



## Population Dynamics of *Scirtothrips dorsalis* (Hood) Infesting Chilli During Kharif at Dharwad, Karnataka

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**ABSTRACT:** The present investigation was undertaken during two *kharif* seasons of 2023 and 2024 at Main Agricultural Research Station, UAS Dharwad to assess the population dynamics of chilli thrips. Taxonomic identification results confirmed the species as *Scirtothrips dorsalis* (Hood). In *kharif* 2023, thrips incidence started in the 31<sup>st</sup> Standard Meteorological Week (SMW) and reached a peak of 4.13±0.52 thrips per leaf during the 34<sup>th</sup> SMW. Whereas, fruit infestation attained its maximum of 2.16±0.42 thrips per fruit at 38<sup>th</sup> SMW. The similar trend was noticed in *kharif* 2024, but overall infestation of chilli thrips was lower due to higher rainfall, reduced temperature and increased humidity. Incidence of thrips first occurred on leaf with initial population of 1.13±0.12 per leaf (31<sup>st</sup> SMW) and reached peak (3.56±0.52 per leaf) in 34<sup>th</sup> SMW. Natural enemies such as coccinellids, spiders and *Orius* sp. were associated with thrips incidence. Multiple regression analysis indicated that weather parameters such as maximum temperature, minimum temperature, morning and afternoon relative humidity along with rainfall have influenced 78.5 and 59.3 per cent of the thrips population on leaves and fruits, respectively. Such studies provide a scientific basis for anticipating pest outbreaks and facilitate the development of predictive models for thrips.

**Keywords:** Chilli thrips, correlation, natural enemies, population dynamics, weather effect

### INTRODUCTION

Chilli (*Capsicum annum* L.) is an economically important tropical vegetable cum spice crop belonging to the family Solanaceae, widely cultivated crop around world. It is a crucial element of Indian cuisine and mainly found to be use in pickles, sauces, ketchup, essence and oleoresins. Nutritionally, it is a rich source of capsaicin, vitamin A, vitamin C, riboflavin and thiamine. Chilli possesses antioxidant, anti-mutagenesis and anti-cancer properties. Additionally, it boosts immunity, relieves pain and guards against cardiovascular diseases (Azizuddin *et al.*, 2022; Sanap *et al.*, 2023). India is the leading producer, consumer and exporter of chilli, accounting for 25 per cent of global production. In India, green chilli grown in an area of approximately 459.19 thousand hectares with a production of 5311.63 thousand MT and productivity of 11.57 MT per hectare during year 2025 (Anonymous, 2025). In India, Karnataka is the second largest chilli producer, next to the Andhra Pradesh. Among the various constraints impacting chilli productivity, insects are the most significant, as they inflict damage on the crop at different growth stages. The chilli crop is vulnerable to several insect pests, many of

which cause serious damage in field conditions as well as during storage (Hossain *et al.*, 2021).

The chilli thrips, *Scirtothrips dorsalis* (Hood) is major regular pest in chilli cultivation. It cause damage by scraping and lacerating leaf epidermis and subsequently suck the cell sap from leaves which leads to leaf crinkling and upward curling of the leaf margins (Chaudhary *et al.*, 2025). Moreover, thrips are known to transmit tospoviruses in chilli and indirectly harm plants by acting as vectors of plant viruses, thereby playing a major role in virus transmission (Feres, 2015). Notably, during reproductive stage of chilli crop, attack of invasive black thrips, *Thrips parvispinus* (Karny) is severe and affecting all the plant parts till the end of crop season (Prasannakumar *et al.*, 2021). The population dynamics of insect pests are governed by complex interactions between biotic and abiotic factors, among which weather parameters such as temperature, relative humidity and rainfall play a pivotal role. Understanding the relationship between these weather factors and pest populations is fundamental for predicting pest outbreaks and formulating effective and timely pest management strategies. The resultant interaction serves as a basis

for understanding population variations throughout the cropping season. In this context, studies on population dynamics become essential to assess the status of *S. dorsalis* in chilli ecosystem. This provides information regarding its change in population size, peak period of pest occurrence, factors checking their population including the natural enemies. It also underscores the impact of weather-related variables on chilli thrips incidence which is vital for optimizing management strategies.

## MATERIALS AND METHODS

The present study on population dynamics of thrips infesting chilli was carried out under field conditions for two consecutive seasons *viz.*, *kharif* -2023 and *kharif*-2024 at Main Agriculture Research station (MARS), University of Agricultural Sciences (UAS), Dharwad. The popular chilli cultivar, *Byadgi dabbi* was selected for the field experimental trial. Three to four weeks old seedlings were transplanted to the main field in an area of 10 m × 10 m size with row to row spacing of 75 cm and plant-plant 60 cm. The crop was raised by following recommended package of practices provided by UAS, Dharwad and plant protection measures were not employed throughout crop growth period. The population of thrips and visible natural enemies were monitored and recorded with the help of hand lens (10x) during the study period. Further thrips and spider samples were collected in 70 per cent of ethanol and sent to Division of insect taxonomy, National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru and Zoological Survey of India, Western Regional Center, Pune, respectively for the taxonomic identification of species.

### Observation and recording of population counts

Thrips population (late instar nymphs and adults) was counted at weekly intervals starting from first week after transplanting up to 3 weeks of transplanting by examining top three leaves on five randomly selected plants. Thereafter, observations were recorded from nine leaves (three each from top, middle and bottom portion) at weekly intervals up to last harvest from randomly selected five plants. The visual observations were taken on population count by using hand lens (10x). The recorded data were averaged and expressed as the mean number of thrips per leaf.

### Nature of thrips damage and severity

Leaf curl index (LCI), caused by chilli thrips was quantified on five randomly selected plants at 30, 60 and

90 days old plants following transplanting. Assignment of damage score to leaves was done by adopting a scale developed by Niles (1980). Where 0= No symptom, 1=1-25 per cent leaves/plant show curling, less damage, 2=26-50 per cent leaves/plant show curling, moderately damaged, 3=51-75 per cent leaves/plant show curling, heavily damaged, 4=> 76 per cent leaves/plant show curling, severe damaged.

### Correlation of weather parameters with thrips incidence

The daily data on weather parameters of MARS, UAS, Dharwad was collected from meteorological department for the study period and mean data of each weather parameters was worked out. The influence of various weather parameters, *viz.*, maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity and rainfall on the incidence of thrips species in chilli crops was correlated to understand the relationship between pest incidence and weather variables.

### Statistical analysis

The data of chilli thrips and natural enemies population were square root transformed. The LCI was calculated according to damage caused by thrips and given index as per above mentioned scale. The correlation and regression was worked out using IBM SPSS Statistics software package version 21.0.

## RESULTS AND DISCUSSION

The taxonomic identification confirmed the thrips species as *Scirtothrips dorsalis* (Hood) (Thysanoptera: Thripidae). During the *kharif*2023, thrips activity on leaf commenced from the fourth week of July (31<sup>st</sup> SMW) and reached its peak density of 4.13±0.52 thrips per leaf during 34<sup>th</sup> SMW (August III week) and later it started to decline steadily as the season advanced towards harvest of crop. The incidence of this pest was nil on chilli flowers throughout the observation period. Probably, it may be due to *S. dorsalis* could not prefer to feed on the flowers (pollen and petals) whereas, leaf and fruit might be acts as staple food sources for their developmental stages. However, infestation on chilli fruit started at 37<sup>th</sup> SMW and attained its maximum population (2.16±0.42 thrips/ fruit) during 38<sup>th</sup> SMW (Table 1). The delayed and intermittent rainfall during *kharif* 2023 at Dharwad might have an increase in the population of *S. dorsalis* during the vegetative stage. The subsequent rainfall

**Table 1. Population dynamics of thrips in chilli (*kharif*-2023)**

Month	SMW	<i>S. dorsalis</i>				
		Thrips/ leaf	Thrips/ flower	Thrips/ fruit	LCI	Natural Enemies/ Plant
July	30	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	0	0.00±0.00 (0.71±0.71)
	31	0.89±0.07 (1.18±0.75)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.27±0.01 (0.88±0.71)
	32	1.63±0.21 (1.46±0.84)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.43±0.02 (0.96±0.72)
August	33	2.71±0.45 (1.79±0.97)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.87±0.07 (1.17±0.75)
	34	4.13±0.52 (2.15±1.01)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	1	1.95±0.25 (1.57±0.87)
	35	2.91±0.37 (1.85±0.93)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	2.21±0.34 (1.65±0.92)
	36	1.57±0.24 (1.44±0.86)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	1.83±0.21 (1.53±0.84)
September	37	1.53±0.26 (1.42±0.87)	0.00±0.00 (0.71±0.71)	0.70±0.09 (1.10±0.77)	*	1.40±0.16 (1.38±0.81)
	38	1.38±0.15 (1.37±0.81)	0.00±0.00 (0.71±0.71)	2.16±0.42 (1.63±0.96)	1	1.36±0.14 (1.36±0.80)
	39	1.35±0.13 (1.36±0.79)	0.00±0.00 (0.71±0.71)	1.95±0.26 (1.57±0.87)	*	1.20±0.15 (1.30±0.80)
	40	1.24±0.17 (1.32±0.82)	0.00±0.00 (0.71±0.71)	1.32±0.14 (1.35±0.80)	*	1.07±0.13 (1.25±0.79)
October	41	1.20±0.12 (1.30±0.79)	0.00±0.00 (0.71±0.71)	1.21±0.17 (1.31±0.82)	*	1.00±0.10 (1.22±0.77)
	42	1.13±0.14 (1.28±0.80)	0.00±0.00 (0.71±0.71)	1.16±0.12 (1.29±0.79)	1	0.86±0.08 (1.17±0.76)
	43	1.02±0.12 (1.23±0.79)	0.00±0.00 (0.71±0.71)	1.06±0.12 (1.25±0.79)	*	0.71±0.09 (1.10±0.77)
	44	0.88±0.09 (1.77±0.77)	0.00±0.00 (0.71±0.71)	1.03±0.14 (1.24±0.80)	*	0.49±0.49 (0.99±0.74)
	45	0.79±0.11 (1.14±0.78)	0.00±0.00 (0.71±0.71)	0.95±0.10 (1.20±0.77)	*	0.38±0.03 (0.94±0.73)
November	46	0.67±0.08 (1.08±0.76)	0.00±0.00 (0.71±0.71)	0.84±0.08 (1.16±0.76)	*	0.30±0.02 (0.89±0.72)
	47	0.60±0.10 (1.05±0.77)	0.00±0.00 (0.71±0.71)	0.61±0.09 (1.05±0.77)	*	0.27±0.01 (0.88±0.71)
	48	0.57±0.09 (1.03±0.77)	0.00±0.00 (0.71±0.71)	0.55±0.07 (1.02±0.75)	*	0.22±0.03 (0.85±0.73)
December	49	0.41±0.02 (0.95±0.72)	0.00±0.00 (0.71±0.71)	0.47±0.05 (0.98±0.74)	*	0.12±0.01 (0.79±0.71)

SMW: Standard Meteorological Week, LCI- Leaf curl index,\*Observations not recorded, Values in the parenthesis are square root transformed.

had negative significant impact on thrips counts on leaf and fruit which likely to washed away the early developmental stages of this pest from the leaf and fruit surface and also hindered the adult dispersal. In contrast to our results, Gopal *et al.* (2018) who recorded *S. dorsalis* incidence on chilli fruits began at the 3<sup>rd</sup> to 11<sup>th</sup> SMW and attained its highest level at the 4<sup>th</sup> SMW. This variation in peak population period may be attributed to differences in location, climatic conditions and time of cultivation of the crop. The population increase due to dry spells and decrease due to heavy rainfall in case of chilli thrips was well documented in past Bailey (1933) and Harish (2009). The present findings are in agreement with Hosamani (2007) and Havanoor and Rafee (2018) at Dharwad. Kumawat (1994) and Meena *et al.* (2013), who found the higher incidence of thrips during first week of October. Likewise, Saini *et al.* (2017) recorded that first occurrence of thrips on chilli began after first week of august and it reached its peak at second week of September. Rajpoot *et al.* (2024) reported the first

appearance of the thrips in the chilli field during 34<sup>th</sup> SMW and attained its peak in last week of September.

In *kharif* 2024, the similar trend was observed in population buildup of *S. dorsalis*. The infestation of chilli thrips on leaf was found throughout crop growth period. Thrips appeared first on leaf with initial population of  $1.13 \pm 0.12$  per leaf (31<sup>st</sup> SMW) and their peak count ( $3.56 \pm 0.52$ /leaf,) recorded in the 34<sup>th</sup> SMW. Unlike *kharif* 2023, there was complete absence of *S. dorsalis* population on flower. Thrips incidence on fruit began from second week of September (37<sup>th</sup> SMW) and peaked in third week of September (38<sup>th</sup> SMW) with the population of  $2.10 \pm 0.41$  per fruit (Table 2). The incidence of *S. dorsalis* was lower than the previous year due to more amount of rainfall received at Dharwad during the season and it might have affected the generational potential of this thrips. This indicates that rainfall exhibited a strong negative correlation with thrips incidence (Table 3). Further, decrease in maximum

**Table 2. Population dynamics of thrips in chilli (*kharif*-2024)**

Month	SMW	<i>S. dorsalis</i>				
		Thrips/ leaf	Thrips/flower	Thrips/ fruit	LCI	Natural Enemies/ Plant
July	30	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	0	0.00±0.00 (0.71±1.71)
	31	1.13±0.12 (1.28±0.79)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.37±0.05 (0.93±0.74)
	32	2.60±0.42 (1.76±0.96)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.55±0.09 (1.02±0.77)
August	33	2.67±0.39 (1.78±0.94)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	0.97±0.14 (1.21±0.80)
	34	3.56±0.52 (2.01±1.03)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	1	1.43±0.17 (1.39±0.82)
	35	2.00±0.23 (1.58±0.85)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	2.01±0.31 (1.58±0.90)
	36	1.28±0.15 (1.33±0.81)	0.00±0.00 (0.71±0.71)	0.00±0.00 (0.71±0.71)	*	1.71±0.26 (1.49±0.87)
September	37	1.26±0.17 (1.33±0.82)	0.00±0.00 (0.71±0.71)	0.52±0.07 (1.01±0.75)	*	1.54±0.19 (1.43±0.83)
	38	1.01±0.12 (1.23±0.79)	0.00±0.00 (0.71±0.71)	2.10±0.41 (1.61±0.95)	1	1.20±0.11 (1.30±0.78)
	39	0.80±0.11 (1.14±0.78)	0.00±0.00 (0.71±0.71)	1.69±0.23 (1.48±0.85)	*	1.04±0.12 (1.24±0.79)

October	40	0.76±0.09 (1.12±0.77)	0.00±0.00 (0.71±0.71)	1.15±0.16 (1.28±0.81)	*	1.00±0.10 (1.22±0.77)
	41	0.61±0.07 (1.05±0.75)	0.00±0.00 (0.71±0.71)	1.07±0.21 (1.25±0.84)	*	0.91±0.08 (1.19±0.08)
	42	0.59±0.08 (1.04±0.76)	0.00±0.00 (0.71±0.71)	1.01±0.12 (1.23±0.79)	1	0.89±0.08 (1.18±0.76)
	43	0.55±0.10 (1.02±0.77)	0.00±0.00 (0.71±0.71)	0.85±0.08 (1.16±0.76)	*	0.78±0.06 (1.13±0.75)
	44	0.47±0.03 (0.98±0.73)	0.00±0.00 (0.71±0.71)	0.79±0.07 (1.14±0.75)	*	0.64±0.10 (1.07±0.77)
November	45	0.31±0.06 (0.90±0.75)	0.00±0.00 (0.71±0.71)	0.71±0.10 (1.10±0.77)	*	0.60±0.07 (1.05±0.75)
	46	0.29±0.05 (0.89±0.74)	0.00±0.00 (0.71±0.71)	0.65±0.07 (1.07±0.75)	*	0.44±0.03 (0.97±0.73)
	47	0.26±0.02 (0.87±0.72)	0.00±0.00 (0.71±0.71)	0.57±0.08 (1.03±0.76)	*	0.29±0.02 (0.89±0.72)
	48	0.22±0.04 (0.85±0.73)	0.00±0.00 (0.71±0.71)	0.45±0.03 (0.97±0.73)	*	0.20±0.01 (0.84±0.71)

SMW: Standard Meteorological Week, LCI- Leaf curl index,\*Observations not recorded, Values in the parenthesis are square root transformed.



**Fig. 1. Chilli plant damaged by *Scirtothrips dorsalis***

and minimum temperature along with the higher relative humidity created less favorable conditions for thrips proliferation. This indicated that high relative humidity and minimum temperature inversely associated with thrips activity while maximum temperature is directly

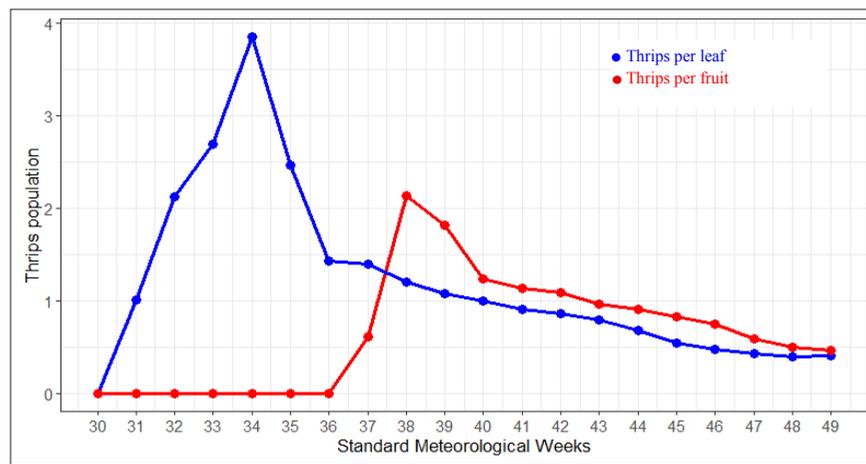
correlated with thrips incidence (Table 3). The findings are in line with earlier workers, North and Shelton, (1986), Prasannakumar et al. (2019), Rakesh *et al.* (2025), Tirkey *et al.* (2020) and Rajpoot *et al.* (2024) who found that *S. dorsalis* abundance on chilli increased under dry weather, while reduction in their counts was related to the increase in rainfall. The linear multiple regression model for *kharif* season showed that weather conditions contributed to 78.5 and 59.3 per cent for the population fluctuations of *S. dorsalis* on leaf and fruit, respectively (Table 3). As continuous rainfall washed off thrips from the foliage, lower curling of leaves was observed and thus LCI was given as 1 throughout entire crop period of both seasons (Fig. 1). Likewise, Nayana (2023) also recorded the leaf curl index of 1 which occurs due to *S. dorsalis* during month of August. The pooled data results pertaining to population dynamics of thrips on leaf and fruit taken during *kharif* 2023 and 2024 also showed the similar trend as observed in individual seasons. The appearance of thrips on leaf first noticed on fourth week of July (31<sup>st</sup> SMW) and reached its peak density of 3.85±0.55 thrips per leaf during 34<sup>th</sup> SMW while peak activity of thrips per fruit was registered during third week of September (2.13±0.41) (Fig. 2).

**Table 3. Relationship between thrips incidence and weather parameters during kharif 2023 and 2024**

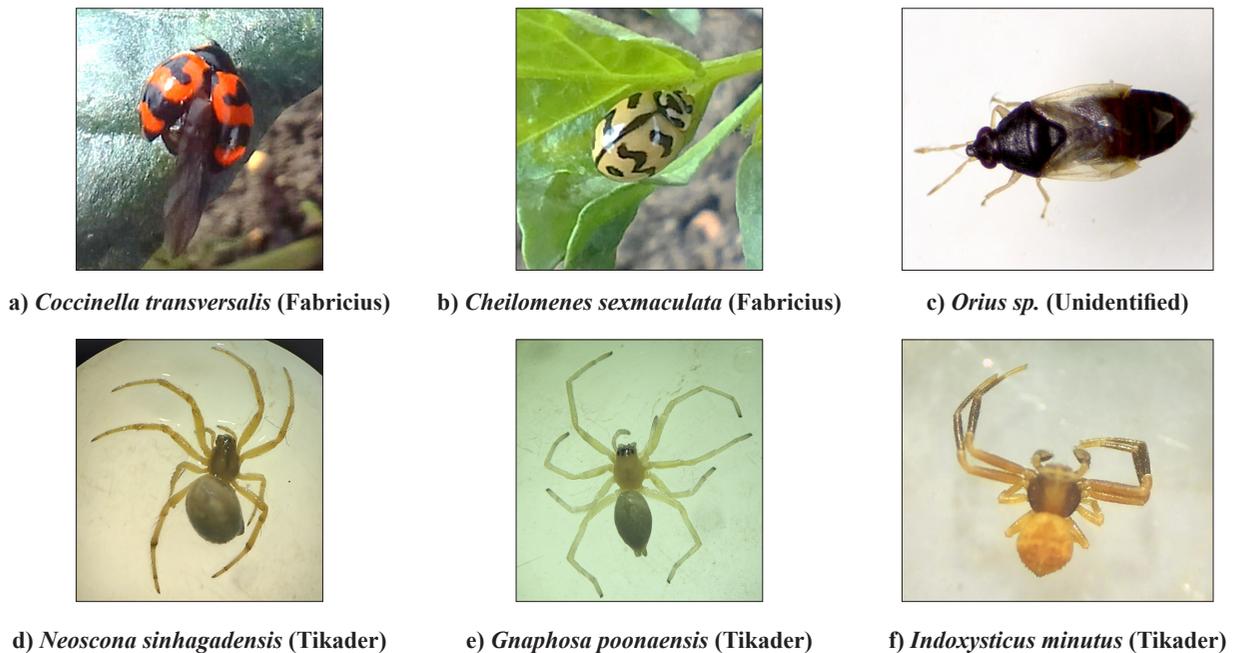
Season	Species	Plant part	Weather parameters				R <sup>2</sup>	
			Correlation coefficient (r)					
			Max. Temperature (°C)	Min. Temperature (°C)	Morning RH (%)	Afternoon RH (%)	Rainfall (mm)	
<i>kharif</i> (Pooled)	<i>S. dorsalis</i>	Leaf	0.705*	-0.743*	-0.682*	-0.725*	-0.871**	0.785
		Flower	0.00	0.00	0.00	0.00	0.00	-
		Fruit	0.592*	-0.678*	-0.783*	-0.674*	-0.842**	0.593

N= 26; RH= Relative humidity; R<sup>2</sup>: Regression coefficient

\*significant at 0.05 level; \*\*significant at 0.01 level



**Fig. 2. Thrips population on chilli leaf and fruit during Kharif 2023 and 2024 (Pooled)**



**Fig 3. Natural enemies observed in chilli field during 2023-24**

The natural enemies documented during the study period were confirmed with the taxonomic keys which includes coccinellids (*Coccinella transversalis* (Fabricius) and *Cheilomenes sexmaculata* (Fabricius), spiders (*Neoscona sinhagadensis* (Tikader), *Gnaphosa poonaensis* (Tikader) and *Indoxysticus minutus* (Tikader)) and the minute pirate bug, *Orius* sp. (Unidentified) (Fig 3). Owing to their low abundance, a pooled population was worked out and presented. The initially their population was low and reached a peak count of 2.21 and 2.01 per plant) at 35<sup>th</sup> SMW in *kharif* 2023 and *kharif* 2024, respectively (Table 1 and 2). Among all natural enemies observed, coccinellids were consistently the most abundant throughout the crop period. Predators tend to attain their peak immediately after 7 to 10 days of thrips population peak, as the abundance of prey provides an adequate food source. Natural enemy numbers fluctuate around chilli thrips populations and found to decline corresponding with decline thrips population. Similar observations were also made by Soujanya (2008) who recorded peak incidence of coccinellids and spiders from mid-October to mid-November coincided with maximum thrips population. Archunan and Pazhanisamy (2021) recorded natural enemies *viz.*, coccinellids, spiders and mirid bugs during first week of September.

## CONCLUSION

Current study elaborated that *S. dorsalis* was multiplied at faster rate during dry condition coupled with maximum temperature and lower afternoon relative humidity. This study lays groundwork for strategic management practices by elucidating the relationship between weather parameters and *S. dorsalis* population dynamics in chilli.

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## AUTHORS CONTRIBUTION

Munj Sujal Suhas-Design of work, data collection, analysis, interpretation of result and writing original manuscript, M. G. Hegde- Conceptualization and design

of work, Subhash B. K., R. Hosamani, J. A. Hosmath and G. B. Balol-Review, supervision and editing the draft. All authors read and approved the manuscript.

## CONFLICT OF INTEREST

Authors have no conflict of interest to express

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