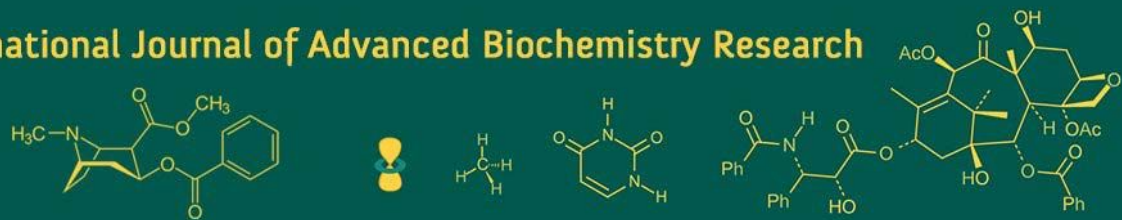


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Population dynamics of invasive thrips, *Thrips parvispinus* (Karny) infesting chilli (*Capsicum annuum* L.) in the coastal zone of North Tamil Nadu

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Abstract

This experiment was carried out at four major chilli-growing villages in Cuddalore district near Annamalai University, Chidambaram during *Kharif* and *Rabi* seasons in the year 2022-23. Direct counting method and blue sticky traps were used to record the population of thrips. The maximum thrips population was observed in Ayipettai (mean no. of 16.84±0.01 thrips/flower on 36th SMW) followed by Parampattu (10.76±0.04 thrips/flower on 34th SMW) during *Kharif*, 2022. The peak incidence was recorded from 34 to 38th SMW in all the four villages. The peak incidence (mean no. of 10.92±0.04 thrips/ flower) was recorded on the 12th SMW in Ayipettai village, followed by 8.98±0.02 thrips/flower in Parampattu, 7.88±0.03 thrips/flower in Sakkangudi and 6.04±0.04 thrips/flower in Parathurchavadi on the 14th SMW during *Rabi*, 2022-23. On an average, the highest number of adult thrips was recorded in all four villages from the 32 to 37th SMW during *Kharif*, 2022 and the thrips population raised from the 51st SMW in all four selected villages during *Rabi*, 2022-2023 in blue sticky traps. During *Kharif*, 2022, the thrips population was positively correlated with maximum temperature, humidity, rainfall, and windspeed. During *Rabi*, 2022-23, the population recorded a significant positive correlation with maximum temperature, minimum temperature, and positive correlation with rainfall, humidity, and wind speed.

Keywords: Chilli, solanaceae, sucking pests, thrips, Thysanoptera

1. Introduction

Chilli (*Capsicum annuum* L.) is one of the most economically important vegetable crops in the world [1]. It is also known as hot pepper and belongs to the family Solanaceae. The origin of chilli was found to be South and Central America [2]. It is used all-over the world and consumed in fresh, dried, and in powder form [3]. India is the world's leading producer of chillies with an annual yield of 4363 thousand metric tonnes [4]. The main chilli-growing states in India are Andhra Pradesh, Maharashtra, Karnataka, Orissa, Tamil Nadu, Bihar, Uttar Pradesh, and Rajasthan [5]. The chilli production is threatened by around 293 insects and mite species which damages the crop both in the field as well as in storage [6]. Additionally, the recently invaded black tobacco thrips, *Thrips parvispinus* (Karny) is considered to be a destructive polyphagous pest causing significant damage to pepper and other solanaceous crops [7, 8]. The spread of *T. parvispinus* from Southeast Asia to other countries like Oceania, North America, Europe, Africa, and now India is due to the increased movement of plant materials through international trade [9, 10]. In India, *T. parvispinus* was first time reported on papaya and various studies suggested that Indonesia could be the potential source of this pest introduction [11]. Then it was reported in ornamental *Dahlia rosea* cav. in Karnataka [12]. Later spread was documented on bell pepper crops in Andhra Pradesh, Chattisgarh, and Karnataka and also *Mangifera indica* in Tamil Nadu [13, 14, 15]. The thrips infestations on non-pungent chillies were recorded across the Anand district of Gujarat [16, 17].

2. Materials and Methods

Extensive surveys were undertaken to document the occurrence of *T. parvispinus* on chilli, by following fixed plot survey in four major chilli-growing villages such as Parampattu, Ayipettai, Sakkangudi and Parathurchavadi (Figure 1 & 2) in Chidambaram Taluk of Cuddalore district, the coastal zone of north Tamil Nadu.

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The survey was conducted during *Kharif* and *Rabi* seasons in the year 2022-23.

2.1 Survey location and cropping pattern

All the surveys were conducted in farmers' fields and they were well informed about the objectives of the survey. The crop was maintained by following recommended crop production practices without any crop protection techniques

and insecticide spray. In each location (village), two fields each of 20 cents were earmarked for the fixed plot survey and to adopt two different scouting methods. There was half a kilometre distance between two fields. Surface irrigation was done to the crop which was raised in rows of 45cm apart and the distance within a row of 60cm. The details of cultivars raised during various cropping seasons at the selected locations were as follows.

The details of cultivars raised during various cropping seasons at the selected locations were as follows.

Location	Cropping details			
	Kharif, 2022 (May-October)		Rabi, 2022-23 (October-April)	
	Variety	Duration of the crop (days)	Variety	Duration of the crop (days)
Sakkangudi	CO1	200-210	CO2	200-216
Ayipettai	PLR1	180-216	CO2	200-216
Parampattu	CO1	200-210	CO3	165-170
Parathurchavadi	CO1	200-210	CO3	165-170

2.2 Scouting

Scouting was undertaken during morning or evening hours at weekly intervals from the flowering stage of the crop to record the occurrence of *T. parvispinus*. Then the mean data was correlated with abiotic factors and regression equation was derived. Two different scouting methods such as direct visual count and trapping by using blue sticky traps were followed separately. In the earmarked field, five spots of 5x5m were selected by criss-cross pattern and ten plants

were observed in each spot randomly. In total 50 plants were audited. Mean number of *T. parvispinus* per flower was calculated. Each spot was considered as a replication. Thus, five replications were followed. Five rows along the borders were avoided while recording the data (Figure 3) [18]. For the direct visual count, all the flowers in the randomly selected 10 plants per spot were observed for the presence of thrips using hand lens (10x) (Figure 4).



Fig 1: Field view of survey locations at Parampattu, Ayipettai, Sakkangudi, and Parathurchavadi-Kharif, 2022



Fig 2: Field view of survey locations at Parampattu, Ayipettai, Sakkangudi, and Parathurchavadi-Rabi, 2023

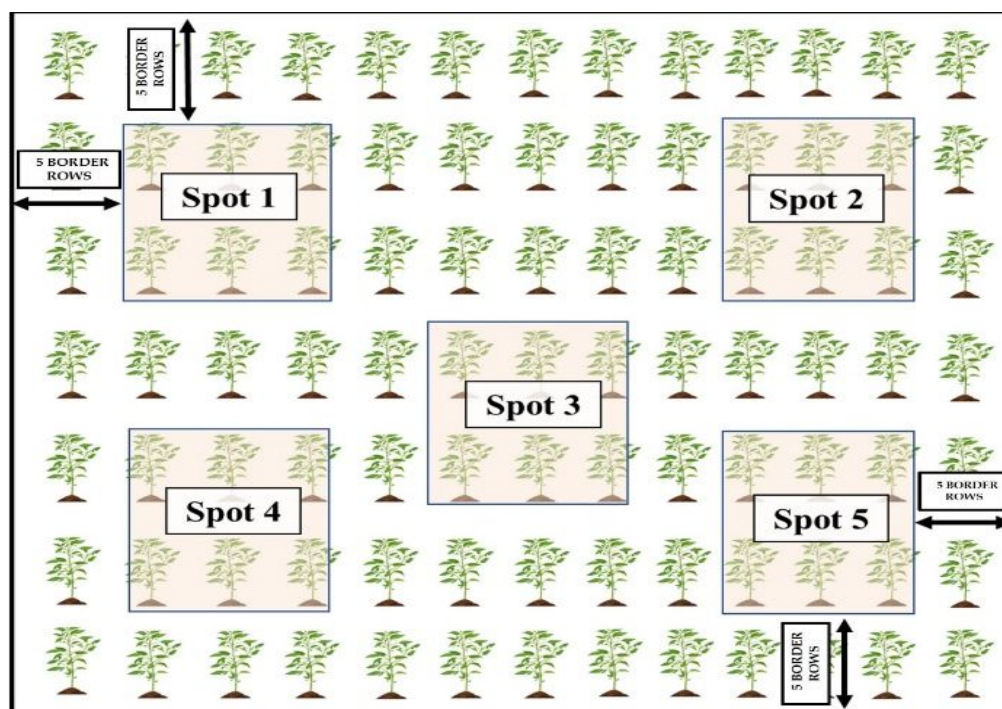


Fig 3: Schematic Layout of Scouting



Fig 4: Infested flower with adult thrips

For the trapping, blue sticky traps of 24×20 cm, engraved with 2.5×2.5 cm squares (6.25 cm^2 area) were used. The traps were mounted on bamboo poles, and positioned along the height of the plant. Five such traps were used in 20 cent field. A thin layer of castor oil was smeared over the blue board. Once in a week, the squares on the boards were observed and the thrips stuck over the surface were taken into account. Ten randomly selected squares on the board were counted and mean per square was worked out. The weekly average meteorological parameters were calculated from the daily meteorological data of the study area for minimum and maximum temperatures, relative humidity, wind velocity, and rainfall. The meteorological data were obtained from the Agro-meteorological Observatory, Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram.

3. Results

3.1 Population dynamics of *T. parvispinus* on chilli in the coastal zone of north Tamil Nadu

3.1.1 Kharif, 2022 (Direct-count)

The data recorded during the survey which was carried out in the coastal zone of Chidambaram, Cuddalore district, Tamil Nadu during *Kharif*, 2022, is presented in the Table 1. Very low incidence of *T. parvispinus* was found in the first two standard meteorological weeks (25 and 26th SMW).

Thrips incidence was gradually increased from 27th SMW in all the four locations where the surveys were conducted. The maximum thrips population was observed in Ayipettai (mean no. of 16.84 ± 0.01 thrips/flower on 36th SMW) followed by Parampattu (10.76 ± 0.04 on 34th SMW), Sakkangudi (10.56 ± 0.02 on 37th SMW) and Parathurchavadi (9.32 ± 0.01 on 37th SMW). The thrips population was started to decline from the 39th SMW, and reached the population size of about 0.36 ± 0.01 , 3.48 ± 0.04 , 0.92 ± 0.04 and 1.96 ± 0.02 at the end of 42nd SMW in Parampattu, Ayipettai, Sakkangudi and Parathurchavadi villages, respectively. Thrips incidence started from the 25th SMW and persisted up to the 42nd SMW during *Kharif*, 2022. The peak incidence was recorded from 34 to 38th SMW in all the four villages.

3.1.2 Rabi, 2022-23 (Direct-count)

During *Rabi*, 2022-23, a similar pattern of incidence was noticed as in the *Kharif*, 2022. However, very low incidence was reported in the first five weeks of flowering and the *T. parvispinus* population gradually increased from the 2nd SMW in all the selected villages. Pest population was found to be below 5.00, up to 5th SMW. The peak incidence (mean no. of 10.92 ± 0.04 thrips/ flower) was recorded on the 12th SMW in Ayipettai village, followed by 8.98 ± 0.02 in Parampattu, 7.88 ± 0.03 in Sakkangudi and 6.04 ± 0.04 in Parathurchavadi on the 14th SMW (Table 2).

Table 1: Incidence of *T. parvispinus* on Chilli during *Kharif*, 2022 (Direct-Count)

Standard Meteorological Week	* Number of <i>T. parvispinus</i> /flower			
	Parampattu	Ayipettai	Sakkangudi	Parathurchavadi
25	0.12 ± 0.01	0.48 ± 0.04	0.24 ± 0.04	0.16 ± 0.01
26	0.32 ± 0.01	0.52 ± 0.03	0.18 ± 0.04	0.12 ± 0.03
27	2.12 ± 0.03	3.64 ± 0.02	1.08 ± 0.01	2.24 ± 0.04
28	3.32 ± 0.04	5.96 ± 0.01	3.16 ± 0.03	2.48 ± 0.02
29	4.72 ± 0.02	5.52 ± 0.04	3.96 ± 0.04	3.16 ± 0.04
30	5.56 ± 0.04	6.92 ± 0.01	5.00 ± 0.01	3.72 ± 0.03
31	5.32 ± 0.04	7.48 ± 0.04	5.52 ± 0.03	4.84 ± 0.04
32	7.52 ± 0.01	7.68 ± 0.04	7.56 ± 0.04	5.88 ± 0.04
33	8.68 ± 0.04	10.24 ± 0.02	7.4 ± 0.04	5.48 ± 0.01
34	10.76 ± 0.04	12.32 ± 0.03	8.32 ± 0.03	6.04 ± 0.04
35	10.64 ± 0.03	13.52 ± 0.04	8.48 ± 0.04	6.72 ± 0.01
36	8.44 ± 0.01	16.84 ± 0.01	9.16 ± 0.04	7.44 ± 0.03
37	6.92 ± 0.03	13.72 ± 0.03	10.56 ± 0.02	9.32 ± 0.01
38	5.16 ± 0.01	11.16 ± 0.01	8.72 ± 0.04	8.28 ± 0.01
39	3.72 ± 0.03	9.72 ± 0.04	5.68 ± 0.03	7.48 ± 0.01
40	3.76 ± 0.03	5.84 ± 0.03	4.48 ± 0.01	4.36 ± 0.03
41	1.44 ± 0.02	4.56 ± 0.04	2.12 ± 0.04	2.32 ± 0.01
42	0.36 ± 0.01	3.48 ± 0.04	0.92 ± 0.04	1.96 ± 0.02

* Mean $\pm$ SE of 10 plants

Table 2: Incidence of *T. parvispinus* on Chilli during Rabi, 2022-23 (Direct-Count)

Standard Meteorological Week	* Number of <i>T. parvispinus</i> /flower			
	Parampattu	Ayipettai	Sakkangudi	Parathurchavadi
49	0.14±0.03	0.46±0.01	0.32±0.01	0.14±0.04
50	0.24±0.02	0.58±0.03	0.46±0.04	0.24±0.04
51	0.28±0.04	1.04±0.04	0.52±0.01	0.44±0.04
52	0.58±0.04	1.74±0.01	0.92±0.04	0.88±0.03
01	0.84±0.03	1.76±0.02	1.88±0.03	0.92±0.02
02	1.48±0.04	2.96±0.01	1.96±0.04	1.76±0.01
03	1.94±0.01	2.84±0.04	2.00±0.02	2.08±0.04
04	2.84±0.04	3.96±0.03	2.04±0.01	2.12±0.03
05	3.28±0.03	4.88±0.04	2.56±0.03	2.44±0.04
06	5.44±0.02	5.24±0.04	3.64±0.01	2.52±0.03
07	6.76±0.04	6.48±0.01	4.84±0.04	2.76±0.01
08	6.94±0.03	7.00±0.03	4.04±0.02	3.00±0.04
09	5.98±0.01	8.44±0.04	5.08±0.03	4.08±0.04
10	7.44±0.04	8.88±0.01	5.36±0.04	4.64±0.01
11	7.52±0.01	9.08±0.02	5.44±0.04	5.84±0.04
12	7.76±0.04	10.92±0.04	6.52±0.03	5.92±0.03
13	7.94±0.03	9.74±0.01	7.68±0.04	6.00±0.02
14	8.98±0.02	9.88±0.04	7.88±0.03	6.04±0.04

* Mean ± SE of 10 plants

Table 3: Incidence of *T. parvispinus* on Chilli during Kharif, 2022 (Blue sticky trap)

Standard Meteorological Week	* Number of <i>T. parvispinus</i> /square			
	Parampattu	Ayipettai	Sakkangudi	Parathurchavadi
25	0.12±0.04	0.24±0.02	0.32±0.04	0.22±0.02
26	0.18±0.03	1.46±0.02	0.96±0.03	0.82±0.02
27	3.28±0.01	3.44±0.03	3.32±0.01	3.38±0.01
28	4.32±0.04	5.14±0.03	4.84±0.04	3.92±0.01
29	5.26±0.03	5.98±0.01	6.22±0.04	4.26±0.02
30	7.46±0.01	6.28±0.02	6.12±0.03	4.68±0.01
31	8.52±0.01	7.12±0.01	7.56±0.01	6.92±0.02
32	10.24±0.04	9.88±0.04	9.16±0.01	8.26±0.03
33	11.26±0.01	12.22±0.01	11.12±0.02	11.96±0.03
34	11.48±0.03	15.96±0.01	13.52±0.01	12.24±0.01
35	12.48±0.01	17.96±0.04	13.12±0.01	13.24±0.04
36	10.48±0.02	15.84±0.01	11.82±0.03	12.88±0.02
37	8.88±0.03	13.44±0.01	8.92±0.04	9.94±0.02
38	7.24±0.03	12.98±0.02	7.16±0.03	7.92±0.01
39	7.62±0.02	9.82±0.03	8.12±0.01	7.96±0.01
40	6.18±0.03	8.24±0.03	7.72±0.02	6.88±0.01
41	5.52±0.03	7.12±0.01	7.86±0.01	5.92±0.01
42	5.26±0.04	6.34±0.01	6.12±0.01	4.68±0.02

* Mean ± SE of 10 squares

Table 4: Incidence of *T. parvispinus* on Chilli during Rabi, 2022-23 (Blue sticky trap)

Standard Meteorological Week	* Number of <i>T. parvispinus</i> /square			
	Parampattu	Ayipettai	Sakkangudi	Parathur-chavadi
49	0.24±0.01	0.44±0.02	0.14±0.02	0.32±0.04
50	1.26±0.03	1.32±0.03	1.32±0.04	1.42±0.04
51	2.48±0.02	2.44±0.04	2.34±0.04	2.38±0.02
01	4.34±0.02	4.14±0.01	3.84±0.03	4.94±0.01
02	4.46±0.03	4.98±0.02	5.44±0.01	3.46±0.01
03	4.66±0.02	5.48±0.04	5.14±0.04	3.68±0.03
04	5.54±0.04	5.14±0.04	6.56±0.01	4.94±0.01
05	6.44±0.04	6.88±0.02	6.16±0.04	5.46±0.02
06	7.46±0.01	7.44±0.04	6.14±0.03	6.96±0.01
07	6.48±0.02	7.96±0.03	7.54±0.01	7.44±0.03
08	7.48±0.01	8.96±0.01	7.14±0.01	7.64±0.01
09	6.48±0.01	9.14±0.01	6.84±0.01	7.38±0.02
10	6.88±0.01	7.44±0.03	6.94±0.03	5.94±0.01
11	6.44±0.03	6.98±0.02	6.16±0.02	6.94±0.03
12	6.64±0.03	7.84±0.01	7.14±0.03	6.96±0.01
13	5.18±0.02	7.44±0.02	6.74±0.01	6.88±0.03
14	4.54±0.02	6.14±0.02	6.86±0.02	5.64±0.01

* Mean ± SE of 10 squares

3.1.3 Kharif, 2022 (Blue sticky trap)

Very low population of thrips were found during the first two weeks (25 and 26th SMW) of flowering during *Kharif*, 2022 (Table 3). The thrips population raised from the 27th SMW in all four locations. On an average, the highest number of adult thrips was recorded in all four villages from the 32 to 37th SMW. The highest number of adults (17.96±0.04 thrips/ square) was trapped on 35th SMW at Ayipettai village in the Blue sticky trap followed by Sakkangudi (13.52±0.01 on 34th SMW), Parathurchavadi (13.24 on 35th SMW) and Parampattu (12.48±0.01 on 35th SMW). After the 35th SMW, the number of thrips declined, and reached the lowest level of 5.26±0.04, 6.34±0.01, 6.12±0.01 and 4.68±0.02 in Parampattu, Ayipettai, Sakkangudi, and Parathurchavadi respectively at 42nd SMW.

3.1.4 Rabi, 2022-23 (Blue sticky trap)

During *Rabi* 2022-23, very low thrips were found during the first two weeks (49th and 50th SMW). The thrips population raised from the 51st SMW in all four selected villages (Table 4). On an average, the highest number of adult thrips was recorded in all four villages from the 5 to 12th SMW. The highest number of adult thrips (9.14±0.01 thrips/square) was trapped on 9th SMW at Ayipettai village in the Blue sticky trap followed by Parathurchavadi (7.64±0.01 on 8th SMW), Sakkangudi (7.54±0.01 on 7th SMW), and Parampattu (7.48±0.01 on 8th SMW). After the 12th SMW, the number of thrips captured tended to decline, reaching the lowest thrips counts of 4.54±0.02, 6.14±0.02, 6.86±0.02 and 5.64±0.01 in Parampattu, Ayipettai, Sakkangudi and Parathurchavadi, respectively at 14th SMW (Table 4).

3.2 Correlation between weather parameters and population dynamics of

T. parvispinus

3.2.1 Kharif, 2022

During the *Kharif*, 2022, a positive correlation was registered between the thrips population and maximum temperature ($r = 0.485, 0.336, 0.278, \text{ and } 0.487$, respectively) at Parampattu, Ayipettai, Sakkangudi and Parathurchavadi. It was observed that *T. parvispinus* incidence in Parampattu, Ayipettai and Parathurchavadi

exhibited a negative correlation with the minimum temperature ($r = -0.436, -0.399 \text{ and } -0.441$, respectively). Thrips population in Sakkangudi village recorded a significant ($P \leq 0.05$) negative correlation with the minimum temperature (-0.584) (Table 5). A positive correlation with humidity ($r = 0.035, 0.161, 0.167 \text{ and } 0.084$) was observed in thrips population of Parampattu, Ayipettai, Sakkangudi and Parathurchavadi villages. Thrips population in Parampattu, Ayipettai, Sakkangudi and Parathurchavadi recorded a positive correlation with the rainfall ($r = 0.106, 0.104, 0.151 \text{ and } 0.155$ respectively) and wind speed ($r = 0.410, 0.355, 0.197 \text{ and } 0.235$ respectively).

3.2.2 Rabi, 2022-23

During *Rabi*, 2022-23, it was found that *T. parvispinus* incidence in Parampattu, Ayipettai, Sakkangudi and Parathurchavadi were recorded a significant ($P \leq 0.05$) positive correlation with maximum ($r = 0.802, 0.753, 0.740, 0.845$), and minimum temperature ($r = 0.675, 0.619, 0.612, 0.758$) (Table 6). A positive correlation was registered in the thrips population of Parampattu, Ayipettai, Sakkangudi and Parathurchavadi with humidity ($r = 0.246, 0.138, 0.069 \text{ and } 0.314$). A positive correlation with rainfall ($r = 0.449, 0.694$) was observed in Sakkangudi and Parathurchavadi villages, whereas thrips population in Parampattu and Ayipettai villages recorded a significant ($P \leq 0.05$) positive correlation with rainfall (0.615, 0.590). *T. parvispinus* population in Parampattu, Ayipettai, Sakkangudi and Parathurchavadi recorded a positive correlation with the windspeed ($r = 0.282, 0.370, 0.281 \text{ and } 0.361$) (Table 6).

3.3 Regression equation on population dynamics of *T. parvispinus*

3.3.1 Kharif, 2022

The regression equation on the population of *T. parvispinus* in chilli during *Kharif*, 2022 are presented in the Table 7. The mean population against weekly average meteorological parameters showed a good and statistically significant R^2 value for thrips population in Parampattu (0.628), Ayipettai (0.511), Sakkangudi (0.631) and Parathurchavadi (0.619) at 5 percent level.

Table 5: Correlation between weather parameters and the population of *T. parvispinus* (*Kharif*, 2022)

Sl. No	Survey location	Temperature (°C)		Humidity (%)	Rainfall (mm)	Windspeed (Km/sec)
		Maximum	Minimum			
1	Parampattu	0.485	-0.436	0.035	0.106	0.410
2	Ayipettai	0.336	-0.399	0.161	0.104	0.355
3	Sakkangudi	0.278	-0.584*	0.167	0.151	0.197
4	Parathurchavadi	0.487	-0.441	0.084	0.155	0.235

* Significant at 5 percent level

Table 6: Correlation between weather parameters and the population of *T. parvispinus* (*Rabi*, 2022-23)

Sl. No	Survey location	Temperature (°C)		Humidity (%)	Rainfall (mm)	Windspeed (Km/sec)
		Maximum	Minimum			
1	Parampattu	0.802*	0.675*	0.246	0.615*	0.282
2	Ayipettai	0.753*	0.619*	0.138	0.590*	0.370
3	Sakkangudi	0.740*	0.612*	0.069	0.449	0.281
4	Parathurchavadi	0.845*	0.758*	0.314	0.694	0.361

* Significant at 5 percent level

3.3.2 Rabi, 2022-23

The mean population against weekly meteorological parameters showed a good and statistically significant R^2

value for *T. parvispinus* population in Parampattu (0.744), Ayipettai (0.684), Sakkangudi (0.626) and Parathurchavadi (0.844) at 5 percent level during *Rabi*, 2022-23 (Table 8).

Table 7: Regression equation on the population dynamics of *T. parvispinus* (Kharif, 2022)

Sl. No.	Study area	Regression equation	R ²
1	Parampattu	$Y = 18.089 + 0.385 X_1 - 1.175 X_2 + 0.019 X_3 - 0.075 X_4 + 0.041 X_5$	0.628*
2	Ayipettai	$Y = 9.434 + 0.418 X_1 - 1.164 X_2 + 0.129 X_3 - 0.110 X_4 + 0.083 X_5$	0.511*
3	Sakkangudi	$Y = 16.611 + 0.241 X_1 - 0.961 X_2 + 0.030 X_3 - 0.062 X_4 + 0.014 X_5$	0.631*
4	Parathurchavadi	$Y = 1.938 + 0.552 X_1 - 0.838 X_2 + 0.059 X_3 - 0.062 X_4 - 0.022 X_5$	0.619*

* Significant at 5 percent level; X₁-Maximum temperature; X₂-Minimum temperature; X₃-Relative humidity; X₄-Rainfall; X₅-Wind speed

Table 8: Regression equation on the population dynamics of *T. parvispinus* (Rabi, 2022-23)

Sl. No.	Study area	Regression equation	R ²
1	Parampattu	$Y = -35.058 + 1.289 X_1 - 0.552 X_2 + 0.128 X_3 - 0.033 X_4 + 0.117 X_5$	0.744*
2	Ayipettai	$Y = -31.610 + 1.323 X_1 - 0.623 X_2 + 0.073 X_3 - 0.025 X_4 + 0.220 X_5$	0.684*
3	Sakkangudi	$Y = -17.538 + 0.707 X_1 - 0.248 X_2 + 0.034 X_3 - 0.037 X_4 + 0.095 X_5$	0.626*
4	Parathurchavadi	$Y = -24.024 + 0.834 X_1 - 0.308 X_2 + 0.087 X_3 - 0.012 X_4 + 0.089 X_5$	0.844*

*Significant at 5 percent level; X₁-Maximum temperature; X₂-Minimum temperature; X₃-Relative humidity; X₄-Rainfall; X₅-Wind speed

4. Discussion

4.1 Population dynamics of *T. parvispinus* on chilli in the coastal zone of north Tamil Nadu

4.1.1 Direct count

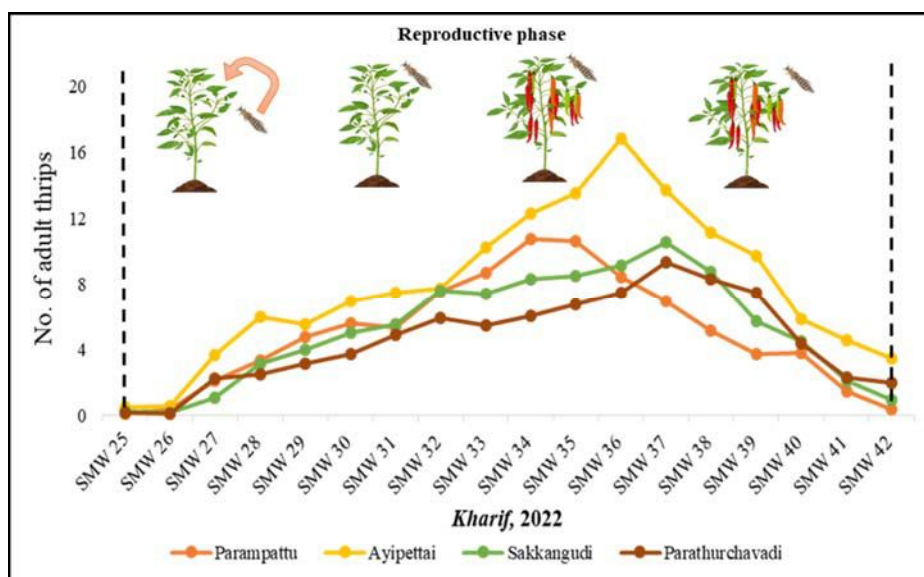
Very low incidence of *T. parvispinus* found in the early stage of the crop in both the seasons (Kharif, 2022 and Rabi, 2022-23) is due to the absence/scattered flowering during the initial vegetative phase in chilli. Sartiami and Mound (2013) [7] in their study indicated the same. Incidence of *T. parvispinus* was gradually increased from 27th SMW (Kharif, 2022) and 2nd SMW (Rabi, 2022-23) in all the four villages (Figure 5 & 6). However, the thrips occurrence in the above-mentioned SMW's coincided with the chilli flowering phase. This showed that *T. parvispinus* has a strong preference for chilli flowers, indicating that they are anthophilous thrips feeding on pollen.

Similar behaviour was also observed in the flower thrips, *Frankliniella occidentalis* (Pergande), since; the pollen is a main component in the diet of adult thrips [19, 20]. The maximum thrips population was recorded in peak flowering phase in all the four villages i.e., 34 to 38th SMW during Kharif, 2022 and 10 to 14th SMW during Rabi, 2022-23 (Figure 5 & 6). Among the four villages, the maximum thrips population was observed in Ayipettai, followed by Parampattu, Sakkangudi and Parathurchavadi during both

seasons. This might be attributed to the microclimate where Ayipettai is located near the riverbank. Ananthakrishnan (1993) [21] stated that the microclimate is very important in altering the population. The suitable environmental factors like high temperature and humidity supports the spread of thrips population [22, 23, 24]. It was also observed that the thrips population started to decline when the chilli plants entered the later stage of the reproductive phase. Similar trend was recorded at the later age of Cayenne pepper plants (*C. frutescens*) at Melinggih Kelod village in Bali, Indonesia [25].

4.1.2 Blue sticky trap

The adult thrips started to get trapped gradually from the flowering phase of the chilli plants (Figure 7 & 8). The highest number of adult thrips (17.96±0.04 and 9.14±0.01 thrips/square) was trapped on 35th and 9th SMW of Kharif, 2022 and Rabi, 2022-23, respectively at Ayipettai village. The thrips incidence was higher during the Kharif season than the Rabi, and it was confirmed by the observations obtained from the blue sticky traps [26, 27]. The number of thrips captured tend to decline after the 35th SMW of Kharif, 2022 and 12th SMW of Rabi, 2022-23 in all the selected four villages (Figure 7 & 8).

**Fig 5:** Population dynamics of *T. parvispinus* on Chilli during Kharif, 2022 (Direct count)

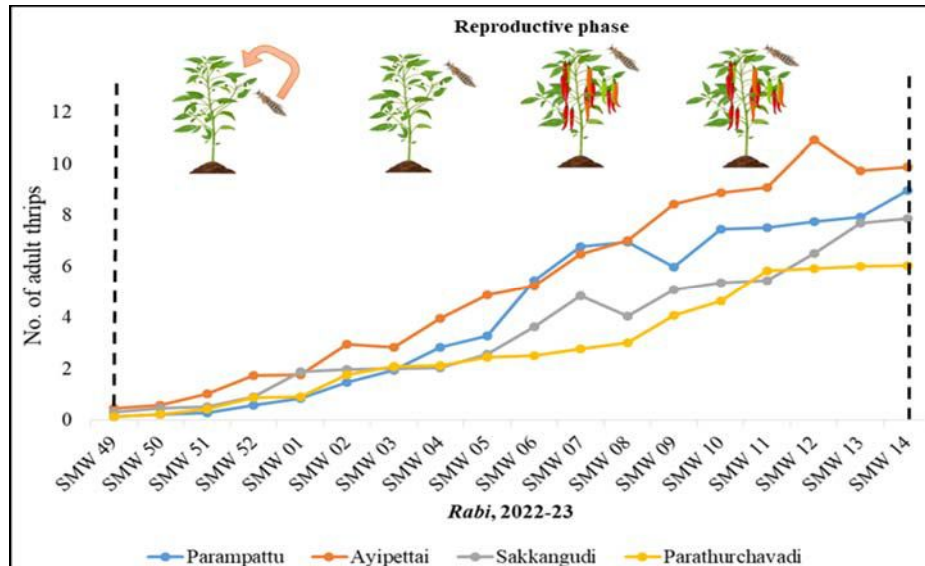


Fig 6: Population dynamics of *T. parvispinus* on Chilli during Rabi, 2022-23 (Direct count)

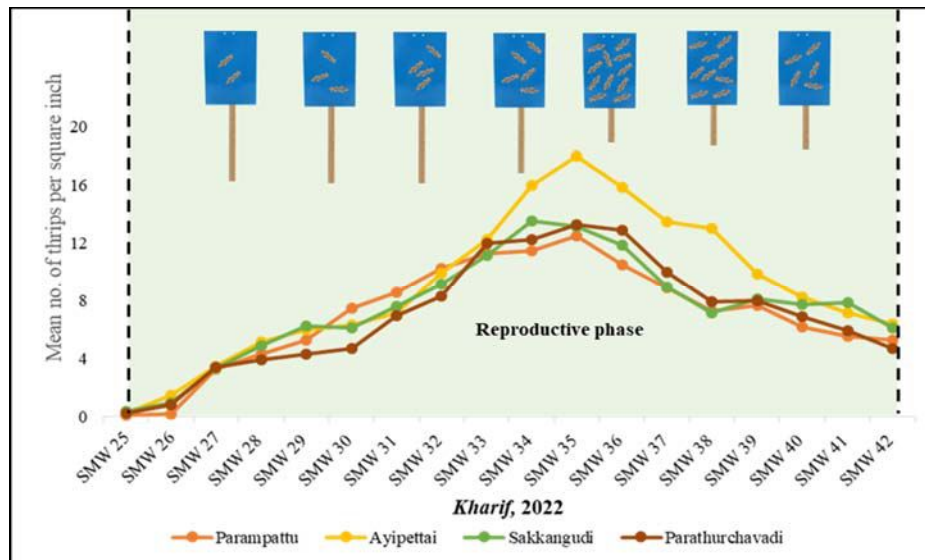


Fig 7: Population dynamics of *T. parvispinus* on Chilli during Kharif, 2022 (Blue sticky trap)

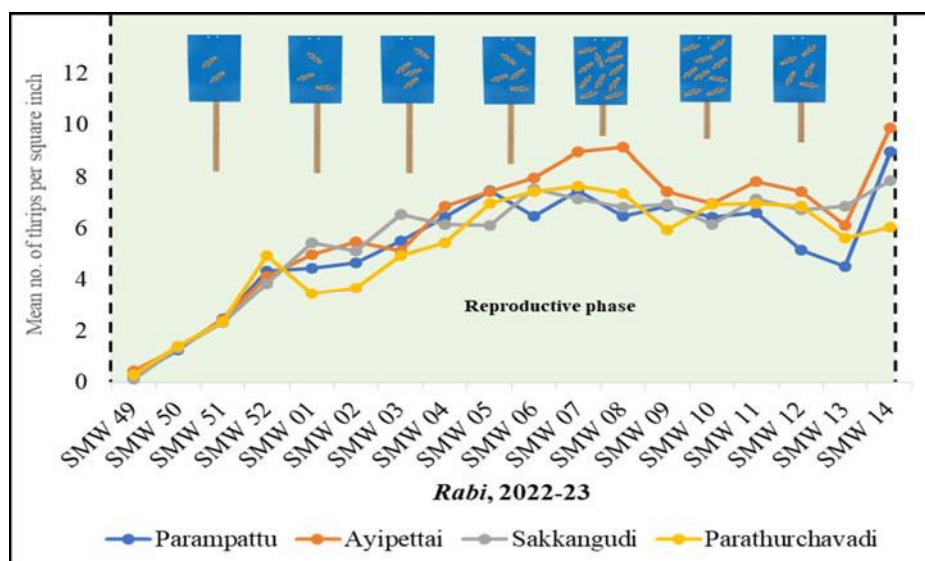


Fig 8: Population dynamics of *T. parvispinus* on Chilli during Rabi, 2022-23 (Blue sticky trap)

4.2 Correlation between weather parameters and population dynamics of *T. parvispinus*

T. parvispinus

During *Kharif*, 2022 and *Rabi*, 2022-23, it was found that *T. parvispinus* registered positive correlation with humidity, rainfall, and wind speed. In *Kharif*, 2022, *T. parvispinus* is positively correlated with maximum temperature and negatively correlated with minimum temperature. Whereas, in *Rabi*, 2022-23, a significant positive correlation was observed in thrips population with maximum and minimum temperature. The present study showed that the population of *T. parvispinus* increased with increase in maximum temperature, humidity, rainfall and windspeed. The thrips population increased due to the presence of maximum temperature (~35 °C) prevailed in 34 to 39th SMW during *Kharif*, 2022. Similarly, the maximum temperature (~30 to 33 °C) and minimum temperature (~24 to 26 °C) favours the incidence of *T. parvispinus*, which was prevailed in 8 to 14th SMW during *Rabi*, 2022-23. Regarding windspeed, heavy winds influenced the highest dispersal of *T. parvispinus* (~25 to 35 km/hr) because they are passive fliers. Many farmers used closer plant spacing and this made the chilli plants more likely to be infested by *T. parvispinus*. The reason for this was the changing microclimate above the crop canopy with increased humidity and temperature. The current findings align with the observations made by Dirgayana *et al.* (2021) [24], who reported that an increase in plant spacing leads to a decrease in the population of *T. parvispinus* in treatment plots. Similar results were obtained by Rabeena *et al.* (2020) [28], who found that temperature and rainfall influence the seasonal dynamics of thrips, *Frankliniella schultzei* incidences in tomato fields.

4.3 Regression equation on population dynamics of *T. parvispinus*

The mean population against weekly average meteorological parameters showed a good and statistically significant R² value for thrips population in Parampattu (0.628 and 0.744), Ayipettai (0.511 and 0.684), Sakkangudi (0.631 and 0.626) and Parathurchavadi (0.619 and 0.844) at 5 percent level during *Kharif*, 2022 and *Rabi*, 2022-23, respectively. The present findings are supported with earlier findings of Naresh *et al.* (2017) [29] and Akashe *et al.* (2016) [30] who reported that maximum and minimum temperature, humidity and rainfall had a positive impact on the *T. palmi* incidence.

5. Conclusion

The study reveals that the *T. parvispinus* population increased with increase in the temperature, humidity and windspeed. The maximum thrips incidence was on the 34th to 38th SMW during *Kharif*, 2022 and in the season *Rabi*, 2022-23, the highest infestation was on the 10th to 14th SMW in all the four villages of Cuddalore district. The highest number of adult thrips trapped in the blue sticky trap was on 35th (17.96±0.04 thrips/flower) and 9th SMW (9.14±0.01 thrips/flower) of *Kharif*, 2022 and *Rabi*, 2022-23, respectively at Ayipettai village. Among the four villages, the maximum thrips population was observed in Ayipettai, followed by Parampattu, Sakkangudi and Parathurchavadi village during both seasons. In both the seasons, thrips population is positively correlated with the weather parameters such as maximum temperature,

humidity, rainfall and windspeed. These findings highlight the influence of climatic factors on *T. parvispinus* population dynamics, emphasizing the need for weather-based forecasting models and timely integrated pest management strategies to mitigate its impact on crop production.

6. References

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