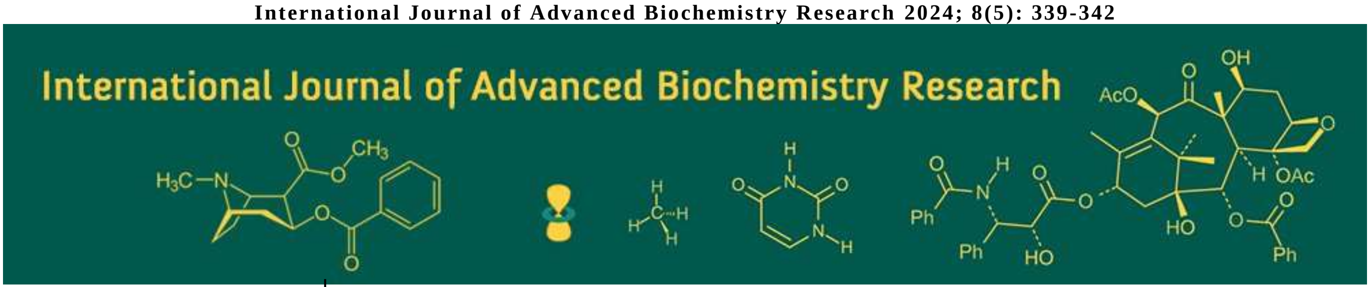

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Efficacy of certain biopesticides and chemicals against gram pod borer [*Helicoverpa armigera* (Hubner)] on chickpea (*Cicer arietinum* L)

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Abstract

The research work was conducted at Central Research Farm in Sam Higginbottom University of Agriculture Technology and Sciences, Naini, Prayagraj during *rabi* season in 2023-2024 includes eight treatments including and control *viz,* T_1-Neem Oil 5%, T_2-NSKE 5%, T_3-*Beauveria bassiana* 1.15% WP, T_4-*Bacillus thuringiensis* 1×10^9 CFU/ml, T_5-Spinosad 45 SC, T_6-Chlorantraniliprole 18.5% SC, T_7-Profenofos 40% + Cypermethrin 4% EC and T_0-untreated plot in Randomized Block Design used in three replications tormenting to study the efficacy of selected insecticides on the larval population of *H. armigera* on Chickpea. Result show that T_6-Chlorantraniliprole 18.5% SC found superior among all treatments with larval population of (0.52) with highest C:B ratio and marketable yield (1:3.49 and 26.83 q/ha), and least effective among the treatments is NSKE 5% with a pest population, C:B ratio and yield (1.77, 1:1.75 and 13.33 q/ha).

Keywords: Biopesticide, botanical, chemical, chickpea, efficacy, *Helicoverpa armigera*. C:B ratio

Introduction

Chickpea [*Cicer arietinum* (L.)], also known as Chana, Bengal gram, or Gram, is a significant pulse crop grown in a lot of countries throughout the world and accounts for 20% of the world's supply of legumes. It is a member of the Leguminaceae family. South Western Asia is where the chickpea, known as the "King of Pulses," originated. The plant typically develops to a height of 20 to 50 cm during the *Rabi* season and has tiny, feathery leaves on both side of the stem. In addition to being a feed, chickpeas are utilized for human consumption. Its seed is used as a green vegetable, in dishes that are fried or roasted, as snacks, and in the production of flour and dhal.

Chickpea is an essential significant pulse, per 100 gm with 19.99 percent of protein and stands third among the food-grains after wheat and rice. It is rich and inexpensive source of proteins and vitamins which constitute 14.00 gm protein, 4.00 gm fat, 12.8 gm fiber, 45 gm Carbs, 8.49%, 23% Zinc, 22% Phosphorous, Potassium 10%. It occupies around 10 million h actor the total area under the pulses in India, and total productivity is 11.91 million tones with average productivity of 1192 kg/ha.

Chickpea solely contribute about 50% of Indian pulse production. Highest gram producing state India are Maharashtra (25.97%), Madhya Pradesh (18.59%), Rajasthan (20.65%), Gujarat (10.10%) and Uttar Pradesh (5.66%) contribution to national production. Bengal gram is 10 million hectares with a production of 11.91 million tonnes with productivity of 1187 kg/ha. (Prasanna *et al.,* 2020) [14].

Pod borer is one of the major pests of gram. The caterpillar starts attacking at initial stage and generate severe infestation at crop adulthood stage, effect on total yield loss up-to 70-80%. A single can damage 25-30 pods of gram in its life time. It feeds on tender leaves and young pods. It makes irregular holes on pods and leaves and keep its half body inside and half body outside the pod to eat the developing seeds, this is the characteristic feature of *Helicoverpa armigera*. The yield loss in chickpea due to pod borer was results as 20 to 70 percent in favourable weather conditions. The pest infestation can be diminished by the spraying of selected insecticides. (Gautam *et al*., 2018) [4].

Pod borer is a universal, polyphagous and electic eater pest and widely distributed in the tropics and sub-tropics. The attacks result in less yield of gram to the regular outbreaks of *H. armigera* which is considered as one of the significant pests of chickpea. *Helicoverpa armigera* is singly destroy and damages upto Rs 35, 000 million annually in India regardless using of several pesticides. (Meena *et al.*, 2018) [12].

Objective

1. To evaluate the efficacy of few biopesticides and chemicals against gram pod borer (*Helicoverpa armigera*) on Chickpea during the *rabi* season 2023-2024.
2. To calculate the cost benefit ratio.

Materials and Methods

Field trails were conducted to study the "Efficacy of certain biopesticides and chemicals against gram pod borer [*Helicoverpa armigera* (Hubner)] on chickpea (*Cicer arietinum*. L)" at central research field, SHUATS, Prayagraj, U.P. during *Rabi* 2023-2024. The survey was laid out in RBD having seven treatments and control in three replications with the plot size 2m^2. The Research was fulfilled on Bengal gram variety Pusa-362. Two spraying intervals were given at fifteen days interval using a hand compression pump during dawn or dusk hours to avoid photo oxidation of insecticides. The treatments details are: T_1-Neem Oil 5% (2.5 lit/ha), T_2-NSKE 5% (2.5 lit/ha), T_3-*Beauveria bassiana* 1.15 WP (1 kg/ha), T_4-*Bacillus thuringiensis* 1×10^9 CFU/ml (1kg/ha), T_5-Spinosad 45 SC (160 ml/ha), T_6 – Chlorantraniliprole 18.5 SC (150 ml/ha), T_7-Profenofos40% + Cypermethrin 4% (1 lit/ha) and T_0-untreated control.

Monitoring and estimation on larval count, gram yield and Benefit cost ratio were made on 5 erraticaly chosen plants in each replication along with the untreated plot. Post treatments monitoring on larval population were reported on third, seventh and fourteenth days of every spray appropriately and were expose to statistical analysis.

Benefit Cost Ratio

$$\text{Benefit Cost Ratio} = \frac{\text{Net Return}}{\text{Cost of Treatment}} \times 100$$

Mohapatra and Yadav (2023) [29]

Result and Discussion

The outcome after 1st and 2nd spray stated that all the treatments were superiorly to control in handle the pest community of pod borer (*Helicoverpa. a*) on gram. The least larval population was recorded in Chlorantraniliprole 18.5 SC. The remaining treatments were also successful in handle the larval population of pod borer (*Helicoverpa armigera)* like. The readings of larval population of *Helicoverpa armigera* after second spray stated that all the treatments were supercilious over untreated plot. Among each on of the treatments poorest population was noted in Chlorantraniliprole 18.5 SC (0.52) found excellence over other treatments accompanied by Spinosad 45SC (0.85) then Profenofos 40% + Cypermethrin 4% (1.03), *Bacillus thuringiensis* 1×10^9 CFU/ml (1.26), *Beauveria bassiana* 1.15% (1), Neem oil 5% (1.22), Neem seed kernal extracT_5% (1.46) were superior over control (2.39). NSKE 5% was least effective treatment. Ultimate number of larvae population was noted in untreated control (2.39).

The data on mean larval population behind first and second spray state that all the insecticides were found very effective and significantly superior over untreated plot. Among all seven treatments minimum Larval number found in T_6-Chlorantraniliprole 18.5 SC (0.52) as the similar findings was reported by Upadhyay *et al.*, (2020) [22] reported that Chlorantraniliprole 18.5 SC was the most workable treatment to control *Helicoverpa armigera* larval population. T_6 Spinosad 45 SC was found the next capable treatment with larval number (0.85) similar finding was noted by Singh *et al.*, (2018) [30], Mohapatra and Yadav (2023) [29], who noted that Spinosad SC was found to be the next best treatment for reducing the larval population of *Helicoverpa armigera.* T_7 Profenofos 40% + Cypermethrin 4% was found the next best effective treatments with the larval number (1.03) which was similarly found by Jadhav *et al.*, (2021) [31], Jayanth and Kumar (2022) [32], who reported Profenofos 40% + Cypermethrin 4% to be the next best and effective treatment in controlling larval population. T_4-*Bacillus thuringiensis* was found the next most effective treatment with a lowest larval number of (1.26) as the same findings was done by Herald *et al.*, (2019) [33], Mohite and Khan (2022) [34]. T_3-*Beauveria bassiana* was found the next best effective treatment with a larval population of (1.38) as the same findings was done by Sai *et al.*, (2020) [35], Vijaykumar *et al.*, (2021) [36]. T_1-Neem oil 5% was found the next effectual treatment with a caterpillar population of (1.56) as the same findings was done by Gautam *et al.*, (2018) [4]. T_2-NSKE 5% was found the next effectual treatment with a larval population of (1.77) and the same findings was done by Herald *et al.*, (2019) [33], Santosh (2022) [37].

The maximum yield was reported in T_6-Chlorantraniliprole 18.5 SC (26.83 q/ha), accompanied by T_5 Spinosad (26.66 q/ha), T_7 Profenofos 40% + Cypermethrin 4% (25.83 q/ha), T_4 *Bacillus thuringiensis* (22.5 q/ha), T_3 *Beauveria bassiana* (21.25 q/ha), T_1 Neem oil 5% (17.08 q/ha) and T_1 NSKE 5% (13.33 q/ha). The treatments T_1 NSKE 5% (13.33 q/ha) was tiniest effective among all the treatments. Untreated plot T0 (11.00 q/ha) yield.

Among all the treatments the dominant C:B ratio was gained from T_6-Chlorantraniliprole 18.5 SC (1:3.49) as the similar findings was done by Upadhyay *et al.*, (2020) [22], followed by T_5-Spinosad 45 SC with a cost benefit ratio of (1:3.32) as the similar finding was done by Reddy *et al.*, (2021) [38], Mohite and Khan (2022), [39]. followed by the T_7-Profenofos 40% + Cypermethrin 4% exhibited a cost benefit ratio of (1:2.283) as the similar finding was done by Jadhav *et al.*, (2021) [31], which was followed by T_4-*Bacillus thuringiensis* which exhibited cost benefit ratio of (1:2.52) which was suggested by the finding of Chitralekha *et al.*, (2018) [2], Abbas *et al.*, (2021) [1], followed by T_3-*Beauveria bassiana* exhibited cost benefit ratio of (1:2.83) it was suggested by Golvankar *et al.*, (2015) [6], Vijaykumar *et al.*, (2021) [36], which was followed by T_1-Neem oil 5% with a C:B ratio of (1:2.25) as the similar finding was done by Yerrabala *et al.*, (2021) [28], Followed by T_2-NSKE 5% which obtained a cost benefit ratio of (1:1.75) which was supported by Meena *et al.*, (2018) [12].

Table 1: Population of *Helicoverpa armigera*/ 5 Plant

Sr. No	Treatments	Population of *Helicoverpa armigera*/ 5 Plant								Yield in q/ha	B:C ratio
		1st Spray				2nd Spray					
		3rd Day	7th Day	14th Day	Mean	3rd Day	7th Day	14th Day	Mean		
T_1	Neem oil 5%	2	1.4	1.8	1.73	2	1.4	1.8	1.9	17.08	1:1.85
T_2	NSKE 5%	2.13	1.6	2	1.91	2.13	1.6	2	2.09	13.33	1:1.75
T_3	*Beauveria bassiana* 1.15% WP	1.93	1.13	1.6	1.55	1.93	1.13	1.6	1.76	21.25	1:1.91
T_4	*Bacillus thuringiensis* 1×10^9 CFU/ml	1.93	0.93	1.4	1.42	1.93	0.93	1.4	1.69	22.5	1:2.52
T_5	Spinosad 45 SC	1.66	0.66	0.93	1.08	1.66	0.66	0.93	1.26	26.66	1:3.32
T_6	Chlorantraniliprole 18.5 SC	0.93	0.26	0.53	0.57	0.93	0.26	0.53	0.88	26.83	1:3.49
T_7	Profenofos 40% + Cypermethrin 4%	1.86	0.8	1.13	1.26	1.86	0.8	1.13	1.44	25.83	1:2.83
T0	Control	2.26	2.33	2.2	2.26	2.26	2.33	2.2	2.16	11.00	1:1.27
F-test		S	S	S	S	S	S	S	S		
S. Ed. (±)		0.161	0.118	0.076	0.188	0.103	0.052	0.063	0.046		
C. D. (P = 0.05)		0.298	0.373	0.162	0.256	0.214	0.111	0.135	0.100		

Conclusion

Above analysis claims between all the treatments Chlorantraniliprole 18.5 SC (0.5 ml/lit) proved to be the satisfying treatment accompanied by Spinosad 45 SC (0.3 ml/lit), Profenofos 40% + Cypermethrin 4% (2.5 ml/lit), *Bacillus thuringiensis* @ 5 mg/ml, *Beauveria bassiana* 1.15% WP (2.5 gm/lit), Neem oil 5% (5ml/lit) and NSKE 5% (50 ml/lit) in reducing *Helicoverpa armigera* larval population. The selected insecticides do not raise problems like contamination of ecosystem, effect on non-target pest. Eventually bio-pesticides are useful in maintaining of proper management of pod borer (*Helicoverpa armigera*).

References

1. Abbas A, Wang Y, Muhammad U, Fatima A. Efficacy of different insecticides against gram pod borer (*Helicoverpa armigera*) and their safety to the beneficial fauna. Int J Biosci. 2021;18:82-88.
2. Chitralekha GS, Verma T. Efficacy of insecticides against *Helicoverpa armigera* on chickpea. J Entomol Zool Stud. 2018;6(3):1058-1061.
3. Choudhary R, Kumar A, Jat GC, Vikram, Deshwal HL. Comparative Efficacy of Certain Bio-Pesticides against Tomato Fruit Borer, *Helicoverpa armigera* (Hub.). Int J Curr Microbiol Appl Sci. 2017;6(8):1068-1081.
4. Gautam MP, Chandra U, Singh SN, Yadav SK, Giri SK. Studies on efficacy of botanicals against *Helicoverpa armigera* (Hubner) on chickpea (*Cicer arietinum* L.). Int J Curr Microbiol Appl Sci. 2018;7:612-618.
5. Gayathri L, Kumar A. Field efficacy of certain insecticides against pod borer, *Helicoverpa armigera* (Hubner) on chick pea in Prayagraj. J Entomol Zool Stud. 2021;9(3):280-283.
6. Golvankar GM, Desai VS, Dhobe NS. Management of chickpea pod borer, *Helicoverpa armigera* Hubner by using microbial pesticides and botanicals. Trends Biosci. 2015;8(4):887-890.
7. SC on pod borer, *Helicoverpa armigera* infesting chickpea. Legume Res Int J. 2021;35(1):13-17.
8. Keval R, Yadav A, Srivastava CP, Kumar R. Evaluation of certain newer insecticides against pod fly (*Melanagromyza obtusa*) and pod borer (*Helicoverpa armigera*) on long duration pigeonpea. Res Crops. 2016;17(1):129-133.
9. Konda JSD, Kumar A. Efficacy and economics of selected biopesticides against *Helicoverpa armigera* (Hubner) on cowpea. Pharma Innov J. 2022;11(5):1395-1398.
10. Kumar A, Miashra M, Prakash S. Biology of *Helicoverpa armigera* (Hubner) on tomato in Tarai Region of Uttar Pradesh. J Exp Zool India. 2012;16(1):101-104.
11. Kumar P, Kumar S, Rana R, Sachan SK. Comparative efficacy of novel insecticides and bio-pesticides on larval population density of gram pod borer (*Helicoverpa armigera* Hubner) on chickpea. J Plant Dev Sci.
12. Meena RK, Naqui AR, Meena DS, Shibbhagvan S. Evaluation of bio-pesticides and indoxacarb against gram pod borer on chickpea. J Entomol Zool Stud. 2018;6:2208-2212.
13. Nitharwal RS, Kumar A, Jat SL, Chula MP. Efficacy of newer molecules against gram pod borer, *Helicoverpa armigera* (Hub.) on chickpea (*Cicer arietinum* L.). J Pharmacogn Phytochem. 2017;6(4):1224-1227.
14. Prasanna PM, Badiger B, Shivamurthy D. Bio-efficacy of insecticide, Cyclaniliprole 100 DC against gram pod borer, *Helicoverpa armigera* (Hubner) infesting chickpea. IJCS. 2020;8(4):3070-3073.
15. Qayyum MA, Wakil W, Muhammad Jalal Arif MJ, Sahi ST. *Helicoverpa armigera*. Int J Agric Biol. 2015;17(5):1043-1048.
16. Rahman AKMZ, Haque MH, Alam SN, Mahmudunnabi M, Dutta NK. Efficacy of Botanicals against *Helicoverpa armigera* (Hubner) in Tomato. Agriculturists. 2014;12(1):131-139.
17. Rani DS, Kumar SP, Venkatesh MN, Sri CHNS, Kumar KA. Bio efficacy of insecticides against gram pod borer, *Helicoverpa armigera* in Redgram. J Entomol Zool Stud. 2018;6(2):3173-3176.
18. Rashid A, Saeed HA, Akhtar LH, Siddiqi SZ, Arshad M. Comparative efficacy of various insecticides to control gram pod borer (*Helicoverpa armigera* Hubner) on chickpea. Asian J Plant Sci.
19. Ravi M, Santharam G, Sathiah N. Ecofriendly management of tomato fruit borer, *Helicoverpa armigera* (Hubner). J Biopesticides. 2008;1(2):134-137.
20. Shah JA, Inayatullah M, Sohail K, Shah SF, Shah S, Iqbal T, Usman M. Efficacy of botanical extracts and a chemical pesticide against tomato fruit worm, *Helicoverpa armigera*. Sarhad J Agric. 2013;29(1).
21. Singh P, Singh R, Kumar S, Kumar V, Kumar S. Bioefficacy of certain new insecticides against larval population of gram pod borer, *Helicoverpa armigera* (Hubner) in chickpea. Ecoscan. 2015;7:315-318.
22. Upadhyay RR, Singh PS, Singh SK. Comparative efficacy and economics of certain insecticides against

gram pod borer, *Helicoverpa armigera* (Hübner) in chickpea. Indian J Plant Prot. 2020;48(4):403-410.
23. Vijaykumar L, Anusha SB, Ashwini SB, Divya B. Bio-efficacy of *Beauveria bassiana* against gram pod borer, *Helicoverpa armigera* Hubner (Noctuidae: Lepidoptera) in chickpea. J Pharmacogn Phytochem. 2022;11(2):197-201.
24. Vikrant DR, Kumar S, Kishor K, Kewal R. Bio-efficacy of Insecticides against *Helicoverpa armigera* in Chickpea. Legume Res. LR-3960 [1-6].
25. Wakil W, Ashfaq M, Ghazanfar MU, Akhtar S, Malhi ZA. Laboratory bioassay with neem (*Azadirachta indica* a. Juss) products to Control *Helicoverpa armigera* (Hubner) fed on chickpea. Pak J Entomol. 2008;30(1):51-54.
26. Wubneh WY. Biological control of chickpea pod borer, *Helicoverpa armigera* Hubner (Lepidoptera: Noctuidae): A global concern. World Scientific News. 2016;45(2):92-110.
27. Yadav RK, Chandra U, Veer R, Raj A, Gautam CPN, Kumar S, Singh G. Relative efficacy of newer insecticides against gram pod borer, *Helicoverpa armigera*. J Pharmacogn Phytochem. 2019;8(4):599-601.
28. Yerrabala S, Kumar HS, Yadav U. Comparative efficacy of Bacillus thuringiensis with botanicals and chemicals against gram pod borer *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) on cowpea [*Vigna unguiculata* (L.) Walp.]. Pharma Innov J SP-10(5):709-712.
29. Patel R, Mohapatra DR, Yadav SK. A bibliometric analysis on the impact of corruption on foreign direct investment attractiveness. Vision. 2023:09722629231172053.
30. Singh R, Upadhyay AK, Chandra P, Singh DP. Sodium chloride incites reactive oxygen species in green algae *Chlorococcum humicola* and *Chlorella vulgaris*: implication on lipid synthesis, mineral nutrients and antioxidant system. Bioresource technology. 2018 Dec 1;270:489-497.
31. Cherian S, Potdar V, Jadhav S, Yadav P, Gupta N, Das M, *et al*. SARS-CoV-2 spike mutations, L452R, T_478K, E484Q and P681R, in the second wave of COVID-19 in Maharashtra, India. Microorganisms. 2021 Jul 20;9(7):1542.
32. Gupta Y, Kumar J, Reifers DA. Identifying security risks in NFT platforms. arXiv preprint arXiv:2204.01487. 2022 Mar 18.
33. Ali SR, Lucas-Herald A, Bryce J, Ahmed SF. The role of international databases in understanding the aetiology and consequences of differences/disorders of sex development. International Journal of Molecular Sciences. 2019 Sep 7;20(18):4405.
34. Othman J, Potter N, Mokretar K, Taussig D, Khan A, Krishnamurthy P, *et al*. High molecular response rate and overall survival with FLT_3 inhibitors as MRD-guided salvage treatment for molecular failure in AML. Blood. 2022 Nov 15;140(Supplement 1):2002-2004.
35. Gao G, Sai L. Towards a ‘virtual’world: Social isolation and struggles during the COVID-19 pandemic as single women living alone. Gender, Work & Organization. 2020 Sep;27(5):754-762.
36. Grieshaber-Bouyer R, Radtke FA, Cunin P, Stifano G, Levescot A, Vijaykumar B, *et al*. The neutrotime transcriptional signature defines a single continuum of neutrophils across biological compartments. Nature communications. 2021 May 17;12(1):2856.
37. Praveena BA, Lokesh N, Buradi A, Santhosh N, Praveena BL, Vignesh R. A comprehensive review of emerging additive manufacturing (3D printing technology): Methods, materials, applications, challenges, trends and future potential. Materials Today: Proceedings. 2022 Jan 1;52:1309-1313.
38. Reddy MS, Ponnamma D, Choudhary R, Sadasivuni KK. A comparative review of natural and synthetic biopolymer composite scaffolds. Polymers. 2021 Mar 30;13(7):1105.
39. Mohite PA, Khan SA. Field evaluation of certain chemicals and biopesticides against pod borer, Helicoverpa armigera (Hubner) in Chickpea: An Experimental Research. Research Highlights in Agricultural Sciences. 2022 Dec 8;6:45-54.