Review Article

Efficacy of synthetic insecticides against pod borer [*Helicoverpaarmigera* (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% SC0.5ml/L, Spinosad45SC1ml/L, Emamectin benzoate 5%SG0.04G/Kg,Neem oil 5%50ml/L,karanj oil 5%50ml/L,NSKE 5%50ml/Land 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 Spinosad45SC (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 Spinosad45 SC (1:2.44), Emamectin benzoate5%SG (1:2.10), Neemoil 5% (1:1.92), karanjoil 5% (1:1.68), NSKE (1:1.49) as compared to the control plot (1:1.01).

Keywords: Benefit cost ratio, Chlorantraniliprole, Cowpea, *Helicoverpaarmigera*, Karanj oil, Neem oil.

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%).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 kg/ha.Because of its wide host range, dispersion, and destructiveness, it is the most severe insect pest of grain legumes in the tropics and subtropics. *Helicoverpaarmigera* 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*Helicoverpaarmigera* after first spray Chlorantraniliprole was found significantly superior in reducingthe pod borer population which wasfollowed by Spinosad, Emamectin benzoate,neem oil,Karanj oil and NSKE.After second spray, all the insecticides were found superior over untreated control. Theoverall mean analysis showed that Chlorantraniliprole and Spinosad were significantly superior to othertreatments followed by Emamectin benzoate, neem oil, Karanj oil and NSKE.The treatments werefoundtobesignificantwitheachother.

Chlorantraniliprolewas found to reduce the Cowpea pod borer population to a tune of (2.03). Regarding theyieldofcowpea,Chlorantraniliproleregisteredsignificantlyhigheryield(22.08q/ha)andB:Cratioof 2.82(Table1).The present finding is in line with observation on field application ofChlorantraniliprole 18.5% SC 0.5ml/L. against pod borer and recorded lowest *Helicoverpaarmigera*population in cowpeacrop(Sonune*et al*.,2016, Jakhar*et al*., 2017).

Diamide have been shown to be highly effective against a number of Lepidopteran pests includingpod borer selectively activating the insect ryanodine receptor (RyR). Contraction of both cardiac and skeletal muscle resulting inexcitationfollowed 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 highestpercent infestation of pod borer population and also reported that yield and quality parameters recorded, were higherintreatedplots comparedtocontrolplots.

(Patil *et al*.,2018) Who reported maximum control of *Helicoverpaarmigera* of cowpea with the application ofa Chlorantraniliprole 18.5% SC 0.5ml/L.followed by Spinosad 45SC1ml/Lreported that Chlorantraniliprole 18.5% SCgave the best performance with minimum (0.055%)numberof Larva followedbySpinosad (0.018%),whichwereatparwitheachother.(Sonnue,*et al*.,2016) reported that the efficacy of newer insecticide for the management of cowpea pod borer,mosteffective wasSpinosad 45SC followed by Emamectin benzoate 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,*Helicoverpaarmigera*on cowpea.

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

S.No.	Treatments	Larval population (*Helicoverpaarmigera*)							Overall Mean	Yield(q/ha)	B:C ratio
		Firstspray				Secondspray					
		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	-	-

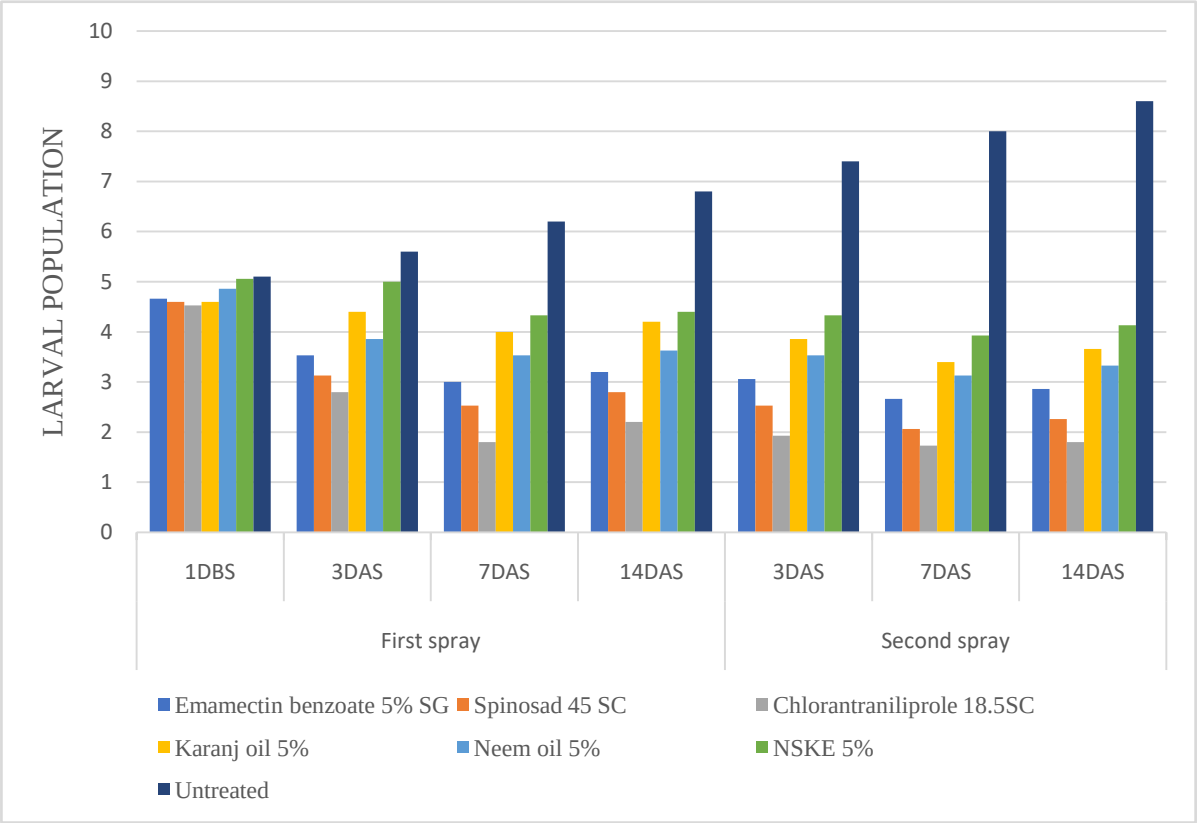

Fig 1: Efficacy of botanicals and synthetic insecticides on population of pod borer (*Helicoverpaarmigera)* on cowpea in *kharif* season 2021.

The above graph explains that lowest mean larval population of *Helicoverpaarmigera* of first and second spray was recorded in Chlorantraniliprole 18.5%SC followed by Spinosad 45% SC,Emamectin benzoate 5%SG, Neem oil 5%,Karanjoil 5%,and highest mean larval population is seen in NSKE 5%.

Conclusion:

It could be concluded that for the management of *Helicoverpaarmigera*on Cowpea crop,recommended synthetic insecticides and botanicals Chlorantraniliprole 18.5% SC. proved to bemost effective and economical. Similarly, the use ofSpinosad 45 % SC, Emamectin benzoate5%SG,Neemoil5%andKaranjoil5%canalsobethoughtofforthemanagementofcowpea pod borer.However,theapplicationofNSKE5%couldnotexertencouragingroleforCowpeapodborermanagement.Thisplantproductalsohelpsinreducingpollutionintheenvironments.Hence itcanbe suitablyincorporatedastreatments inIPMperspective.

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