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Anil Kumar
Department of Entomology, T.D.P.G. College, Jaunpur, Uttar Pradesh, India

MK Tripathi
Department of Entomology, T.D.P.G. College, Jaunpur, Uttar Pradesh, India

Umesh Chandra
Department of Entomology, N.D. University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Ram veer
Department of Entomology, N.D. University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Correspondence
Anil Kumar
Department of Entomology, T.D.P.G. College, Jaunpur, Uttar Pradesh, India

Studies on correlation co-efficient of larval population of *Helicoverpa armigera* in reference to weather parameters

Anil Kumar, MK Tripathi, Umesh Chandra and Ram veer

Abstract
Chickpea, (*Cicer arietinum* L.) is an important pulse crop world-wide. There are many constraints in the production of the crop, of which pod borer, *Helicoverpa armigera* Hubner is the notorious one which causes both quantitative and qualitative loss. Therefore, an experiment was conducted during *Rabi* 2010-11 and 2011-12. The larval population was recorded at weekly interval from a vegetative stage to till maturity and meteorological data was collected from the department of meteorology during crop season The results of the investigation on larval population of pod borer (*Helicoverpa armigera* Hubner) in relation to abiotic factors revealed that the appearance from 46 standard week to till 14 standard week. The correlation co-efficient with the population of *H. armigera* was significantly positively correlated with minimum temperature (0.5463 during 2010-11 and 0.7998 during 2011-12) and maximum temperature (0.5202 during 2010-11 and 0.6339 during 2011-12) respectively. While relative humidity (-0.3536 during 2010-11 & -4191) and rainfall (-0.14966 during 2010-11 & 0.3343 during 2011-12) showed negative correlation.

Keywords: Pod borer, correlation, temperature, chickpea, R.H and rainfall

Introduction
Chickpea, (*Cicer arietinum* L.) is an important pulse crop in Bangladesh. There are many constraints in the production of the crop, of which pod borer, *Helicoverpa armigera* Hubner is the notorious one which causes both quantitative and qualitative loss. On an average, 30 – 40% pods were found to be damaged by this pest and an average of 400 kg/ha grain was lost by the borer (Rahman, 1990) [10]. In favourable condition, pod damage goes upto 90-95 percent (Shengal and Ujagir, 1990) [12]. Preference of insecticides depends on their easy availability and applicability, but their excessive and indiscriminate use has resulted in the development of insecticidal resistance in the pests and environmental pollution (Phokela *et al.*, 1990) [9].
Helicoverpa armigera Hubner (Lepidoptera: Noctuidae), the cotton bollworm, also known as the gram pod borer or the tomato fruit worm, is a polyphagous agricultural pest with a wide geographical distribution, recorded from Europe, Asia, Africa, Oceania, and recently South America. Larvae of *H. armigera* have been reported from over 67 host families, including Asteraceae, Fabaceae, Malvaceae, Poaceae and Solanaceae and this pest has caused losses to economically important crops such as cotton, legumes, sorghum, maize, tomato, soybean, ornamentalplants, and fruit trees (Krinski and Godoy, 2015) [6]. Marigold (Tagetes spp.) (Asterals: Asteraceae), a native of Mexico, is one of the most popular cut flowers in the world having the highest economic importance in the floriculture industry and comprises about 33 species (Adriana *et al*., 2012) [1].
The area under floriculture production in India during the year 2015-2016 was estimated to be as 243 thousand hectares with a production of 2236 thousand metric tonnes (Anonymous, 2016) [2]. Among the various factors responsible for low yield of marigold in India, *H. armigera* is most important, which cause very heavy losses in yield. Excessive use of chemicals not only causes the economic restrain on farmers, but also produces the harmful side effects on the environments as well as mammals. The best way to overcome this situation is to destroy the pest at the initial stage of the life cycle (Chatar *et al*., 2010) [3]. This is possible if timely prediction of the incidence of the pest can be made. Hence, an attempt was made to investigate the incidence of pod borer, *H. armigera* infesting marigold in relation to different abiotic factors.

Materials and Methods

The larval population was recorded at weekly interval from a vegetative stage to till maturity and meteorological data was collected from the department of meteorology during crop season. The larval populations were correlated with abiotic factors.

Results and Discussion

The correlation co-efficient with the population of *H. armigera* was significantly positively correlated with minimum temperature (0.5463 during 2010-11 and 0.7998 during 2011-12) and maximum temperature (0.5202 during 2010-11 and 0.6339 during 2011-12) respectively. While relative humidity (-0.3536 during 2010-11 & -4191) and rainfall (-0.14966 during 2010-11 & 0.3343 during 2011-12) showed negative correlation.

Table 1: Seasonal incidence of *Helicoverpa armigera* Hub. in chickpea during *Rabi* season 2010-11

Standard week	Mean larval population per square meter	Weather Parameters			
		Temperature ^{0}C		Relative humidity (%)	Rain fall (mm)
		Minimum	Maximum		
46	2.8	15.7	29.5	76.75	001.2
47	4.4	14.7	25.2	74.10	000.0
48	5.6	11.5	26.1	70.4	000.0
49	4.9	9.2	25.8	68.4	000.0
50	4.2	8.5	24.3	66.95	000.0
51	2.5	5.8	23.64	69.45	000.0
52	2.1	5.64	27.57	81.6	000.0
1	2.0	3.5	15.3	84.95	001.3
2	0.8	2.5	14.3	85.7	000.0
3	1.0	5.2	22.1	57.45	000.0
4	1.6	4.6	19.5	77.8	001.3
5	2.1	6.0	23.7	70.55	000.0
6	2.5	7.4	26.2	65.4	000.0
7	2.8	11.4	25.2	74.45	007.5
8	3.5	8.2	25.2	67.60	001.4
9	3.9	10.5	27.0	61.85	005.0
10	2.8	8.6	25.3	68.55	008.9
11	1.4	12.1	31.4	53.45	000.0
12	1.0	14.0	35.1	42.60	000.0
13	0.6	15.8	33.8	46.90	000.0
14	0.4	14.7	35.8	36.50	000.0

It is evident from data that the larval population showed significant positive correlation with minimum temperature and maximum temperature during 2010-11 and 2011-12 while relative humidity and rainfall showed significant with negative correlation during 2010-11 and 2011-12.

Table 2: Seasonal incidence of *Helicoverpa armigera* Hub. in chickpea during *Rabi* season 2011-12

Standard week	Mean larval population/ square meter	Weather Parameters			
		Temperature ^{0}C		Relative humidity (%)	Rain fall (mm)
		Minimum	Maximum		
46	2.1	15.1	32.6	72.2	000.0
47	3.5	13.7	33.5	72.2	000.0
48	4.8	10.1	21.2	65.9	000.0
49	5.7	10.9	29.8	70.7	000.0
50	4.0	9.8	29.1	85.5	000.0
51	3.0	5.5	28.8	84.0	000.0
52	1.8	5.1	27.8	65.5	000.0
1	0.9	11.5	26.4	83.7	059.8
2	1.0	13.0	27.6	82.1	000.0
3	1.5	7.9	19.7	77.2	000.0
4	2.1	5.5	22.2	71.5	000.0
5	2.6	5.0	23.0	72.5	000.0
6	2.0	6.6	22.5	74.7	015.2
7	2.4	8.6	24.3	67.7	005.2
8	1.8	11.0	27.0	74.8	000.0
9	3.2	9.8	28.4	68.7	000.0
10	4.5	10.8	28.0	69.6	000.0
11	6.2	10.7	28.4	61.3	004.2
12	5.3	13.2	32.1	52.0	000.0
13	4.1	14.9	35.8	42.1	000.0
14	2.2	19.0	36.5	50.2	000.0

The present findings are also in contrary with the findings Khorasiya *et al.* (2016) [5] reported that the direct and indirect effect of various abiotic factors on the population build-up of *H. armigera* indicated that the maximum temperature exerted very high negative direct effect (-1.1428) while morning relative humidity registered positive and high direct effect (0.4842). Negative high indirect effect was noticed of minimum temperature (-0.8909), morning (-0.4419) and evening relative humidity (-0.3891) through maximum temperature. While remaining weather parameters showed moderate to low positive indirect effect except evening relative humidity on the population build-up of *H. armigera* during 2011-12. Minimum temperature (-0.5537), morning relative humidity (-0.9521) and wind speed (-0.4425) exerted negative high direct influence while, evening relative humidity (0.9534) exerted positive high direct influence on the population build-up of *H. armigera.* Morning relative humidity exerted high negative indirect effect (-0.8193) through evening relative humidity and high positive indirect effect through wind speed (0.4493) and evaporation (0.6588) during *rabi,* 2012-13.

Table 3: Correlation co-efficient of mean larval population with weather parameters

S. No.	Abiotic factors			
	Temperature		Relative humidity	Rain fall
	Min.	Max.		
2010-11	0.5463	0.5202	-0.3536	-0.14966
2011-12	0.7998	0.6339	-0.4191	-0.3343

The present findings are also in partial agreement with the findings of Singh (2015) observed that the temperature and rainfall had significantly positive correlation maximum relative humidity and minimum relative humidity had significantly negative correlation and sunshine had no significantly effect on larval population of *H. armigera*. The present findings are also in partial agreement with the findings of Ganai *et al* (2017) [4] reported that the population dynamics of pod borer (*Helicoverpa armigera* Hubner) in relation to abiotic factors revealed that the pest commenced from 7th standard week, which remained till 18th standard week with its peak activity during 15th standard week. The correlation studies indicated highly significantly positive association between larval population of *H. armigera* and mean maximum temperature (0.349**) and highly significantly negative association between *H. armigera* and mean relative humidity (morning) (-0.284**). The present investigations are also in contrary with the finding of Singh *et al.* (2014) [13] found that the gram pod borer, *Helicoverpa armigera* Hubner was a most grave pest. The maximum population was recorded during February and March at the poding stage of the crop. A regards the correlation between the larval population and environmental factors, there was showed negative effect of maximum and minimum temperature on the larval population of pod borer in chickpea while relative humidity and rainfall showed positive role on larval population during the both year**.** The present investigations are also in accordance with the findings of Nadaf and Kulkarni (2006) [7] in a similar study reported that the maximum temperature and minimum temperature had positive significantly effect on *H. armigera* population. The results are in agreement with with the findings of Reddy *et al*., (2009) [11] who reported that the pod borer population had significantly positive correlation with both minimum and maximum temperature and the correlation coefficient being 0.71 and 0.82, respectively. The correlation coefficient of morning and evening relative humidity was - 0.66. This findings are also in accordance with the findings of Singh *et al*., (2010) and Pandey *et al*., (2012) [8] reported that the negative correlation of rainfall and relative humidity with the pest activity, whereas maximum and minimum temperature, were positively correlated with pest activity.

Reference

1. Adriana DB, Doru P, Adriana FS, Lucica M, Radu ES. Heterosis studies for response to *Aphis fabae* attack in Calendula. Bull. UASVM. Hort. 2012; 69(1):40-47.
2. Anonymous. Area and Production of Horticulture Crops - All India. National Horticulture Board, 2016, 3.
3. Chatar VP, Raghvani KL, Joshi MD, Ghadge SM, Deshmukh SG, Dalave SK. Population dynamics of pod borer, *Helicoverpa armigera* (Hubner) infesting chickpea. Intl. J Plant Prot. 2010; 3(1):65-67.
4. Ganai SA, Ahmad H, Sharma D, a Khaliq N, Sharma S, Kaur R *et al*. Effect of Abiotic Factors on the Populations of Pod Borer, *Helicoverpa armigera* (Hubner) on Marigold, *Tagetes erecta* in Jammu, India. Int. J Curr. Microbiol. App. Sci. 2017; 6(9):181-185.
5. Khorasiya SG, Raghavani KL, Bharadiya AM. Direct and indirect effect of abiotic factors on population fluctuation of *H. armigera* in chickpea, International Journal of Agriculture Sciences. 2016; 8(57):3106-3109.
6. Krinski D, Godoy AF. First record of *Helicoverpa armigera* (Lepidoptera: Noctuidae) feeding on *Plectranthus neochilus* (Lamiales: Lamiaceae) in Brazil. Fla. Entomol. 2015; 98(4):1238-40.
7. Nadaf AM, Kulkarni KA. Seasonal Incidence of the fruit borers, *Helicoverpa armigera* (Hubner) and *Spodoptera litura* Fabricius on chilli in Dharwad. Karnataka. J Agric. Sci. 2006; 19(3):549-552.
8. Pandey BM, Tripati MK, Lakshmi V. Seasonal incidence of gram pod borer *Helicoverpa armigera* (hub.) on chickpea in Varanasi area. J Exp. Zool. 2012; 15(2):667-669.
9. Phokela A, Dhingra S, Sinha SN, Mehrotra KN. Pyrethroid resistance in *Heliothis armigera* Hub. III Development of resistance in field. Pesticide Research Journal. 1990; 2(l):28-30.
10. Rahman MM. Infestation and yield loss in chickpea due to pod borer in Bangladesh. Bangladesh Journal of Agricultural Research. 1990; 15(2):16-23.
11. Reddy AV, Anandhi P, Elamathi S, Verma S. Seasonal occurrence of pulse pod borer *Helicoverpa armigera* (L.) on chick pea at eastern U.P. region. Agric. Sci. Digest. 2009; 29(2):60-62.
12. Shengal VK, Ujagir R. Effect of synthetic pyrethroids, neem extracts and other insecticides for the control of pod damage by *Helicoverpa armigera* on chickpea and pod damage-yield relationship at Patancheru in Northern India. Crop Protection. 1990; 9:29-32.
13. Singh S, Singh RS, Shanker K, Verma SK. Seasonal profusion of gram pod borer, *Helicoverpa armigera* hubner In chick pea in relation to meteorological surroundings. Society for Sci. Dev. in Agric. and Tech. Progressive Research. 2014; 9(1):268-271.