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Management of gram pod borer *Helicoverpa armigera* (Hubner) in chickpea with bio-pesticides and combination

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Abstract
An experiment was laid during *Rabi* 2019 at central research field, SHUATS, Prayagraj, U.P. Bio-pesticides and combination were used with seven treatments and three replications. Experiment was carried out in Randomized Block Design. The results obtained based on pest population, grain yield and B: C ratio are as follows, Emamectin benzoate (220gm/ha) + Indoxacarb (30gm/ha) (2.19) and (1932.67kg/ha) was most effective treatment followed by Indoxacarb (60gm/ha) (3.3) (1880.33kg/ha), NSKE (25kg/ha) + Indoxacarb (30gm/ha) (3.6) (1584.33kg/ha), Neem oil (5ml) + Indoxacarb (30gm/ha) (3.9) (1435.00kg/ha), *Beauveria bassiana* (400gm/ha) + Indoxacarb (30gm/ha) (4.4) (1332.00kg/ha) and *Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (30gm/ha) (5.2) (1224.33kg/ha). The highest cost benefit ratio was obtained from Emamectin benzoate + Indoxacarb (1:2.70) > Indoxacarb (1:2.65) > NSKE + Indoxacarb (1:2.23) > Neem oil + Indoxacarb (1:2.03) > *Beauveria bassiana* + Indoxacarb (1:1.84) > *Bacillus thuringiensis* + Indoxacarb (1:1.64) > control (1:1.21).

Keywords: Bio-pesticides, combination, B: C ratio, *Helicoverpa armigera*, gram pod borer

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". It 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. The total area and production of chickpea in Uttar Pradesh is 0.0604 million hectare and 0.0732 million tonnes, respectively, with an average yield of 1212kg/ha having productivity of 748.51kg/ha (Anonymous 2013-14) [1]. Chickpea crop is attacked by a number of insect- pests from seedling to its maturity. The major insect-pests attacking chickpea crop are *Helicoverpa armigera*, *Spodoptera litura*, *Agrotis ipsilon*, *Plusia orichalchea* and *Bemisia tabaci* during winter and summer seasons (Yogeeswarudu and Krishna 2014) [16]. Gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is the most important pest of chickpea. It is the major pest of gram and the damage is caused by caterpillar. 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 (Verma *et al.*, 2015) [15]. A single larva of *H. armigera* can damage 25-30 pods of gram in its life time. Conventionally farmers are using various types of synthetic chemical insecticides to control gram pod borer. But the unconscious and unjustified use of synthetic pesticides creates several problems in agro-ecosystem such as direct toxicity to beneficial insects and humans. The repeated use of systemic insecticides alone has resulted in the development of resistance in the insect pest, and disturbance to the agro-ecosystem by affecting the non-target ones. Farmers largely follow the chemical method as it gives quick results. High frequency application is the common scenario. However these chemicals in many cases invited the problems of pesticide resistance, resurgence, secondary pest outbreak, environmental contamination, residual toxicity, phyto-toxicity and toxicity to beneficial organisms like predator and parasitoids as well as disturbance in homeostasis of natural population (Patil *et al.*, 2018) [11]. Thus, we need to use integrated approaches for the control of gram pod borer in order to avoid indiscriminate use of pesticides. Therefore, it is now an urgent need to use integrated approaches for the control of

gram pod borer in order to avoid indiscriminate use of pesticide.

Materials and Methods

Field trails were conducted to study the "Management of gram pod borer, *Helicoverpa armigera* (Hubner) in Chickpea with bio-pesticides and combination" at central research field, SHUATS, Prayagraj, U.P. during *Rabi* 2019. The trail was laid out in RBD having seven treatments and three replications with the plot size 2 x 2m. The experiment was carried out on Chickpea variety Pusa-362. Two rounds of spray were given at fifteen days interval using a hand operated sprayer during morning hours to avoid photo oxidation of chemicals. The treatments details are: T_1 Emamectin benzoate (220gm/ha) + Indoxacarb (30gm/ha), T_2 Indoxacarb (60gm/ha), T_3 Neem oil (5ml) + Indoxacarb (30gm/ha), T_4 *Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (60gm/ha), T_5 NSKE (25kg/ha) + Indoxacarb (30gm/ha), T_6 *Beauveria bassiana* (400gm/ha) + Indoxacarb (30gm/ha) and T_7 Control.

Observations and calculations on pest population, grain yield and B:C ratio were made on 5 randomly selected plants in each replication along with the unsprayed control. Post treatments observations on number of larvae were recorded on 3rd, 7th and 14th days of each spray and were subjected to statistical analysis.

Result and Discussion

The results (Table: 1) after 1st and 2nd spray revealed that all the treatments were significantly superior to control in managing the pest population of *Helicoverpa armigera* on chickpea. The lowest pest population was observed in Emamectin benzoate (5% SG) + Indoxacarb (14.5% SC) (2.5) (1.8). The rest of the treatments were also successful in managing the pest population of *Helicoverpa armigera* like Indoxacarb (60gm/ha) (4.1) (2.5), NSKE (25kg/ha) + Indoxacarb (30gm/ha) (4.3) (3.0), Neem oil (5ml) + Indoxacarb (30gm/ha) (4.5) (3.4), *Beauveria bassiana* (400gm/ha) (5.0) (3.8) and *Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (30gm/ha) (5.6) (4.1). Highest pest population was recorded in Control (8.3) (9.2).

From the above findings it is evicted that all the treatments were effective in reducing the pest population of *Helicoverpa armigera*. After each spray Emamectin benzoate (5% SG) + Indoxacarb (14.5% SC) was most effective treatment reducing the pest population of *Helicoverpa armigera* which was reported by (Chaukikar *et al.*, 2017) [3] (Kambrekar *et al.*, 2012) [8]. Followed by Indoxacarb (14.5% SC) which was reported by (Gautam *et al.*, 2018) [6] (Kumar *et al.*, 2017) [9] (Pal *et al.*, 2018) [10]. (Bhushan *et al.*, 2011) [2] (Choudhary *et al.*, 2017) [4] (Reddy *et al.*, 2010) [12] observed that low pest population was recorded in NSKE + Indoxacarb (14.5% SC). (Faqiri and Kumar 2016) [5] (Gautam *et al.*, 2018) [6] reported that Neem oil found to be most effective in reducing pest population of *Helicoverpa armigera*. Followed by *Beauveria bassiana* + Indoxacarb and *Bacillus thuringiensis* + Indoxacarb which was supported by (Choudhary *et al.*, 2017) [4] (Harshita *et al.*, 2018) [7] (Regmi *et al.*, 2018) [13] (Singh *et al.*, 2017) [14].

The highest yield was recorded in Emamectin benzoate (5% SG) @ 200gm/ha + Indoxacarb (14.5% SC) @ 30gm/ha (1932 kg/ha) of chickpea as against (856 kg/ha) in untreated control. Whereas the treatment with Indoxacarb (14.5% SC) @ 60gm/ha recorded (1880 kg/ha) yield of chickpea. However, the treatments with Emamectin benzoate (5% SG) @ 200gm/ha + Indoxacarb (14.5% SC) @ 30gm/ha registered maximum (1:2.70) B:C ratio followed by Indoxacarb (14.5% SC) @ 60gm/ha (1:2.65), NSKE (25kg/ha) + Indoxacarb (14.5% SC) @ 30gm/ha (1:2.23), Neem oil (5ml) + Indoxacarb (14.5% SC) @ 30gm/ha (1:2.03), *Beauveria bassiana* (400gm/ha) + Indoxacarb (14.5% SC) @ 30gm/ha (1:1.84), *Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (14.5% SC) @ 30gm/ha (1:1.64). Although the treatment with Emamectin benzoate (5% SG) @ 200gm/ha + Indoxacarb (14.5% SC) @ 30gm/ha was found most effective against gram pod borer and obtaining good yield of chickpea. It reported lowest B: C ratio *Bacillus thuringiensis* + Indoxacarb (14.5% SC) @30gm/ha (1:1.64) similar results were reported by (Singh *et al.*, 2017) [14].

Table 1: Percent infestation of gram pod borer (*Helicoverpa armigera*) on chickpea at different days of interval

Sr.no	Treatment	Population of *Helicoverpa armigera* (Number)/plot								Yield in q/ha	B:C Ratio
		1st spray				2nd spray					
		3rd DAS	7th DAS	14th DAS	Mean	3rd DAS	7th DAS	14th DAS	Mean		
T_1	Emamectin benzoate (220gm/ha) + Indoxacarb (30gm/ha)	2.9	2.5	2.1	2.5	2.2	2.1	1.2	1.8	1932	1:2.70
T_2	Indoxacarb (60g/ha)	4.0	4.4	4.0	4.1	2.9	3.0	1.8	2.5	1880	1:2.65
T_3	Neem Oil (5ml) + Indoxacarb (30gm/ha)	4.2	4.6	4.8	4.5	3.8	3.5	3.1	3.4	1435	1:2.03
T_4	*Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (30gm/ha)	4.7	6.0	6.1	5.6	4.2	4.2	4.0	4.1	1224	1:1.64
T_5	NSKE (25kg/ha) + Indoxacarb (30gm/ha)	4.1	4.5	4.6	4.3	3.2	3.4	2.5	3.0	1584	1:2.23
T_6	*Beauveria bassiana* (400gm/ha)+ Indoxacarb (30gm/ha)	4.6	5.1	5.4	5.0	4.0	3.9	3.6	3.8	1332	1:1.84
T_7	Control	8.1	8.3	8.5	8.3	9.0	9.2	9.6	9.2	856	1:1.21
F- test		S	S	S	S	S	S	S	S	S	
S.E (m) ±		0.33	0.59	0.66	0.31	0.36	0.38	0.52	0.27	16.64	
C.D at 5%		0.72	1.28	1.44	0.67	0.78	0.83	1.14	0.60	7.638	

Conclusion

From the analysis of the present findings, it can be concluded that among all the treatments Emamectin benzoate (220gm/ha) + Indoxacarb (30gm/ha) proved to be the best treatment followed by Indoxacarb (60gm/ha), NSKE (25kg/ha) + Indoxacarb (30gm/ha), Neem oil (5ml) + Indoxacarb (30gm/ha), *Beauveria bassiana* (400gm/ha) + Indoxacarb (30gm/ha) and *Bacillus thuringiensis* (750-1000gm/ha) + Indoxacarb (30gm/ha) in managing *Helicoverpa armigera* pest population. This does not create different problems like contamination of ecosystem, including soil, water pollution and occurrence of pesticides residue in

food, pest resurgence, effect on non-target pest etc. Therefore bio-pesticides with combination may be useful in devising proper Integrated pest management strategy against *Helicoverpa armigera.*

References

1. Anonymous. Area, Production, Productivity and Yield of Gram (Chickpea) 2013-2014. http//www.indiastat.com.
2. Bhushan S, Singh RP, Shanker R. Bioefficacy of neem and *Bt* against pod borer, *Helicoverpa armigera* in chickpea. Journal of Biopesticides. 2011;4(1):87-89.
3. Chaukikar K, Bhowmick AK, Das SB, Marabi RS, Tomar VS. Bio efficacy of Emamectin benzoate against *Helicoverpa armigera* (Hubner) and its natural enemies on chickpea (*Cicer arietinum*) crop. International Journal of Bio-resource and Stress Management 2017;8(5):716-720.
4. Choudhary R, Kumar A, Jat GC, Vikram, Deshwal HL. Comparative Efficacy of Certain Bio-Pesticides against Tomato Fruit Borer, *Helicoverpa armigera* (Hub.). International Journal of Current Microbiology Applied Sciences. 2017;6(8):1068-1081.
5. Faqiri M, Kumar A. Management of tomato fruit borer *Helicoverpa armigera* (Hubner) by chemical insecticides and neem products. International Journal of Multidisciplinary Research and Development 2016;3(6):82-85.
6. Gautam MP, Chandra USN, Singh SK, Yadav, 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.
7. Harshita AP, Saikia DK, Deeve A, Bora LC, Phukan SN. Seasonal incidence of fruit borer, *Helicoverpa armigera* and its eco-friendly management in tomato, *Solanum lycopersicum.* International Journal of Chemical Studies. 2018;6(5):1482-1485.
8. Kambrekar DN, Somanagouda G, Basava Rajappa MP, Halagalimath SP. Effect of different dosages of Emamectin benzoate 5SG and Indoxacarb 14.5SC on pod borer, *Helicoverpa armigera* infesting chickpea. Indian Journals Legume Research 2012;35(1):13-17.
9. Kumar S, Singh G, Kumar D. Effect of some novel insecticides on larval population of gram pod borer, *Helicoverpa armigera* (Hub.) in chickpea. An International Quarterly Journal of Life Sciences 2017; 11(1):285-287.
10. Pal S, Singh DK, Umrao RS, Sharma O. Eco-Friendly Management of Tomato Fruit Borer, *Helicoverpa armigera* under Hill Condition, Uttrakhand, India. International Journal of Current Microbial Applied Sciences 2018;7(10):3008-3013.
11. Patil PV, Pawar SA, Kadu RV, Pawar DB. Bio-efficacy of newer insecticides, botanicals and microbial against tomato fruit borer *Helicoverpa armigera* (Hubner) infesting tomato 2018;6(5):2006-2011.
12. Reddy V, Anandhi P, Elamathi S, Simon S. Efficacy of some common insecticides for the management of pod borer *Helicoverpa armigera* (Hubner) on chick pea at field condition. Indian Journals Legume Research 2010;33(1):74-75.
13. Regmi R, Poudel S, Regmi RC, Poudel S. Efficacy of commercial insecticide for the management of tomato fruit borer, *Helicoverpa armigera (*Hubner), on tomato in chitwan Nepal. Journal of Agriculture and Forestry University 2018;2:127-131.
14. Singh N, Dotasara SK, Kherwa B, Singh S. Management of tomato fruit borer by incorporating newer and bio rational insecticides. Journal of Entomology and Zoology Studies 2017;5(2):1403-1408.
15. Verma S, Ramteke L, Amit KU, Sinha AKU, Kumar A, Nandanwar *et al*. Effective management of gram pod borer *Helicoverpa armigera* (Hubner) with combination of NSKE and flubendiamide 39.39SC**.** International Journal of Applied and Pure Science and Agriculture. 2015;01(08):74-77.
16. Yogeeswarudu B, Krishna VK. *Helicoverpa armigera* (Hubner) infesting on Chickpea. Journal of Entomology and Zoology Studies 2014;2(5):35-38.