The Pharma Innovation Journal 2023; 12(6): 3536-3539

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 3536-3539

www.thepharmajournal.com
Received: 03-04-2023
Accepted: 08-05-2023

Nagalakshmi
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Usha Yadav
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Corresponding Author:
Nagalakshmi
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Comparitive efficacy of selected insecticides against gram pod borer, *Helicoverpa armigera,* (Hubner)

Nagalakshmi and Usha Yadav

Abstract
A field investigation was carried out in *rabi* season of 2022-2023 at Cental Research Farm (CRF), Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India. The experiment was laid in Randomised Block Design with eight treatments each replicated thrice *viz*., T1 Flubendiamide 39.5% SC (0.4 ml/lit) SC (0.4 ml/lit) SC (0.4 ml/lit), T2 Indoxacarb 14.5% SC (0.65 ml/lit), T3 Emamectin benzoate 5% SG, T4 NSKE 5% SC (1 ml/lit), T5 Neem oil 0.03% EC (2 ml/lit), T6 Spinosad (0.4 g/lit),T7 Chlorantraniliprole 18.5 SC (0.3 ml/lit) and untreated control T0 are the treatments used in this experiment. Among the botanicals and insecticides evaluated, Chlorantraniliprole 18.5 SC (0.3 ml/lit) recorded low infestation of pod borer population i.e. (1.79) which was significantly superior over control followed by Indoxacarb 14.5% SC (2.02), Spinosad (2.23), Flubendiamide 39.5% SC (0.4 ml/lit) SC (0.4 ml/lit) SC (2.41), Emamectin benzoate 5% SG, SC (2.61), NSKE 5% SC (1.86) and Neem oil 0.03% EC (2.99) was least effective among all the treatments. Among the treatment studied the best and most economical treatment was Chlorantraniliprole 18.5 SC (1:2.8) followed by Indoxacarb 45% SC (1:2.6), Spinosad (1:2.0), Flubendiamide 39.5% SC (0.4 ml/lit) SC (0.4 ml/lit) SC (1:1.6), Emamectin benzoate 5% SG (1:1.4), NSKE 5% SC (1:1.5), Neem oil 0.03% (1:0.8) as compared to control (1:0.7).

Keywords: Botanicals, B C ratio, chemicals, efficacy, insecticides

Introduction

Chickpea (*Cicer arietinum*) a member of family Fabaceae, is an ancient self pollinated leguminous crop. Chickpea is mostly grown in soils, poor in fertility and moisture retention capacity. Gram commonly known as Chickpea or Bengal gram is the most important Rabi season pulse crop of India. In India it is also known as 'King of pulses. Chickpea provides rich source of soluble fiber. It is useful in lowering the cholesterol. It contains zinc, folic acid and protein. Chickpea also contains complex carbohydrates, vitamins, minerals and are the chief source of protein particularly to the vegetarian diet, fat content is low and most of this is unsaturated. Chickpea (*Cicer arietinum*) is the world's third most important legume food and is currently grown on about 11 million hectors, with 96% cultivated in the developing countries. *Anonymous* (2013-2014) [2]. Chickpea production has increased during the past 30 years from 7.3 million tonnes to 8.4 mt because of increase in productivity from 693 to 786 kg/ha during this period FAO (2018-2019).

Helicoverpa armigera is a cosmopolitan and widely distributed insect pest in world. It is a serious pest of all the legumes. In India, it has been observed to feed on 181 cultivated and uncultivated species belonging to 45 families. *H. armigera* is found in the Palearctic, Oriental, Ethiopian and Australian provinces, south of a line at approximately 520N (Pittaway *et al.*, 2008) [13]. This range occupied by the species includes tropical, dry and temperate climates. The currently reported global distribution of *H. armigera* suggests that the pest may be most closely associated with deserts and xeric shrub lands; Mediterranean scrub; temperate broadleaf and mixed forests and subtropical grasslands, savannas, and shrub lands; and tropical and subtropical moist broadleaf forest. (Reddy *et al.*, 2019) [14].

Gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is the most important pest of chickpea. It is the major pest of gram. The pest starts its attack at early stage and become severe during maturity stage of the crop. The pest accounts for 90- 95% of total damage. A single larva of *H. armigera* can damage 25-30 pods of gram in its life time. (Wajid *et al.*, 2016) [18].

Infestation of this pest was found on 8-26% of plants and the number of larvae on infested plants varied from 1-4 (average 2.6) per plant.

The extent of damage caused by *H. armigera* to chickpea depends on number of larval pests per plant and on its developmental stages. This is an era of Integrated pest management involving several eco-friendly approaches. Realizing the importance of chemical and botanicals in Integrated pest management on sustainable basis the present investigation were undertaken to evaluate different Bio-pesticides and insecticidal combination against chickpea pod borer, *Helicoverpa armigera* Roopa *et al*., 2014) [15].

Materials and Methods

The experiment was conducted at the experimental research plot of the Department of Entomology, Central Research Farm, Sam Higginbottom University of Agriculture Technology and Sciences, during the *rabi* season of 2022, in a Randomized Block Design with eight treatments replicated thrice using variety PUSA -362 @ 60 kg/ha in a plot size of 2 m×1 m at a spacing of 30cm×10cm with a recommended package of practices excluding plant protection. The soil of the experimental site was well drained and medium high. Research farm situated at 250 27" North Latitude 800 05'' East Longitudes and at an Altitude of 98 meter above sea level the maximum temperature reaches upto 420C in summer and crops down to 40C in winter. The treatments used in experiment are *viz.* T1 Flubendiamide 39.5% SC (0.4 ml/lit), T2 Indoxacarb 14.5% SC (0.65 ml/lit), T3 Emamectin benzoate 5% SG, T4 NSKE 5% SC (1 ml/lit), T5 Neem oil 0.03% EC (2 ml/lit), T6 Spinosad (0.4 g/lit), T7 Chlorantraniliprole18.5 Sc (0.3 ml/lit) and control.

Observations on larval population of pod borer per plant before and after treatment application. Pre-count larval population was taken one day before spraying on five randomly selected plants in each plot. Post count was taken 3rd, 7th, 14th days after treatment application for two sprayings. The insecticides sprayed at recommended doses when *Helicoverpa armigera* reaches its ETL level of 10%.

The healthy marketable yield obtained from different treatments were collected separately and weighted. The cost of insecticides used in this experiment was recorded during *rabi* season. The cost of bio pesticides used was obtained from nearby market. The total cost of plant protection consisted of cost of the treatments, sprayer, rent and labour charges for the spray. There are two sprays throughout the research period and the overall plant protection expenses were calculated. Total income was obtained by multiplying the total yield per hectare by the prevailing market price, while the net benefit is obtained by substracting the total cost of plant protection from the total income. Benefit over the control for each sprayed treatment was obtained by subtracting the income of the control treatment from that of each sprayed treatment.

Results and Discussion

The findings of the current investigation demonstrated that after insecticidal applications against pod borer *Helicoverpa armigera* were found significantly superior over treated plots when compared to control plot on reducing larval population. Chlorantraniliprole18.5 SC (0.3 ml/lit) (2.22) followed by Indoxacarb 14.5% SC (0.65 ml/lit) (2.42), Spinosad (2.66) (0.4 g/lit), Flubendiamide 39.5% SC (0.4 ml/lit) (2.86), Emamectin benzoate 5% SG (3.10) (2 m/lit), NSKE (3.40) (1 ml/lit) and Neem oil 0.03% EC (2 ml/lit) (3.53) was found to be least effective than all the treatments and is significantly superior over the control (7.56) at 3, 7 and 14 days after 1st spray as shown in (Table 1).

As in second spray among the insecticides treated against *Helicoverpa armigera* was found significantly superior over treated plots when compared to control plots on reducing larval population in Chlorantraniliprole18.5 SC (0.3 ml/lit) (1.36) followed by Indoxacarb 45% SC (0.65 ml/lit) (1.63), Spinosad (0.4 g/lit), (1.80), T1 Flubendiamide 39.5% SC (0.4 ml/lit) (1.96), Emamectin benzoate 5% SG (2 m/lit) (2.13), NSKE (1 ml/lit) (2.26) and Neem oil 0.03% EC (2 ml/lit) (2.46) was found to be least effective than all the treatments and is significantly superior over the control (8.00). at 3, 10 and 15 days after spray as shown in (Table 1).

All insecticides were significantly superior over control in reducing the larval population of pod borer recorded at 3, 7 and 14 DAS after insecticidal applications. Among all these treatments Chlorantraniliprole 18.5 Sc (0.3 ml/lit) recorded low infestation of pod borer population i.e., (1.79) which was significantly superior over control followed by Indoxacarb 14.5% SC (0.65 ml/lit) (2.02), Spinosad (0.4 g/lit) (2.23), T1 Flubendiamide 39.5% SC (0.4 ml/lit) (2.41%), Emamectin benzoate 5% SG, SC (2 m/lit) (2.61), NSKE 5% SC (1 ml/lit) (1.86) and Neem oil 0.03% EC (2 ml/lit) (2.99) at 3, 7 and 14 days after spray.

From the above results it is discussed that the highest yield and b:c ratio among the insecticides treated are Chlorantraniliprole 18.5 SC (0.3 ml/lit) (2200 kg/ha) followed by Indoxacarb 14.5% SC (0.65 ml/lit) (1880 kg/ha), Spinosad (0.4 g/lit) (1550 kg/ha), Flubendiamide 39.5% SC (0.4 ml/lit) (1435 kg/ha), Emamectin benzoate 5% SG (2 m/lit) (1332 kg/ha), NSKE 5% (1 ml/lit) (1224 kg/ha), Neem oil 0.03% EC (2 ml/lit) (1100 kg/ha) as compared to T0control (100q/ha). When the benefit cost ratio was worked out, interesting results was achieved. Among the treatment studied the best and most economical treatment was Chlorantraniliprole 18.5 SC (0.3 ml/lit) (1:2.8), Indoxacarb 14.5 SC (0.65 ml/lit) (1:2.6), followed by Spinosad (0.4 g/lit) (1:2.0), T1 Flubendiamide 39.5% SC (0.4 ml/lit) (1:1.6), Emamectin benzoate 5% SG (2 m/lit) (1:1.4), NSKE 5% (1 ml/lit) (1:1.5), Neem oil 0.03% EC (2 ml/lit) (1:0.8) as compared to control T0 (1:0.7).

The minimum larval population were recorded in Chlorantraniliprole 18.5 SC (0.3 ml/lit). The results were similar to be findings reported by Nitharwal *et al*. (2017) [10], Sushma *et al*. (2016) [18], Roopa and Kumar (2014) [15]. Indoxacarb 14.5 SC (0.65 ml/lit) found to be next best. The results of Indoxacarb14.5 SC (0.65 ml/lit) were supported by (Pal *et al*., 2018) [12], (Singh *et al*., 2017) [17] and (Gautam *et al*., 2018) [5]. Spinosad (0.4 g/lit) found to be next best effective treatment. This esults were similar finding of (Khademul *et al.*, 2020) [19], Kumar and sarda (2018). Flubendamide 39.5% SC (0.4 ml/lit) found to be next effective treatment and its results are supported by (Jat *et al.*, 2013) [7] and (Deshmukh *et al.*, 2010) [3]. Emamectin benzoate 5% SG (2 m/lit) and NSKE 5% (1 ml/lit) are found to be effective treatments and the results were similar to findings reported by (Ghosal *et al.*, 2016) [18], (Satish *et al.*, 2018) [16] and (Ambule *et al*., 2014) [1]. Neem oil found to be effective in reducing the larval population and the results were supported by (Ojha *et al.*, 2017) [11].

Cost benefit ratio

Higher yield (226 q/ha) and higher cost benefit ratio was obtained from Chlorantraniliprole18.5 SC (0.3 ml/lit) and lowest in control plot (2200 kg/ha). Similar findings made by (Nitharwal *et al*., 2017) [10], recorded the highest cost benefit ratio. (Pal *et al*., 2018) [12] who reported that the Indoxacrb 14.5 SC (0.65 ml/lit) is the best and most economical treatment recorded (1880 kg/ha) and cost benefit ratio (1:2.6). (Khademul *et al.,* 2020) [19] reported cost highest grain yield was recorded in Emamectin benzoate 5% SG (2 m/lit) and cost effectiveness of Emamectin benzoate 5% SG (2 m/lit) was also very high and very favourable with incremental benefit ratio. Kumar and Sarada (2015) [9] reported that cost effectiveness of Flubendiamide 39.5% SC (0.4 ml/lit) was high with cost benefit ratio. Recorded yield (1435 kg/ha) and cost benefit ratio (1:1.6).

Table 1: Comparitive efficacy of selected insecticides against gram Pod borer, *Helicoverpa armigera,* (Hubner)” DBS=Day before spray, DAS=Day after spray

S.No.	Treatments	Larval population of pod borer / 5 selected plants							Overall	Yield (Kg/h)	B:C ratio
		First spray				Second spray					
		1 DBS	3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS			
T1	Flubendiamide 20% WG (0.4 ml/lit)	5.4 (12.05)	3.26 (10.39)	2.40 (8.89)	3.00 (10.9)	2.73 (9.42)	1.53 (7.11)	1.73 (7.56)	2.41	1435.00	1:1.6
T2	Indoxacarb 14.5% SC (0.65 ml/lit)	4.87 (12.91)	3.00 (9.97)	1.93 (7.89)	2.66 (9.79)	2.26 (8.63)	1.26 (6.43)	1.53 (7.10)	2.02	1800.00	1:2.6
T3	Emamectin benzoate 5% SG (2 m/lit)	4.40 (12.67)	3.53 (10.82)	2.66 (9.39)	3.26 (11.81)	2.96 (9.84)	1.66 (12.7)	1.93 (7.98)	2.61	1332.00	1:1.4
T4	NSKE 5% (1 ml/lit)	4.0 (13.26)	3.80 (11.24)	2.80 (9.62)	3.60 (12.1)	3.06 (10.05)	1.60 (7.22)	2.06 (8.23)	1.86	1224.00	1:1.5
T5	Neemoil 0.03% EC (2 ml/lit)	5.00 (14.34)	3.93 (11.43)	2.93 (9.84)	3.66 (12.65)	3.26 (10.38)	1.86 (7.85)	2.40 (8.91)	2.99	1100.00	1:0.8
T6	Spinosad (0.4 g/lit)	5.73 (12.91)	3.13 (10.19)	2.20 (8.47)	2.73 (10.80)	2.46 (9.00)	1.40 (6.79)	1.60 (7.25)	2.23	1550.00	1:2.0
T7	Chlorantraniliprole 18.5 SC (0.3 ml/lit)	6.20 (11.62)	2.73 (9.43)	1.86 (7.74)	2.20 (9.47)	2.13 (8.35)	0.93 (5.53)	1.06 (5.92)	1.79	2200.00	1:2.8
T0	Control	6.2 (13.79)	7.13 (15.47)	6.93 (15.24)	8.46 (16.91)	7.93 (16.33)	8.33 (16.7)	7.86 (16.27)	7.78	856.00	1:0.7
	F-test	NS	S	S	S	S	S	S		S	
	S. Ed (±)	1.469	0.93	0.93	0.81	0.93	0.40	0.65		16.64	
	C.D. (P = 0.05%)	0.685	5.31	5.31	6.75	6.939	5.31	6.753		7.638	

Reference

1. Ambule AT, Radadia GG, Shinde CU, Patil DL. Relative efficacy of newer insecticides against *Helicoverpa armigera* (Hubner) in tomato under South Gujarat condition. International Journal of plant protection. 2015;8(2):250-255.
2. Anonymous. Area, production, productivity on yield of gram (Chickpea); c2013-2014.
3. Deshmukh SG, Sureja BV, Jethva DM, Chatar VP. Field efficacy of different insecticides against Helicoverpa armigera (Hubner) infesting chickpea. Legume Research-An International Journal. 2010;33(4):269-273.
4. Food and agricultural organization of united nation; c2018-2020.
5. Gautam MP, Chandra U, Singh SN, Yadav SK, Giri SK. Studies on efficacy of botanicals against *Helicoverpa armigera* (Hubner) on chickpea (*Cicer arietinum* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7:612-618.
6. Ghosal A, Chatterjee ML, Manna D. Studies on some insecticides with novel mode of action for the management of tomato fruit borer (*Helicoverpa armigera* Hub.). Journal of Crop and weed. 2012;8(2):126-129.
7. Jat SK, Ameta OP. Relative efficacy of biopesticides and newer insecticides against *Helicoverpa armigera* (Hub.) in tomato. The Bioscan. 2013;8(2):579-582.
8. Islam MK, Howlader MTH, Ahmed KS. Management of *Helicoverpa armigera* (Hubner) infesting tomato using biopesticides under field condition and its effect on tomato yield. Journal of the Bangladesh Agricultural University. 2020;18(1):1-5.
9. Kumar GS, Sarada O. Field efficacy and economics of some new insecticide molecules against lepidopteran caterpillars in chickpea. Current Biotica. 2015;9(2):153-158.
10. Nitharwal RS, Kumar A, Jat SL, Chula MP. Efficacy of newer molecules against gram pod borer, *Helicoverpa armigera* (Hub.) on chickpea (*Cicer arietinum* L.). Journal of Pharmacognosy and Phytochemistry. 2017;6(4):1224-1227.
11. Ojha PK, Kumari R, Chaudhary RS. Field evaluation of certain bio- pesticides against *Helicoverpa armigera* Hubner (Noctuidae: Lepidoptera) and its impact on pod damage and per plant yield of chickpea. Journal of Entomology and Zoology Studies. 2017;5(2):1092-1099.
12. Pal S, Singh DK, Umrao RS, Sharma O. Eco-Friendly Management of Tomato Fruit Borer, *Helicoverpa armigera* under Hill Condition, Uttarakhand, India. International Journal of Current Microbiology and Applied Sciences. 2018;7(10):3008-3013.
13. Pittaway JK, Robertson IK, Ball MJ. Chickpeas may influence fatty acid and fiber intake in an ad libitum diet, leading to small improvements in serum lipid profile and glycemic control. Journal of the American Dietetic Association. 2008;108(6):1009-1013.
14. Reddy KVN, Lekha AV, Chhangani G. Bioefficacy of insecticides against fruit borer, *Helicoverpa armigera* (Hub.) infesting tomato (*Solanum lycopeRsicum* L.). Indian Journal of Applied Entomology. 2019;33(1):24-28.
15. Roopa M, Kumar CT. Bio-efficacy of new insecticide molecules against capsicum fruit borer, *Helicoverpa*

armigera (Hubner). Global Journal of Biology Agriculture Health Science. 2014;3(3):219-221.
16. Sathish BN, Singh VV, Kumar S, Kumar S. Efficacy of different chemical insecticides and bio-pesticides against tomato fruit borer *Helicoverpa armigera* (Hubner) on tomato crop. Bulletin of Environmental Pharmacol and Life Sciences. 2018;7(12):107-110.
17. Singh N, Dotasara SK, Kherwa B, Singh S. Management of tomato fruit borer by incorporating newer and biorational insecticides. Journal of Entomology and zoology studies. 2017;5(2):1403-1408.
18. Hasan W, Chhibber RC, Singh CP. Effect of indoxacarb against tomato fruit borer (*Helicoverpa armigera* Hub.) and phytotoxicity to tomato plants. Advances in plants and Agriculture research. 2016;3:00093.
19. Turjya RR, Khan MA, Mir Md. Khademul Islam AB. Perversely expressed long noncoding RNAs can alter host response and viral proliferation in SARS-CoV-2 infection. Future Virology. 2020 Sep;15(9):577-593.