



# **Incidence of Cotton Thrips (*Thrips tabaci* Lindeman) and Its Correlation with Weather Parameters**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Investigations on incidence of cotton thrips (*Thrips tabaci* Lindeman) on *Bt* and non-*Bt* cotton hybrid were carried out at Main Cotton Research Station, Navsari Agricultural University, Surat (Gujarat) during *Kharif*, 2017-18. The thrips incidence initiated from fourth week of June and it continued till first week of December in *Bt* and non-*Bt* cotton. The peak activity of thrips was observed during third week of August in *Bt* hybrid and the higher fluctuation of thrips was observed during the second week of August to third week of September and first week of October. Thrips population had significant negative correlation with maximum temperature in *Bt* cotton. In case of non-*Bt*, the peak activity of thrips was found during first week of September. As far as association with abiotic factors was concerned, maximum temperature and bright sunshine hours had significantly negatively correlation, while minimum temperature and morning relative humidity were positively associated.

**Keywords:** *Thrips*; incidence; cotton; correlation; *Bt* & non-*Bt* hybrid.

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## 1. INTRODUCTION

Cotton (*Gossypium hirsutum* L.), is the “King of fibre” popularly known as “White gold”, an important cash crop in India. The total cotton production was recorded at 113.32 million bales from 32.20 million hectares of total cultivated area with the productivity of 766 kg/ha in the world. The production of cotton was 29.00 million bales from the 13.35 million hectares of cultivated area and the productivity was 473 kg/ha in India [1]. The major cotton producing states are Gujarat, Maharashtra, Telangana, Andhra Pradesh, Karnataka, Madhya Pradesh, Haryana, Rajasthan and Punjab in India. Among the various causes of low productivity of cotton in India the insect pests is one of the major cause. Nowadays sucking insect pests viz., sap feeders aphid; *Aphis gossypii* Glover, leafhopper; *Amrasca biguttula biguttula* Ishida, thrips; *Thrips tabaci* Lindeman and whitefly; *Bemisia tabaci* Gennadius are the major importance [2]. Sucking pests alone caused 40 to 50 per cent damage if unattended [3]. In the era of climate change, also recognized the serious pest status of thrips in *Bt* and non-*Bt* cotton, groundnut, chillies, citrus and pomegranate [4]. The thrips, *T. tabaci* being the minute in size and having short life cycle, inflicting damage unnoticed by the farmers and appeared as one of the limiting factor in achieving higher productivity of cotton. The infestation at seedling stage damaged the leaves which became wrinkled, curled upwards and distorted with white shiny patches. The affected plants showed rusty appearances in patches on lower surface of leaves. The top leaves of the affected plants with rusty appearance could be visible from a distance. Severe infestation during vegetative crop growth caused late bud formation and premature dropping of squares during fruiting stages and delayed crop maturity and ultimate yield reduction. The feeding by thrips on the developing bolls late in the season caused spots or wounds on the pericarp but that did not affect the ripening of the boll or the quality of the seed [5]. The study on population dynamics helps in decision making for the timely application of various control measures. Therefore, the present investigation was carried out on the incidence of thrips in *Bt* and non-*Bt* cotton hybrid.

## 2. MATERIALS AND METHODS

In order to study the population dynamics and impact of weather parameters on the incidence of thrips in *Bt* and non-*Bt* cotton, a field

experiment was carried out under large plot (24 x 30 m) on short to medium duration hybrid, G.Cot.Hy.8 BG II *Bt* and G.Cot.Hy.8 non-*Bt*. The field trials were conducted at the Main Cotton Research Station, Navsari Agricultural University, Surat (Gujarat) during *Kharif*, 2017-18. The incidence of thrips (nymphs and adults) was recorded from three leaves (each from top, middle and bottom canopy) on fifty randomly selected plants. Observations were recorded during morning hours (8 to 10 AM) on account of low movement helping in assessing population counts. The observations were recorded at weekly intervals from seven days after germination till harvest. For recording observations, the whole plot was divided into ten equal quadrates and five plants was selected randomly and tagged in each quadrate. Plots were kept completely free from any insecticidal spray during the whole cropping season. In order to study the instantaneous effect of weather parameters on the population fluctuation of thrips, the weekly observations on the nymphal and adults population were averaged and correlated with the physical factors of environment viz., maximum and minimum temperature, morning and evening relative humidity, bright sunshine hours, rainfall and rainy days by using SPSS statistical software. The weekly data on various weather parameters were obtained from the Meteorology Observatory, Main Cotton Research Station, Navsari Agricultural University, Surat during season.

## 3. RESULTS AND DISCUSSION

### 3.1 Population Dynamics of Thrips, *T. tabaci* on *Bt* Cotton

The periodical week wise data on population of thrips per three leaves are summarized in Table 1 and depicted in Fig. 1. The pest appeared from fourth week of June (26<sup>th</sup> standard week) and it continued till first week of December (49<sup>th</sup> SW) which range from 3.46 to 69.88 thrips/3 leaves. The incidence of thrips gradually increased up to third week of August (34<sup>th</sup> SW) and showing first peak (69.88 thrips/3 leaves). Slightly reduction in incidence was recorded during fourth week of August and first week of September (35<sup>th</sup> and 36<sup>th</sup> SW) and then showed second peak (52.34 thrips/3 leaves) during second week of September (37<sup>th</sup> SW). Again the thrips population decreased during fourth week of September (39<sup>th</sup> SW) and showed third peak (38.30 thrips/3 leaves) during first week of October (40<sup>th</sup> SW).

The above ETL (>10 thrips/leaf) incidence of thrips was observed during the second week of August (33<sup>rd</sup> SW) to third week of September (38<sup>th</sup> SW) and first week of October (40<sup>th</sup> SW). The population of thrips gradually decreased from second week of October (41<sup>st</sup> SW) to first week of December (49<sup>th</sup> SW) and disappeared from the cotton crop from second week of December (50<sup>th</sup> SW). Thus, it is clear from data that relatively higher activity (28.06 to 69.88 thrips/3 leaves) observed during second week of August to first week of October in G.Cot.Hy.8 BG II hybrid. In line with the present findings, Bhute et al. [6] found that peak incidence of thrips (107.65/3 leaves) was recorded in 40<sup>th</sup> SMW (1<sup>st</sup> week of October) in *Bt* cotton. Babu and Meghwal [7] noted that thrips population was higher during 39 to 41<sup>st</sup> standard week and population ranged from 0.0 to 87.0/3 leaves in *Bt* cotton. As per the Latif et al. [8], the thrips

population reached its peak and was highest during the third week of August (7.66/leaf) and onwards decreasing in October due the maturity of the crop. Bhanderi et al. [9] revealed that peak activity of thrips observed during 31<sup>st</sup> to 34<sup>th</sup> SW with peak population (65.75 thrips/3 leaves) in 32<sup>nd</sup> in RCH 2 BG II hybrid. According to Rawal et al. [10], peak activity of thrips was observed during 25<sup>th</sup> to 40<sup>th</sup> SMW (3<sup>rd</sup> week of June to 1<sup>st</sup> week of October) in *Bt* cotton. Sharma and Sharan [11] revealed that the peak population (51.0 thrips/3 leaves) of thrips was observed in 34<sup>th</sup> SMW (3<sup>rd</sup> week of August) in *Bt* cotton. Badgujar et al. [12] reported that activity of thrips was started from 32<sup>nd</sup> to 33<sup>rd</sup> SW and goes its highest peak population (110.2 thrips/3 leaves) recorded in 40<sup>th</sup> SW in first season whereas highest peak population (75.4 thrips/3 leaves) observed in 38<sup>th</sup> SW in second season on BG II hybrids.

**Table 1. Population dynamics of thrips, *T. tabaci* in Bt and non-Bt cotton**

Sr. No.	Standard Week (SW)	Weeks of Month	No. of thrips/3 leaves	
			<i>Bt</i> cotton	Non- <i>Bt</i> cotton
1	26	25 June – 01 July	4.20	2.86
2	27	02 July – 08 July	3.46	5.26
3	28	09 July – 15 July	7.92	8.54
4	29	16 July – 22 July	15.24	10.20
5	30	23 July – 29 July	11.38	12.44
6	31	30 July – 05 August	12.54	11.14
7	32	06 August – 12 August	18.32	17.54
8	33	13 August – 19 August	38.62	22.16
9	34	20 August – 26 August	69.88	27.66
10	35	27 August – 02 Sept.	32.22	32.58
11	36	03 Sept. – 09 Sept.	28.06	35.72
12	37	10 Sept. – 16 Sept.	52.34	30.18
13	38	17 Sept. – 23 Sept.	40.62	23.54
14	39	24 Sept. – 30 Sept.	20.14	15.08
15	40	01 Oct. – 07 Oct.	38.30	12.04
16	41	08 Oct. – 14 Oct.	14.42	9.14
17	42	15 Oct. – 21 Oct.	12.26	7.58
18	43	22 Oct. – 28 Oct.	10.88	8.24
19	44	29 Oct. – 04 Nov.	9.60	5.66
20	45	05 Nov. – 11 Nov.	14.68	7.82
21	46	12 Nov. – 18 Nov.	16.44	8.28
22	47	19 Nov. – 25 Nov.	7.22	3.84
23	48	26 Nov. – 02 Dec.	9.12	0.64
24	49	03 Dec. – 09 Dec.	4.28	1.34
25	50	10 Dec. – 16 Dec.	0.00	0.00
26	51	17 Dec. – 23 Dec.	0.00	0.00
27	52	24 Dec. – 31 Dec.	0.00	0.00
Mean			20.51	13.31

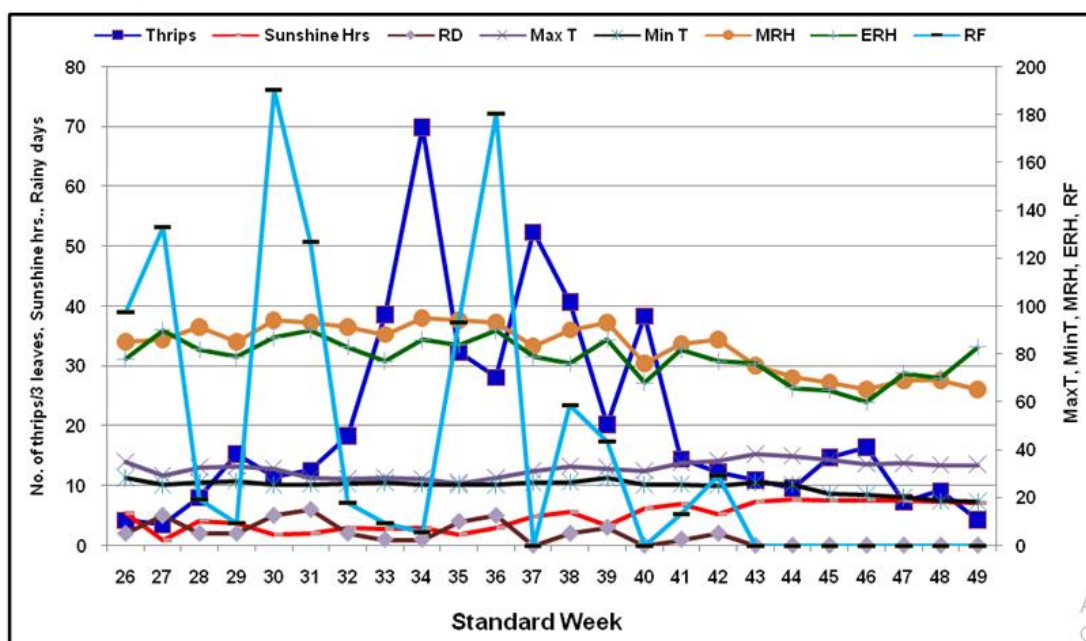


Fig. 1. Population dynamics of thrips in relation to weather parameters on *Bt* cotton

The results on correlation (Table 2) between incidence of thrips and different weather parameters revealed that only maximum temperature ( $r = -0.496^*$ ) showed significant negative association whereas, bright sunshine hours ( $r = -0.247$ ), rainfall ( $r = -0.136$ ) and rainy days ( $r = -0.110$ ) showed non-significant negative association with the thrips population. The minimum temperature ( $r = 0.275$ ), morning relative humidity ( $r = 0.373$ ) and evening relative humidity ( $r = 0.085$ ) had positive association with the incidence of thrips infesting *Bt* cotton hybrid. According to Shivanna et al. [13] revealed that minimum temperature and relative humidity showed non-significant positive whereas rainfall had negative effect on the thrips population in *Bt* cotton. Babu and Meghwal [7] stated that main contributing weather factor for the incidence of thrips in *Bt* cotton was maximum temperature ( $r = -0.613^{**}$ ) and sunshine hours ( $r = -0.344^{**}$ ). Muchhadiya et al. [14] reported that thrips population had significant negative correlation with sunshine hours in *Bt* cotton. Singh et al. [15] stated that thrips population had positive correlation with morning relative humidity (0.219) but negative correlation with rainfall (-0.210) in *Bt* cotton. Kumar et al. [16] reported that thrips population was significantly negatively correlated with maximum temperature in *Bt* cotton. Majeed et al. [17] found that relative humidity and rainfall did not influence the thrips population on *Bt* cotton. Rawal et al. [10] noticed that thrips population in *Bt* cotton showed negative correlation with sunshine hours. According to

Sharma and Sharan [11] relative humidity and rainfall had no significant role on fluctuation of thrips population. Janu et al. [18] revealed that maximum temperature correlated significantly negative while minimum temperature, morning and evening relative humidity correlated significantly positive with thrips population.

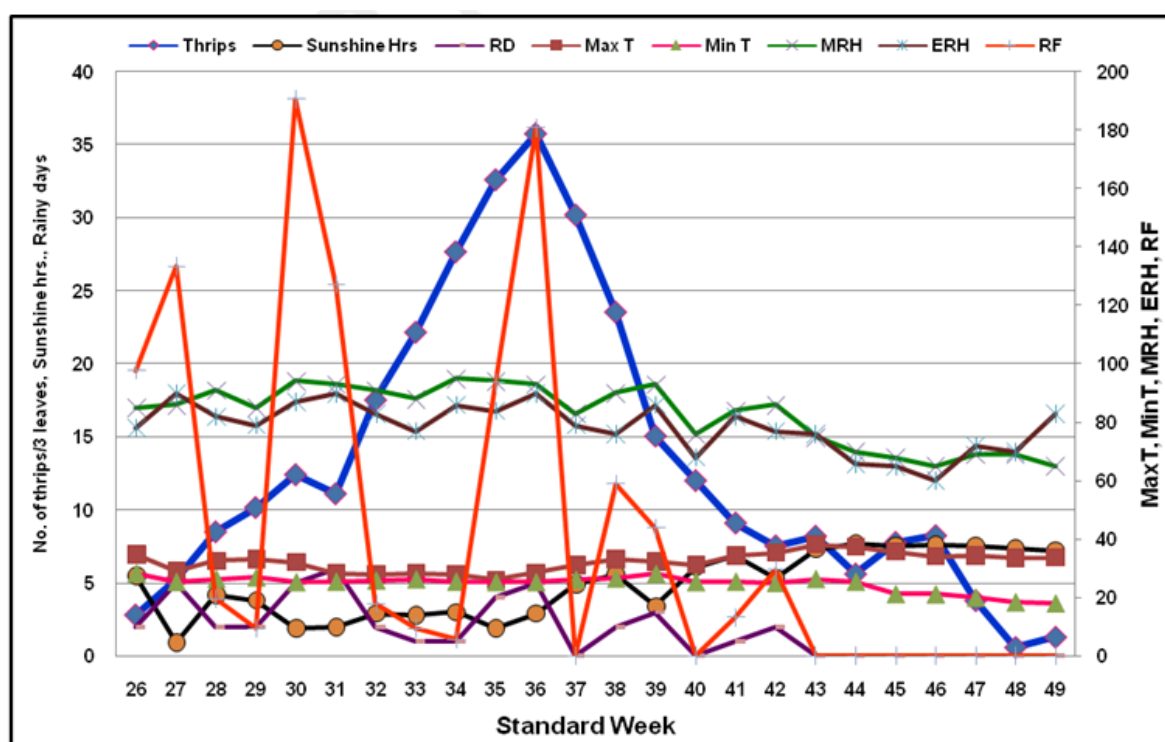
### 3.2 Population Dynamics of Thrips, *T. tabaci* on Non-*Bt* Cotton

The data on population of thrips per three leaf (Table 1 and Fig. 2) revealed that the incidence of pest commenced from fourth week of June (26<sup>th</sup> SW) and it continued till first week of December (49<sup>th</sup> SW) which ranged from 0.64 to 35.72 thrips per three leaf. The incidence gradually increased up to first week of September (36<sup>th</sup> SW) showed its peak (35.72 thrips/3 leaves). Thereafter the population of thrips was decreased from third week of September (38<sup>th</sup> SW) up to first week of December (49<sup>th</sup> SW). The above ETL population of the thrips was observed during the fourth week of August (35<sup>th</sup> SW) to second week of September (37<sup>th</sup> SW). However, pest showed violent fluctuation for its activity with peak (35.72 thrips/3 leaves) during first week of September (36<sup>th</sup> SW). According to Phulse and Udikeri [19], the highest (34.00 thrips/3 leaves) activity of *T. tabaci* recorded during first fortnight of September (36 and 37<sup>th</sup> SMW) on non-*Bt* genotypes.

**Table 2. Correlation between the incidence of *T. tabaci* and weather parameters on *Bt* and non-*Bt* cotton**

Weather parameters	Correlation co-efficient (r)	
	<i>Bt</i> cotton (G. Cot. Hy. 8 BG II)	Non- <i>Bt</i> cotton (G. Cot. Hy.8)
Maximum Temperature, °C (MaxT)	-0.496*	-0.667**
Minimum Temperature, °C (MinT)	0.275	0.405*
Morning Relative Humidity, % (MRH)	0.373	0.614**
Evening Relative Humidity, % (ERH)	0.085	0.377
Bright Sunshine Hours	-0.247	-0.515**
Rainfall, mm(RF)	-0.136	0.275
Rainy days (no.)	-0.110	0.303

\*\*Significant at the  $P < 0.01$  level; \*Significant at the  $P < 0.05$  level



**Fig. 2. Population dynamics of thrips in relation to weather parameters on non-*Bt* cotton**

To determine the influence of various abiotic factors in causing fluctuation in incidence of thrips, a correlation coefficient study attempted. The data showed that minimum temperature ( $r = 0.405^*$ ) and morning relative humidity ( $r = 0.614^{**}$ ) showed significant positive association with the thrips population. The maximum temperature ( $r = -0.667^{**}$ ) and bright sunshine hours ( $r = -0.515^{**}$ ) observed highly significant negative impact on fluctuation of the pest. Rest of the parameters under studied did not show any significant role on the population of the thrips infesting Non-*Bt* hybrid. According to Selvaraj and Adiroubane [20], thrips population had significant and positive correlation with

minimum temperature and morning relative humidity in non-*Bt* cotton. Panwar et al. [21] reported that positive and significant association between thrips population and minimum temperature, morning relative humidity and rainy days. Bhandari et al. [9] revealed that thrips population had significant and negative correlation with maximum temperature ( $r = -0.5427^{**}$ ) and sunshine hours ( $r = -0.7538^{**}$ ) whereas it was significant and positive correlation with minimum temperature ( $r = 0.4789^*$ ), morning relative humidity ( $r = 0.4928^*$ ) and evening relative humidity ( $r = 0.4520^*$ ) in non-*Bt* cotton. Kumar et al. [16] reported that thrips population was significantly

negatively correlated with maximum temperature in non-*Bt* cotton.

#### 4. CONCLUSION

The peak population of *T. tabaci* was observed during the third week of August (34<sup>th</sup> SW) on *Bt* and during first week of September (36<sup>th</sup> SW) on non-*Bt* cotton. The peak activity of thrips *Bt* hybrid was recorded higher (69.88 thrips/3 leaves) on *Bt* cotton hybrid compared to non-*Bt* cotton hybrid (35.72 thrips/3 leaves). Thrips population had significant negative correlation with maximum temperature in *Bt* cotton. In case of non-*Bt*, maximum temperature and bright sunshine hours had significantly negatively correlated, while minimum temperature and morning relative humidity were positively associated.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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