***Review Article***

# Efficacy of botanicals and synthetic insecticides against pod borer [*Helicoverpa armigera* (Hubner)] on cowpea [*Vigna unguiculata* (L.) Walp]


## ABSTRACT

The present investigation was conducted at Central Research Field, Department of Entomology, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the *kharif* season of 2021. The field was laid in randomized block design (RBD) with six treatments Chlorantraniliprole 18.5% SC@0.5ml/L, Spinosad 45SC@1ml/L, Emamectin benzoate 5%SG @0.04G/Kg , Neem oil 5%@50ml/L, karanj oil 5%@50ml/L , NSKE 5%@50ml/L and control viz., The larval population per plant was taken before spraying and 3,7 and 14 days after each spray all the insecticides tested significally reduced the pest infestation compared to control. The results of the efficacy showed that the minimum larval population was recorded in treatment Chlorantraniliprole 18.5% SC (2.26%,1.80%). The next effective treatments were Spinosad 45SC (2.80%,2.23%), Emamectin benzoate 5%SG (3.23%,2.80%), Neem oil 5% (3.63%,3.30%), karanj oil 5% (4.20% ,3.60%.), NSKE 5% (4.56%,4.10%.), which was found to be least effective among all treatments. The best and most economical treatment Chlorantraniliprole 18.5% SC (1:2.82) followed by Spinosad 45 SC (1:2.44), Emamectin benzoate5%SG (1:2.10), Neem oil 5% (1:1.92), karanj oil 5% (1:1.68), NSKE (1:1.49) as compared to the control plot (1:1.01).



Keywords: Benefit cost ratio, Chlorantraniliprole, Cowpea, *Helicoverpa armigera*


## INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) is a tropical annual herbaceous legume of the Fabaceae family (Stoilova *et al*., 2013). It's also known as black-eyed pea or southern pea, and it's used for a variety of things like food, feed, forage, fodder, green manure, and vegetables. Cowpea is also useful as a cover crop and helps to improve soil fertility by fixing nitrogen (Asiwe *et al*., 2009). Cowpea seeds are high in protein, calories, minerals, and vitamins (Goncalves *et al*., 2016). A seed can include 23–25 percent protein, 50–67 percent carbs, 8–9% moisture, and very little fat (3.99 percent ). They also have a significant amount of micronutrients like vitamin A, iron, and calcium (Prinyawiwatkul *et al*., 1996). Africa, Nigeria, Brazil, Haiti, India, Myanmar, Sri Lanka, Australia, and the United States are all big cowpea producers. Cowpeas are grown all over the world, with an estimated yearly cultivation area of 12 to 14 million hectares and a global yield of around 4.5 million metric tonnes (Singh *et al*., 2006). Cowpeas are farmed on 10 million hectares with a yield of 387 kg/ha (FAO, 2004). Cowpeas are grown on roughly 3.9 million hectares, with a yield of 567 kilogrammes per hectare. Because of its wide host range, dispersion, and destructiveness, it is the most severe insect pest of grain legumes in the tropics and subtropics. *Helicoverpa armigera* is a polyphagous pest that has been designated as a national pest due to its destructiveness during critical stages of crop development, such as flowering and pod development, especially to economically valuable plant parts such as flowers and pods. As a result, it has become a significant constraint to grain legume productivity. (Yerrabala *et al*. 2021).

## MATERIALS AND METHODS

The trial took place in *Kharif*, season 2021, at SHUATS, Prayagraj (U.P.). The study was set up in a randomised block design with eight different treatments. The Cowpea variety Ankur Gomati was employed in the study, and each treatment was replicated three times. Treatments for the management of the gram pod borer were applied after a sufficient level of insect population was seen. The data was statistically analysed. In addition, the yield per plot was recorded**.**

## RESULTS AND DISCUSSION

The results of the field trail revealed that among the insecticides treated against *H. armigera* after first spray Chlorantraniliprole was found significantly superior in reducing the pod borer population which was followed by Spinosad, Emamectin benzoate, neem oil, Karanj oil and NSKE. After second spray, all the insecticides were found superior over untreated control. The overall mean analysis showed that Chlorantraniliprole and Spinosad were significantly superior to other treatments followed by Emamectin benzoate, neem oil, Karanj oil and NSKE. The treatments were found to be significant with each other.

Chlorantraniliprole was found to reduce the Cowpea pod borer population to a tune of (2.03). Regarding the yield of cowpea, Chlorantraniliprole registered significantly higher yield (22.08 q/ha) and B:C ratio of 2.82 (Table 1). The present finding is in line with observation on field application of Chlorantraniliprole 18.5 SC @0.5ml/L. against pod borer and recorded lowest *H. armigera* population in cowpea crop (**Sonune *et al*.,2016, Jakhar *et al*., 2017**).

Diamide have been shown to be highly effective against a number of Lepidopteran pests including pod borer selectively activating the insect ryanodine receptor (RyR). Contraction of both cardiac and skeletal muscle resulting in excitation followed by death **(Jakhar *et al*., 2017).** Spinosad 45 SC and Emamectin benzoate 5%SG was found effective in reducing Larva population **(Nitharwal *et al*.,2017, Chaukikar *et al*.,2017).** Present finding is in conformity reported that the Spinosad performed as the most effective bio-insecticide in reducing the highest percent infestation of pod borer population and also reported that yield and quality parameters recorded, were higher in treated plots compared to control plots.

**(Patil *et al*., 2018)** Who reported maximum control of *H. armigera* of cowpea with the application of a Chlorantraniliprole 18.5 SC @0.5ml/L. followed by Spinosad 45SC@1ml/L reported that Chlorantraniliprole 18.5 SC gave the best performance with minimum (0.055%) number of Larva followed by Spinosad (0.018%), which were at par with each other. (**Sonnue, *et al*., 2016)** reported that the efficacy of newer insecticide for the management of cowpea pod borer, most effective was Spinosad 45SC followed by Emamectin benzoate 18.5%SG.

From the above discussion it may be concluded that among the tested insecticides, Chlorantraniliprole 18.5 SC @0.5ml/L. may be recommended for most and economic and effective management of pod borer, *H. armigera* on cowpea.

**Table 1: Efficacy of botanicals and synthetic insecticides on population of pod borer (*Helicoverpa armigera*) on cowpea in *kharif* season 2021**

| S.No. | Treatments | Larval population (*Helicoverpa armigera*) | | | | | | | Overall Mean | Yield (q/ha) | B:C ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | First spray | | | | Second spray | | | | | |
| | | 1DBS | 3DAS | 7DAS | 14DAS | 3DAS | 7DAS | 14DAS | | | |
| $T_1$ | Emamectin benzoate 5% SG @ 0.04g/kg | 4.66 | $3.53^{e}$ | $3.00^{e}$ | $3.20^{d}$ | $3.06^{e}$ | $2.66^{d}$ | $2.86^{e}$ | $3.01^{bcd}$ | 16.80 | 1:2.10 |
| $T_2$ | Spinosad 45 SC @ 1ml/L | 4.60 | $3.13^{f}$ | $2.53^{f}$ | $2.80^{e}$ | $2.53^{f}$ | $2.06^{e}$ | $2.26^{f}$ | $2.51^{cd}$ | 19.20 | 1:2.44 |
| $T_3$ | Chlorantraniliprole 18.5 SC @ 0.5ml/L | 4.53 | $2.80^{g}$ | $1.80^{g}$ | $2.20^{f}$ | $1.93^{g}$ | $1.73^{f}$ | $1.80^{g}$ | $2.03^{d}$ | 22.08 | 1:2.82 |
| $T_4$ | Karanj oil 5% @ 50ml/L | 4.60 | $4.40^{c}$ | $4.00^{c}$ | $4.20^{b}$ | $3.86^{c}$ | $3.40^{c}$ | $3.66^{c}$ | $3.90^{bc}$ | 13.20 | 1:1.68 |
| $T_5$ | Neem oil 5% @50ml/L | 4.86 | $3.86^{d}$ | $3.53^{d}$ | $3.63^{c}$ | $3.53^{d}$ | $3.13^{c}$ | $3.33^{d}$ | $3.46^{bcd}$ | 14.80 | 1:1.92 |
| $T_6$ | NSKE 5% @ 50ml/L | 5.06 | $5.00^{b}$ | $4.33^{b}$ | $4.40^{b}$ | $4.33^{b}$ | $3.93^{b}$ | $4.13^{b}$ | $4.33^{b}$ | 11.80 | 1:1.49 |
| $T_0$ | Untreated | 5.10 | $5.60^{a}$ | $6.20^{a}$ | $6.8^{a}$ | $7.40^{a}$ | $8.00^{a}$ | $8.60^{a}$ | $7.10^{a}$ | 7.3 | 1:1.01 |
| | F-test | NS | S | S | S | S | S | S | S | - | - |
| | CV | **5.21** | **2.71** | **4.73** | **4.12** | **4.33** | **4.77** | **3.91** | 16.23 | - | - |
| | C.D. (P = 0.5) | - | **0.19** | **0.30** | **0.28** | **0.29** | **0.30** | **0.26** | 1.49 | - | - |

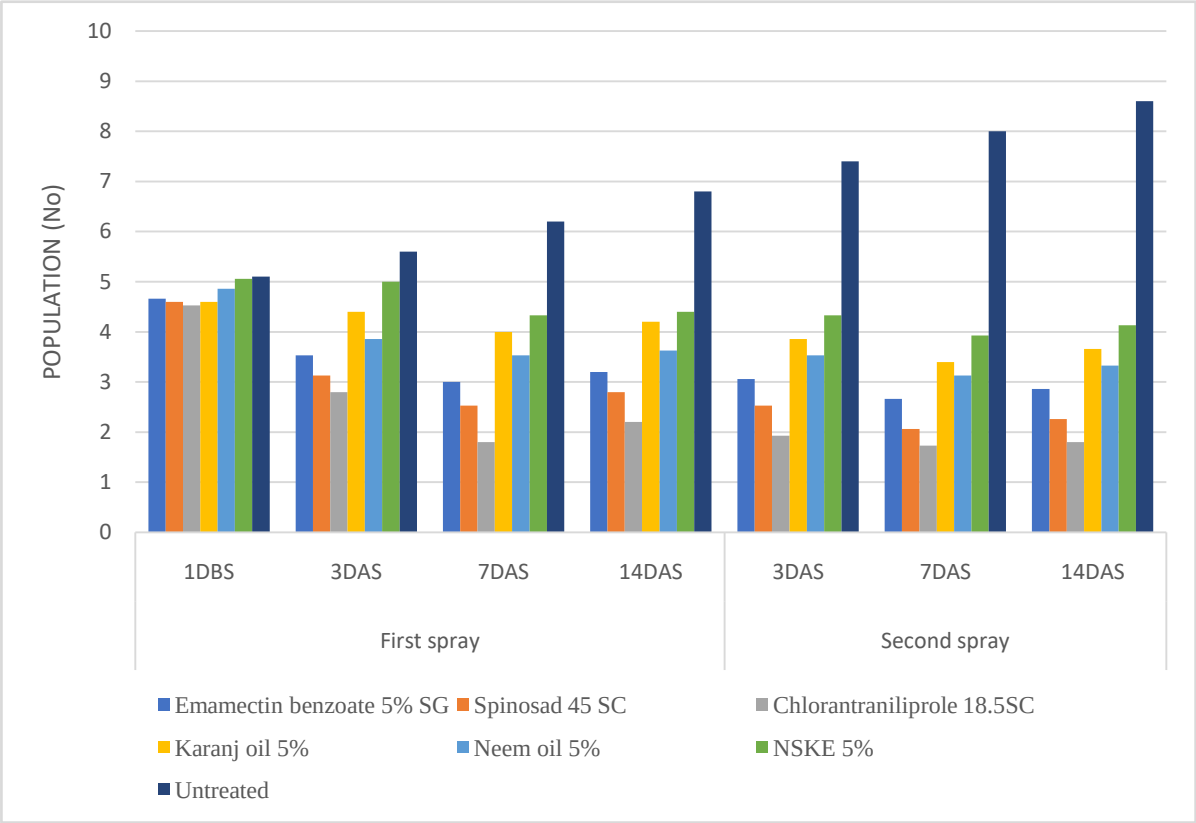


**Fig 1: Efficacy of botanicals and synthetic insecticides on population of pod borer (*Helicoverpa armigera)* on cowpea in *kharif* season 2021.**

## Conclusion:

It could be concluded that for the management of *Helicoverpa armigera* on Cowpea crop, recommended synthetic insecticides and botanicals Chlorantraniliprole 18.5 SC. proved to be most effective and economical. Similarly, the use of Spinosad 45 % SC, Emamectin benzoate 5% SG, Neem oil 5% and Karanj oil 5% can also be thought of for the management of cowpea pod borer. However, the application of NSKE 5% could not exert encouraging role for Cowpeapod borer management. This plant product also helps in reducing pollution in the environments. Hence it can be suitably incorporated as treatments in IPM programme.



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