

# Seasonal Incidence and Varietal Response of Gram against *Helicoverpa armigera* (Hubner) at Talwandi Sabo, Punjab

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## ABSTRACT

**Background:** *Helicoverpa armigera* is considered as a major economical important pest of chickpea throughout the country so the present study was conducted on the seasonal incidence and varietal response of *H. armigera* (gram pod borer) on three varieties i.e. PBG 7, GNG 469 and GPF 2 of chickpea were conducted at Agriculture field of Guru Kashi University, Talwandi Sabo, Punjab during 2017 to 2018.

**Methods:** The field study on the seasonal incidence and the varietal response of *H. armigera* (gram pod borer) on three varieties i.e. PBG7, GNG469 and GPF2 of chickpea was conducted at Agriculture field of Guru Kashi University, Talwandi Sabo, Punjab during 2017 to 2018.

**Results:** The first incidence of gram pod borer was started on the first week of December in all selected varieties of a gram. The maximum population of gram pod borer was recorded at flowering and pod formation stage. The pod damage percentage was recorded more in GPF2 followed by GNG469. Minimum pod damage percentage was recorded in PBG7 chickpea variety.

**Conclusion:** Hence PBG7 shows more resistivity against *H. armigera* followed by GNG469, GPF2. Therefore, this kind of study will motivate the use of more eco-friendly, less toxic control measures to decrease the *H. armigera* population in agriculture field.

**Key-words:** *Helicoverpa armigera*, Chickpea, Incidence, Pod damage percentage, Varieties

## INTRODUCTION

*Cicer arietinum* L. (Family: Fabaceae) commonly known as Bengal gram or gram is most economic importance pulse crops, which widely grown throughout the country [1,2]. Gram is a good source of protein and known as “a poor man’s meat” [3]. Major chickpea production constraints are insect pests and diseases under field as well as under storage conditions [4]. Out of many insect pests, *H. armigera* is economic importance pest of *C. arietinum* [5]. It is polyphagous, cosmopolitan, devastating and worldwide distributed pest [6].

The seed yield losses due to *H. armigera* were 75-90% or at some times causes 90 to 95% and in some places, the losses were up to 100% [7,8]. The low yield of gram is due to the attack of gram pod borer from the vegetative stage which continues up to the maturity of the crop [9]. The larval stage is feeding on flowers and pods of pulses resulting in direct reduction in yield [10]. This pest can be controlled by using different integrated methods. In this host plant resistance is a real implement in integrated pest management (IPM) for control of pest as compared to many other control methods [11]. Host plant resistance as one of the important component of integrated pest management can play a major role in the management of *H. armigera* [12]. This method is reliable, ecologically safe and compatible with other IPM strategies [4]. Therefore the present investigation was conducted on the seasonal incidence and the varietal response of *H.*

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*armigera* on three different chickpea varieties of chickpea at Talwandi Sabo, Punjab.

## MATERIALS AND METHODS

The present study was conducted at the Guru Kashi University, Talwandi Sabo, Bathinda, Punjab during Rabi season of 2017–18. The site is located at latitude 29°59'0" N and longitude 75°5'0" East, has semi-arid climate with wide variations of summer and winter temperatures. The weather generally remained dry, but from May to August, it was recorded very humid. The rainfall concentrated in July to September.

**Preparation of experimental field-** The land was given pre-sowing irrigation. It was prepared by using plough followed by a subsequent harrowing. Sowing of three chickpea varieties i.e. GNG469, GPF2 and PBG7 were grown in Randomized block design at an experimental area of Guru Kashi University, Talwandi Sabo by seed drill in line as per agronomical recommendation in 5 rows of 2 meter length with spacing of 30 cm (row to row) x 10 cm (plant to plant). Two irrigations were done first at 45 days after sowing and second just before flowering stage. The plots were kept free from weeds.

**Seasonal incidence of *H. armigera* on Chickpea-** Larvae of gram pod borer was recorded on randomly selected plants in the trial plot. The crop was kept free from insecticides. The recording of data started from 15 days after sowing and continued up to crop maturity. The data were collected at weekly interval. The effect of abiotic factors on fluctuation in the incidence of chickpea pod borer was analyzed further. The meteorological observations during the period of investigation were recorded from the observatory of KVK, Bathinda.

**Varietal response of chickpea against *H. armigera*-** For this observations and recording of data damaged pods with bored holes were collected. Further percentage of pod damage due to *H. armigera* was calculated using the below formula:

$$\text{Pod damage (\%)} = \left( \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \right) \times 100$$

**Statistical Analysis-** The raw data from the field diary was transferred in an electronic format in the spreadsheet layout of Microsoft Excel 2013 and data were analyzed.

## RESULTS

Data recorded on seasonal incidence of *H. armigera* on tender leaves of all three selected genotype (PBG-7, GNG469 and GPF-2) of *C. arietinum* during 2017-18 are present in Table 1. At 49<sup>th</sup> Standard Week (SW) the pest made its first presence on tender leaves with a population of 0.05 larvae per plant on PBG-7, GNG469 and GPF-2. The maximum population was recorded at 4<sup>th</sup> SW (flowering stage) with 2.8 (PBG-7), 2.9 (GNG469) and 3.15 (GPF-2) larvae per plant respectively. Next pick in larvae population was recorded at 8<sup>th</sup> SW (podding stage) with 2.6 (PBG-7), 2.5 (GNG469) and 3.10 (GPF-2) larvae per plant respectively. Simple correlation with weather parameters and larvae population revealed that all three varieties (PBG-7, GNG 469 and GPF-2) was a negative correlation with minimum-maximum temperature and positive correlation was recorded with minimum-maximum relative humidity (RH), whereas the positive correlation was also recorded with rainfall (Table 1).

**Table 1:** Seasonal Incidence of *H. armigera* on PBG-7, GNG 469 and GPF-2 chickpea genotype during 2017-2018

Stander weather Week No.	Crop Stages	*Mean Larval count			Temperature (°C)		Relative humidity (%)		Rainfall (mm)
		PBG7	GNG469	GPF2	Min	Max	Min	Max	
49	Vegetative	0.05	0.05	0.05	4.3	24.02	78.14	36	0
50	Vegetative	0.05	0.1	0.15	6.2	16.41	94.28	68.14	0.85
51	Vegetative	0.2	0.2	0.25	5.28	23.91	88.4	47.71	0
52	Vegetative	0.2	0.5	0.50	4.6	22.18	92.85	45.85	0
1	Bud Initiation	0.5	0.6	1.00	3.4	15.7	95.71	66.57	0



2	Initiation of Flowering	1.0	1.6	1.50	3.2	21.6	90.28	38.28	0
3	Flowering	2.1	2.4	2.80	4.6	22.5	83.42	44.71	1.54
4	Flowering	2.8	2.9	3.15	5.41	15.7	94.42	74.28	0
5	Flowering	2.7	2.5	2.50	6.11	21.4	89.57	49.43	0
6	Flowering	2.3	2.1	2.15	4.41	21.3	80.71	45.14	0
7	Podding	2.8	2.8	2.80	7.61	22.01	87	50.21	0.31
8	Podding	2.6	2.5	3.10	10.61	26.94	82.57	53.42	0
9	Grain Filling	1.5	2.0	2.10	12.2	26.91	86.28	51	0
10	maturity	0.1	0.1	0.15	11.47	26.62	84.42	39.14	0
11	maturity	0.0	0.0	0.00	14.15	30.3	77.57	39.57	0
				PBG7	-0.054	-0.17	0.011	0.26	0.1
	Correlation value ( r ) for larva Population			GNG469	-0.079	-0.17	0.068	0.25	0.13
				GPF2	-0.067	-0.18	0.07	0.30	0.17

**\*Mean of randomly selected chickpea plants**

**Varietal response of chickpea against *H. armigera***- The total average number of damage pods by gram pod borer in variety: PBG7 was 5.3 out of 34.65 average total pods, in GNG469 was 6.85 out of 41.35 average total pods and in GPF2, was 7.7 out of 45.25 average total

pods (Table 2), whereas the pod damage percentage was recorded in GPF2 (17.01%), which was followed by GNG469 (16.56%) and PBG7 (15.29%) varieties of chickpea (Table 2).

**Table 2:** Pod damage percentage on PBG-7, GNG 469 and GPF-2 chickpea genotype during 2017-2018 by *H. armigera*

Plant No.	Different Varieties of gram					
	PBG7		GNG469		GPF2	
	Total No. of Pod/ Plants	Damage Pod	Total No. of Pod/ Plants	Damage Pod	Total No. of Pod/ Plants	Damage Pod
1	41	15	19	1	47	2
2	14	4	31	2	55	5
3	46	2	83	1	91	6
4	19	4	32	1	48	7
5	57	5	30	1	36	3
6	27	3	42	6	11	3
7	59	2	56	1	23	5
8	35	4	28	4	51	2
9	14	2	24	1	52	6
10	37	12	88	1	38	7
11	35	9	19	3	46	1
12	17	3	56	9	56	1
13	34	7	27	4	90	2
14	55	10	38	5	49	1



15	32	4	46	6	24	5
16	50	6	31	4	10	1
17	21	1	67	8	34	3
18	40	6	60	8	54	7
19	20	2	21	2	48	4
20	40	5	29	3	42	7
Total	693	10	827	1	905	1
Mean	34.6	5.	41.35	6	45.2	7
Mean Pod Damage (%)	15.29%		16.56%		17.01%	

## DISCUSSION

The present results were in close conformity with the result reported earlier at Raipalpur Village, Kanpur the studies on population dynamic of *H. armigera* revealed that the first incidence was noticed at 44<sup>th</sup> SW till crop harvest [13]. Field experiment at Udaipur Rajasthan recorded the population dynamics of gram pod borer. The result revealed the first incidence in the second week of December. But correlation is conflict with present results as it was showing a positive correlation with temperature and negative correlation with humidity [14]. Field monitoring of gram pod borer at Meerut revealed that pest population first recorded at 52<sup>nd</sup> week till 15<sup>th</sup> week, where the temperature is showing positive correction with larval population whereas RH is showing negative correlation with a larval population [15]. The population dynamic of gram pod borer was investigated at Bihar Agriculture University revealed that larvae were first arrived at 47<sup>th</sup> week, where the population is showing significant positive correlation with temperature and negative correlation with RH [16]. In a similar type of study at agriculture research station Badnapur during 2016-17. The seasonal incidence of *H. armigera* on chickpea crop result revealed that the larva population first recorded at 47<sup>th</sup> SW to 10<sup>th</sup> SW [17].

Many researchers evaluated these resistance varieties against gram pod borer under field condition. Screening of twenty chickpea genotypes including GNG469 against *H. armigera* on agriculture research farm at the Institute of Agricultural Sciences, Banaras Hindu University recorded 15.49% pod damage [18]. A similar type of experiment conducted in Punjab reported pod borer damage percentage of PBG7 and GPF2 as 15.44% and 18.50% respectively [19]. Similar type of study revealed

that 0.87 mean incidence of *H. armigera* larvae on GNG 469 gram variety [20]. At Punjab in similar type of study revealed the 35.4% incidence of gram pod borer on GPF 2 [21]. Therefore, the present study will help to motivate farmer for using resistant varieties, which are eco-friendly and cost-effective against *H. armigera*.

## CONCLUSIONS

Based on the result, it can be concluded that chickpea pod borer at Talwandi Sabo, Punjab started at 49<sup>th</sup> week till 11<sup>th</sup> SW. Pod borer damage percentage was in following sequence GPF2 >GNG469 > PBG7 varieties of chickpea.

Therefore, this study will motivate to develop and use of resistant varieties to minimize the incidence of Pod borer, which is considered as a major pest in the field, which ultimately reduces the use of the toxic chemical.

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## CONTRIBUTION OF AUTHORS

**Research concept-** Dr. Jora Singh Brar, Dr. Anita Singh

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**Data collection-** Kulwinder Singh

**Data analysis and Interpretation-** Kulwinder Singh

**Literature search-** Kulwinder Singh

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**Article editing-** Dr. Anita Singh

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