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Population dynamics of gram pod borer on late sown chickpea

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Abstract
The present investigation were carried out during *rabi* 2013-2014 at the Entomology experimental farm of College of Agriculture JNKVV, Jabalpur to study the population dynamics of gram pod borer, *Helicoverpa armigera* on late sown chickpea. The pod borer egg population appeared from 3rd SW (15/1/2014 to 21/1/2014) and was available upto the 16th SW (16-04-2014 to 22-04-2014). Pod borer egg population attained its first peak (2.25 egg/mrl) during 12th SW (19-03-2014 to 25-03-2014), when maximum and minimum temperature were 34 and 13.4 ºC, respectively, whereas morning relative humidity and evening relative humidity were 79 and 27%, respectively. The pod borer larval population appeared from 4th SW (22-1-2014 to 28-1-2014) and was available upto the 16th SW (16-04-2014 to 22-04-2014). Pod borer larval population attained its first peak (1.15 larvae/mrl) during 7th SW (12-02-2014 to 18-02-2014), when maximum and minimum temperature were 23.9 and 9.5 ºC, respectively, whereas morning and evening relative humidity were 88 and 41%, respectively.

Keywords: Population, *Helicoverpa armigera*, chickpea, climatic factors, correlation

Introduction
The early instar larva of gram pod borer devours the chlorophyll from the epidermis of the leaves which results in netty whitish patches in leaves. In their later stage, they nibble the leaf sheaths leaving their mid ribs only. In case of heavy infestation only bare stem and branches are left on the plants. During the podding stage early instar larvae make scratches on the green pods by feeding on its green matter, while the later instar makes a more or less circular hole in the pods and inserts its head and the former portion of the body into it and feed upon the developing grains. The larvae also feed on the flowers resulting in less pod setting. A single larva can infest several pods and neatly, eats away the developing grains resulting in substantial yield loss. In this scenario, pod borer can be considered as the major constraint in chickpea cultivation. The best way to overcome this situation is to sustain the pest at its initial stage of the life cycle. This is possible if timely prediction of the transpire of the pest can be made. Hence, an attempt has been made to investigate the seasonal incidence of pod borer, *H. armigera* infesting chickpea to the different meteorological parameters on late sown chickpea.

Material and methods
The present investigation was carried out during *rabi* 2013-2014 at the Entomology experimental field of College of Agriculture JNKVV, Jabalpur.
JG-12 cultivar of chickpea was sown in 10 m×9.9 m field area on 18th December 2013. In the sown field area row length was 10 m and row to plant distance was 0.30×0.10 m. Observations were recorded on one meter row length per site (20 sites per observation) twice in a standard week, which started from the first appearance of the pest (egg and larva) and continued till their availability or maturity of the crop, whichever was earlier. At the same time a corresponding weekly record of meteorological data *viz*. minimum and maximum temperature, morning and evening relative humidity, total rainfall and number of rainy days per week, wind speed, sunshine, morning and evening vapour pressure and evaporation were maintained. The influence of different meteorological parameters on immature stages of gram pod borer was studied by graphical super imposition technique [1].

Results
The data presented in Table 1 and figure 1 revealed that Correlation (r) and regression coefficient (byx) of abiotic factors on immature stages of *Helicoverpa armigera* on late sown

chickpea during 2013-14. The Chickpea pod borer egg population appeared from 3rd SW (15-1-2014 to 21-1-2014) and was available upto the 16th SW (16-04-2014 to 22-04-2014). Pod borer egg population attained its first peak (1.50 eggs /mrl) during 12th SW (19-03-2014 to 25-03-2014), when maximum and minimum temperature were 34 and 13.4 ºC, respectively, whereas morning relative humidity and evening relative humidity were 79 and 27%, respectively. Further wind speed, sunshine, morning and evening vapour pressure and evaporation were 3.2 km/hr, 8.6 hrs, 13.8 mm, 10.5 mm and 4.8 mm respectively. There was no rainfall received during this week.

Second peak was attained (2.25 eggs /mrl) during 14th SW (2-04-2014 to 8-04-2014), when maximum and minimum temperature were 37.4 and 18.5 ºC, respectively, whereas morning and evening relative humidity were 55 and 16%, respectively. Further wind speed, sunshine, morning and evening vapour pressure and evaporation were 3.9 km/hr, 9.3 hrs, 11.2 mm, 7.4 mm and 6.9 mm respectively. There was no rainfall received during this week.

First appearance of the pod borer larva was observed from 4th SW (22-1-2014 to 28-1-2014) and was available upto the 16th SW (16-04-2014 to 22-04-2014). Pod borer larval population attained its first peak (1.15 larvae/mrl) during 7th SW (12-02-2014 to 18-02-2014), when maximum and minimum temperature were 23.9 and 9.5 ºC, respectively, whereas morning and evening relative humidity were 88 and 41%, respectively. Further wind speed, sunshine, morning and evening vapour pressure and evaporation were 3.8 km/hr, 7.7 hrs, 9.4 mm, 8 mm and 2.9 mm respectively. There was no rainfall received during this week.

Second peak was attained (3.30 larvae/mrl) during 11th SW (12-03-2014 to 18-03-2014), when maximum and minimum temperature were 30.5 and 12.6 ºC, respectively, whereas morning and evening relative humidity were 84 and 45%, respectively. Further wind speed, sunshine, morning vapour pressure, evening vapour pressure and evaporation were 2.9 km/hr, 8hrs, 14.6mm, 14.7 mm and 3.10 mm respectively. There was no rainfall received during this week.

Third peak was attained (2.40 larvae/mrl) during 14th SW (2-04-2014 to 8-04-2014), when maximum and minimum temperature were 37.4 and 18.5 ºC, respectively, whereas morning and evening relative humidity were 55 and 16%, respectively. Further wind speed, sunshine, morning vapour pressure, evening vapour pressure and evaporation were 3.9 km/hr, 9.3 hrs, 11.2 mm, 7.4 mm and 6.9 mm respectively. There was no rainfall received during this week.

Table 1: Correlation (r) and regression coefficient (byx) of abiotic factors on immature stages of *Helicoverpa armigera* on late sown chickpea during 2013-14

Standard weeks	Mean population of *H. armigera* / metre row length #							
	Eggs				Larvae			
3	0.05				-			
4	0.20				0.55			
5	0.10				0.85			
6	0.00				0.95			
7	0.20				1.15			
8	0.00				0.00			
9	0.00				0.80			
10	0.00				0.75			
11	1.40				3.30			
12	1.50				2.00			
13	1.15				2.35			
14	2.25				2.40			
15	0.10				1.95			
16	0.15				0.35			
Abiotic factors	**Same week**		**Preceding week [1]**		**Same week**		**Preceding week[1]**	
	R	**Byx**	**R**	**byx**	**R**	**Byx**	**r**	**Byx**
Maximum temperature (^{0}C)	0.57*	0.07	0.47NS	-	0.53NS	-	0.41NS	-
Minimum temperature (^{0}C)	0.38NS	-	0.33NS	-	0.28NS	-	0.25NS	-
Morning RH (%)	-0.49NS	-	-0.15NS		-0.40NS	-	-0.19NS	-
Evening RH (%)	-0.50NS	-	-0.35NS	-	-0.48NS	-	-0.34NS	-
Sunshine (hrs)	0.23NS	-	0.09NS	-	0.10NS	-	0.17NS	-
Rainfall (mm)	-0.28NS	-	-0.33NS	-	-0.27NS	-	-0.31NS	-
No. of rainy days	-0.24NS	-	-0.30NS	-	-0.13NS	-	-0.41NS	-
Wind speed (km/hr)	-0.04NS	-	-0.35NS	-	-0.12NS	-	-0.50NS	-
Morning vapour pressure (mm)	0.38NS		0.71**	0.25	0.40NS	-	0.50NS	-
Evening vapour pressure (mm)	-0.20NS	-	0.07NS	-	-0.10NS	-	0.20NS	-
Evaporation (mm)	0.54*	0.22	0.35NS	-	0.44NS	-	0.31NS	-

Mean of 40 observations

* = Significant at 5% level

**= Significant at 1% level

NS = Non significant

1 =r and byx of immature stages of *H. armigera* with abiotic factors of preceding week

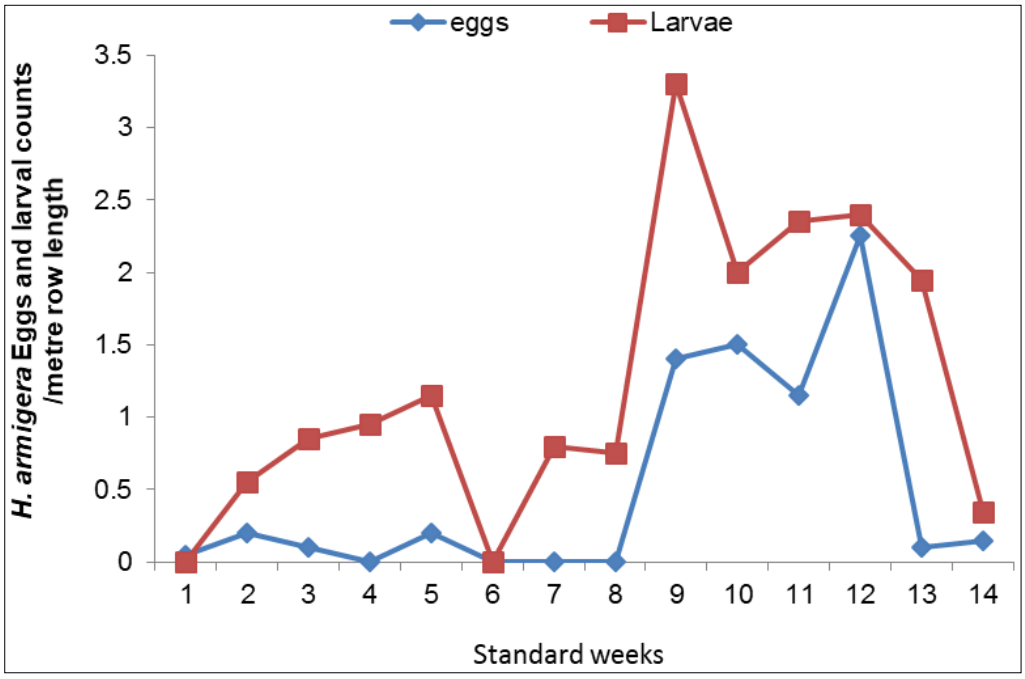

Fig 1: Incidence of *Helicoverpa armigera* (Hub.) on late sown chickpea at Jabalpur during 2013-14

Discussion

The eggs of *H. armigera* were first observed on chickpea crop during 3rd SW (3rd week of January 2014) at vegetative stage of the crop (0.05 egg/mrl) and was available till 16th SW (3rd week of April) *i.e.* maturity stage of the crop (0.15 egg/mrl). Maximum (2.25 eggs / mrl) was observed during 14th SW. On the contrary [2] reported that under the North Central agro climatic zone of Orissa peak oviposition of *H. armigera* on chickpea was recorded during 52nd SW. In the present study correlation studies carried out between abiotic factors and the egg population revealed that maximum temperature and evaporation showed significant positive correlation with the egg population. The present findings confirm the findings of [3], they also reported that egg population was positively correlated with maximum temperature. In the present study minimum temperature, sunshine and morning vapour pressure exhibited a positive correlation but found to be non significant. Morning relative humidity, evening relative humidity, wind speed, rainfall, rainy days and evening vapour pressure exhibited negative correlation but found to be non significant. Correlations computed with egg counts of one week and weather data of the preceding week revealed that morning vapour pressure showed significant positive correlation with egg population.

The *H. armigera* larvae were first observed on chickpea crop during 4th SW (4th week of January 2014) at vegetative stage of the crop and was available till 16th SW (3rd week of April) *i.e.* maturity stage of the crop. The present findings are in conformity with the findings of [4]. They also reported that the first appearance of the larva was observed during third week of January. On the contrary [5-14], reported that the first appearance of the larva was observed during third week of November, January, October, 9th standard week, February, first fortnight of November, first week of November, second week of December and fourth week of March, respectively. The variation in the incidence of the pest may be attributed to the differences in the time of sowing, variety, spacing, crop cultivated under irrigated or rainfed condition, residual pest population, location *etc.*

In the present study the peak larval population of the pest was observed during 11th SW (*i.e.* mid of March). During this period maximum and minimum temperature were 30.5 ^{0}C and 12.6 ^{0}C, respectively whereas morning relative humidity and evening relative humidity ranged from 84% and 45%, respectively.

Further sunshine, wind speed, morning and evening vapour pressure and evaporation were 8.0 hrs, 2.9 km/hr, 14.6mm, 14.7mm and 3.1 mm, respectively. There was 2.6mm rainfall received during this period, which occurred in one day. However [6, 14, 8- 12], reported that the peak activity of the pest was recorded during January, first week of January, February and March, 14th and 15th SW, end of February, second week of March and second week of January, respectively.

Correlation studies revealed that maximum temperature, minimum temperature, sunshine, morning vapour pressure and evaporation exhibited positive correlation with larval population, but statistically found to be non significant. The present findings confirm the findings of [3, 9-11, 13]. They also reported the positive influence of maximum and minimum temperature and sunshine on larval population. On the contrary [13] reported the negative impact of maximum and minimum temperature on the larval population.

Further, morning relative humidity, evening relative humidity, rainfall, rainy day, wind speed and evening vapour pressure exhibited negative correlation with larval population, but statistically found to be non significant. Similar findings have been reported by [3, 9, 6, 10, 13]. They also reported negative impact of morning relative humidity, wind speed and rainfall on larval population. On the contrary [4, 12] reported positive impact of wind speed and morning and evening relative humidity on the larval population, respectively.

Conclusion

Gram pod borer egg and larvae appeared from 3th SW and 4th SW, respectively. The maximum egg and larval population were observed on 14th and 11th SW, respectively. Maximum temperature and evaporation of the same week and morning vapour pressure of the preceding week exhibited significant positive association ship with egg population.

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References

1. Snedecor GW, Cochran WG. Statistical Methods, Oxford and IBH Publishing Company, New Delhi, 1967, 1-292.
2. Patnaik HP, Senapati B. Trends in *Helicoverpa* egg, larval and adult population changes in the chickpea environment of Orissa. Indian Journal of Plant Protection. 1991; 24(1-2):18-23.
3. Shah ZA, Shahzad MK. Population fluctuations with reference to different developmental stages of *Helicoverpa armigera* (Lepidoptera: Noctuidae) on chickpea and their relationship with the environment. International J of Agriculture and Biology. 2005; 7(1):90-93.
4. Kant K, Kanaujia KR, Kanaujia S. Role of plant density and abiotic factors on population dynamics of *Helicoverpa armigera* (Hubner) in chickpea. Annals of Plant Protection Sciences. 2007; 15(2):303-306.
5. Patel CC, Koshiya DJ. Population dynamics of gram pod borer, *Helicoverpa armigera* (Hubner) Hardwick on cotton, pigeonpea and chickpea. Gujarat Agricultural University Research Journal. 1999; 24(2):62-67.
6. Tripathy MK, Rakesh Kumar, Singh HN. Host range and population dynamics of *Helicoverpa armigera (*Hubn.) in Eastern Uttar Pradesh. Journal of Applied Zoological Researches. 1999; 10 (1):22-24.
7. Chandel SF, Singh PK, Ahmad R. Population dynamics of *Helicoverpa armigera* (Hubner) and *Campoletis chloridae* on different crops. Annals of Plant Protection Sciences. 2005; 13(2):379-383.
8. Kant Krishna, Kanaujia KR. Role of plant density and abiotic factors on larval and pupal population dynamics of *Helicoverpa armigera* (Hubner) in chickpea. Environment and Ecology. 2008; 26(1A):277-281.
9. Reddy VP, Anandhi S, Elamathi, Varma S. Seasonal occurrence of pulse pod borer *Helicoverpa armigera* (L.) on chickpea at Eastern U.P. region. Agricultural Science Diges. 2009; 29(2):60-62.
10. Yadav SR, Jat BL. Seasonal incidence of *Helicoverpa armigera* (Hubner) on chickpea. Journal of Insect Science (Ludhiana). 2009; 22(3):325-328.
11. Bajya DR, Monga D, Tyagi MP, Meena BL. Population dynamics of *Helicoverpa armigera* on chickpea, pigeonpea and cotton and correlation with weather parameters. Annals of Plant Protection Sciences. 2010; 18(1):227-229.
12. Chatar VP, Raghvani KL, Joshi MD, Ghadge SM, Deshmukh SG, Dalave SK. Population dynamics of pod borer, *Helicoverpa armigera* (Hubner) infesting chickpea. International J of Plant Protection. 2010; 3(1):65-67.
13. Pandey Bal Mukund, Tripathi MK, Lakshmi Vijay. Seasonal incidence of gram pod borer *Helicoverpa armigera* (HUB.) on chickpea in Varanasi area. Journal of Experimental Zoology, India. 2012; 15(2):667-669.
14. Shukla Abhishek. Population dynamics of *Helicoverpa armigera* (Hubner) in chickpea, In Kymore plateau and Satpura hills zone. Geobios (Jodhpur). 2006; 33(4):245-248.