Asian Journal of Agricultural Extension, Economics & Sociology

38(12): 107-111, 2020; Article no.AJAEES.64684
ISSN: 2320-7027

Impact of Light Traps on the Larval Population of Gram Pod Borer, *Helicoverpa armigera* (Lepidoptera: Noctuidae) on Chickpea

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Authors' contributions

This work was carried out in collaboration among all authors. Author SAH designed the study & wrote the first draft of the manuscript. Author FR performed the statistical analysis & wrote the protocol. Authors SB, SN, ZAD and GZ managed the analyses of the study. Authors MH, SM, SN, ZR and AAL managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2020/v38i1230495
Editor(s):
(1) Dr. Wang Guangjun, Chinese Academy of Fishery Sciences, China.
Reviewers:
(1) Onésime Mubenga Kankonda, University of Kisangani, DR Congo.
(2) Dr. Araz Meilin, Ministry of Agriculture, Indonesian.
Complete Peer review History: http://www.sdiarticle4.com/review-history/64684

Short Research Article

Received 25 October 2020
Accepted 30 December 2020
Published 31 December 2020

ABSTRACT

One (T1) and two (T2) light traps per ha were compared with control with no light source (T3) against gram pod borer, *Helicoverpa armigera*. Pooled data of 2018 and 2019 showed that TI resulted with average population of 0.31larvae per plant with 5.46% pod damage and average yield of 1235 kg per ha. In T2, lowest larval population was recorded (0.25/plant), lesser pod damage (4.02%) and higher yield (1244.8 kg /ha) while in control plots (T3), larval population density was maximum with 0.377 larvae/plant with pod damage of 10-25% and 1162.90 kg /ha yield was recorded.

Keywords: Gram; helicoverpa armigera; light traps; larval population management.

1. INTRODUCTION

Gram pod borer (*Helicoverpa armigera*) is the most destroying pest of different crops, chickpea, pigeon mungbean, lentil, maize, berseem. Chickpea (*Cicer arietinum*) is one of the most important pulse crops of India. Ahmad and Iqbal recorded 26%, 41% and 42% damage to

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Chickpea due to *Helicoverpa armigera* in Jacobabad, Dokri and Shikarpur districts of Sind Pakistan [1]. Besides Gram pod borer, it is also known as Gram Catterpillar, bollworm, tomato fruit borer and tobacco bud worm [2] However, chickpea production is hampered by biotic stress. Percent larval survival and pupation of Pod borer has been studied maximum on Chickpea [2] among insect pests the pod borer (*Helicoverpa armigera*) is the main constraint during the flowering and pod formation stages. The pest appears in feburary late and reaches its peak by end of April. In May the population decreases gradually and rarely found in june [3] Since not much resistant genotypes are available against the pod borer [4] and farmers are relying on synthetic insecticides to manage this pest [5,6]. Which causes adverse effects on natural enemies besides other hazards on the soil [7]. Hence an attempt was undertaken to investigate light traps as a tool for managing the pest population.

2. MATERIALS AND METHODS

Field studies were conducted to check the efficacy of light traps on the larval population of *H. armigera*. Shalimar chickpea 3 variety was sown in DARS SKUAST farm and in three different adjoining villages (namely Kralpora, Wathoora and Vadipora) in completely randomized design. Each village was considered as a replicate with three treatments including a control. In treatment (T1) efficacy of single light trap per hawas tested whereas in second treatment (T2) two light traps per ha were installed. Untreated plot (T3) in each of the same village was taken as control were traps with no light were installed. Traditional agronomic practices were followed for crop maintenance without any chemical treatment. Light traps were installed in the April 2018 and 2019 and fortnightly data was recorded till end of June 2018 and 2019.For this purpose, 50 plants were randomly selected from each treatment and the number of *Helicoverpa armigera* larvae per plant was counted. Data regarding pod damage were estimated by harvesting one m^2 from the five zones (10,20,30,40 and 50 m distance) from the light source of each treatment. Total number of pods and damaged pods were counted and percentage for damaged pods was calculated. In a similar fashion yield in Kg/ha was calculated by harvesting one area from the five zones within the treatments and converted into yield (kg/ha) by the following formula:

Yield (Kg/ha) = (Weight of grains (gm.) per m^2 / 1000g) x 10,000

3. RESULTS

The study of larval infestation of the pod borer/plant revealed that T2 resulted in significantly lower larval infestation with 0.25 larvae per plant, followed by T1 and T3 with 0.310 and 0.377 larvae per plant, respectively (Table 1).Mean pod borer damage was significantly low in T2 with 4.02% Pod damage followed by T1 with 5.5% mean pod damage. In T3 with no light trap, the pod damage was 10.25%. Samples collected from the five zones (10 to 50 meters from the light trap sources) revealed that poddamage increased as the distance from the light source increases (Table 2). Significantly higher yield of 1244.8 kg /ha was recorded in T2 followed by T1 with 1235.0 kg/ha. The treatment with no Light trap significantly resulted in lower yield of 1162.9 kg per ha (Table 3).The yield obtained from 10,20 and 30 m zones was not significantly different from each but significantly higher from that of 40 and 50 m.

4. DISCUSSION

The studies revealed effectiveness of the light traps against the gram pod borer (*Helicoverpa armigera*). Our results are somewhat in concurrence with those by Dillion and Mackinnon, 2002 who reported that once the light trap array was operational the average total egg density dropped to 1.09 eggs per meter in the treatment as compared with 1.3 eggs per meter in the control and concluded that the higher the intensity of light trap the lesser will be the population density [8] and also by Farman, et al. who reported that installation of 2 light traps /ha was effective than the trap without light source.(Control treatment). [9] Muneer abbas et al. [10] reported that light traps against Pod borer proved more efficient and feasible having low environmental risks having minimum percent foliage ,pod and grain damage of 2.09,0.71 and 0.29 respectively with 0.13 larval population /plant, maximum yield of 875 kg/ha with 68.84 % yield increase over control.

The study of percent pod damage revealed that the far the area from the light the less was the light intensity and the greater was the pod damage. Furthermore pod damage was less in T2 (4.02%) as compared to T1 (5.46%) and T3 (10.25%). If compared with the control (T3) these figures show about 50 to 60 %reduction in pod

damage. These studies clearly indicate that by removing adult moths through the light traps, pod damage could be minimized. Data regarding the yield from five zones reveal that from the light trap sources, showed that lesser the intensity of light (light trap at farther distance) lesser will be the yield because pod damage will be more. The yield data revealed 1244.8 kg /ha in T2,1235 Kg /ha in T1 and 1162.9 kg /ha in T3.It shows that the installation of two light traps /ha can save about 9% of the potential yield that otherwise would be lost to the pod borer infestation.

Table 1. Mean number of *Helicoverpa armigera Larvae* per plant during the experiment

Date	2018	2019	2018	2019	2018	2019
	T1		T2		T3 (Control)	
11.03.2018	0.49	0.49	0.48	0.48	0.48	0.47
27.03.2018	0.08	0.08	0.09	0.09	0.09	0.09
11.04.2018	0.06	0.06	0.05	0.05	0.07	0.07
24.04.2018	0.19	0.19	0.15	0.15	0.02	0.02
12.05.2018	0.20	0.20	0.15	0.15	0.26	0.26
27.05.2018	0.39	0.39	0.30	0.30	0.54	0.54
12.06.2018	0.71	0.71	0.53	0.53	0.96	0.96
Mean	0.30	0.30	0.25	0.25	0.37	0.37
Pooled Mean	0.31		0.25		0.37	
CD (0.05)	0.53	0.44	0.42	0.38	0.24	0.45

Table 2. Mean percent pod damage at different ranges from light trap sources during rabi 2018 and 2019

Distance	2018	2019	2018	2019	2018	2019
	T1		T2		T3	
10 m	3.51	3.50	2.52	2.51	10.14	10.13
20 m	4.15	4.14	3.11	3.10	10.56	10.57
30 m	5.44	5.43	3.71	3.70	10.59	10.60
40 m	6.48	6.47	4.71	4.70	10.60	10.61
50 m	7.72	7.70	6.08	6.07	10.11	10.11
Mean	5.46	5.44	4.02	4.00	10.40	10.10
Pooled Mean	5.45		4.01		10.25	
CD(0.05)	2.19	2.63	2.08	2.16	3.12	3.23

Table 3. Mean yield (kg/ha) in the different ranges from the light trap sources during rabi 2018 and 2019

Distance	2018	2019	2018	2019	2018	2019	% increase 2018 over control	% increase (2019)
	T1	T1	T2	T2	T3	T3		
10 m	1260	1262	1270	1271	1174	1176	8.01	8.07
20 m	1247	1248	1254	1255	1162	1164	7.90	7.81
30 m	1232	1233	1234	1236	1160	1161	6.37	6.45
40 m	1230	1234	1232	1235	1158	1160	6.33	6.37
50 m	1202	1204	1230	1231	1155	1158	6.42	6.30
Mean	1234	1236	1244	1245.6	1161.8	1164		
Pooled Mean	1235		1244.8		1162.90			

Table 4. Monitoring of *Helicoverpa armigera* population through pheromone traps during Rabi 2018-19

Month/Year	Std Week	Pheromone trap catches	No. of *H. armigera* larvae / meter row length
March	09	0.00	0.00
	10	0.00	0.44
	11	0.00	1.20
	12	0.15	1.25
April	13	2.00	1.97
	14	3.16	5.30
	15	6.58	8.85
	16	3.30	10.70
May	17	2.30	13.25
	18	2.15	9.66
	19	0.88	6.45
	20	0.58	2.95
June	21	2.42	14.20
	22	2.32	9.89
	23	2.18	6.55
	24	0.62	2.99

5. CONCLUSION

The results of the study infer that two light traps installed at 10 m distance was found significantly effective against pod borer damage compared to other treatments under study. Further, the cost of light traps and the impact on beneficial orthopods should be kept into consideration before using such protective measures.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ahmad K, Iqbal SM. Survey report on incidence of insect pests and diseases of Chickpea growing areas of Sindh under food legumes improvement programme PARC (NARC), Islambad. Annual report; 1990.
2. Atwal AS, Dhaliwal GS. Agricultural pest of south Asia and their management. Kalayani publishers. 2nd edition, 487 Khalique F, Ahmad K (1993). Studies on the phenology of the larval stages of *H. armigera* in relation to phenology of Chickpea. PARC (NARC), Islamabad. Annual report; 1997.
3. Khalique F, Ahmad K. Studies on the phenology of the larval stages of *H. armigera* in relation to phenology of chickpea. PARC (NARC), Islamabad. Annual report. 1993.
4. Wakil W, AM, Ahmad S. Larval population and pod infestation by *Helicoverpa* on chickpea in Rawalpindi, Pakistan. Pakistan Entomologist. 2005:27(1):33-36.
5. Bashir K. Chemical control of gram pod borer *H. armigera* with different insecticide and resistance cultivars against the pest. M.sc Thesis (Unpublished) Deptt of Entomology K P (NWEP) Agri. Univ, Peshwar; 1986.
6. Shanower TG, Kelly TG, Cowgill SE. Development of effective and environmentally sound strategies to control *Helicoverpa armigera* in pigeonpea and chickpea production system. In: Abstract of 3rd International Conference on Tropical Entomology, Narobi, Kenya; 1994.
7. Balk F, Koeman TH. Future hazards from pesticide use, with special reference to West Africa and South East Asia. The Environmentalists. 1984;4(6):99.
8. Dillon MM. Using light traps to suppress *Helicoverpa*, *CSIRO Entomology*, Australian Cotton CRC, Narrabri. Cotton Grower; 2002.
9. Farman Ullah, Ali M, Ahmad S, Badshah H. Impact of light traps on population

density of gram pod borer (*Helicoverpa armigera*) Lepidoptera; Noctuidae and its Larval parasitoid Campoletis Chloridae in REDKholi area of Khan Deraismail, Pakistan. J. Ent. Zool Stud. 2015;3:631-634.

10. Muneer Abbas et al. Efficacy and feasibility of various IPM tools against Pod borer (*Helicoverpa armigera*) of Chickpea in Thai regions of Punjab; 2020.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/64684