Study on the Incidence of Sucking Pests and Pink Bollworm in Cotton

Abstract

Sucking pests and pink bollworm are serious pest of cotton one after the other in India by causing serious yield losess. The present investigation was carried out in three major cotton growing mandals of NTR district to understand the level of pest incidence in *Bt* cotton during *Kharif*,2022-23 on regular interval. Among the sucking pests only thrips population recorded 32.26 no/3 leaves and crossed the ETL at 45 DAS. Remaining sucking pests such as Leafhopper, whitefly and aphid did not crossed ETL during crop growth period and highest incidence of 5.92, 4.04 and 27.14 no/3 leaves was recorded respectively at 45, 60 and 120 DAS. Whereas pink bollworm recorded 23.10% rosette flowers, 44.04% boll damage in Bheemavaram village of Vastavaimandal and 40.83% locule damage in Konakanchi village of Penuganchiprolumandal.

Key words: Sucking pest, Pink bollworm, Rosette flowers, Boll damage and Locule damage

Introduction:

Cotton (*Gossypiumhirsutum*) belongs to the family Malvaceaeis one of the world's most essential fiber crop grown in 111 countries.China, India and the United States are the leading cotton-producing countries. India cultivates more than 11 million hectares annually and is the largest area in the world.

In spite being the best cotton producing country, India faces a plenty of issues in cotton production and out of which damage by insect pests attract greater importance. In India over 166 insect species affect cotton and of which 15 are considered key pests, which include bollworms and sucking pest complex. The boll worms are American boll worm, *Helicoverpaarmigera* (Hubner)Spotted boll worm, *Eariasvittella*(Fabricius) and Pink boll worm, *Pectinophoragossypiella* (Saunders) pose greater threat to cotton production. Besides these, a complex of sucking pests viz., Green leaf hopper-*Amrascadevastans*(Distant), Aphid- *Aphis gossypii* (Glover) and Whitefly-*Bemisiatabaci* (Gennadius), are also known to cause a great devastation (Gosh 2001) and account for the yield loss of 22.85 per cent (Satputeet al 1990).Pink bollwormalone account for a considerable yield loss to the extent of 36.2%. In 2002 and2006, a single gene (Cry 1Ac) and dual gene (Cry 1Ac + Cry 2Ab) Bt cotton hybrids werecommercially released in India, targeting thedreaded bollworm complex, which included theAmerican bollworm *Helicoverpaarmigera* (Hub.),spotted bollworm *Eariasvitella*(Fab.) and Pink boll worm.Until 2009, Bt, cotton technology performed welland offered promising boll-worm complex control.As a result, PBW infestations were very low in thefirst decade after Bt cotton

was released. *H.armigera* and *E. vitella* still susceptible even after15 years of continuous Bt cotton cultivation inIndia. However, pink bollworm reappeared as a major pestproblem in India's central and southern cotton-growing belt, a nearly two-decade hiatus. Onthese, the pest was confirmed to feed and thriveon single (Bollgard I) and dual (Bollgard II) Btcotton genes. Under this circumstances **Study on the incidence of sucking pests and pink bollworm in cotton** aims to record the incidence of sucking pests and rosette flowers, Boll damage, locule damage due to PBW on BT cotton was studied in three major cotton growing districts of NTR, district.

Materials and Methods

Experimental details :

Field experiments were conducted in the farmer fields at Penuganchiprolu, Jaggayyapeta, Nandigama and Vastavaimandals to study the incidence of sucking pests and pink bollworm in cotton. In each mandal three villages were selected about an area of one acre. Crop was raised under recommended agronomic practices and following observations were recorded.

Data on sucking pests:

Counts of leafhoppers, thrips and whiteflies per three leaves one each from top, middle and bottom of plant will be recorded on 20 plants from each farmer field at 15 days interval starting from three weeks after sowing by random selection.

Collected data on sucking pest incidence was subjected to Random Block Design (RBD).

Per cent Rosette flowers:

Data was taken from 45 (Days After Sowing) DAS on 50 randomly selected plants. Then the total number of flowers and rosette flowers were counted and per cent rosette flowers were worked out using following formula.

$$\% \text{ Rosette flowers} = \frac{\text{Total no of rosette flowers}}{\text{Total no of flowers}} \times 100$$

Per cent boll damage:

At every 15 days interval 25 bolls from each field was collected and observed for larval presence. Boll damage was calculated by using following formula.

$$\text{Per cent Boll damage} = \frac{\text{Total no of damaged bolls}}{\text{Total no of bolls}} \times 100$$

Per cent locule damage:

Collected bolls also examined for the locule damage.locule damage was calculated by using following formula

$$\% \text{ locule damage} = \frac{\text{Total no of damaged locules}}{\text{Total no of locules}} \times 100$$

Collected data on per cent rosette flowers, boll damage and locule damage was subjected to Random Block Design.

Results and Discussions:

Sucking pest population data was recorded from 45 to 150 DAS for every 15 days interval. Among the pest complex leafhopper incidence was ranged from 0.47 to 5.92 nos/3 leaves and did not crossed the economic threshold levelthroughout the crop growth period. Peak incidence of leafhopper was observed at 45 DAS (5.92/3leaves) which is statistically differ with 4.47, 3.41 and 3.35 at 75, 120 and 90 DAS respectively (Table.1 and Figure. 1). Similar results were observed with the findings of Prashantet al (2018) who recorded 0.51 to 4.42 leafhoppers/3 leaves at 31 and 41 DAS. These results also corroborate with findings of Arifet al(2006) who recorded maximum leafhopper population to be 1.85 per leaf during second week of August.

The observation regarding thrips population recorded on 45 DAS showed a peak with 32.26 nos/ 3 leaves and which is crossed the ETL (10 no/leaf).There after population was decreased gradually throughout crop period and reached 0.32 nos/ 3 leaves at 150 DAS (Table.1 and Figure. 1).The present findings are not conformity with the findings of Chauhanet al., (2017) he observed that thrips population remains active throughout crop growth period. Incidence was stated building up from the last week of July (0.15 thrips/leaf) and Peak incidence of thrips population was observed at 15th WAS (15.04thrips/leaf) during the month of October. In our study thrips population was decreased gradually, this might be due to prolonged rain spell up to December. Whereas our findings are close conformity with the findings of Rajasekharet al (2018) who also observe the decreasing trend of thrips population, peak incidence was noticed at 45 DAS and decline gradually to 0.30 no/3leaves at 150 DAS.

The incidence of whitefly population ranged from 0.59 to 4.04 whiteflies/ 3 leaves and its population did not crossed the ETL throughout crop growth period. There was slight increase in

the whitefly population at 120 DAS (1.87 no/3 leaves) and decline continues (Table.1 and Figure. 1).This might be due the domination of other sucking pests and peak incidence of whitefly was observed only at 60 DAS, there after decline in the pest population. Similar results were observed with the Sana et al (2011) who observed the peak incidence of whitefly at 60 DAS with 5.78/leaf, there after decline in the population and reached 0.53/leaf at 120 DAS.

The maximum population of aphids was recorded to be 27.14 aphids/ 3 leaves at 120 DAS, which is statistically differ with 16.55 and 15.58 per three leaves during 135 and 150 DAS respectively (Table.1 and Figure. 1). In general population of aphid recorded to be not crossed the economic threshold level throughout the crop season. Present results are corroborate with the findings of Sohrabet al (2021) who observed two peaks during the crop growth period, 1st peak at 30 DAS and 2nd at 150 DAS with 11.65 and 26.83 aphids/leaf. Whereas Kiruthikaet al(2022) the highest aphid population was observed at 50DAS itself, during flowering stage of the crop with 18.7 adults / 3 leaves.

Table.1. Incidence of sucking pests in cotton during *Kharif*2022-23.

DAS	Pest population/3Leaf/Plant*			
	Leafhoppers	Thrips	Whitefly	Aphids
45	5.92 (2.61)a	32.26 (5.73)a	1.56 (1.59)bc	5.71 (2.57)c
60	2.50 (1.86)c	7.88 (2.97)b	4.04 (2.24)a	5.69 (2.58)c
75	4.47 (2.32)b	5.14 (2.46)cd	1.25 (1.49)cd	4.83 (2.40)c
90	3.35 (2.08)bc	4.74 (2.39)d	1.28 (1.50)cd	2.13 (1.76)d
105	2.91 (1.97)c	4.36 (2.30)d	1.87 (1.68)b	3.74 (2.16)cd
120	3.41 (2.09)bc	4.58 (2.35)d	1.17 (1.47)c	27.14 (5.29)a
135	0.47 (1.21)d	1.25 (1.49)e	0.99 (1.40)de	15.58 (4.04)b
150	0.74 (1.32)d	0.32 (1.14)e	0.59 (1.25)e	16.55 (4.18)b
CD	0.26	0.50	0.15	0.45
SEm	0.86	0.16	0.05	0.14
CV%	7.67	11.01	5.42	8.21

*Figures in the parenthesis are subjected to square root transformation.

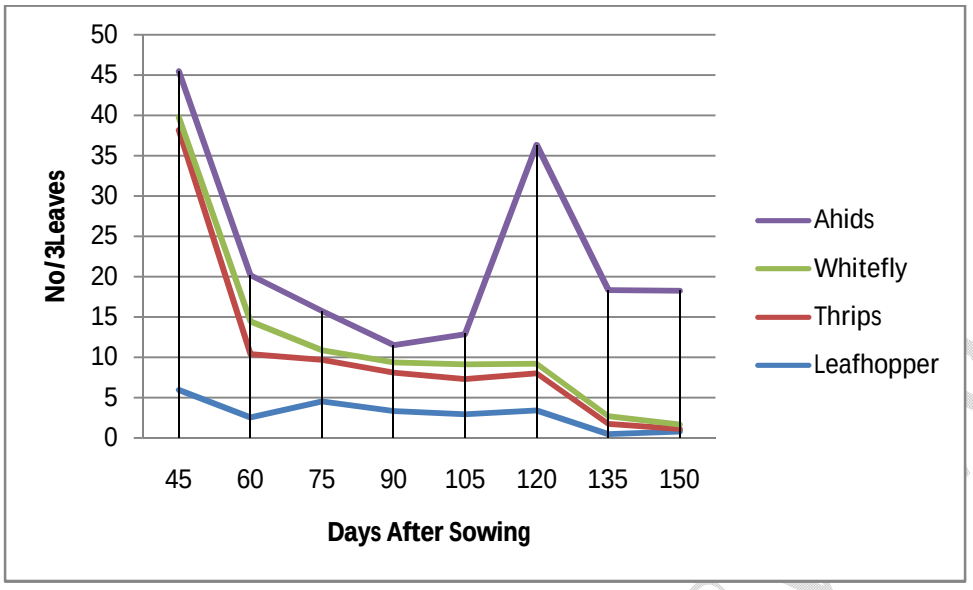

Figure.1. Incidence of sucking pests in cotton during *Kharif* 2022-23.

Pink bollworm:

The results on the incidence of pink bollworm on cotton in three different cotton growingmandals of Nandamuridistrict of Andhra Pradesh are present in the table (Table.2). Data on the incidence of rosette flowers were recorded from 60 DAS to 135 DAS in three different villages of each mandal. Rosette flowers ranged from 3.81% to 35.12% throughout crop growth period. The lowest damage of 3.81% was observed in Mullapadu village of Penuganchiprolumandal at 60 DAS and highest per cent 35.12 rosette flowers was observed in Bheemavaram village of Vastavaimandal at 135 DAS. The average infestation ratio was ranged from 10.49 to 23.10%. highest per cent rosette flowers was observed in Bheemavaram village of Vastavaimandal with 23.10%, which is statistically differ with the all other villages. Followed by Cheruvukommupalem and Peddavaramvillages recorded 20.53 and 18.62% rosette flowers respectively in Nandigamamandal. Whereas lowest per cent rosette flowers was observed in Chandapuram and Mullapadu villages in Nandigama and Penuganchiprolumandals respectively with 11.89 and 10.49%.

Present findings are in conformity with Rajuet al(2021) who recorded 2.0 and 39% rosette flower at 60 and 120 DAS. Who also recorded 18.33% average highest rosette flowers during crop growth period. Whereas in our study we recorded 23.10% average highest rosette flowers during crop growth period. Likewise Patil(2002)also recorded maximum per cent rosette flowers was 21.12 per cent in 2001-02 to 23.55 per cent during 2004-05 seasons with the highest incidence of boll damage to the tune of 38.75 to 54.45%.

Per cent boll damage:

Data on per cent boll damage revels that highest damage was observed in 63.65% at Bheemavaram village of Vastavaimandal at 75 DAS and lowest per cent boll damage (12.77%) was observed in Mullapadu village of Penuganchiprolumanadal at 135 DAS during crop growth period. The average boll infestation ratio was ranged from 25.83 to 44.04%. The highest per cent boll infestation was observed in Bheemavaram village (44.04%) of Vastavaimandal, which is statistically on par with Konakanchi village (41.64%) of Penuganchiprolumandal. Lowest boll damage was observed in Chandapuram (26.40%) and Mullapadu (25.83%) villages of Nandigama and Penuganchiprolumandals respectively. Present findings are coincide with the findings of Muttappaet al(2019) who observed green boll damage on cotton was ranging from 7.6 to 42.21 per cent per 50 bolls with a seasonal mean of 30.52 per cent during the cropping period. Furthermore Ingoleet al(2019) recorded 40.42 per cent boll damage during entire crop growth period. Whereas Patil, et al (2007)observedhighest incidence of 54.45 per cent boll damage which resulted in 62.56 per cent locule damage.

Per cent locule damage:

Per cent locule damage ranged from 3.99 to 64.00% throughout crop growth period. The lowest damage of 3.99% was observed in Mullapadu village of Penuganchiprolumandal at 60 DAS and highest per cent (64.00%) locule damage was observed in Bheemavaram village of Vastavaimandal at 135 DAS. The average locule infestation ratio was ranged from 24.89 to 40.83% during crop growth period. The highest per cent locule damage was observed in konakanchi village of penuganchiprolumandal with 40.83%. Followed by Peddavaram and Bheemavaramvillages recorded 39.76 and 38.08% locule damage respectively in Nandigama and Vastavaimandals. Whereas lowest per cent locule damage was recorded in Balusupadu and Mullapadu villages in Penuganchiprolu and Jaggayyapetamandals respectively by recording 25.73 and 24.89% locule damage. Similar findings are observed with the Swaroopa Reddy et al(2022). Who recorded green boll damage caused by pink bollworm ranged between 20 to 90% with a seasonal mean of 26.52%. Further Shrilakshmi and Udikeri(2021)recorded per cent flower damage, green boll damage, no. of larvae and locule damage appeared to be highest in Raichur (5.97%, 42.78%, 61/50bolls, 62.69%).Chinnababuet al(2014) also observed maximum per cent locule damage was at 145 DAS with 44.54% and boll damage was 4.25/30green bolls.

Table: 2. Per cent pink boll worm infestation on flowers, bolls and locules in three major cotton growing mandals of NTR district.

Name of the mandal	Name of the village	Per cent rosette flowers*				Per cent boll damage*				Per cent locule damage*			
		60DAS	100DAS	135DAS	Average IR%	75DAS	120DAS	180DAS	Average IR%	75DAS	120DAS	180DAS	Average IR%
Penuganchiprolu	Gouravaram	4.96 (10.81)d	13.51 (21.42)cd	18.70 (25.47)def	12.39 (20.01)gh	14.54 (22.28)de	20.78 (26.16)cd	46.39 (42.88)	27.24 (30.80)e	4.67 (12.40)bcd	30.28 (33.34)c	52.35 (43.09)c	29.10 (30.72)cde
	Mullapadu	3.81 (10.48)d	12.77 (20.89)d	14.90 (22.66)f	10.49 (18.29)h	12.77 (20.89)e	18.45 (23.68)d	46.27 (42.82)	25.83 (29.73)e	3.99 (11.49)cd	26.93 (30.95)c	43.75 (42.99)c	24.89 (28.05)e
	Konakanchi	9.28 (16.33)ab	17.66 (24.70)abc	24.93 (29.80)bcd	17.29 (24.17)cde	21.82 (27.69)ab	41.15 (39.56)a	61.94 (52.31)	41.64 (39.87)ab	6.49 (14.66)ab	43.29 (41.08)a	72.70 (54.29)ab	40.83 (38.11)a
Jaggayyapeta	Balusupadu	5.53 (12.16)bcd	12.77 (20.89)d	22.35 (28.16)cde	13.55 (20.90)fg	15.96 (23.50)cde	20.78 (26.35)cd	50.06 (45.01)	28.93 (31.88)e	3.99 (11.49)cd	28.20 (31.92)c	45.00 (43.76)c	25.73 (28.56)de
	Anumanchipalli	6.88 (13.58)abcd	16.62 (23.91)bcd	24.93 (29.80)bcd	16.14 (23.06)de	15.58 (23.11)cde	22.16 (26.33)cd	51.42 (45.85)	29.72 (32.36)de	5.19 (13.08)abc	30.39 (33.30)c	55.26 (44.62)bc	30.28 (31.53)cde
	makkapeta	8.25 (14.99)abcd	19.16 (25.90)ab	27.67 (31.63)bc	18.36 (24.78)bcd	17.13 (24.40)bcde	30.47 (32.73)b	60.66 (51.19)	36.09 (36.35)c	5.32 (13.30)abc	31.09 (33.76)bc	57.50 (51.51)abc	31.30 (32.16)cd
Nandigama	Peddavaram	9.11 (15.83)abc	19.74 (26.22)ab	27.01 (31.15)bc	18.62 (25.07)bc	18.70 (25.47)bcd	31.22 (33.65)b	61.19 (51.83)	37.04 (37.00)bc	5.71 (13.74)ab	40.88 (39.71)ab	72.70 (54.29)ab	39.76 (37.34)a
	Cheruvukommupalem	9.45 (16.55)ab	21.28 (27.42)ab	30.86 (33.69)ab	20.53 (26.36)b	20.33 (26.74)abc	31.22 (33.53)b	62.07 (52.03)	37.87 (37.57)bc	5.32 (13.30)abc	34.77 (36.10)abc	57.50 (51.51)abc	32.53 (32.91)bc
	Chandapuram	4.50 (11.21)d	13.51 (21.42)cd	17.66 (24.70)ef	11.89 (19.54)gh	13.51 (21.42)e	19.87 (24.83)d	45.81 (42.54)	26.40 (30.19)e	3.90 (11.30)d	27.94 (31.85)c	52.35 (43.09)c	28.06 (29.87)cde
Vastavai	Bheemavaram	11.84 (17.02)a	22.35 (28.16)a	35.12 (36.29)a	23.10 (28.21)a	24.48 (29.59)a	43.99 (41.38)a	63.65 (52.99)	44.04 (41.35)a	6.65 (14.91)a	43.60 (41.26)a	64.00 (55.75)a	38.08 (36.45)ab
	Kanneveedu	5.89 (13.44)abcd	17.66 (24.70)abc	23.89 (29.10)bcde	15.81 (22.70)ef	16.62 (23.91)bcde	22.16 (27.65)cd	52.15 (46.28)	30.31 (32.77)de	5.19 (13.08)abcd	30.38 (33.39)c	56.71 (45.39)bc	30.76 (31.81)cde
	Gopinenipalem	7.14 (14.09)abcd	17.03 (24.32)bc	21.28 (27.42)cd	15.15 (22.43)ef	17.03 (24.32)bcde	26.32 (30.74)bc	58.13 (49.69)	33.83 (34.95)cd	5.32 (13.30)abc	30.49 (33.46)bc	52.50 (48.38)ab	29.44 (31.08)cde
	CD	4.53	3.73	4.65	1.83	3.79	5.59	N/A	3.01	1.93	6.30	9.78	4.05
	SEm	1.53	1.26	2.23	0.62	1.28	1.89	3.19	1.02	0.65	2.13	3.31	1.37
	CV%	19.18	9.07	9.36	4.68	9.10	10.74	11.54	5.11	8.74	10.55	11.90	7.35

*Figures in the parenthesis are subjected to angular transformed values.

Conclusion:

Based on the results obtained through the present investigation cotton crop is initially invaded by the leafhopper, thrips and whitefly population, then their incidence was declined. Aphid population was slowly buildup and attained peak incidence at 120 DAS. Later on pink boll worm incidence started and causing severe yield losses. The main problem in pest management in cotton is lack of awareness on pest identification and time of application of insecticides especially for pink boll worm. Thus population dynamics play major role in integrated pest management practices.

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