SEASONAL INCIDENCE OF SUCKING PESTS WITH RELATION TO WEATHER PARAMETERS IN *BT* COTTON

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ABSTRACT

The population dynamics of sucking pests Bt cotton along with their correlation with weather factors were studied during 2011-2012 at Junagadh. According to average data the maximum aphid population (74.6 aphids/3 leaves/ plant) was recorded 22nd week whereas, the maximum (16.4 jassids/3 leaves/ plant) activity of jassid was observed during 16th week after sowing. In case of thrips and whitefly, the activity of thrips was highest (22.4 thrips/3 leaves/plant) in 4th week of September and that of whitefly (58.8 whiteflies /3 leaves/plant) during, during 44th standard week. The mealy bug incidence was observed highest (58.8 mealy bugs /plant) during 44th standard week. The weather parameter data showed that the aphid and jassid population had exhibited highly significant positive correlation with weather parameters viz., minimum temperature, morning relative humidity, afternoon relative humidity whereas, in case of thrips it was positively correlated with maximum temperature and minimum temperature. The incidence of whitefly and mealy bug was highly positive correlated with maximum temperature.

Keywords*: Bt cotton, correlation, seasonal incidence, sucking pests, weather parameters*

INTRODUCTION

Cotton crop is known as "White gold" and is a premier commercial crop in India, which occupies only 5 per cent of the arable land and supports 60 million people having direct bearing on the country's economy. India is a unique among the cotton growing countries of the world in which four species of cotton *viz*, *Gossypium hirsutum, G. barbadense, G. arboreum* and *G. herbaceum* are grown commercially under diversified ecosystem. Many allied activities like ginning, fabric production, textile processing, garment manufacture and their marketing etc. provides employment about 6 million people. It also provides 65 percent raw material to textile industry and contributed 1/3rd of total foreign exchange earning of India (Mayee and Rao, 2002). In India, it is cultivated in 110.00 million hectares with 325.00 lakh bale production and an average productivity was 503 kg/ha during 2010-11 (Anon., 2011).

About 160 species of insect pests have been reported to attack the cotton crop in India right from time of germination till the final harvesting of cotton (Agarwal, 1978). The total loss due to cotton pests (jassid and bollworm complex) in north, central and south zone was estimated as 52.80, 46.53 and 47.56 per cent, respectively (Basu *et. al.*, 1990). The sucking pests viz. Aphids (*Aphis gossypii* Glover), Jassids (*Amrasca biguttula biguttula* Ishida), Whiteflies (*Bemisia tabaci* Gennadius), Thrips (*Thrips tabaci* Lindeman) and Mealy bug (*Phenococcus solenopsis* Tinsley) are most serious and destructivesucking pests with regular occurrence. The information on population dynamics in relation to abiotic factors of major sucking pests of the *Bt* cotton particularly under Junagadh condition is very scanty hence in view of the importance of sucking pests, it is necessary to have comprehensive information on this aspect.

METHODOLOGY

The present investigation was carried out at College Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* season of the year 2011-12. The *Bt* hybrid cotton cultivar KDCHH-441 was grown with all the recommended agronomical practices. The plot was kept unsprayed throughout the crop seasons. Plot was divided in to ten quadrates. Five plants were selected randomly from each quadrate and observed at weekly intervals to record incidence of major sucking pests on cotton. Recording of the observations was started with the initiation of infestation of the major sucking pests up to the completion of the crop season.

The observations were recorded in each week from the field. Observations on aphids, jassids, thrips, whiteflies and mealy bug count were recorded by randomly selecting five plants from each field plot on top, middle and bottom leaves per plant. The weekly meteorological data on

maximum and minimum temperature, morning and afternoon relative humidity, mean bright sunshine hours, rainfall and rainy days during the course of study were obtained from the meteorological observatory of Central Experimental Research Station, Junagadh Agricultural University, Junagadh.

RESULTS AND DISCUSSION

The result presented in Table 1 revealed that the aphid began its activity at the 10th week after sowing i.e. 3rd week of September with 0.8 aphids/3 leaves/plant. The aphid population was gradually increased and reached to a peak level of 74.6 aphids/3 leaves/ plant during 22nd week after sowing and gradually declines. The average population of jassid was ranged from 0.8 to 16.4 jassid per 3 leaves per plant which was started appearing during 5 week after sowing i.e. 2nd week of August with a low level (0.8 jassid/3 leaves/ plant). The pest population increased gradually and reached to a peak level of 16.4 jassid during 16th week after sowing.

Table 1 : Seasonal incidence of aphid, jassid, whitefly, thrips and mealy bug on *Bt* cotton KDCHH-441 during *Kharif* - 2011-12

Weeks after sowing	Standard Week	Aphids/3 leaves/ Plant	Jassids/3 leaves/ plant	Whitefly/3 leaves/ plant	Thrips/3 leaves/ Plant	Mealy bugs/ plant
5	32	-	00.8	00.6	00.8	00.2
6	33	-	01.4	01.8	02.8	01.4
7	34	-	02.8	02.6	04.6	02.2
8	35	-	01.6	04.2	07.8	03.8
9	36	-	02.6	05.8	10.6	05.4
10	37	00.8	03.2	09.2	16.4	08.6
11	38	01.4	04.6	14.6	22.4	12.4
12	39	02.6	04.8	18.4	12.8	15.34
13	40	05.4	07.2	26.8	15.6	20.36
14	41	08.4	09.6	32.4	13.4	27.58
15	42	11.6	10.8	38.8	15.2	31.58
16	43	15.8	16.4	44.2	17.4	38.29
17	44	20.6	11.2	58.8	13.2	45.29
18	45	27.2	09.4	26.4	11.8	28.59
19	46	34.6	07.2	18.8	10.6	19.3
20	47	45.2	04.8	10.8	08.8	10.8
21	48	54.8	03.4	05.6	09.4	07.58
22	49	74.6	02.4	07.2	07.2	05.48
23	50	60.8	02.2	06.4	08.4	04.2
24	51	51.8	01.4	04.6	07.6	03.2
25	52	48.6	01.2	03.8	06.4	02.78
26	01	40.2	-	03.2	04.8	01.39
27	02	57.6	-	02.6	03.6	00.7
28	03	42.8	-	01.4	02.8	00.14
29	04	29.4	-	01.2	01.4	00.0

In case of thrips (Table 1), the activity was started during 2nd week of August and attained a peak in 4th week of September (22.4 thrips/3 leaves/plant). The incidence of whitefly was initiated during 32nd std. week with population of 0.6 whitefly per 3 leaves per plant. The pest population increased gradually and reached to a peak level of 58.8 whiteflies per 3 leaves per plant, during 44th std. week on *Bt* cotton (Table 1). The population of mealy bug varied from 0.6 to 58.8 mealy bugs per plant on cotton KDCHH-441. The pest population increased gradually and reached to a peak level of 58.8 mealy bugs per plant, during 44th std. week. Gupta *et al*. (1998) reported the peak population of aphid on cotton during the last week of July to mid August. Reddy *et al*., (2011) showed that the peak incidence of jassid was observed from the second fortnight of October to first fortnight of November in 2009-10 (10.11 to 10.82/leaf) and in the season of 2010-11, the peak incidence was noticed in mid-September to first fortnight of October (6.02 to 5.48/ leaf). Bharpoda *et al.*, (2013) concluded that the peak activity of jassid was recorded during 38th to 45th SMW to the tune of 3.17 to 4.82 per 3 leaves. These results are in line with the present findings. During our studies, the peak activity of

whitefly was recorded during during 44th std. week which corroborate with the results of Deb and Bharpoda (2013) who reported that the peak activity of white fly was observed during 46th SMW (2nd week of November). Panickar and Patel (2001) recorded activity of *T. tabaci* on cotton from 2nd week of August until first week of January. Sharma and Rishi (2004) found the appearance of the whitefly and mealy bug on cotton from the first week of June to end of September, being high between mid-August and end of September which are line with the results of present studies.

Correlation studies

Study on effect of various weather parameters on the fluctuation of aphid population was carried out on cotton and the data obtained are presented in Table 2.

Table 2 : Correlation co-efficients between population of major sucking pests of cotton and weather parameters during *Kharif* - 2011-12

Sr. No.	Sucking pests	Weather parameters								
		Temperature (°C)			Relative humidity (%)			aphid population & brigh sunshine	Rainfall	Rainy day
		Max.	Min.	Ave.	Morn.	Even.	Ave.			
1	Aphid	-0.2871	0.4514	0.8604	0.5796	0.4717	0.9621	-0.4713	-0.3136	-1
2	Jassid	0.8447**	-0.8802	0.5342	0.7123	0.3710	0.9768	-0.7953	-0.5339	-0.5827
3	Thrips	0.5679	0.3583	0.7187	0.7136	0.5041	0.9750	-0.8072	-0.4982	-0.5803
4	Whitefly	0.8071	0.3582	0.7131	0.7108	0.5007	0.9767	-0.8001	-0.4900	-0.5743
5	Mealybug	0.8578	0.3595	0.7106	0.7197	0.5020	0.9790	-0.8137	-0.4950	-0.5693

*Significant at 0.05 level- Aphid (n=20) (r=0.444), Jassid (n=21) (r=0.433), Thrips, Whitefly and mealybug (n=25) (r=0.396)

**Significant at 0.01 level - Aphid (n=20) (r=0.561), Jassid (n=21) (r=0.549), Thrips, Whitefly and mealybug (n=25) (r=0.505)

(1) Aphids

Aphid population had exhibited significantly positive correlation with minimum temperature (r= 0.4514). It was positive correlation with morning relative humidity (r= 0.5796), evening relative humidity (r= 0.4717). Whereas, it was negative correlation with maximum temperature (r= -0.2871), and rainy days (r= -1.0000). Correlation co-efficients between aphid population and bright sunshine hours (r= -0.4713) and rainfall (r= -0.3136) were negative. The present findings on positive relationship between relative humidity and population buildup of aphids corroborate with observations of Mohapatra (2008) and Selvaraj and Adiroubne (2012).

(2) Jassids

The activity of jassid was highly significantly positive correlation with maximum temperature (r= 0.8447), morning relative humidity (r= 0.7123), evening relative humidity (r= 0.3710). Whereas, it was non-significantly negative between pest population and minimum temperature (r= -0.8802), rainfall (r= -0.5339), rainy days (r= -0.5827) and bright sunshine hours (r= -0.7953). Singh *et al*. (2002) reported that population of cowpea jassid positively correlated with maximum temperature and negatively correlated with relative humidity and minimum temperature.

(3) Thrips

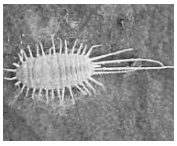
The thrips population had exhibited significantly positive correlations with maximum temperature (r= 0.5679) and minimum temperature (r= 0.3583). It was non-significantly positive between pest population and morning relative humidity (r= 0.7136) and evening relative humidity (r= 0.5041). While, it was non-significantly negative with rainfall (r= -0.4982) and rainy days (r= -0.5803) and bright sunshine hours (r= -0.8072). The impact of BSH showed significantly negative correlation with thrips (--0.8072). The present findings are in controversy with Selvaraj and Adiroubne (2012) who stated that thrips population build up showed a significant and positive correlation with BSH.

(4) Whitefly

The data revealed that whitefly population had exhibited highly significantly positive correlation with maximum temperature (r= 0.8071). It was non-significantly positive with minimum temperature (r= 0.3582), morning relative humidity (r=

0.7108) and evening relative humidity (r= 0.5007) and non-significantly negative with rainfall (r= -0.4900) and rainy days (r= -0.5743) and mean bright sunshine hours (r= -0.8001). Meena *et al*., (2013) concluded that whitefly population exhibited positive correlation with maximum temperature on chilli.

(5) Mealy bugs



The mealy bug population had exhibited highly significantly positive correlation with maximum temperature (r= 0.8578). It was non-significantly positive with minimum temperature (r= 0.3595), morning relative humidity (r= 0.7197) and afternoon relative humidity (r= 0.5020) and non-significantly negative with rainfall (r= -0.4950) and rainy days (r= -0.5693) and mean bright sunshine hours (r= -0.8137). Hanchinal *et. al.* (2010) evaluated that the population dynamics of the mealy bug and revealed that the mealy bug infestation started appearing in the month of September and gradually increased as crop growth advanced.

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