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To study the seasonal incidence of gram pod borer (*Helicoverpa armigera* Hubner) in chickpea (*Cicer arietinum* L.)

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Abstract

The present investigation entitled, "Seasonal incidence and management of gram pod borer (*Helicoverpa armigera* Hubner), on chickpea (*Cicer arietinum* L.)", was conducted during *Rabi* 2020-21 at Research farm, College of Agriculture, Pune- 411 005, Dist. Pune (Maharashtra). The studies on seasonal incidence of *Helicoverpa armigera* revealed that the appearance of *H. armigera* eggs was observed during 51st SMW (third week of December, 2020) and remained up to 13th SMW (fourth week of March, 2021). The peak in egg population of *H. armigera* was observed during the third week of February (7th SMW) at flowering stage of the crop and recorded 5.25 eggs/meter row length. Non-significant negative correlation between egg population of *H. armigera* and weather parameters (maximum temperature, minimum temperature, wind speed, rainy days and evaporation) was observed, whereas non-significant positive correlation with egg population of *H. armigera* and relative humidity (morning) ($r = 0.488$), relative humidity (evening) ($r = -0.187$), rainfall ($r = 0.115$) and sunshine ($r = 0.097$) was observed. Then the eggs population gradually decreased with the maturity of the crop and minimum egg population (0.20 eggs/meter row length) was observed in 13th SMW (fourth week of March, 2021). The appearance of *Helicoverpa armigera* larvae was recorded during 52nd SMW (fourth week of December, 2020) and remained up to 13th SMW (fourth week of March, 2021). The peak larval population of *H. armigera* was observed during the fourth week of February (9th SMW) at pod formation stage of the crop and recorded 5.15 larvae/meter row length. Then the larval population gradually decreased with the maturity of the crop and minimum larval population (1.50 larvae/meter row length) was observed in 13th SMW (fourth week of March, 2021). Non-significant negative correlation between incidence of *H. armigera* larval population and weather parameters i.e. temperature (minimum), relative humidity (morning and evening), wind speed, rainfall and rainy days was observed, whereas non-significant and positive correlation was observed between *H. armigera* and maximum temperature ($r = 0.384$), evaporation ($r = 0.401$), and sunshine ($r = 0.372$).

Keywords: chickpea, abiotic factors, *H. armigera* and correlation

Introduction

Chickpea (*Cicer arietinum* L.) is a member of family 'Fabaceae'. It is an ancient self-pollinated leguminous crop. The word 'chickpea' is derived from French 'Ciche'. It is also called as gram, Bengal gram, garbanzo bean. It is one of the key pulse crop grown in India. Chickpea is herbaceous annual plant with height ranging between 30-70 cm. It has tap root system having symbiotic nodules with rhizobium bacteria which are capable of fixing atmospheric nitrogen in plant usable form. It is matched to areas having relatively cooler climatic conditions and low rainfall. It is grown in a wide range of soils but soils with sufficient drainage system are best to achieve higher yield. Chickpea is mostly grown in soils which are deprived in fertility and moisture retention capacity. Gram which is commonly known as Chickpea or Bengal gram is India's most important *Rabi* season pulse crop. The crop is of tropical, subtropical and temperate region. Chickpea is a flexible crop that is grown in almost every part of globe today. In India it is abundantly grown in Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan and Maharashtra and is commonly used as a protein adjunct to starchy diets. It is cultivated in an area with acreage of 11.89 million hectare yielding about 11.38 million tones and productivity of 956 kg per hectare (Anonymous, 2018). It is mostly cultivated where dry land condition prevail with heavy cloudy soil. Abiotic and Biotic stresses are the main constraints in enhancing the productivity of chickpea in India. Insect – pests and diseases are biotic bottlenecks in realizing its potential yield and are disturbing effective chickpea cultivation in India. Chronological data concerning chickpea production shows an irregular trend due to abiotic factors like weather conditions, intensity of rains and different biotic factors such as diseases and insect pests (MINFAL, 2016) [2]. Gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is the most significant pest of chickpea.

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It is one of the most principal insect pests in agriculture, accounting for half of the total insecticides usage in India for protection of crops. Weather factors are the chief regulating causes for the insect pest population in field conditions. The climatic factors like rainfall, temperature, humidity and sunshine hours mainly influence the population of *H. armigera*. The information on gram pod borer seasonal incidence would undoubtedly aid in the formulation of various insect pest management tactics for *H. armigera*. Bearing in mind the above facts, the present experiment was carried out on the seasonal incidence of gram pod borer in chickpea.

Materials and Methods

The field experiments were undertaken to study the seasonal incidence of gram pod borer (*H. armigera*) on chickpea (*Cicer arietinum* L.) during Rabi 2020-21 at Research farm, College of Agriculture, Pune-05, Dist. Pune (MS). The experiment on seasonal incidence of gram pod borer in chickpea was conducted on 10.00 x 10.00 square meter net area and the plot was kept without application of any insecticides from sowing till harvesting of chickpea. Twenty number of spots were selected randomly from the plot and tagged. The survival population of larvae and eggs of gram pod borer were recorded from selected spot per meter row length from sowing till harvesting of crop at weekly interval and finally the data was correlated with weather parameters. and it is presented in Table 1 and depicted in figure 1.

Results and Discussion

The incidence of *H. armigera* on chickpea crop along with meteorological observations during Rabi 2020-21 has been presented in Table-1.

Eggs of *H. armigera*

The eggs of *H. armigera* were first recorded (0.20 eggs/meter row length) on chickpea in 51st SMW (i.e. third week of December, 2020), at seedling stage of the crop, when maximum and minimum temperature were 29.3 and 11.6 °C,

respectively and relative humidity at morning and evening was 96% and 37%, respectively. Then gradually increase in eggs population from 52nd to 2nd SMW was observed. In the 52nd, 1st and 2nd SMW it was recorded, 0.25, 1.50 and 2.30 eggs/meter row length when maximum and minimum temperature were (29.6, 29.5, 29.7 °C) and (11.8, 16.9, 17.2 °C), respectively with morning and evening relative humidity were (96, 91, 96%) and (37, 51, 56%), respectively. Slight increase in eggs population (3.00 eggs/ meter row length) in the 3rd SMW was observed at vegetative stage of the crop, when maximum and minimum temperature were 31.9 and 16.0 °C, respectively and relative humidity morning and evening was 94 and 40%, respectively. Then eggs population increased gradually in 4th, 5th and 6th SMW (3.50, 3.70, 3.90 eggs/ meter row length), when maximum and minimum temperature were (32.1, 30.5, 30.4 °C) and (13.0, 11.9, 9.9 °C), respectively and relative humidity morning and evening were (94, 93, 92%) and (34, 32, 26%), respectively. The egg population of *H. armigera* was maximum (5.25 eggs / meter row length) during 7th SMW (i.e. third week of February, 2021) at flowering stage of the crop, when minimum and maximum temperature were 13.8 and 32.0 °C, respectively and relative humidity morning and evening was 90 and 30%, respectively. Thereafter, the egg population decreased 4.50 eggs/meter row length in 8th SMW, when the maximum and minimum temperature were 30.7 and 14.4 °C, respectively and relative humidity morning and evening was 87 and 34%, respectively. Later on egg population declined gradually (0.20 eggs / meter row length) towards the maturity of the crop in the 13th SMW of 2021.

Larval population of *H. armigera*

The early instars of *H. armigera* larvae appeared (0.10 larvae/meter row length) on chickpea in 52nd SMW (i.e. fourth week of December, 2020), at the vegetative growth stage of crop, when maximum and minimum temperature were 29.6 and 11.8 °C, respectively and relative humidity at morning and evening was 96% and 37%, respectively.

Table 1: Seasonal incidence of *H. armigera* on chickpea in relation to meteorological parameters

SMW	Average weekly meteorological data									No. of Eggs	No. of Larvae
	Temperature (°C)		Relative Humidity (%)		Wind speed (km/hr)	Rainfall (mm)	Rainy Days (hrs/day)	Evap.	Sunshine (hrs/day)		
	Max.	Min.	R. H. I	R. H. II						/meter row length	
51	29.3	11.6	96	37	1.8	0.0	0	3.0	8.3	0.20	0.00
52	29.6	11.8	96	37	1.5	0.0	0	3.0	8.6	0.25	0.10
1	29.5	16.9	91	51	2.0	0.0	0	2.6	4.8	1.50	0.15
2	29.7	17.2	96	56	1.3	36.8	2	2.6	6.2	2.30	0.15
3	31.9	16.0	94	40	0.9	0.0	0	2.5	7.5	3.00	1.05
4	32.1	13.0	94	34	1.4	0.0	0	3.3	9.0	3.50	2.20
5	30.5	11.9	93	32	1.5	0.0	0	3.5	8.5	3.70	2.85
6	30.4	9.9	92	26	1.7	0.0	0	3.8	9.8	3.90	3.25
7	32.0	13.8	90	30	1.2	0.0	0	3.8	8.0	5.25	3.45
8	30.7	14.4	87	34	3.2	0.0	0	4.5	8.1	4.50	3.85
9	35.6	15.4	78	18	1.7	0.0	0	5.3	9.2	3.75	5.15
10	36.0	14.5	70	17	1.5	0.0	0	5.7	9.2	3.50	3.90
11	36.2	16.1	70	18	1.7	0.0	0	5.7	8.3	1.75	3.30
12	35.5	17.8	73	24	2.2	4.8	1	5.5	7.4	0.50	3.25
13	37.4	17.1	24	13	2.5	0.0	0	7.1	9.4	0.20	1.50

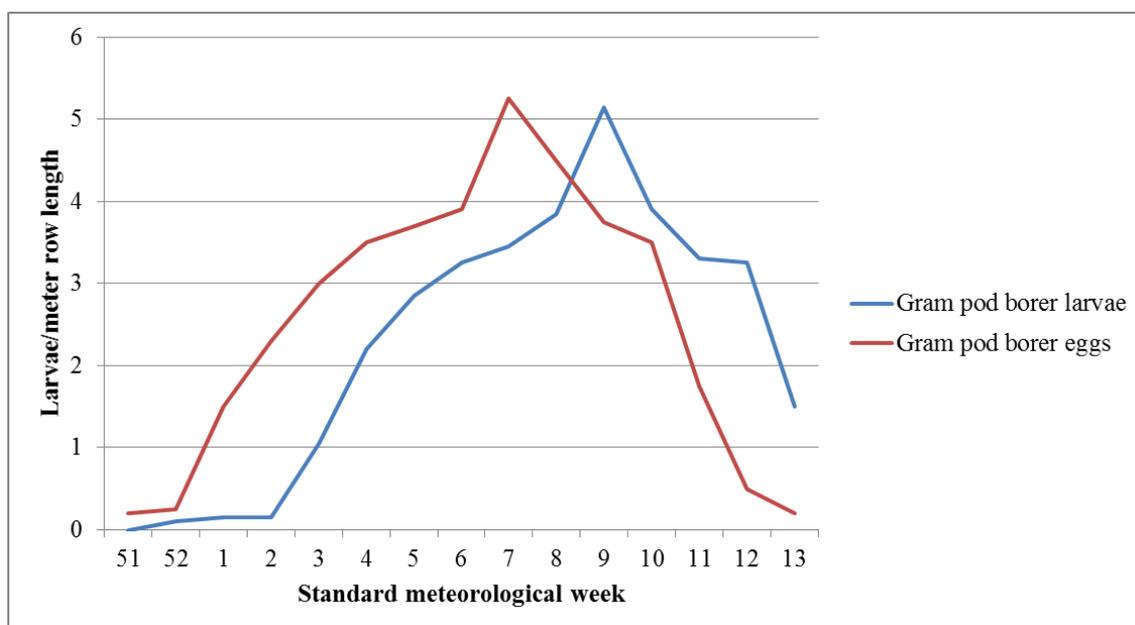


Fig 1: Seasonal incidence of *H. armigera* on chickpea in relation to meteorological parameters

Then gradually increase in larval population from 1st to 3rd SMW was observed. In the 1st, 2nd and 3rd SMW it was recorded, 0.15, 0.15 and 1.05 larvae/ meter row length when maximum and minimum temperature were (29.5, 29.7, 31.9 °C) and (16.9, 17.2, 16.0 °C), respectively and relative humidity in morning and evening were (91, 96, 94%) and (51, 56, 40%), respectively. Slight increase in larval population (2.20 larvae/meter row length) in the 4th SMW was observed at initiation of flowering stage of the crop, when maximum and minimum temperature were 32.1 and 13.0 °C, respectively and relative humidity morning and evening was 94 and 34%, respectively. Then larval population increased gradually in 5th, 6th, 7th and 8th SMW (2.85, 3.25, 3.45, 3.85 larvae/ meter row length), when the maximum and minimum temperature were (30.5, 30.4, 32.0, 30.7 °C) and (11.9, 9.9, 13.8, 14.4 °C), respectively and relative humidity in morning and evening were (93, 92, 90, 87%) and (32, 26, 30, 34%), respectively. The larval activity of *H. armigera* peaked (5.15 larvae/ meter row length) during 9th SMW (i.e. fourth week of February, 2021) at pod formation stage of the crop, when maximum and minimum temperature were 35.6 and 15.4 °C, respectively and relative humidity morning and evening was 78 and 18%, respectively. Thereafter, the larval population decreased 3.90 larvae/meter row length in 10th SMW, when minimum and maximum temperature were 14.5 and 36.0 °C, respectively and relative humidity morning and evening was 70 and 17%, respectively. Later on larval population declined gradually (1.50 larvae/ meter row length) towards the maturity of the crop in the 13th SMW of 2021.

The present findings on population fluctuation are very similar to those of Singh *et al.* (2018) [3] as they reported that the *H. armigera* infestation on chickpea initiated during fourth week of December. It was highest in fourth week of February (2015-16). These findings were also in line with, Spoorthi *et al.* (2017) [4] reported that the *H. armigera* infestation on chickpea initiated during fourth week of December (2016-17). Similarly, Gautam *et al.* (2018) [5] stated the active period of *H. armigera* started from vegetative stage and remained till harvesting stage of chickpea. These findings corroborate with Roshan and Raju (2018) [6] observed the

peak population when the crop was in the pod formation stage i.e. during 9th to 10th standard week. The larval population in the field was recorded until the crop reached maturity, they also support the present findings. Kumar *et al.* (2018) [7] reported that the larval population maintained on chickpea throughout the growth phase and it was found to be lower at vegetative stage and higher at the pod development stage which support the present findings. Ojha *et al.* (2017) [8] reported that the pest displayed its activity in an increasing trend from second week of January and reached its high until fourth week of February (2010-2011). Thereafter, it started to decline gradually. This is in agreement with the present findings.

Correlation of gram pod borer with weather parameters Eggs

It is evident from Table 2, that a non-significant negative correlation between egg population of *H. armigera* and weather parameters (maximum temperature, minimum temperature, wind speed, rainy days, evaporation) was observed. However, a non-significant positive correlation was observed with egg population of *H. armigera* and relative humidity (morning) ($r = 0.488$), relative humidity (evening) ($r = 0.187$), rainfall ($r = 0.115$) and sunshine ($r = 0.097$).

Table 2: Correlation (r) between *H. armigera* on chickpea and meteorological parameters during Rabi 2020-21.

Weather Factors	Gram pod borer, <i>H. armigera</i> population in	
	Eggs stage	Larval stage
Max. Temp. (°C)	-0.320NS	0.384NS
Min. Temp. (°C)	-0.253NS	-0.072NS
Relative humidity I (%)	0.488NS	-0.225NS
Relative humidity II (%)	0.187NS	-0.393NS
Wind speed (km/hr)	-0.076NS	-0.028NS
Rainfall (mm)	0.115NS	-0.057NS
Rainy days (hrs)	-0.023NS	-0.178NS
Evaporation (mm)	-0.305NS	0.401NS
Sunshine (hrs)	0.097NS	0.372NS

*Significant at 5% level

** Significant at 1% level

NS= Non-significant

Larvae

A non-significant negative correlation between infestation of *H. armigera* larval population and weather parameters (minimum temperature, relative humidity, wind speed, rainfall, rainy days) was observed. However, a positive and non-significant correlation was observed with *H. armigera* larvae and maximum temperature ($r = 0.384$), evaporation ($r = 0.401$), and sunshine ($r = 0.372$).

The result of present study on correlation between weather parameters and *H. armigera* larval population on chickpea are in agreement with the findings of Kumar *et al.* (2018) [7] found positive correlation between *H. armigera* larval population and maximum temperature (0.495), while minimum temperature and relative humidity (morning and evening) showed non-significant and negative correlation (-0.055), (-0.553), respectively. This is in line with observations reported by Singh *et al.* (2018) [3] also mentioned non-significant positive correlation with maximum temperature and non-significant negative correlation with rainfall and relative humidity on the *H. armigera* population build. Patel *et al.* (2015) [9] observed a non-significant impact in relation to temperature (maximum), relative humidity (evening), evaporation and wind speed which is in agreement with present findings.

Conclusion

It is concluded that the incidence of *H. armigera* egg population on chickpea crop was started from 51st SMW (third week of December, 2020) and remained up to 13th SMW (fourth week of March, 2021), with peak at flowering stage of chickpea crop. *H. armigera* egg population displayed negative and non-significant correlation with minimum temperature, maximum temperature, wind speed, rainy days and evaporation, whereas non-significant positive relation with relative humidity (morning), relative humidity (evening), rainfall and sunshine hours.

The *H. armigera* larvae were active on chickpea crop from 52nd SMW (fourth week of December, 2020) and remained up to 13th SMW (fourth week of March, 2021), with peak at podding stage of chickpea crop. *H. armigera* larval population displayed negative non-significant correlation with minimum temperature, relative humidity (morning and evening) wind speed, rainfall and rainy days, whereas non-significant positive relation with maximum temperature, evaporation and sunshine.

References

1. Anonymous. Food and Agriculture Organisation of the United Nations. FAOSTAT Statistical Database 2018. <http://faostat.fao.org>.
2. MINFAL. Economic survey of Pakistan. Govt. of Pakistan. Economic Advisor Wing, Finance Division, Islamabad, 2016, 24-30.
3. Singh VV, Agarwal N, Sathish BN, Kumar S, Kumar S, Pal K. Studies on insect diversity in chickpea (*Cicer arietinum* Linnaeus) ecosystem. Journal of Entomology and Zoology Studies 2018;6(5):693-697.
4. Spoorthi GS, Singh R, Sachan SK, Singh DV, Sharma R, Kumar S. Monitoring and seasonal incidence of gram pod borer (*Helicoverpa armigera* Hubner) in relation to abiotic factor in chickpea. Journal of Pharmacognosy and Phytochemistry, SPI: 490-494 2017.
5. Gautam MP, Chandra U, Yadav SK, Jaiswal R, Giri SK, Singh S. Studies on population dynamics of gram pod borer *Helicoverpa armigera* (Hubner) on chickpea (*Cicer*

arietinum L.) Journal of Entomology and Zoology Studies 2018;6(1):904-906.

6. Roshan RD, Raju SVS. Effect of certain weather parameters on population fluctuation of gram pod borer (*Helicoverpa armigera* Hubner) in chickpea. Journal of Pharmacognosy and Phytochemistry 2018;7(6):1093-1096.
7. Kumar P, Mohammad AA, Kumari L, Kumar R, Kumar A, Singh A. Population dynamics of gram pod borer (*Helicoverpa armigera* Hübner) on chickpeas. Journal of Pharmacognosy and Phytochemistry 2018;7(5):967-969.
8. Ojha PK, Kumari R, Chaudhary RS. Impact of abiotic and biotic factors on population dynamics of *Helicoverpa armigera* Hubner (Noctuidae: Lepidoptera) in chickpea. Journal of Entomology and Zoology Studies 2017;5(1):636-642.
9. Patel SR, Patel KG, Ghetiya LV. Population dynamics of pod borer *Helicoverpa armigera* (Hubner) infesting chickpea in relation to abiotic factors. An International e-Journal 2015;4(2):163-170.