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Seasonal Activities of Thrips (*Thrips tabaci* Lindeman.) in Onion and Their Relation with the Various Environmental Factors

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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

Aim: To study the population dynamics of thrips (*Thrips tabaci* Lindeman) infesting onion in relation to weather parameters
Study Design: Field trail; Randomized Block Design.
Place and Duration of Study: The study was conducted at College farm at Navsari Agricultural University (NAU) Southern Gujarat, INDIA during Rabi of 2022-23 and 2023-24.
Methodology: For observations of thrips (*Thrips tabaci* Lindeman), the whole experimental plot was divided in five sectors and 5 plants were randomly selected from each sector. The observations

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on absolute thrips population were recorded at weekly interval by counting the number of thrips per plant during morning hours starting from one week after transplanting till to harvesting of the crop.
Results: Thrips population initiated during 3rd week of December (51st Standard Meteriological Week) during both the year in the range of 2.25 to 15.87, 1.60 to 24.50 and 2.51 to 18.85 thrips per plant with an average of 6.67, 10.54 and 8.60 per plant during 2022, 2023 and in average of two years. The highest peak (15.87 /plant) was observed during 3rd week of February (8th Standard Meteriological Week) in 2022 whereas, during 4th week of February (9th Standard Meteriological Week) in 2023 as well as in average of two years with a population of 24.50 and 18.85 per plant, respectively. Thrips population had highly significant positive correlation with MaxT (r=0.678) whereas, highly significantly negatively correlated with Evening Relative Humidity (r = -0.727) during 2022. The population of thrips highly significantly positively correlated with Bright Sunshine Hours (r=0.672) during 2023. The other weather parameters had no role on incidence of thrips as the results were non-significant.
Conclusion: results of population dynamics of thrips (*Thrips tabaci*) on Onion for both the years, it can be concluded that the infestation of thrips was higher during 5th week of January to 1st week of March on onion.

Keywords: Thrips; Thrips tabaci; Lindeman.; onion; population dynamics; weather parameters.

1. INTRODUCTION

The onion (*Allium cepa* L.) is a common vegetable plant in the *Alliaceae* family. The onion commonly known as the bulb onion or common onion is the genus Allium's most frequently farmed species. Onion (*A. cepa*) is one of the important vegetables (bulb) crop, believed to have originated from Central Asia. In India, it is cultivated for more than 5000 years. According to colour, there are red, white and yellow types. Red and white varieties are grown in India. Onions is a critical source of numerous phytonutrients as flavonoids, fructooligo saccharides (FOS), and thiosulfates and other sulfur compounds, identified as crucial factors of the Mediterranean eating regime Liguori et al. [1]. Onion is a main supply of phytochemicals beneficial for human health and wealthy in sulphur compounds accountable for their usual odour and flavour Loredana et al. [2]. In Gujarat, major onion growing districts are Bhavnagar, Junagadh, Jamnagar, Rajkot, Amreli, Surendranagar, Mehsana, Surat and Kheda. The area production in onion in Gujarat state have increased during last decade. The area under cultivation was about 100 thousand ha and production of about 25.55 lacs MT. According to Hill [3], insect pest attacking the onion are onion thrips (*Thrips tabaci* Lindeman), onion fly (*Delia hylema*), aphids (*Myzus ascalomicus*), cut worm (*Agrotis ipsilon*), onion maggot (*Delia anticua*), army worm (*Spodoptera exiqua*) and leaf miner (*Liriomyza trifolii* B.). Of these thrips, *T. tabaci* is one of the common and the most damaging pest of onion. This polyphagous insect occurs worldwide and attacks virtually all Allium crops Lal and Singh, [4] and Gupta et al. [5]. Thrips attack onion at all the stages of crop growth, but their number increases from bulb initiation and remains high up to bulb development till maturity. Nault et al. [6] reported about 30-50 per cent and also causes significant reduction (28-73%) in the bulb size. Moreover, weather parameters also play a pivotal role in the biology of any insect pests. Temperature, humidity, sun shine hours and wind velocity are the most crucial weather parameters influencing the rate of growth and development of insect pests.

2. MATERIALS AND METHODS

2.1 Research Location

Onion was transplanted during third week of December and raised by adopting recommended agronomical practices at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari. The crop was sown during Rabi in the years 2022-23 and 2023-24.

2.2 Methodology

The Agrifound light red variety of onion raised on the experimental plot of 20 × 20 m^2 size with the spacing 15 cm x 10 cm. The crop was sown in second week of December. The plot was kept insecticide free for pest development. For observations of thrips, the whole experimental plot was divided in five sectors and 5 plants were randomly selected from each sector. The observations on absolute *Thrips tabaci* population were recorded at weekly interval by counting the number of thrips per plant during

morning hours starting from one week after transplanting till to harvesting of the crop.

The data on weather parameters were collected from meteorological observatory of College farm, Department of Meterology, N. M. College of Agriculture, Navsari Agricultural University for the investigation. The relationship between meteorological variables viz., maximum temperature (MaxT), minimum temperature (MinT), morning relative humidity (RH1), evening relative humidity (RH2), bright sunshine hours (BSS) and wind speed (WS) and pest population was studied. The weekly mean observation made on insect pests was subjected to Pearson's correlation coefficient analysis. Also, correlation analysis was conducted for the data of number of thrips per plant with weather parameters.

3. RESULTS AND DISCUSSION

The data presented in the (Column 4 in Table 1), reveals that the pest population started from 2nd Week After Transplanting, i.e., 51st Standard Meteriological Week. The pest population of thrips fluctuated from 1.82 to 15.87 thrips/plant. The pest activity gradually increased from the 1st Standard Meteriological Week to 3rd Standard Meteriological Week, then a slight decline was seen the following week i.e., on 4th Standard Meteriological Week. After that, the population gradually increased till the peak pest population was observed. The peak activity was seen in 8th Standard Meteriological Week when highest number of thrips per plant i.e., 15.87 thrips/plant was recorded. After that, it gradually declined till the harvest.

The data recorded in the year 2023-24 (Column 5 in Table 1) (Fig. 1), was found to be similar to the data of the previous season. The pest population started from 2nd week of transplanting during 3rd week of December (51st Standard Meteriological Week) and remained in the field up to 4th week of March (13th Standard Meteriological Week) in the range of 1.60 to 24.50 thrips per plant with an average of 10.54. The population further increased during next week and found increasing upto 4th week of February and reached to the highest peak (24.50 per plant) during 4th week of February (9th Standard Meteriological Week). The incidence of thrips gradually decreased then after upto the harvest of the crop.

The average data of two years on thrips population (Column 6 in Table 1) revealed that the thrips appeared from 3rd week of December (50th Standard Meteriological Week, 2nd Week After Transplanting)) and persisted throughout the crop season up to 4th week of March (13th Standard Meteriological Week, 16th Week After Transplanting). The incidence of thrips was at the highest peak (18.85 per plant) during 4th week of February (9th Standard Meteriological Week. The population was in range of 2.01 to 18.85 thrips per plant with 8.60 mean population. In nutshell, the thrips population in rabi onion crop was observed higher during last week of January to 1st week of March. Patel [7] observed the higher incidence of thrips on onion during first week of February and remained in the field till to crop maturity at Anand. Panse et al. [8] noticed the peak thrips population during 10th meteorological standard week. According to Patel and Patel [9], thrips population initiated after 1st week after transplanting and attended its highest peak during 2nd week of March and remained in field till to crop matured. Chhatrola et al. [10] also reported higher activity of thrips in garlic during 9th to 16th week after transplanting. Kumawat et al. [11] recorded the incidence of thrips on onion during 3rd week of February (3.66 /plant) and peaked during the last week of March (40.32 thrips /plant).

3.1 Correlation of Thrips Population with Weather Parameters

The correlation analysis between number of larvae per plant and weather parameters of the year 2022-23. The population of thrips (Column 2 in Table 2) had highly significant positive correlation with MaxT (r=0.678) indicating that as MaxT increased; the incidence of thrips also increased or vice versa. Thrips population was highly significantly negatively correlated with Evening Relative Humidity (r = -0.727). It indicates that as there is a unit increase or decrease in Evening Relative Humidity, the population of thrips was decreased or increased. The other weather parameters Minimum Temperature and Bright Sunshine Hours were positively correlated with population but the result was non-significant. Similarly, MinT, Temperature Morning Relative Humidity, Evening Relative Humidity, Medium Relative Humidity and Wind Speed were non significantly negatively correlated with thrips population.

During the year 2023-24, the correlation between number of thrips per plant and weather

parameters revealed that the population of thrips had highly significant positive correlation with BSS (r=0.672). The population of thrips was positively correlated with Maximum Temperature, while it was negatively correlated with Minimum Temperature, Medium Tempoerture, Morning Relative Humidity, Medium Relative Humidity, Evening Relative Humidity and Wind Speed.

Table 1. Population dynamics of thrips, *T. tabaci* on onion

Months and Weeks		Weeks after transplanting	Std. Meteorological Week	No. of thrips /plant 2022	2023	Average
1		**2**	**3**	**4**	**5**	**6**
December	**II**	1	50	0.00	0.00	0.00
	III	2	51	2.42	1.60	2.01
	IV	3	52	3.10	3.24	3.17
January	**I**	4	1	2.25	4.84	3.54
	II	5	2	3.94	5.61	4.77
	III	6	3	5.38	3.22	4.30
	IV	7	4	3.61	8.40	6.00
	V	8	5	8.55	12.20	10.37
February	**I**	9	6	10.73	14.81	12.77
	II	10	7	12.40	16.33	14.36
	III	11	8	15.87	20.54	18.21
	IV	12	9	13.20	24.50	18.85
March	**I**	13	10	11.68	22.34	17.01
	II	14	11	7.55	15.72	11.63
	III	15	12	4.21	10.11	7.16
	IV	16	13	1.82	5.24	3.53
Mean				**6.67**	**10.54**	**8.60**

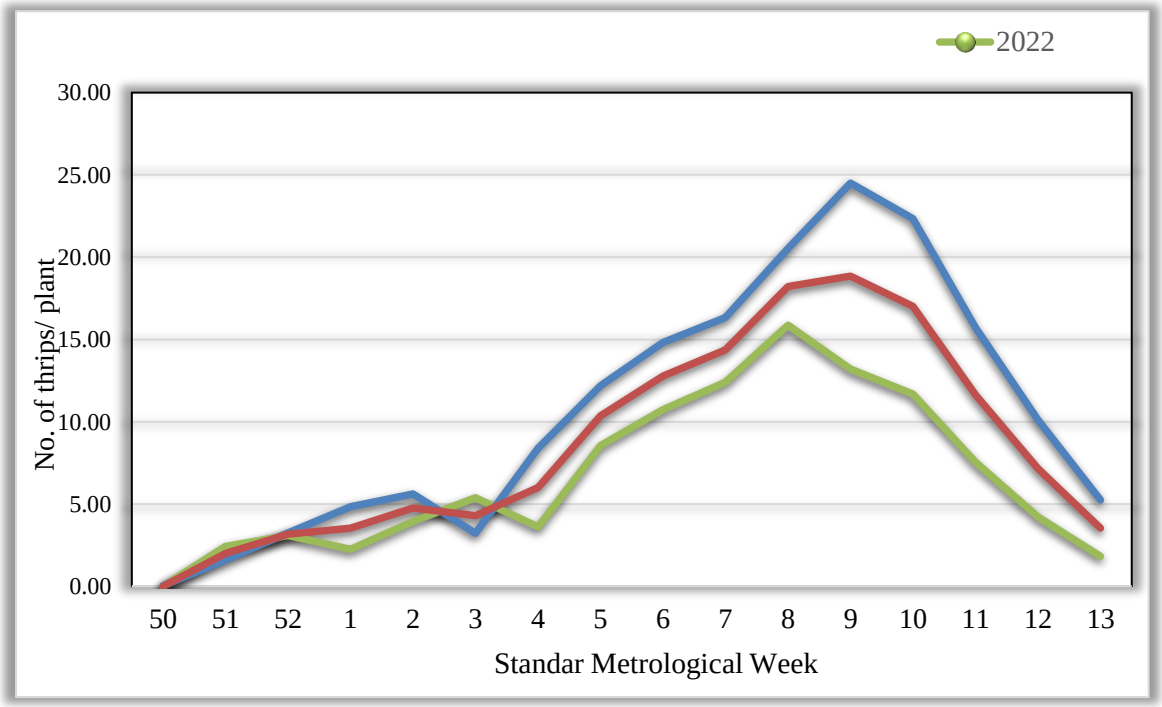

Fig. 1. Population dynamics of *Thrips tabaci* L. on onion

Table 2. Relationship between weather parameters and population of thrips in onion

Weather parameters	Correlation Co-efficient (r)	
	2022	2023
1	2	3
Maximum Temperature, ºC (MaxT)	0.678**	0.340
Minimum Temperature, ºC (MinT)	-0.209	-0.422
Mean Temperature, ºC (MeT)	0.476	-0.135
Morning Relative Humidity, % (MoRH)	-0.298	-0.255
Evening Relative Humidity, % (EvRH)	-0.727**	-0.300
Mean Relative Humidity, % (MeRH)	-0.623	-0.222
Wind Speed, km/hr (WS)	-0.233	-0.102
Bright Sun Shine Hours, hr/day (BSS)	0.354	0.672**

**Significant at 5 per cent level **Significant at 1 per cent level*

Waiganjo et al*.* [12] concluded that there was significantly negative correlation between thrips population and both maximum and minimum relative humidity. Patel [7] reported that thrips population on garlic significantly positively correlated with bright sunshine hours and morning vapour pressure however, significantly negatively correlated with morning relative humidity, evening relative humidity, evening vapour pressure and mean vapour pressure. Bhonde et al*.* [13] reported that maximum temperature had significant positive correlation with thrips population and minimum temperature, relative humidity (am), relative humidity (pm) and rainfall had non-significant negative correlation with thrips population.

4. CONCLUSION

With the reference of the above results of population dynamics of thrips on Onion for both the years, it can be concluded that the infestation of thrips was higher during 5th week of January to 1st week of March on onion. Thus, the weather parameters Maximum Temperature, Evening Relative Humidity and Bright Sunshine hours had significant and major role on fluctuation of thrips during season. Hence, with increase or decrease in Evening Relative Humidity, population of thrips was decreased or increased. This knowledge will enable the farmers to keep track of the said pest according to the changing climate.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text to image generation have been used during writing or editing of manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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