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Study on incidence of insect pests in chickpea

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Abstract
The experiment was conducted at Students' Instructional Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya during *Rabi* season, 2017-18 and *Rabi* season, 2018-19. Revealed that the larval population of *H. armigera* were noticed for the first time during 47th & 46th standard week (SW) of *Rabi* season, 2017-18 & *Rabi* season, 2018-19. The minimum larval population of *Helicoverpa armigera* was 0.27 & 0.33 larvae /plant recorded during 47th SW of *Rabi* season, 2017-18 & *Rabi* season, & 2018-19 followed by 0.40 & 0.47 larvae /plant were recorded in 48th of *Rabi* season, 2017-18 & 46th SW of *Rabi* season, 2018-19. The maximum larvae were recorded in the 10th SW of *Rabi* season, 2017-18 & 12th SW of *Rabi* season, 2018-19 with respective larval population of *H. armigera* 3.13 & 3.86 /plant followed by 2.93 larvae & 3.54 larvae /plant in 9th SW of *Rabi* season, 2017-18 & 11th SW of *Rabi* season, 2018-19. The minimum damage plants due to cut worm was recorded during 45th SW of *Rabi* season, 2017-18 & 51st SW of *Rabi* season, 2018-19 with respected damage plant 0.67 & 0.33 /m^2 and maximum damage plants due to cut worm were recorded in the 48th SW of *Rabi* season, 2017-18 & 47th SW of *Rabi* season, 2018-19 with respective, 2 & 2.33 damage plant /m^2. The minimum damage plants due to termite was recorded during 45th SW and 50th SW of *Rabi* season, 2017-18 & 1st SW of *Rabi* season, 2018-19 with respected damage plant 0.33, 0.33 & 0.33 /m^2 and maximum damage plants due to termite were recorded in the 48th SW of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 with respective, 1.67 & 1.33 damage plant /m^2.

Keywords: Pod borer, cut worm, termites**,** larvae, damage plant, temperature and chickpea

1. Introduction

Chickpea is one of the most important *Rabi* pulse crop of India and occupies first position among the pulses. It is grown in an area 10.56 million ha and producing 11.23 million tones with productivity of 1063 kg/ha. As usual, U.P. has contributed an area 0.61 million ha and production 0.65 million tons during 2017-18 in India [2]. India ranked first in area and production in the world.

Production of chickpea in our country is low one of the major reason is the losses caused by several pests and diseases, both in field and in storage. It is attacked by number of insect-pest among them; the pod borer (*H. armigera*) is the most serious insect pest in the most of the chickpea growing areas of the country [4]. It damages various plant parts at different stage of growth. Due to its polyphagous nature, it is also known as American cotton boll warm, corn ear worm, tomato fruit borer, tobacco bud worm, carnation worm etc. It has been recorded feeding on 181 cultivated and uncultivated plants species belonging to 45 families. It is an established serious pest of gram in all the state of Indian union. The attack of this pest starts from vegetative stage and continue up to crop maturity [16].

Gram pod borer, *Helicoverpa armigera*, is considered as a notorious pest of chickpea. It also attacks pigeon pea, moong bean, lentil, soybean okra, maize, berseem, sunflower, sorghum, tobacco and tomato. Besides gram pod borer, it is also known as cotton bollworm, gram caterpillar, tomato fruit worm and tobacco bud worm. Pod borer is the most serious insect pest of Chickpea. Percent larval survival and pupation were the maximum on chickpea as compared to other host plants [19].

The cutworms also caused some times heavy losses to the chickpea crop with maximum population from 1st January to the end of March. Termites (*Odontotermes obesus*), cutworms (*Agrotis ipsilon*, *A. segetum*, *A. spinifera)* appear during seedling stage in certain areas, while pod borer (*Helicoverpa armigera)* appear in large number during vegetative growth and at pod formation stage of chickpea.

2. Materials and Methods

To study the incidence of insect pests in chickpea variety 'Uday (KPG-59)'' was shown on 19h October, 2017-18 and 22 October 2018-19. The rows and plants were spaced 30×10 cm apart, respectively. All the agronomic practices were followed to raise a good crop.

2.1. Gram pod borer, *H. armigera*

In order to study the incidence of gram pod borer at Students' Instructional Farm. For recording the larvae of *H. armigera* during *Rabi* season, 2017-18 & *Rabi* season, 2018-19 were counted on 5 randomly selected plants at three places at weekly interval starting with 30 DAS (Days after Sowing). Weekly meteorological data during crop period were collected from meteorological observatory in the university.

2.2. Cut worm, *Agrotis ipsilon*

Observation on the incidence of cut worm was recorded by counting the damaged plants/sq. m at weekly interval starting from seedling stage to vegetative stage during *Rabi* season, 2017-18 & *Rabi* season, 2018-19.

2.3. Termites, *Odontotermes obesus*

Observation on the incidence of termite was recorded by counting the damaged plants/sq. m at weekly interval starting from seedling stage to vegetative stage during *Rabi* season, 2017-18 & *Rabi* season, 2018-19.

3. Results and Discussion

3.1. Incidence of insect pests in chickpea

Weekly observations of major insect pests in chickpea starting from germination to harvest of chickpea crop showed that only three insect pests *viz*, gram pod borer (*Helicoverpa armigera*, Hübner), cut worm (*Agrotis ipsilon*, Hufnagel) and termite (*Odontotermes obesus*, Rambur) caused damage to chickpea crop at different stages in this area.

3.1.1. Gram pod borer, *Helicoverpa armigera*

The data recorded on larval population of *H. armigera* during *Rabi* season 2017-18 and 2018-19 have been presented in Table-1 & 2. It is evident from the data that the pest activity started since vegetative growth and continued till maturity stage of the crop. The larval population of *H. armigera* were noticed for the first time during 47th & 46th standard week (SW) of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 at the minimum temperature of 11.1 ^{0}C & 14.1^{0}C, maximum temperature of 27.3 ^{0}C & 30.03 ^{0}C, relative humidity 67.4 & 71.2 per cent and there were no rains during this week. Thereafter activity of *H. armigera* continued though in fluctuating number throughout crop season. In 48th SW of *Rabi* season, 2017-18 & 47th SW *Rabi* season, 2018-19 at the minimum temperature 12.2 ^{0}C & 11.0 ^{0}C, maximum temperature 25.8 ^{0}C & 27.8 ^{0}C and relative humidity 79.9 & 67.5 per cent and no rainfall, respective larvae recorded of 0.40 & 0.33 /plant. The larval population of 0.93 and 0.54 larvae /plant was respectively recorded during 49th of *Rabi* season, 2017-18 and 48th SW of *Rabi* season, 2018-19 at the minimum temperature 11.7 ^{0}C & 11.1 ^{0}C, maximum temperature 19.2 & 26.8, relative humidity 86.6 & 70.7 and no rains during this weeks of *Rabi* season, 2017-18 & *Rabi* season, 2018-19. The larval population of *H. armigera* in 50th SW of *Rabi* season, 2017-18 & 49th of *Rabi* season, 2018-19 of 0.80 & 0.73 /plant. The respective minimum and maximum temperatures were 9.0 ^{0}C & 8.5 ^{0}C and 19.5 ^{0}C & 25.2 ^{0}C, relative humidity 86.9 & 71.0 per cent and no rainfall during this week. The larvae of *H. armigera* of 1.20 & 1.13 /plant were respectively recorded during 51st SW of *Rabi* season, 2017-18 & 50th SW of *Rabi* season, 2018-19 with respective minimum and maximum temperatures recorded during this week were 7.5 ^{0}C & 7.5 ^{0}C and 23.2 ^{0}C & 24.2 ^{0}C, relative humidity 74.0 & 69.0 per cent and there were no rains. The larval population of *H. armigera* in 52nd SW of *Rabi* season, 2017-18 and 51st SW of *Rabi* season, 2018-19 was 1.86 & 1.33 larvae /plant during this week, the minimum temperature 10.6 ^{0}C & 5.0 ^{0}C, maximum temperature 20.1 ^{0}C 23.2 ^{0}C and relative humidity of 84.1 & 71.3 per cent was recorded and there were no rains during *Rabi* season, 2017-18 & *Rabi* season, 2018-19. During 1st SW of *Rabi* season, 2017-18 & 52nd SW of *Rabi* season, 2018-19 the larval population was 2.0 & 2.13 /plant. During this week temperature range from 10.2 & 6.3 -18.0 & 23.5 ^{0}C, relative humidity 88.2 & 70.5 per cent and no rainfall. During 2nd SW of *Rabi* season, 2017-18 & 1st SW of *Rabi* season, 2018-19 the mean larvae 1.73 & 1.67 /plant. The respective temperatures during this week and ranged from 4.9 & 5.3 -20.6 & 22.5 ^{0}C, relative humidity 66.3 & 72.2 per cent and no rainfall. The larval population of *H. armigera* of 1.93 & 1.53 larvae/plant at the minimum temperature 5.9 ^{0}C & 5.7 ^{0}C, Maximum temperature 22.4 ^{0}C & 21.8 ^{0}C, relative humidity 68.0 & 72.0 per cent and there were no rains during 3rd SW of *Rabi* season, 2017-18 and 2nd SW of *Rabi* season, 2018-19. The larvae of *H. armigera* of 1.26 & 1.47 /plant were respectively recorded during 4th SW of *Rabi* season, 2017-18 & 3rd SW of *Rabi* season, 2018-19 with respective minimum temperature recorded during this week were 9.1 ^{0}C & 5.0 ^{0}C, maximum temperature 23.7 ^{0}C & 22.5 ^{0}C, relative humidity 76.0 & 70.5 per cent and 16.8 mm rains was recorded during 4th SW of *Rabi* season, 2017-18 and no rains during 3rd SW of *Rabi* season, 2018-19. In 5th SW of *Rabi* season, 2017-18 & 4th SW of *Rabi* season, 2018-19 at the minimum temperature 8.2 ^{0}C & 10.6 ^{0}C, maximum temperature 21.9 ^{0}C & 21.1 ^{0}C and relative humidity 80.2 & 76.1 per cent and no rainfall during 5th SW of *Rabi* season, 2017-18 and 41.0 mm rains were recorded during 4th SW of *Rabi* season, 2018-19, respective larvae 2.67 & 1.26 /plant was recorded. The minimum larval population of *H. armigera* was recorded during 47th SW of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 at the minimum temperature of 11.1^{0}C & 11.1^{0}C, maximum temperature of 27.3 ^{0}C & 27.8 ^{0}C, relative humidity 67.4 & 67.5 per cent and there were no rains during this week with respected larvae 0.26 & 0.33 followed by 0.40 & 0.47 larvae /plant were recorded in 48th of *Rabi* season, 2017-18 & 46 SW of *Rabi* season, 2018-19 at the minimum temperature 12.2 & 14.1, maximum temperature 25.8 & 30.3, relative humidity 79.9 & 71.2 and no rains during this weeks. The maximum larvae were recorded in the 10th SW of *Rabi* season, 2017-18 & 12th SW of *Rabi* season, 2018-19 with respective larval population of *H. armigera* 3.13 & 3.86 larvae /plant. During this week, the minimum temperature was 12.3 ^{0}C & 14.2 ^{0}C, maximum temperature 27.8 ^{0}C & 31.9 ^{0}C, relative humidity 62.4 & 60.5 per cent and there was no rainfall followed by 9th SW of *Rabi* season, 2017-18 & 11th SW of *Rabi* season, 2018-19 at the minimum temperature 11.5 ^{0}C & 12.7 ^{0}C, maximum temperature 28.8 ^{0}C & 30.0 ^{0}C and relative humidity 57.8 & 60.4 per cent and there was no rains during this weeks, respective larvae 2.93 & 3.54 /plant was recorded. The present findings are also in accordance with the findings of Yadav and Jat (2009) [20] who found that the infestation of *H. armigera* on chickpea 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 developmental stages. This is in partial agreement with the findings of Kant and Kanaujia (2008) [7] who recorded the larval population buildup in chickpea started during standard week 9 at the vegetative stage of the crop and reached its maximum during 14 and 15 standard weeks. The present investigations are in accordance with those of Ali and Kumar (2001) [1] who reported the *H. armigera* was found most active between 47th to 16th standard week on chickpea and attained peak density 5th to 11th standard week. Bajya *et al*., (2010) [3] also noticed highest population ((9.2 larvae/10 plants) was recorded during the second week of March and gradually decreased. The pest was active from November to March on this crop. The present findings are also in partial agreement with the findings of Manjula *et al.,* (2003) [10] who were reported that the *H. armigera* active throughout the growth stage with the maximum activity (4.56 larvae/ plant) at pod formation stage and the lowest (1.58 larvae/ plant) at flowering stage, whereas the moderate activity (3.36 larvae/ plant) was found at vegetative stage of the crop. The present findings with the accordance Gautam (2018) [5] who recorded the *Helicoverpa armigera* population were noticed for the first time during 46th SW of 2016 and respective mean population were 0.33 larvae/plant. The lowest mean population of *H. armigera* is 0.33larvae/plantn was recorded during 46ndand 47th SW and maximum mean population of *Helicoverpa armigera* of 5.67 larvae/plant was recorded during 08 SW. This is accordance with the findings of Prasad *et al.,* (1989) [14] who recorded the population of *H. armigera* was highest in the first week of March, when the chickpea crop was sown on 22nd October, 1st or 21st November or 1st December. However, peaks of the pest also occurred on 25th January and 11th February on the crops sown on 12th October and 11th November, resp. The present findings are also in accordance with the findings of Lal (1996) [9] who reported that the *Heliothis armigera* during vegetative growth stage with a high incidence at pod formation stage. This is partial agreement with the findings of Kachhawa *et al.,* (2016) [6] who found the highest mean larval population of *H. armigera* 1.48 and 1.68 larva per meter row length was observed in 6th and 7th standard meteorological week during 2013-14 and 2014-15 respectively. The present investigations are in accordance with those of Singh *et al.* (2014) [17] who reported the maximum population was recorded during February and March at poding stage of the crop.

3.1.2. Cut worm, *Agrotis ipsilon*

The data recorded on damage plant of cut worm during *Rabi* season 2017-18 and 2018-19 have been presented in Table-1 & 2.The damage plants due to cut worm were notice for first time during 45th SW of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 at the minimum temperature of 12.7 ^{0}C & 12.7 ^{0}C, maximum temperature of 29.7 ^{0}C & 28.7 ^{0}C, relative humidity 67.2 per cent & 68.3 percent and there were no rains during this weeks. The mean damage plants of cut worm recorded during first observation in 45th SW was 0.67 & 1 damage plant /m^2. The minimum damage plants due to cut worm was recorded during 45th SW of *Rabi* season, 2017-18 & 51st SW of *Rabi* season, 2018-19 at the minimum temperature of 12.7 ^{0}C & 5.0 ^{0}C, maximum temperature of 29.7 ^{0}C & 23.2 ^{0}C, relative humidity 67.2 & 71.3 per cent and there were no rains during this week with respected damage plant 0.67 & 0.33 /m^2. The maximum damage plants due to cut worm were recorded in the 48 th SW of *Rabi* season, 2017-18 & 47th SW of *Rabi* season, 2018-19 with respective, 2 & 2.33 damage plant /m^2. During this week, the minimum temperature was 12.2 ^{0}C & 11.0 ^{0}C, maximum temperature 25.8 ^{0}C & 27.8 ^{0}C, relative humidity 79 & 67.5 per cent and there was no rainfall. The present investigations are also in partial agreement with the findings of Naresh & Malick (1989) [12] who reported that the nine insect pests infesting of chickpea in Haryana, (India), They were *Aphis craccivora, Odontotermes obesus, Agrotis ipsilon, A. flammatra, Autographa nigrisigna, Spodoptera exigua* and *Heliothis armigera*. This is in also accordance with the findings of Lal (1996) [9] found that the *Agrotis ipsilon* appear during the seedling stage. This is in partial agreement with the findings of Mari (2013) [11] who recorded the three insect -pests (*Helicoverpa armigera, Spodoptera litura* and *Agrotis ipsilon*) and four natural enemies (*Geocorisspp, Oriusspp, Delta sp* and *Coccinella undecimpunctata*) were recorded from the study plots.

3.1.3. Termite, *Odontotermes obesus*

The data recorded on damage plant of termite during *Rabi* season 2017-18 and 2018-19 have been presented in Table-1 & 2.The damage plants due to termite were notice for first time during 45th SW of *Rabi* season, 2017-18 & 46th SW of *Rabi* season, 2018-19 at the minimum temperature of 12.7 ^{0}C & 14.1 ^{0}C, maximum temperature of 29.7 ^{0}C & 30.3 ^{0}C, relative humidity 67.2 per cent & 71.2 percent and there were no rains during this weeks. The mean damage plants of termite recorded during first observation in 45th SW and 46th SW was 0.33 & 0.67 damage plant /m^2. The minimum damage plants due to termite was recorded during 45th SW and 50th SW of *Rabi* season, 2017-18 & 1st SW of *Rabi* season, 2018-19 at the minimum temperature of 12.7 ^{0}C, 9.0 ^{0}C & 5.3 ^{0}C, maximum temperature of 29.7 ^{0}C, 19.5 ^{0}C & 22.5 ^{0}C, relative humidity 67.2, 86.9 & 72.2 per cent and there were no rains during this week with respected damage plant 0.33, 0.33 & 0.33 /m^2. The maximum damage plants due to termite were recorded in the 48th SW of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 with respective, 1.67 & 1.33 damage plant /m^2. During this week, the minimum temperature was 12.2 ^{0}C & 11.0 ^{0}C, maximum temperature 25.8 ^{0}C & 26.8 ^{0}C, relative humidity 79 & 70.7 per cent and there was no rainfall. The present investigations are also in partial agreement with the findings of Naresh & Malick (1989) [12] who reported that the nine insect pests infesting of chickpea in Haryana, (India), They were *Aphis craccivora, Odontotermes obesus, Agrotis ipsilon, A. flammatra, Autographa nigrisigna, Spodoptera exigua* and *Heliothis armigera*. This is in partial agreement with the findings of Pandey (2012) [13] who recorded the termite caused 25-26 per cent plant damage /m2 at different locations. The present findings are also in accordance with the findings of Saha *et al.,* (2015) [15] reported that the other major insect pests of chickpea are termite and cutworm. This is in also accordance with the findings of Singh *et al.,* (2018) [18] reported that the four insect-pests *Helicoverpa armigera* (Hubner), *Agrotis ipsilon* (Hufnagel), *Spodoptera litura* (Fabricius) and *Odontotermes obesus* (Rambur) in the chickpea.

Table 1: Incidence of insect pests in chickpea during *Rabi* season, 2017-18

S.W.	Mean larval population/Plant	Mean no. of damage plants/sq m.		Abiotic parameters			
		Cut worm	Termite	Temperature (ºC)		RH (%)	Rainfall (mm)
				Min.	Max.		
45	00	0.67	0.33	12.7	29.7	67.2	0.0
46	00	1.33	1.00	11.8	29.0	67.4	0.0
47	0.27	1.67	1.33	11.1	27.3	67.4	0.0
48	0.40	2.00	1.67	12.2	25.8	79.9	0.0
49	0.93	1.33	0.67	11.7	19.2	86.6	0.0
50	0.80	00	0.33	9.0	19.5	86.9	0.0
51	1.20	00	00	7.5	23.2	74.0	0.0
52	1.86	00	00	10.6	20.1	84.1	0.0
01	2.00	00	00	10.2	18.0	88.2	0.0
02	1.73	00	0.67	4.9	20.6	66.3	0.0
03	1.93	00	00	5.9	22.4	68.0	0.0
04	1.26	00	00	9.1	23.7	76.0	16.8
05	2.67	00	00	8.2	21.9	80.2	0.0
06	1.40	00	00	8.4	24.5	69.3	41.0
07	2.53	00	00	9.9	25.7	70.3	0.0
08	2.73	00	00	11.1	27.9	63.9	0.0
09	2.93	00	00	11.5	28.8	57.8	0.0
10	3.13	00	00	12.3	27.8	62.4	0.0
11	2.33	00	00	10.0	29	56.8	0.77
12	2.46	00	00	15.5	33.4	50.9	0.0
13	2.06	00	00	18.8	37.8	52.0	0.0
14	1.46	00	00	20.2	37.2	57.5	0.0

Table 2: Incidence of insect pests in chickpea during *Rabi* season, 2018-19

S.W.	Mean larval population/Plant	Mean no. of damage plants/sq m.		Abiotic parameters			
				Temperature (ºC)		RH	Rainfall
		Cut worm	Termite	Min.	Max.	(%)	(mm)
45	0	1.00	00	12.7	28.7	68.3	0.0
46	0.47	1.67	0.67	14.1	30.3	71.2	0.0
47	0.33	2.00	1.00	11.0	27.8	67.5	0.0
48	0.54	1.33	1.33	11.0	26.8	70.7	0.0
49	0.73	1.00	0.67	8.5	25.2	71.0	0.0
50	1.13	0.67	00	7.5	24.2	69.0	0.0
51	1.33	0.33	00	5.0	23.2	71.3	0.0
52	2.13	00	1.00	6.3	23.5	70.5	0.0
01	1.67	00	0.33	5.3	22.5	72.2	0.0
02	1.53	00	00	5.7	21.8	72.0	0.0
03	1.47	00	00	5.0	22.5	70.5	0.0
04	1.26	00	00	10.6	21.1	76.1	41.0
05	2.20	00	00	7.1	21.7	74.9	0.0
06	1.20	00	00	6.7	21.8	72.5	41.0
07	2.73	00	00	10.5	21.8	76.6	0.0
08	3.13	00	00	11.2	25.3	69.1	0.0
09	3.33	00	00	10.0	22.9	72.7	0.0
10	3.26	00	00	9.8	22.8	74.0	0.0
11	3.54	00	00	12.7	30.0	60.4	0.0
12	3.86	00	00	14.2	31.9	60.5	0.0
13	2.20	00	00	17.4	34.0	62.1	0.0
14	1.80	00	00	13.1	29.4	64.3	7.0

4. Conclusion

"Studies on incidence of insect pests in chickpea" revealed that the larval population of *H. armigera* was noticed for the first time during 47th & 46th standard week (SW) of *Rabi* season, 2017-18 & *Rabi* season, 2018-19 at the minimum temperature of 11.1 ^{0}C & 14.1 ^{0}C, maximum temperature of 27.3 ^{0}C & 30.03 ^{0}C, relative humidity 67.4 & 71.2 per cent and there were no rains during this week. Thereafter activity of *H. armigera* continued though in fluctuating number throughout crop season.

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