g/l, endosulfan 35 EC @ 2.0 ml/l and control. The application of treatments was started at flowering stage and subsequent two sprays were given at 15 days' interval. All agronomical practices were followed as per recommendations. The pod damage recorded at each picking and number and weight of healthy and damaged fruit was taken separately and the cumulative per cent fruit damage on number basis and weight basis was worked out and subjected to statistical analysis. The economics of the insecticide treatments was also determined through cost: benefit analysis. The number of pods damaged per plant was recorded by using the following formula:

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

The data observed during 2009 and 2010 were pooled and subjected to statistical analysis.

## RESULTS AND DISCUSSION

The data presented in the Table 1 revealed that at first picking, on number basis the lowest per cent pod damage (0.87%) was observed in flubendiamide 20 WG @ 1.0 g/l and it was found at par with endosulfan 35 EC @ 2.0 ml/l sprayed plot with 1.50% pod damage and highest (3.33%) pod damage recorded in emamectin benzoate 5 SG @ 0.5 g/l. At second picking, significantly lowest per cent pod damage (4.09) was recorded in flubendiamide 20 WG @ 1.0 g/l and it was found at par with spinosad 45 SC @ 0.3 ml/l and indoxacarb 14.5 SC @ 0.5 ml/l with 6.22 per cent and 6.47 per cent, respectively, and the highest (12.10%) was recorded in control plot. At third picking, significantly lowest per cent pod damage (8.21%) on number basis was recorded in flubendiamide 20 WG @ 1.0 g/l and it was found at par with spinosad 45 SC @ 0.3 ml/l, indoxacarb 14.5 SC @ 0.5 ml/l and thiodicarb 75 WP @ 1 g/l with 10.50 per cent, 12.33 per cent and 13.49 per cent, respectively, and the highest (21.26%) was recorded in endosulfan 35 EC @ 2.0 ml/l treated plots. At fourth and fifth pickings, significantly lowest per cent pod damages were recorded as 5.05% and 5.77%, respectively, on number basis in flubendiamide 20 WG @ 1.0 g/l and it was found at par with indoxacarb 14.5 SC @ 0.5 ml/l at fifth picking. The highest pod damages, recorded at fourth and fifth picking, were 18.35 per cent and 15.70 per cent, respectively, in control plot. Significantly lowest mean pod damage (4.79%) was recorded on number basis in flubendiamide 20 WG @ 1.0 g/l followed by indoxacarb 14.5 SC @ 0.5 ml/l, spinosad 45 SC @ 0.3 ml/l, emamectin benzoate 5 SG @ 0.5 g/l, thiodicarb 75 WP @ 1 g/l and endosulfan 35 EC @ 2.0 ml/l with 7.99 per cent, 8.70 per cent, 9.39 per cent, 9.47 per cent and 13.32 per cent, respectively, and the highest pod damage (13.46%) recorded in control plot (Fig. 1).

The results obtained by Mallikarjuna (2009) also indicate that flubendiamide 24% + thiodicarb 24-48%

SC recorded the highest per cent larval reduction after second (76.29), fifth (79.78%) and tenth (81.15%) day after first spray followed by emamectin benzoate and indoxacarb against borer of field bean. Patel *et al.* (2012) also reported that the emamectin benzoate 5 SG @ 3 g/l (2.70%) found significantly better in reducing the spotted pod borer damage which was equally effective with indoxacarb 14.5 SC @ 3.45 ml/10 l (2.98%) and spinosad 45 SC @ 1.62 ml/10 l (3.58%). Ashok Kumar and Shivaraju (2009) also reported that among the newer insecticides flubendiamide 480 SC @ 36 g a.i./ha and flubendiamide 480 SC @ 48 g a.i./ha performed better for reducing larval population of pod borer of black gram followed by indoxacarb 14.5SC @ 75 g a.i./ha. Swamy *et al.* (2010) also reported that flubendiamide provided good protection and registered significantly less incidence of *Maruca* larvae and pod damage among newer insecticides *viz.*, flubendiamide, spinosad, indoxacarb, emamectin benzoate, novaluron, chlorpyriphos, profenophos, acephate and thiodicarb. Grigolli *et al.* (2015) also observed the similar findings in context to management of *Maruca vitrata* through flubendiamide

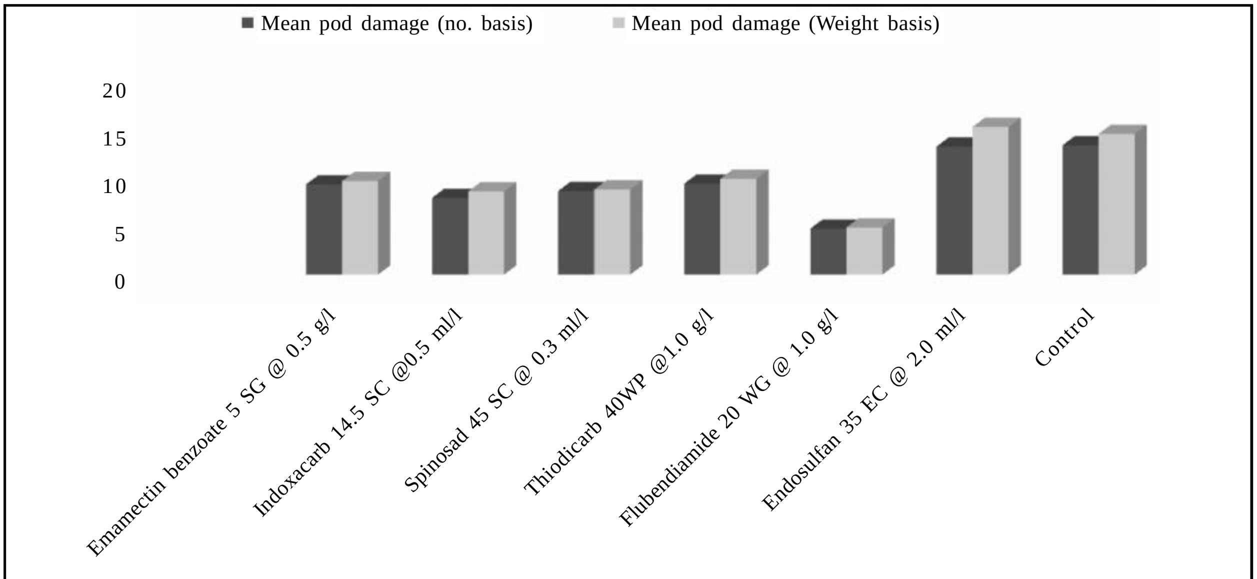


**Fig. 1: Per cent pod damage caused by spotted pod borer**

**Table 1 : Pooled efficacy of new generation insecticides against cowpea pod borer**

| Treatments | Per cent pod damage on no. basis at each picking | | | | | Mean pod damage (no. basis) | Per cent pod damage on weight basis at each picking | | | | | Mean pod damage (weight basis) | Marketable yield (q/ha) | C:B ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | | 1st | 2nd | 3rd | 4th | 5th | | | |
| Emamectin benzoate 5 SG @ 0.5 g/l | 3.33 | 6.81 | 14.80 | 11.39 | 10.64 | 9.39 | 3.24 | 7.93 | 12.59 | 14.51 | 10.43 | 9.74 | 87.23 | 1:01.3 |
| Indoxacarb 14.5 SC @ 0.5 ml/l | 2.57 | 6.47 | 12.33 | 9.13 | 9.45 | 7.99 | 2.56 | 7.91 | 10.88 | 15.86 | 6.11 | 8.66 | 81.86 | 1:02.3 |
| Spinosad 45 SC @ 0.3 ml/l | 2.70 | 6.22 | 10.50 | 14.09 | 10.03 | 8.70 | 2.45 | 5.95 | 9.63 | 14.04 | 12.20 | 8.85 | 91.39 | 1:01.9 |
| Thiodicarb 40 WP @ 1.0 g/l | 2.55 | 10.0 | 13.49 | 10.12 | 11.20 | 9.47 | 2.83 | 10.53 | 10.99 | 16.03 | 9.54 | 9.98 | 88.23 | 1:03.2 |
| Flubendiamide 20 WG @ 1.0 g/l | 0.87 | 4.09 | 8.21 | 5.05 | 5.77 | 4.79 | 0.91 | 4.24 | 5.27 | 8.83 | 5.34 | 4.91 | 91.49 | 1:01.1 |
| Endosulfan 35 EC @ 2.0 ml/l | 1.50 | 10.61 | 21.26 | 17.64 | 15.61 | 13.32 | 1.87 | 11.34 | 24.84 | 23.48 | 15.33 | 15.37 | 73.42 | 1:00.3 |
| Control | 2.86 | 12.10 | 18.33 | 18.35 | 15.70 | 13.46 | 3.49 | 9.02 | 20.98 | 22.92 | 16.87 | 14.65 | 72.21 | |
| S.E.± | 0.49 | 1.09 | 2.40 | 1.78 | 1.65 | 1.22 | 0.51 | 1.07 | 1.66 | 2.63 | 1.67 | 1.30 | 5.30 | |
| C.D. (P=0.05) | 1.20 | 2.67 | 5.87 | 4.36 | 4.04 | 2.56 | 1.25 | 2.62 | 4.06 | 6.44 | 4.09 | 2.73 | 12.97 | |

in soybean.

The highest pod damage (from first picking to fifth picking) on weight basis was recorded in flubendiamide 20 WG @ 1.0 g/l and it was found at par with spinosad 45 SC @ 0.3 ml/l at second and fourth picking and indoxacarb 14.5SC @ 0.5 ml/l at fifth picking. On weight basis, the lowest mean pod damage (4.91%) was recorded in flubendiamide 20 WG @ 1.0 g/l followed by indoxacarb 14.5 SC @ 0.5 ml/l, spinosad 45 SC @ 0.3 ml/l, emamectin benzoate 5 SG @ 0.5 g/l and thiodicarb 75 WP @ 1 g/l with 8.66%, 8.85%, 9.74%, 9.98% and 13.32%, respectively, and the highest pod damage (15.37%) recorded in endosulfan 35 EC @ 2.0 ml/l followed by control plot (14.65%).

The highest marketable yield (91.49 q/ha) was recorded in flubendiamide 20 WG @ 1.0 g/l followed by spinosad 45 SC @ 0.3 ml/l, thiodicarb 75 WP @ 1 g/l, emamectin benzoate 5 SG @ 0.5 g/l, indoxacarb 14.5 SC @ 0.5 ml/l and endosulfan 35 EC @ 2.0 ml/l with 91.39, 88.23, 87.23, 81.86 and 73.42 q/ha, respectively, and the lowest yield (72.21 q/ha) was recorded in control plot. The studies conducted by Swamy *et al*. (2010) are in support to the present findings. The highest cost benefit ratio (1:3.2) was recorded in thiodicarb 75 WP @ 1g/l and it was followed by indoxacarb 14.5 SC @ 0.5 ml/l (1:2.3), spinosad 45 SC @ 0.3 ml/l (1:1.9), emamectin benzoate 5 SG @ 0.5 g/l (1:1.3), flubendiamide 20 WG @ 1.0 g/l (1:1.1) and endosulfan 35 EC @ 2.0 ml/l (1:0.7).

### Conclusion:

It may be concluded that flubendiamide 20 WG @ 1.0 g/l gave better protection against *Maruca vitrata* among the new generation insecticides. The highest marketable yield of pods was also noticed in the plots treated with flubendiamide, therefore, this molecule may be included in the formulation of sound management strategy against spotted pod borer.

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## REFERENCES

**Ahlawat, I.P.S. and Shiva Kumar, B.G. (2005).** *Kharif* pulses. In Textbook of Field Crops production. Dr. R. Prasad (Ed.) Indian Council of Agricultural Research, New Delhi, India.

**Ashok Kumar, C.T. and Shivaraju, C. (2009).** Evaluation of newer insecticide molecules against pod borer of black gram. *Karnataka J.Agric. Sci.,* **22**:521-523

**Grigolli, J., Lourenção, A. and Ávila, C. (2015).** Field efficacy of chemical pesticides against *Maruca vitrata* Fabricius (Lepidoptera: Crambidae) infesting soybean in Brazil. *American J. Plant Sci.,* **6** : 537-544.

**Jackai, L.E.N. and Daoust, R.A. (1986).** Insect pests of cowpeas. *Ann. Rev. Entomol.,* **3** : 195 -119.

**Jackai, L.E.N. (1985).** Cowpea entomology research at IITA and its impact on food production in the tropics. *Nigeria J. Ent.,* **6** : 87-97.

**Jackai, L.E.N. (1993).** The use of neem in controlling cowpea pests. IITA Research No., **7**:5-11

**Mallikarjuna, J. (2009).** Studies on pod borers of dolichos bean, *Lablab purpureus* L. (Sweet) and their management. M.Sc. (Ag.) Thesis. University of Agricultural Sciences, Bangalore, India

**Pandey, S.N., Singh, R., Sharma, V.K. and Kanwat, P.W. (1991).** Losses due to insect pests in some *Kharif* pulses. *Indian J. Ent.,* **53** : 629-631.

**Patel, P.S., Patel, I.S., Panickar, B. and Ravindrababu, Y. (2012).** Management of spotted pod borer, *Maruca vitrata* in cowpea through newer insecticides. *Trend Biosciences,* **5** (2) : 149-151.

**Rajput, S.K. and Rana, D.S. (2016).** Crop diversification with vegetable cowpea for improving productivity, resource use efficiency, soil and human health. *Indian Farming,* **66** (1): 5-9.

**Singh, V. and Singh, B. (1992).** Tropical grain legume as important human foods. *Economic Botany*, **1646** : 310-321.

**Suh, J.B., Jackai, L.E.N. and Hammond, W.N.O. (1986).** Observations on pod sucking bug populations on cowpea at Mokwa, Nigeria. *Tropical Grain Legume Bulletin,* **33**: 17-19.

**Swamy, S.V. S.G., Ramana, M.V. and Krishna, Y.R. (2010).** Efficacy of insecticides against the spotted pod borer, *Maruca vitrata* (Geyer), in black gram [*Vigna mungo* (L.) Hepper] grown in rice fallow. *Pest Mgmt. & Economic Zool.,* **18**(1/2) : 157-164.