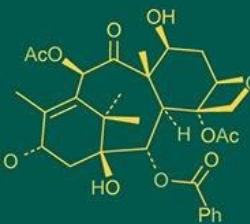
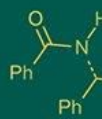


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Population dynamics of invasive *Thrips parvispinus* (Karny) infesting chilli in Prayagraj

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Abstract

A field study was conducted during the 2023-24 *Kharif-Rabi* season at Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj, to investigate the population dynamics of *Thrips parvispinus* in chilli crops and its correlation with weather parameters. Infestation began in mid-August (33rd SMW) with 0.26 thrips per flower, coinciding with the onset of flowering, and peaked in early January (1st SMW) at 14.67 thrips per flower. The highest populations were observed under cooler temperatures (mid to low 20s °C), low rainfall, and elevated morning relative humidity. In contrast, lower infestation levels (<1.00 thrips/flower) occurred during periods of high maximum temperatures (mid to upper 30s °C) and minimal rainfall. Correlation analysis revealed significant negative relationships between thrips population and maximum temperature ($r = -0.931^{**}$), minimum temperature ($r = -0.904^{**}$), and sunshine hours ($r = -0.432^{**}$). Other parameters, such as rainfall and relative humidity, showed non-significant correlations. Multiple linear regression indicated that the combined weather variables explained 93.00% ($R^2 = 0.930$) of the variation in thrips population. These results highlight the critical role of climatic factors in influencing *T. parvispinus* population dynamics, providing a foundation for developing weather-based integrated pest management strategies to improve chilli crop productivity.

Keywords: *Thrips parvispinus*, chilli, population dynamics, weather parameters, *Kharif-Rabi* season, correlation analysis, regression analysis

Introduction

Chilli stands as a vital commercial spice and vegetable crop in India, widely recognized for its versatility and commonly referred to as the “wonder spice.” The country leads globally in the production, consumption, and export of dry chillies. During the year 2021-22, chilli was cultivated over an estimated 852,000 hectares, producing around 1,578,000 metric tons with a productivity rate of 1.90 MT per hectare (Anon., 2023a) ^[2]. More than 35 species of insects and mites have been documented as pests affecting chilli cultivation. Among these, thrips and mites are identified as the most significant threats to successful chilli production. Historically, *Scirtothrips dorsalis* (Hood) has been regarded as the principal thrips species attacking chilli. However, a new invasive species, *Thrips parvispinus* (Karny), has recently emerged, inflicting considerable damage on chilli leaves, flowers, and fruits across major chilli-producing areas in India. This species was initially detected on papaya in Bangalore, Karnataka (Tyagi *et al.*, 2015) ^[10]. Subsequent outbreaks of *T. parvispinus* on chilli crops have been recorded in southern states such as Andhra Pradesh, Karnataka, and Telangana, where damage levels have ranged between 50% and 80% (Anon., 2022) ^[11]. Known for its wide host range, this polyphagous pest affects a variety of fruit, vegetable, and ornamental plants, including coffee, gardenia, papaya, potato, sweet pepper, green bean, tobacco, *Vigna* spp., strawberry, watermelon, eggplant, and various cucurbits (Moritz *et al.*, 2013) ^[6]. Both nymphs and adult thrips predominantly inhabit the undersides of leaves and flowers, extracting plant sap and causing visible injury (Kalshoven, 1981) ^[5]. Symptoms include punctures and scratches on leaves, along with brown streaks on flower petals due to feeding damage, leading to desiccation and flower loss. Heavy infestations can severely affect plant health, reduce flowering, inhibit fruit development, and ultimately cause substantial yield losses. In extreme cases, crop loss may exceed 85% (Prasannakumar *et al.*, 2021) ^[7]. This research aims to investigate the seasonal occurrence of the invasive thrips species *Thrips parvispinus* in chilli cultivation.

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By analyzing fluctuations in its population in relation to various environmental conditions, the study seeks to generate valuable knowledge essential for formulating effective integrated pest management (IPM) practices. These insights are intended to protect chilli yields and promote long-term agricultural sustainability.

Materials and Methods

The investigation on the population dynamics of invasive thrips (*Thrips parvispinus*) in chilli was undertaken at the Central Research Farm, Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh), during the *Kharif-Rabi* season of 2023-24, covering the period from July to March. Seedlings of the local chilli variety G-4 (Bhagyalakshmi) were transplanted with a spacing of 45 x 30 cm. Standard agronomic practices were employed to raise the crop, except for the use of insecticides. The experimental field was segmented into three equal quadrants, each measuring 4 x 4 meters. Within each quadrant, five plants were randomly selected and observed weekly, beginning two weeks after transplanting and continuing until the crop was harvested. Thrips counts were recorded from five flowers on each of the five randomly selected plants per plot. As per the established protocol, flowers were tapped over an A4-sized white sheet, which was then covered with a transparent film to prevent thrips from escaping. The invasive black thrips that fell onto the paper were counted using a magnifying lens. The data collected on *T. parvispinus* populations were statistically analyzed in relation to various abiotic factors, including maximum and minimum temperatures (MaxT and MinT), morning and evening relative humidity (RH1 and RH2), bright sunshine hours (BSS), and rainfall (RF). Correlation coefficients were computed using OPSTAT software to understand the relationship between environmental variables and thrips incidence.

Results

Seasonal Occurrence of *Thrips parvispinus* on Chilli During *Kharif-Rabi* Season of 2023-24

Data collected during the Standard Meteorological Weeks (SMW) for the 2023-24 season are detailed in Table 1 and depicted in Figure 1. The initial detection of *Thrips parvispinus* occurred in mid-August (33rd SMW), with an average of 0.26 thrips per flower, coinciding with the onset of flowering in the chilli crop. The infestation persisted through to the final harvest in March (12th SMW). The peak infestation was recorded in early January (1st SMW), averaging 14.67 thrips per flower, aligning with the peak flowering period. Elevated thrips populations were observed from the 44th to the 52nd SMW, with the highest counts between the 46th and 48th SMWs, ranging from 6.60 to 8.00 thrips per flower. This surge corresponded with cooler temperatures (mid to low 20s °C), low rainfall, and high morning relative humidity. Following the initial detection in the 33rd SMW, the thrips population increased, peaking in the 1st SMW, and then declined sharply. However, even in the 12th SMW, a moderate population of 2.30 thrips per flower was still present. The lowest infestation levels were

recorded between the 32nd and 40th SMWs, with counts generally below 1.00 thrips per flower, a period characterized by higher maximum temperatures (mid to upper 30s °C) and minimal rainfall.

Associations between *Thrips parvispinus* Population and Weather Variables in Chilli Crops during *Kharif* 2023-24: Correlation and Regression Analysis

In the 2023-24 *Kharif* season, the correlation analysis revealed that the population of *Thrips parvispinus* exhibited a significant negative relationship with maximum temperature ($r = -0.931^{**}$), minimum temperature ($r = -0.904^{**}$), and sunshine hours ($r = -0.432^{**}$). Conversely, it showed a non-significant negative association with rainfall ($r = -0.306^{NS}$) and morning relative humidity ($r = -0.064^{NS}$), and a positive but non-significant correlation with evening relative humidity ($r = 0.280^{NS}$). The multiple linear regression model indicated that the combined influence of these weather parameters accounted for 93.00% ($R^2 = 0.930$) of the variation in the population dynamics of both nymphs and adults of *T. parvispinus* during the 2023-24 *Kharif* season.

Discussion

In the 2023-24 growing season, the population dynamics of *Thrips parvispinus* on chilli crops were closely monitored. The infestation commenced in mid-August (33rd Standard Meteorological Week, SMW) with an average of 0.26 thrips per flower, aligning with the onset of flowering. The population progressively increased, reaching its peak in early January (1st SMW) with an average of 14.67 thrips per flower. This peak period coincided with cooler temperatures (mid to low 20s °C), minimal rainfall, and elevated morning relative humidity. Following the peak, the thrips population declined sharply, yet a moderate presence of 2.30 thrips per flower was still recorded in mid-March (12th SMW). Lower infestation levels, generally below 1.00 thrips per flower, were observed between the 32nd and 40th SMWs, a period characterized by higher maximum temperatures (mid to upper 30s °C) and very low rainfall. Feninga *et al.* (2022) ^[3] observed that tobacco thrips (*Thrips parvispinus*) populations peaked during the flowering stage of ridged gourd. Similarly, Sisodiya and Kalola (2025) ^[8] reported a peak infestation of 8.20 thrips per twig during the 2nd Standard Meteorological Week (SMW), with a subsequent decline to 5.60 thrips per twig by the 11th SMW. The discrepancy in population figures between their study and the current research may be attributed to differences in the sampling unit; their study measured thrips per twig, whereas the present study measured thrips per flower. Additionally, Jeyashree and Arivudainambi (2025) ^[4] documented an increase in thrips population from the 51st SMW, with a mean incidence ranging from 6.04 to 10.92 thrips per flower across four selected villages. Timmanna *et al.* (2022) ^[9] observed a high infestation level of 8 to 12 thrips per flower on chilli in Madhya Pradesh and on greenhouse-grown capsicum hybrids in Haryana, which aligns with the findings of the current study.

Table 1: Population dynamics of *Thrips parvispinus* occurring in Chilli and their weather data during *Kharif*, 2023

SMW	Duration	Thrips per flower	Temp (°C)		Rainfall (mm)	Relative Humidity (%)		Sunshine (Hrs/day)
			Max	Min		Morning	Evening	
27	02-08 Jul	0.00	35.71	28.57	1.06	80.14	62.14	6.71
28	09-15 Jul	0.00	35.00	27.51	10.51	88.71	64.71	0.97
29	16-22 Jul	0.00	34.97	27.89	0.00	85.43	60.29	3.63
30	23-29 Jul	0.00	36.17	27.51	0.49	83.14	58.29	6.26
31	30-05 Aug	0.00	33.29	27.26	14.00	84.71	71.86	1.83
32	06-12 Aug	0.00	35.49	28.14	0.00	85.43	58.57	7.91
33	13-19 Aug	0.26	34.80	27.14	4.89	88.43	74.14	4.94
34	20-26 Aug	0.50	32.66	26.94	1.86	91.43	73.57	2.91
35	27-02 Sep	0.40	34.57	26.74	5.74	87.14	68.43	8.63
36	03-09 Sep	0.80	34.49	25.77	0.00	85.71	60.57	6.83
37	10-16 Sep	0.50	32.20	26.34	4.07	85.71	66.57	3.11
38	17-23 Sep	0.40	36.66	26.60	0.00	79.00	43.00	8.14
39	24-30 Sep	0.46	34.54	21.66	0.00	73.00	41.86	7.69
40	01-07 Oct	0.80	32.40	18.20	0.00	84.57	40.14	7.29
41	08-14 Oct	1.20	32.63	17.91	0.00	72.14	39.29	7.09
42	15-21 Oct	1.53	32.57	17.71	0.00	72.57	39.29	7.09
43	22-28 Oct	2.80	30.51	16.77	0.00	70.57	39.43	7.06
44	29-04 Nov	4.86	29.69	15.20	0.00	75.14	42.57	6.40
45	05-11 Nov	6.20	27.69	15.43	1.37	76.14	58.86	0.89
46	12-18 Nov	6.60	25.71	16.71	0.60	75.29	77.57	1.83
47	19-25 Nov	7.40	25.71	16.71	0.60	75.29	77.57	1.83
48	26-02 Dec	8.00	24.00	9.54	0.00	68.00	60.71	6.20
49	03-09 Dec	9.20	21.18	11.65	0.00	66.75	52.00	5.30
50	10-16 Dec	9.60	18.79	12.57	2.71	77.14	61.00	1.09
51	17-23 Dec	13.47	20.80	9.43	0.00	77.29	58.71	1.80
52	24-31 Dec	14.20	16.00	7.37	0.00	91.43	91.43	0.51
1	01-07 Jan	14.67	17.53	6.74	0.00	87.29	67.43	0.69
2	08-14 Jan	10.00	23.83	10.31	0.00	88.43	57.14	5.14
3	15-21 Jan	9.06	23.93	10.28	0.00	85.00	60.71	7.15
4	22-28 Jan	6.07	26.91	13.54	0.00	77.57	53.43	8.00
5	29-04 Feb	6.47	27.26	13.37	1.23	76.71	47.14	6.97
6	05-11 Feb	5.00	29.09	13.89	0.51	75.86	45.43	7.43
7	12-18 Feb	4.27	30.94	14.74	0.00	78.43	40.00	9.26
8	19-25 Feb	3.30	34.09	18.79	0.00	74.14	36.71	9.43
9	26-04 Mar	3.60	35.54	18.60	0.00	73.00	37.71	9.34
10	05-11 Mar	2.00	38.68	21.28	0.00	73.80	37.60	9.44
11	12-18 Mar	2.13	37.60	20.20	0.00	69.00	39.00	8.80
12	19-25 Mar	2.30	37.40	19.80	0.00	74.00	37.00	9.20

Table 2: Correlation coefficient (r) and multiple regression of *T. parvispinus* occurring in Chilli during *Kharif*, 2023-24.

Year	Correlation coefficient (r)						Multiple regression with weather parameters	
	Temperature (°C)		Rainfall (mm) (X3)	Relative Humidity (%)		Sunshine (Hrs/day) (X6)	R ²	Multiple Regression equation
	Max (X1)	Min (X2)		Morning (X4)	Evening (X5)			
2023-24	-0.931**	-0.904**	-0.306 ^{NS}	-0.064 ^{NS}	0.280 ^{NS}	-0.432**	0.93	y=13.669 + (-0.178) X1 + (-0.431) X2 + (-0.113) X3 + (0.027) X4 + (0.046) X5 + (-0.107) X6

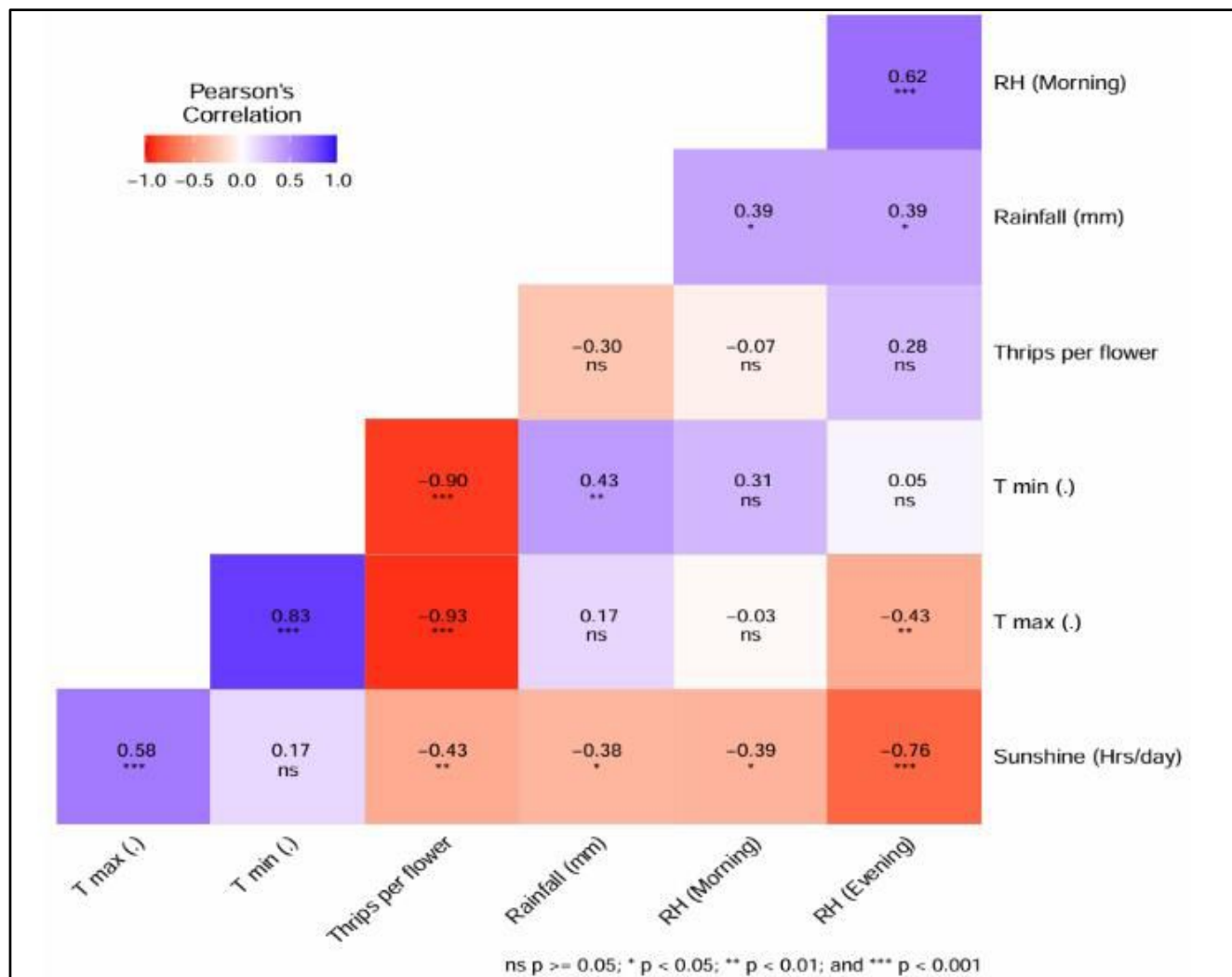


Fig 1: Correlation Matrix of Weather Parameters and Thrips Infestation in Flowers

Conclusion

The study conducted during the 2023-24 *Kharif-Rabi* season at Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj, revealed that *Thrips parvispinus* infestation in chilli crops commenced in mid-August (33rd SMW) with an average of 0.26 thrips per flower, aligning with the onset of flowering. The population progressively increased, peaking in early January (1st SMW) at 14.67 thrips per flower, coinciding with cooler temperatures (mid to low 20s °C), minimal rainfall, and elevated morning relative humidity. Subsequently, the thrips population declined sharply, yet a moderate presence of 2.30 thrips per flower was still recorded in mid-March (12th SMW). Lower infestation levels, generally below 1.00 thrips per flower, were observed between the 32nd and 40th SMWs, a period characterized by higher maximum temperatures (mid to upper 30s °C) and very low rainfall. Correlation analysis indicated significant negative relationships between thrips population and maximum temperature ($r = -0.931^{**}$), minimum temperature ($r = -0.904^{**}$), and sunshine hours ($r = -0.432^{**}$). Rainfall and morning relative humidity showed non-significant negative correlations, while evening relative humidity had a non-significant positive correlation. Multiple linear regression analysis demonstrated that these weather parameters collectively accounted for 93.00% ($R^2 = 0.930$) of the variation in thrips population. These findings underscore the influence of specific weather conditions on the population dynamics of *T. parvispinus* in chilli crops.

Understanding these relationships is crucial for developing timely and effective integrated pest management strategies, thereby enhancing chilli production and agricultural sustainability.

Disclaimer (Artificial Intelligence)

The authors affirm that no generative AI technologies, including large language models (e.g., ChatGPT, Copilot) or text-to-image generation tools, were used in the writing or editing of this manuscript."

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Competing Interests

Authors have declared that no competing interests exist.

References

1. Anonymous. Directorate of Plant Protection, Quarantine and Storage. Ministry of Agriculture and Farmers Welfare, Government of India. 2022.
2. Anonymous. Area, production and productivity of chilli, India statistics. 2023.

3. Fening GKO, Amouzou K, Hevi W, Forchibe EE, Billah MK, Wamonjee FO. First report and population dynamics of the Tobacco Thrips, *Thrips parvispinus* (Karny) (Thysanoptera: Thripidae) on ridged gourd, *Luffa acutangula* (L.) Roxb. in selected export fields in southern Ghana. Journal of Agriculture and Rural Development in the Tropics and Subtropics. 2022;123(2):235–245.
4. Jeyashree J, Arivudainambi S. Population dynamics of invasive thrips, *Thrips parvispinus* (Karny) infesting chilli (*Capsicum annuum* L.) in the coastal zone of North Tamil Nadu. International Journal of Advanced Biochemistry Research. 2025;SP-9(2):642–651.
5. Kalshoven LGE. The pests of crops in Indonesia. Revised by Van der Laan PA. Jakarta: P.T. Ichtiar Baru Van Hoeve; 1981.
6. Moritz G, Brandt S, Triapitsyn S, Subramanian S. Identification and information tools for pest thrips, *Thrips parvispinus* (Karny, 1922) in East Africa. Queensland: CBIT Publishing; 2013.
7. Prasannakumar NR, Venkataravanappa V, Rachana RR, Sridhar V, Govindappa MR, Basavarajappa MP, et al. Status of the outbreak of *Thrips parvispinus* (Karny) on chilli in Karnataka. Pest Management in Horticultural Ecosystems. 2021;27(2):286–290.
8. Raval AT, Sisodiya DB, Kalola AD. Seasonal incidence of invasive thrips, *Thrips parvispinus* (Karny) infesting chilli. International Journal of Advanced Biochemistry Research. 2025;9(1):532–537.
9. Timmanna H, Prassantha C, Shashank PR, Nigam VD, Narendra B. Occurrence and spread of invasive thrips *Thrips parvispinus* (Karny) in North India. Indian Journal of Entomology. 2022. <https://doi.org/10.55446/IJE.2022.987>
10. Tyagi K, Kumar V, Singha D, Chakraborty R. Morphological and DNA barcoding evidence for invasive pest thrips, *Thrips parvispinus* (Thysanoptera: Thripidae), newly recorded from India. Journal of Insect Science. 2015;15(1):105.