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Arthropods succession on chickpea

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Abstract
Regarding arthropods succession on chickpea, three farmers' fields of Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) area jurisdiction were selected. The population of cutworm and termite initiated at seedling stage while semi looper and pod borer population initiated at vegetative stage to till the harvesting of crop. The cutworm infestation started from the seedling stage (47th SW) to vegetative stage (50th SW). The maximumlarvae of cut worm were observed during 47th SW (1.8 larvae/m^2). The termite damage started from 47th SW and continued up to 51th SW. Termite damage fluctuated during the whole crop period. Maximum damage by termite was 1.5 plants/m^2 during 48th and 51th SW. The larval population of semi-looper was recorded for the first time on 47th SW and maximum was on 6th, 8th and 12th SW (0.33 larvae/plant). The larval population of *H. armigera* started from 50thSW and maximum population in these locations were 3.40 larvae/plant during 11th SW.

Keywords: Arthropods diversity on chickpea, cutworm, termite, semilooper and pod borer

Introduction
Chickpea (*Cicer arietinum* L.) is the third most important pulse crop in the world, after dry beans and field peas. Among all the pulses, the chickpea (*Cicer arietinum* L.) which is commonly known as Gram or Bengal gram is the most important pulse crop of India. Chickpea is grown in tropical, subtropical and temperate regions. Kabuli type is mostly grown in temperate regions while the desi type chickpea is grown in semi-arid and tropics [Nene *et al*. 1978 [10]. Muehlbauer [7] and Singh, 1987; Malhotra *et al*. 1987 [6].

In India, total pulse had the area of 8.25 million hectare with production of 7.33 million tones and productivity 889 kg/ha in 2015. It is grown in six major states viz., Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka and Andhra Pradesh altogether contribute 91 per cent of the production and 90 per cent of the area. In U.P. chickpea is grown an area of 558 thousand hectare with production of 367.70 thousand tones and productivity 659 kg/ha in 2015. Madhya Pradesh is the single largest producer of chickpea in the country accounting for over 40% of total production while Rajasthan, Maharashtra, Uttar Pradesh and Andhra Pradesh contributes about 14%, 10%, 9% and 7%, respectively (Anonymous, 2016) [1].

More than 150 species of insects are known to attack pulse crops in India and out of these, about 25 causes damage winter pulse crops (Bindra, 1968) [3]. Chickpea plant is under threat of many insect pests that attack on its roots, foliage and pods. It is infested by 57 species of insect pests and other arthropods in India; however, the major insect pest of chickpea is the gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) which is the most noxious, polyphagous, multivoltine and cosmopolitan pest has resulted in substantial yield loss (37-50%) and in severe cases up to 90% pod damage (Davies and Lateef, 1975) [4]. 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 Ali, 2006 [14] Sarwar *et al*. 2009) [12]. An attempt has been made about arthropods succession associated with chickpea crop at different growth stages and their nature of damage at Eastern U.P.

Materials and Methods
The observations on arthropods succession in chickpea was recorded on three farmers' fields of villages Pandekapurwa, Pithla and Joriumin comes under Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) area jurisdiction during

Rabi, 2017-18. Weekly observations were recorded forthe incidence of cut worm (*Agrotis ipsilon* Huf.) as number of larvae/m^2 (under the soil near cut plant) andfor Termite (*Odontotermes obesus* or *Microtermes obesus*) as damaged plants/m^2 at seedling stage. Semi looper (*Autographa nigrisigna*) and *Helicoverpa armigera* population was recorded in terms of no. of larvae/plant starting with vegetative stage to harvest of the crop.

Results and Discussion

Weekly observation on major insect-pests on chickpea starting from germination to harvest of chickpea crop showed that only four insect-pest *viz*., cut worm (*Agrotis ipsilon* Hufnagel), termite (*Odontotermes obesus* Ramb. or *Microtermes obesi* Holmgren), semi-looper (*Autographa nigrisigna* Walker) and pod borer (*Helicoverpa armigera* Hubner), caused damage to chickpea crop at different stages in this area (Table 1 and figure 1).

Table 1: Arthropods diversity on Chickpea during *Rabi*, 2017-18

Standard Week (SW)	Mean no. of cut worm larvae/m^2	Mean no. of damaged plants/m^2	Mean no. of semilooper larvae/ plant	Mean no. of podborer larvae/ plant	Abiotic factors			
					Temp (^{0}C)		RH (%)	Rainfall (mm)
					Max.	Min.		
46	0.00	0.00	0.00	0.00	29.9	13.9	66.7	0.0
47	1.80	0.30	0.10	0.00	26.8	11.9	66.0	0.0
48	1.79	1.50	0.10	0.00	25.9	08.1	63.0	0.0
49	1.60	1.20	0.00	0.00	26.1	09.8	66.7	0.0
50	0.40	0.90	0.10	0.60	25.5	10.1	71.2	0.0
51	0.00	1.50	0.00	0.80	23.3	08.1	78.2	0.0
52	0.00	0.00	0.00	1.00	19.4	08.4	85.6	0.0
1	0.00	0.00	0.00	1.20	15.1	04.7	84.3	0.0
2	0.00	0.00	0.06	1.40	13.8	05.2	87.8	0.0
3	0.00	0.00	0.03	1.80	21.8	04.8	74.1	0.0
4	0.00	0.00	0.23	1.80	21.3	05.9	74.8	1.0
5	0.00	0.00	0.30	1.60	24.3	07.2	70.0	0.0
6	0.00	0.00	0.33	1.60	24.3	08.1	60.7	0.0
7	0.00	0.00	0.03	1.80	24.7	10.7	72.2	0.0
8	0.00	0.00	0.33	2.20	28.7	11.8	66.3	0.0
9	0.00	0.00	0.23	2.60	30.1	14.1	67.3	0.0
10	0.00	0.00	0.00	2.60	31.1	12.3	64.7	0.0
11	0.00	0.00	0.00	3.40	32.8	13.7	58.2	0.0
12	0.00	0.00	0.33	3.20	34.2	14.2	54.5	0.0
13	0.00	0.00	0.00	2.80	35.2	15.5	54.4	0.0
14	0.00	0.00	0.00	1.60	35.3	18.7	58.0	0.0

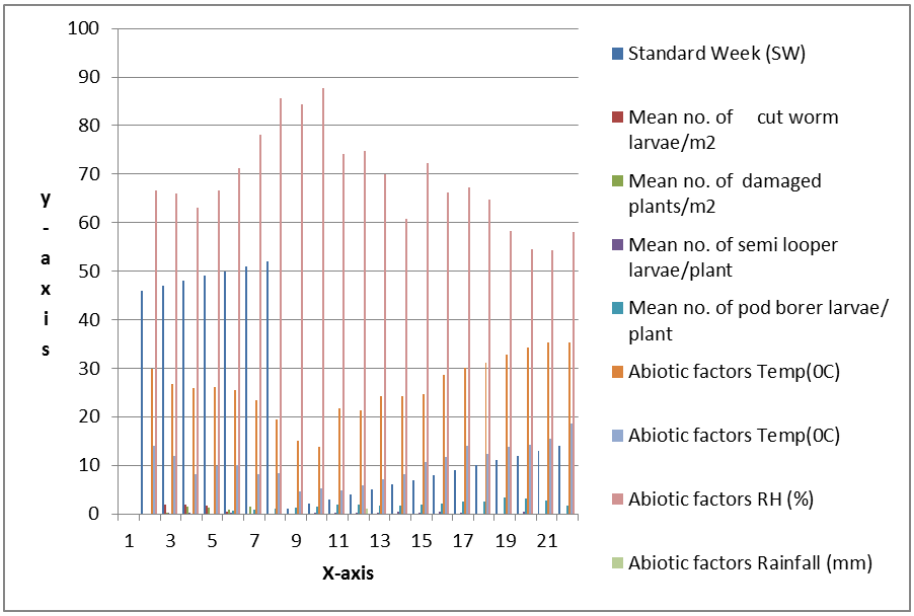

Fig 1: Arthropods diversity on chickpea during Rabi, 2017-18

The cutworm infestation started from 47th SW with maximum 1.80 larvae/m^2 at seedling stage of the crop. After that their population gradually declined upto 50th SW and reaches to its lower level of infestation (0.40 larvae/m^2). The overall population of the cutworm ranged from 0.40 to 1.80 infestations. The present findings are in agreement with the findings of Mehto and Singh (1983) [7] and Lal (1996) [5]. The termite damage started from 47th SW and continued up to 51st SW. Maximum damage was observed on 48th and 51th SW (1.50 plants/m^2) and the minimum was on 47th SW (0.30 plants/m^2). Populations of termite fluctuated during the whole crop periods. The present findings are in agreement with the observations of Naresh & Malick (1989) [9]. The larval population of semi-looper was recorded for the first time on

47th SW and continued up to 12th SW. The population of larvae fluctuated various times due to climatic conditions. The maximum population of larvae was recorded on 6th, 8th and 12th SW (0.33 larvae/plant). The overall population of the semi-looper larvae ranged from 0.03 to 0.33 larvae/plant. Present results are also in conformity with the reports of Naresh & Malik (1989) [9] who reported nine insect pests infesting the chickpea crop. The data recorded on larval population of *H. armigera* evident that the pest activity started at vegetative stage and continued till harvesting stage of the crop. The pod borer infestation was started from 50th SW and continued till the harvesting of the crop. The maximum larval population (3.40 larvae/plant) was recorded on 11th SW and the minimum larval population on 50th SW (0.60 larvae/plant). The overall larval population of pod borer ranged from 0.60 to 3.40 larvae/plant.

Present results are in conformity with the reports of Sharma *et al.* (2008) [13] and Singh *et al.* (2012) [15] who reported that the activity of *H. armigera* started with flowering and continues to harvesting stage of the crop. Similar reports were made by various workers on chickpea pod borer in various parts of India (Atwal and Dhaliwal (2005) [2] and Subramanian *et al*. 2013) [16] causing 8.15 to 92.5 percent damage to the crop and yield losses upto 400 kg/ha in chickpea crop (Rahman and Mahbubar, 1993) [11].

Conclusion

Weekly observation on major insect-pests on chickpea starting from germination to harvest of chickpea crop showed that only four insect-pest viz, cut worm (*Agrotis ipsilon* Hufnagel), termite (*Odontotermeso obesus* Ramb. or *Microtermesobesi* Holmgren), semi-looper (*Autographa nigrisigna* Walker) and pod borer (*Helicoverpa armigera* Hubner), caused damage to chickpea crop at different stages in this area.

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