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Effect of abiotic factors on population dynamics of *Thrips tabaci* Lindeman infesting *Bt.* cotton

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Abstract
Present investigation on population dynamics against *Thrips tabaci* Lindeman infesting *Bt* cotton. Dominant invertebrate animal, insect, have capacity to change their behavior and habitat with the changing of the environment and so, it is necessary to see the impact of changing pattern in Abiotic factors on *Thrips tabaci* Lindeman infesting *Bt* cottonwith provide information regarding this utility. The incidence of thrips was commenced from fifteen days after sowing (DAS) i.e., 3rd week of July and continued till third week of November (47th SMW)) *i.e.* 125 DAS which was ranged from 0.96 to 27.96 thrips/three leaves. The infestation showed its peak showed its first peak (27.96 thrips/3 leaves) during 3rd week of August *i.e.*, 34th SMW. After reaching its peak, thrips population was continuously decreased. Association between thrips infestation and weather factors indicated that there was negative significant impact due to maximum temperature [r = -0.570*] on incidence of thrips. There was a significant positive correlation between thrips and morning relative humidity [0.562*], Rainfall [0.768*] and evening relative humidity [0.574*].

Keywords: Population dynamics, *Thrips tabaci* Lindeman, *Bt* cotton

Introduction
Cotton is a fiber, oil and protein yielding crop of global significance. This multipurpose crop supplies five basic products *viz*., seed, lint, oil, hulls and linters. The seeds are being use for crop production, animal feed and oil extractions (by refining) and seed meal for livestock feed. While, lint is used in textile industry and linters are used for various industrial purpose.In India, cotton crop was grown over an area of 124.29 lakh ha with a production of 370 lakh bales and productivity 506 kg/ha. Such a crop has a pride of place in the farming of Gujarat's Agriculture. The economy of the entire state is very much dependent on success or failure of this cash crop. In Gujarat, cotton crop was grown over an area of 26.23 lakh ha with a production of 104.00 lakh bales and productivity 674.00 kg/ha (Anonymous, 2018) [1]. Studies on the role of various abiotic factors are of prime importance as they have a profound impact on the survival, development and population build-up of insect pests. The extent of losses caused by sucking pests, bollworms and both of them have been recorded up to 12, 44 and 52 per cent, respectively on *Hirsutum* cotton (Dhawan *et al.*, 1988) [7]. A thysanopteran pest, thrips (*Thrips tabaci* Lindeman) belongs to a family Thripidae having rasping and sucking type of mouthparts which causes scrapping of the cotton by lacerating the leaf tissues of cotton leaves from underside which imbibes the oozing sap from the leaf cell and sucks the sap. Initially white specks can be observed which later coalesce and results in silvery shining on the under surface along the veins of leaf and at the end leaf curls up and it loose the natural luster/succulence. Life cycle of thrips varies greatly with temperature. Development from egg to adult may last from less than 15-20 days at very warm temperature to several weeks at cool temperature. Studies on population dynamics of thrips helps in effective management strategies in cotton agro ecosystem. Studies on the role of various abiotic factors are of prime importance as they have a profound impact on the survival, development and population build-up of insect pests. The extent of losses caused by sucking pests, bollworms and both of them have been recorded up to 12, 44 and 52 per cent, respectively on *Hirsutum* cotton (Dhawan *et al.*, 1988) [7].

Materials and Methods
Experiment layout
The population study of thrips was carried out on *Bt* cotton variety, RCH-2 during *Kharif*

2018-19 at Cotton Research Station, Junagadh Agricultural University and Junagadh. The crop was grown in a plot size of 20 m x 20 m at the spacing of 120 cm x 45 cm. All other agronomical practices were followed as per the scientific recommendations. The crop under the experiment was free from any insecticidal sprays throughout the cropping season.

Observation

For recording the observations, the plot was divided in ten equal quadrates each of size 2.4 m x 1.8 m from which 5 plants were selected randomly and tagged. Population of thrips was recorded by observing three leaves from upper, middle and lower portion of each tagged plant at weekly interval from appearances of the pests till harvest of the crop.

Data analysis

With a view to study the impact of different abiotic factors [*i.e.*, Maximum Temperature (MaxT^0C), Minimum Temperature (MinT^0C), Morning Relative Humidity (RH_1%), Evening Relative Humidity (RH_2%), Rainfall (mm R), Wind Speed (WS kmhr^{-1}) and Bright Sunshine Hours, (BSS hrday^{-1})] on pest incidence, a simple correlation between pest population and weather parameters was worked out. The weekly meteorological data were obtained from the Meteorological Observatory of Junagadh Agricultural University, Junagadh.

Results and discussion

In the present investigation, it was observed that the incidence of thrips was commenced from 3rd week of July *i.e.*, 29th Standard Meteorological Week (SMW) and 15 day after sowing (DAS) and continued till third week of November (47th SMW) *i.e.*,125 DAS which ranged from 0.96 to 27.96 (thrips/three leaves) (Table 1). The population of *T. tabaci* was fluctuated during the crop period. The infestation (0.96 thrips/3 leaves) was started from 3rd week of July (29th SMW) and showed its first peak (27.96 thrips/3 leaves) during 3rd week of August *i.e.*, 34th SMW. In subsequent weeks, the incidence was decreased and reached to 1.55 thrips/3 leaves during 3rd week of November (47th SMW). Starting from germination of the crop, pest showed continuous trend of increasing and after reaching its first peak thrips were continuously decreased. The similar trend was observed by Bindu and Patel (2001) [6], Prasad *et al.* (2009) [11], Sitaramaraju *et al.* (2010) [14] and Bhute *et al.* (2012) [5]. However in contrast Shitole and Patel (2009) [12], Babu and Meghwal (2014) [2] and Nemade *et al.* (2018) [9] the present findings are vary with their worker. This might be due to location and weather parameters.

Table 1: Infestation of thrips, *Thrips tabaci* in cotton during *Kharif* 2018

Sr. No.	Month	SMW	Mean of thrips, *T. tabaci* /3 leaf
1.	July	29	0.96
2.		30	2.25
3.		31	5.85
4.	August	32	10.65
5.		33	19.48
6.		34	27.96
7.		35	21.14
8.	September	36	16.34
9.		37	13.16
10.		38	9.34
11.		39	7.64
12.	October	40	6.34
13.		41	5.94
14.		42	5.28
15.		43	3.88
16.		44	3.01
17.	November	45	2.33
18.		46	2.07
19.		47	1.55

Note: SMW- Standard Metrological Week

The data (Table 2) on association between thrips, *T. tabaci* infestation and weather factors indicted that there was negative significant impact due to maximum temperature [r = -0.570*] on incidence of thrips. There was a significant positive correlation between thrips and morning relative humidity [0.562*]. Rainfall [0.768*] and evening relative humidity [0.574*] has significantly positive correlation to infestation of *T. tabaci*. There was no any significant linear correlation either negative or positive between incidences of *T. tabaci* population for rest of the abiotic factors. However, bright sunshine hours [-0.336] was negatively, wind speed [0.254] and minimum temperature [0.437] were positively correlated with the incidence of *T. tabaci* population. The similar trend was observed by Babu and Meghwal (2014) [2], Panwar *et al.* (2015) [10], Bhanderi *et al.* (2016) [4] and Nemade *et al.* (2018) [9]. However, in contrast, Shivanna *et al.* (2011) [13], Badgujar *et al.* (2018) [3] and Kumar *et al.* (2016) [8] are varying with the present findings.

Table 2: Correlation of *T. tabaci* infesting *Bt* cotton with abiotic factors during *Kharif* 2018

Abiotic factors	Mean of thrips, *T. tabaci*
Maximum Temperature, ^{0}C (MaxT)	-0.570*
Minimum Temperature, ^{0}C (MinT)	0.437
Morning Relative Humidity, % (RH_1)	0.562*
Evening Relative Humidity, % (RH_2)	0.574*
Rainfall, mm (R)	0.768*
Wind Speed, kmhr^{-1} (WS)	0.254
Bright Sunshine Hours, hrday^{-1} (BSS)	-0.336

* Significant at 5% level (r = 0.444), n=19

Conclusion

The incidence of thrips was commenced from fifteen days after sowing (DAS) i.e., 3rd week of July and continued till

third week of November. The infestation showed its peak showed its first peak during 3rd week of August. After reaching its peak, thrips population was continuously decreased. Association between thrips infestation and weather factors indicated that there was negative significant impact due to maximum on incidence of thrips. There was a significant positive correlation between thrips and morning relative humidity, Rainfall and evening relative humidity.

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