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Original Research Article

Seasonal Incidence of *Helicoverpa armigera* Influenced by Desi and Kabuli Genotype of Chickpea

S. R. Sardar[1], S. D. Bantewad[2] and N. E. Jayewar[3*]

[1]Department of Agricultural Entomology, College of Agriculture, Badnapur, Maharashtra, India
[2]Department of Agricultural Entomology Agricultural Research Station, Badnapur, Maharashtra, India
[3]Department of Agricultural Entomology, College of Agriculture, Parbhani, Maharashtra, India
**Corresponding author*

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Chickpea, *Helicoverpa armigera*, *Campoletis chlorideae* and seasonal incidence

A B S T R A C T

A study on the seasonal incidence of *Helicoverpa armigera* on chickpea crop was studied at Research Farm, Department of Agricultural Entomology Agricultural Research Station, Badnapur during *Rabi* season of 2016-2017on variety desi BDNG 9-3 and kabuli BDNG 798 with a view to find out the peak period of gram pod borer, *H.armigera*, population fluctuation influenced by the varities and also the population density in relation to age of the crop. The results of seasonal incidence showed that the larval population of *H. armigera* was recorded on desi chickpea from 47th MW to 10th MW and population ranged in between 0.14 to 2.66 larvae/ plant with pod damage in between 4.68 to 14.38 per cent from 8th January to 11th March (2nd MW to 10th MW) and larval parasitoid *Campoletis chlorideae* was the most important mortality factor for the larvae of *H. armigera* with average parasitism 0.21*Campoletis chlorideae* / plant during season. Whereas seasonal incidence studies of *H. armigera* on Kabuli chickpea genotypes revealed that from 47th MW to 10th MW larval population was recorded and it was ranged from 0.56 to 4.86 larvae/ plant with pod damage ranged in between 5.58 to 21.46 per cent during 24th December to 11th March (52nd MW to 10th MW) and Average larvae parasitism due to *Campoletis chlorideae* was 0.35 *C. chlorideae/* plant which means that kabuli genotypes were preferred by the pest and due to which parasitism was also seen higher on these genotypes.

Introduction

Chickpea (*Cicer arietinum*) is considered as "King of Pulses" and is commonly known as "Bengal Gram or Chana", belongs to family Fabaceae. It is an important winter season soil fertility restorative legume crop and is grown globally as food source. In India chickpea, is grown on 8.95 million hectares area with production 7.06 million tonnes and productivity 801 kg per ha. The production of chickpea in Maharashtra is 7.76 lakh tonnes with productivity 539 kg per ha which covered nearly 14.52 lakh hectares of area. Maharashtra contributes about 16.42 per cent share in total production of country, still it is much lower than global average due to abiotic and biotic stress. (Anonymous, 2016).

Among biotic stress the chickpea is damaged by over 50 insect species in different parts of the world, of which the Gram pod borer, *Helicoverpa armigera*

(Hubner) (Noctuidae: Lepidoptera) is the most important biotic constraint. It is a polyphagous, multi-voltine and cosmopolitan pest and is reported to feed and breed on 182 species of host plants belonging to 47 families in India (Pawar, 1998). *H. armigera* is known to be the key pest and most important limiting factor in the successful cultivation of chickpea (Lateef, 1985; Reed *et al.,* 1987) due to high reproduction rates, a fast generation on turn over, wide genetic diversity occurs location and an ability to withstand, metabolize and avoid toxic chemicals.

This pest starts infesting the shoot/tips few weeks after crop emergence and feed on buds, flowers and pods till harvesting, causing heavy yield losses. Larvae of *H. armigera* are voracious foliar feeder as early instars and later shift to the developing seeds and fruits leading to drastic reduction in yield. The pod borer *H. armigera*, is the most serious pest which cause high economic losses to the chickpea crop (Singh and Yadav, 2006; Sarwar *et al.,* 2009).

Pod borer *H. armigera* has developed resistance to several pesticides, especially synthetic pyrethroids, organophosphates, carbamates and organochlorine insecticides, leading to excessive use of more chemicals, which also lead to environmental pollution. Use of insecticides also increases cost of cultivation for the small scale farmers, since they are not affordable and are increasingly become less feasible. Thus, Host Plant Resistance (HPR) along with natural enemies and the cultural practices remains the backbone of pest management system and is favourable to most agro ecosystems. (Sharma, 2007).Therefore present study was undertaken to device effective HPR policy with prime object to study seasonal incidence of *Helicoverpa armigera* on Desi and Kabuli genotypes of chickpea to identify peak population phage of the season and genotype response to pest.

Materials and Methods

The details of materials and methods used for conducting the experiment and the procedure referred for collection of data and drawing the inference are as below, the present investigation was conducted at Research Farm, Department of Agricultural Entomology Agricultural Research Station, Badnapur during *Rabi* season of 2016-2017. The site selected was uniform with medium black cotton soil having fairly good drainage. Badnapur comes under Central Maharashtra Platue Zone. Plot size was 19.50 x 20.0 m^2 with spacing in Desi variety BDNG 9-3as 30 x 10 cm^2 and Kabuli – BDNG 798 45 x 15 cm^2, the crop was on 26th October, 2016.

The observations on seasonal incidence of number of *H. armigera*, larval population and Parasitization by natural enemies i.e. Campoletis chloridae were recorded on five randomly selected plants from desi and kabuli chickapea at weekly interval and the pod damage was recorded from pod development upto harvesting of the crop. At maturity, the total number of healthy and damaged pods was counted and the per cent of pod damage was worked out by using the formula (Kumar *et. al*. 2013).

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

The pod damage caused by *H. armigera* was asartained on the basis of infestation pattern specified by Bindra and Jokhmola (1967). The data, thus obtained were subjected to statistical analysis after suitable transformations for drawing meaningful conclusions.

Results and Discussion

The results obtained in the present investigation are reported as under:

A perusal of the data in Table 1 revealed that the number of larval populations on kabuli chickpea were more at vegetative, 50 per cent flowering and pod formation stage of the crop, recorded at weekly interval and per cent pod damage by *H. armigera* were recorded at pod formation to harvest of the crop.

The results of seasonal incidence showed (Table 1) that the larval population of *H. armigera* was recorded on desi chickpea from 47th MW to 10th MW and population ranged in between 0.14 to 2.66 larvae/ plant. The activity continued throughout the crop season with two peak period during entire crop season, first from 10th December to 31th December (49th to 52th SMW) and second from 15th January to 18th February (3th to 7th standard weeks) in year 2016. The maximum pod borer, *H. armigera* larval population was observed on 4th SMW (22th - 28th January) during pod development stage of the crop. In case of pod damage (Table 1) due to the *H. armigera* was recorded on desi chickpea from 8th January to 11th March (2nd MW to 10th MW) and per cent pod damage ranged in between 4.68 to 14.38 per cent. The pod damage increased continuously from the first week of January to first week of March and highest per cent pod damage was during in 12th to 18th February (7 SMW) i. e. 14.38 per cent. The results also showed that the larval parasitoid *Campoletis chlorideae* was the most important mortality factor for the larvae of *H. armigera* Parasitism due to *C. chlorideae* ranged from 0.08 to 0.62 parasitization /plant throughout the crop season. The maximum parasitism was recorded during the 14th January to 4th February (2nd to 5th SMW). On average larvae of *H. armigera* parasitism due to *Campoletis chlorideae* was 0.21 *Campoletis chlorideae/*plant during season in desi chickpea.

The results of the seasonal incidence of larval population of *H. armigera* was recorded on Kabuli chickpea genotypes (Table 2) shows that it was observed from 47th MW to 10th MW and ranged in between 0.56 to 4.86 larvae/plant. The activity continued throughout the crop season with peak period during entire crop season, from 03rd December to 18th February (49th to 7th SMW) during 2016. The maximum pod borer, *H. armigera* larval population was observed on 4th SMW (22th -28th January) i.e.4.86 larvae per plant during pod development stage of the crop. The pod borer *H. armigera* population increased continuously from the first week of December to mid of February showing the peak of intensity in the reproductive phase of crop. Whereas pod damage (Table 2) due to the *H. armigera* was recorded on kabuli chickpea from 24th December to 11th March (52nd MW to 10th MW) and per cent pod damage ranged in between 5.58 to 21.46 per cent. The pod damage increased continuously from the last week of December to second week of March. The highest per cent pod damage was in 5th to 11th March (10 SMW) i.e. 21.46 per cent. The results also revealed that the larval parasitoid *Campoletis chlorideae* was the most important mortality factor for the larvae of *H. armigera* parasitism due to *C. chlorideae*. The larval parasitism ranged from 0.16 to 0.84 pupae of *C. chlorideae/*plan throughout the crop season on kabuli. The maximum parasitism was recorded during the 16th December to 11th February (50th to 6th SMW). Average larvae parasitism due to *C. chlorideae* was 0.35 *C. chlorideae/*plant during season on kabuli chickpea crop.

Table.1 Seasonal incidence of *H. armigera* on desi chickpea during *rabi* season

Months	**SMW**	**No. of *H. armigera* Larvae/plant**	**Per cent Pod damage**	**Pupae of *C. chloridae/plant***
19-25Nov	47	0.14	00	0.00
26 Nov-2 Dec	48	0.40	00	0.00
3-9 Dec	49	1.26	00	0.00
10-16Dec	50	1.84	00	0.00
17-23Dec	51	2.16	00	0.12
24-31Dec	52	1.82	00	0.08
1-7 Jan	1	1.33	00	0.16
8-14Jan	2	1.18	4.68	0.36
15-21Jan	3	2.54	6.52	0.54
22-28Jan	4	2.66	7.94	0.45
29Jan-4 Feb	5	2.46	9.26	0.62
5-11Feb	6	1.62	11.36	0.28
12-18Feb	7	1.48	14.38	0.00
19-25Feb	8	1.02	10.40	0.09
26Feb-4Mar	9	0.54	12.02	0.32
5-11March	10	0.22	9.54	0.38
Average		**1.42**	**5.38**	**0.21**

Table.2 Seasonal incidence of *H. armigera* on kabuli chickpea during *rabi* season

Months	**SMW**	**No. of *H. armigera* Larvae/plant**	**Pod damage (%)**	**Pupae of *C. chloridae*/plant**	**Grain yield (kg/ha)**
6-12 Nov	45	0.56	0.00	0.00	--
13-18 Nov	46	0.64	0.00	0.00	--
19-25Nov	47	0.55	0.00	0.00	-
26 Nov-2 Dec	48	0.36	0.00	0.16	-
3-9 Dec	49	1.82	0.00	0.00	-
10-16Dec	50	1.51	0.00	0.42	-
17-23Dec	51	1.64	0.00	0.58	-
24-31Dec	52	2.98	5.58	0.00	-
1-7 Jan	1	3.26	10.33	0.66	-
8-14Jan	2	3.82	12.50	0.84	-
15-21Jan	3	4.68	12.54	0.84	-
22-28Jan	4	4.86	14.48	0.56	-
29Jan-4 Feb	5	3.33	18.65	0.42	-
5-11Feb	6	2.46	16.24	0.66	-
12-18Feb	7	1.58	18.32	0.23	-
19-25Feb	8	0.66	16.60	0.20	-
26Feb-4Mar	9	0.34	17.02	0.00	-
5-11March	10	0.08	21.46	0.00	1740
Average		**1.95**	**9.10**	**0.35**	**1740**

Larval population

The above results are confirmed with, Suganthy *et al.,* (2003) who reported seasonal incidence of gram pod borer in rain fed chickpea. It was reported that peak activity of pest was observed in first fortnight of December, January and February when the crop was at peak podding stage. Singh and Ali (2006) have also recorded two peaks in the larval population of *H. armigera* throughout the crop season, first from 46th to 49th and second from 5th to 13th standard weeks. Similarly, Shinde *et al.,* (2013) have reported that the season with larval population peaking twice, first during 47th to 50th standard weeks and second from 10th to 14th standard weeks in both the years.

The findings of Chatar *et al.,* (2010) regarding the appearance of gram pod borer in chickpea from 2nd week of December to 3rd week of January and decline in population gradually towards the maturity of the crop, confirms the present studies.

Pod damage

Yadav and Jat (2009) who reported that the infestation started in the second fortnight of November and reached its peak in the end of February. The larval population of the pest occurred throughout the growth period of crop and was maximum at pod formation and grain development stages. Similarly, Shivaraj *et al.,* (2011) reported that the seasonal incidence and pod damage due to *H. armigera* started from the beginning of pod development stage till pod maturation stage.

Parasitization by *C. chlorideae*

Singh and Ali (2006) reported that the maximum parasitization by *C. chlorideae* was observed in 4th standard weeks. Parasitization declined from 44th to 50th standard weeks. The present findings are in accordance with, Kaur *et al.,* (2000) who reported that the larval parasitoid *Campoletis chlorideae* was the most important mortality factor for the larvae of *H. armigera* parasitism due to *Campoletis chlorideae* ranged from 0.98 to 68.50% throughout the crop season. The maximum parasitism was recorded during the third week of February.

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