



Documentation of Chilli Thrips with Emphasis to Invasive Thrips, *Thrips parvispinus* (Karny) and their Natural Enemies in Karnataka

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Abstract

The present investigation was carried out to the documentation of chilli thrips with special reference to invasive thrips, *T. parvispinus* and their natural enemies in major chilli growing district of Karnataka. A roving survey was carried out in ten major chilli growing districts of Karnataka viz., Bidar, Shivamogga, Chitradurga, Davanagere, Dharwad, Haveri, Ballari, Kalaburgi, Yadgiri and Raichur during the crop growing seasons of 2023-24 and 2024-25. Survey results revealed that the seven thrips species were recorded on chilli host across the major chilli growing districts of Karnataka. The chilli thrips species viz., *Thrips parvispinus* (Karny), *T. palmi* (Karny), *T. hawaiiensis* (Morgan), *T. florum* (Schmutz), *Frankliniella schultzei* (Trybom), *F. occidentalis* (Pergande) and *Megalurothrips usitatus* (Bagnall). Ballari district documented the highest population of *T. parvispinus* (25.39 thrips per three terminal twigs) followed by Haveri, Raichur, Kalaburgi and Dharwad. The moderate but considerable population was noticed in Chitradurga, Yadgiri, Davanagere and bidar. The lesser population of thrips observed in Shivamogga district. The four coccinellids species viz., *Cheilomenes sexmaculata* (Fabricius), *Coccinella transversalis* (Fabricius), *Harmonia octomaculata* (Fabricius) and *Hippodamia variegata* (Goeze) and other predators are like predatory bug and Spiders were also documented on chilli thrips.

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1. Introduction

Chilli (*Capsicum annum L.*) is one of the important commercial crop in the world grown for vegetable, spice and condiment purposes and it has immense commercial, dietary and therapeutic values. Chilli fruit is mainly used as green or dried to impart pungency to food. Dried red chilli powder is used as a condiment for preparation of vegetable and it is rich in vitamin A and C (Anonymous, 1968) ^[2]. Globally, India is the largest area and production of dry chilli in the world followed by China, Thailand, Ethiopia, and Indonesia (Bindu and Mahantesh, 2021) ^[7]. Chilli is mainly grown for its green and ripe fruits in the tropical and sub-tropical regions, with an area of 8.09 lakh hectares with a production of 29.13 lakh tonnes and productivity of 3273 Kg per hectare. Karnataka is the fourth largest chilli producing state in India with an area of 1.34 lakh hectares, production of 1.81 lakh tonnes and productivity of 1351 Kg per hectare (Anonymous, 2024) ^[4].

Thrips parvispinus larvae suck the sap from under surface of leaves and adults mainly colonize on flowers and underside of leaves. These thrips mainly infest the flowers which are white in colour and fragrant (Mound and Collins, 2000) [14], because the inclusion of pollen in the diet can stimulate oviposition, reduce larval development time and increase fecundity (Zhi *et al.*, 2005; Riley *et al.*, 2007) [29, 22]. Due to thrips scraping on petals, petals on floral sections develop brownish streaks (Plate 1 and 2). Damage causes flowers to dry out and wilt, which reduces fruit production. Severe infestation, results in shedding of flowers, heavy flower drop and malformation of fruits and fruit drop accounts to 80-90 per cent loss (Anonymous., 2022) [3].

A total of eight species of thrips have been reported infesting to chilli crop in India. These species were *Thrips parvispinus* (Karny), *Scirtothrips dorsalis* (Hood), *Frankliniella schultzei* (Trybom), *Thrips florum* (Schmutz), *Thrips hawaiiensis* (Morgan), *Thrips palmi* (Karny), *Thrips subnudula* (Karny),



Plate 1: Thrips Damage on Chilli Flower

2. Material and methods

The roving survey were conducted in major chilli growing districts of different agroclimatic zone of Karnataka during Kharif and Rabi seasons of 2023-24 and 2024-25 (Fig.1). Ten major chilli growing districts were selected, in each district three talukas were selected, in each taluka's three villages were chosen for the survey. In each field five spots (5m x 5m) were selected randomly and five plants were selected in each spot. There was total 25 plants observed in each plot and computed mean and standard deviation for each location.

The chill thrips and natural enemy population were recorded following as per standard procedures. The thrips population was recorded on three terminal twigs per plant on 25 randomly selected plants. The natural enemies population was recorded on per plant basis.

Samples of adult thrips were collected by tapping the top three terminal twigs (leaves, flowers and fruits) onto the white plastic plate and collected by using a fine hair brush then transferred into vials (2.5 ml) containing AGA (mixture of 60% ethyl alcohol, glycerine and acetic acid - 6:1:1) media. Each vial will be labeled with the details viz., host plant,

Thrips tabaci (Lindeman) and *Megalurothrips usitatus* (Bagnall) (Praveenkumar *et al.*, 2025) [20].

Recently an outbreak of invasive thrips species, *Thrips parvispinus*, is observed in chilli growing areas of southern India during 2021-22. It was first noticed in Guntur district of Andhra Pradesh during January, 2021 and subsequently its spread was noticed in all chilli growing areas of Andhra Pradesh (Sireesha *et al.*, 2021) [24]. This was also observed in the chilli growing districts of Telangana (Kumari *et al.*, 2021) [10] and Karnataka during November and December of 2021 (Nagaraju *et al.*, 2021) [15]. Subsequently this invasive thrips species has dominated and displaced the well-established chilli thrips, *S. dorsalis* which was a regular pest on chilli (Sridhar *et al.*, 2021) [25]. An attempt was made to documentation of invasive thrips, *T. parvispinus* and their natural enemies in major chilli growing districts of Karnataka.



Plate 2: Thrips damage on chilli leaves and fruits

locality and date of collection, global positioning system of the respective locations. The infested plant parts along with thrips colonies were collected in polythene covers and separated thrips from plant parts and transferred to vials and brought to the laboratory at NBAIR, Bangalore.

3. Results and Discussion

3.1. Chilli Thrips

During the study period, a roving survey was carried out on chilli crop in major chilli growing districts of Karnataka and documented seven thrips species infesting chilli host viz., *T. parvispinus* (Karny), *T. palmi* (Karny), *T. hawaiiensis* (Morgan), *T. florum* (Schmutz), *Frankliniella schultzei* (Trybom), *F. occidentalis* (Pergande) and *Megalurothrips usitatus* (Bagnall) but *T. parvispinus* (Karny) emerged as the predominant species across all surveyed locations (Table 1). The present findings were in line with Praveenkumar *et al.*, 2025 [20], a total of eight species of thrips have been reported infesting to chilli crop in India. The current findings are also matched with the findings of Sireesha *et al.*, 2021 [24], Kumari *et al.*, 2021 [10], Nagaraju *et al.*, 2021 [15] and Sridhar *et al.*

(2021) [25], reported that *T. parvispinus*, subsequently its spread was noticed in all chilli growing areas of Andhra Pradesh, Telangana and Karnataka, respectively.

Table 1: List of thrips species, their natural enemies on chilli recorded during 2023-24 and 2024-25

SL. No.	Common name	Scientific name	Order: Family	Plant parts damaged
A. Thrips complex				
1	Taiwanese thrips or Southeast Asian thrips	<i>Thrips parvispinus</i> (Karny)	Thysanoptera: Thripidae	Leaves, flowers and Fruits
2	Melon thrips or southern yellow thrips	<i>Thrips palmi</i> (Karny)		leaves
3	Hawaiian flower thrips	<i>Thrips hawaiiensis</i> (Morgan)		flowers
4	Banana flower thrips	<i>Thrips florum</i> (Schmutz)		flowers
5	Western flower thrips	<i>Frankliniella occidentalis</i> (Pergande)		flowers
6	Common blossom thrips	<i>Frankliniella schultzei</i> (Trybom)		Leaves and flowers
7	Bean flower thrips	<i>Megalurothrips usitatus</i> (Bagnall)		Leaves, flower and pods
B. Natural enemies				
1	Coccinellids (Ladybird beetles)	<i>Cheilomenes sexmaculata</i> (Fabricius)	Coleoptera: Coccinellidae	Predators
2		<i>Coccinella transversalis</i> (Fabricius)		
3		<i>Harmonia octomaculata</i> ((Fabricius)		
4		<i>Hippodamia variegata</i> (Goeze)		
5	Spiders	Unidentified		General predator

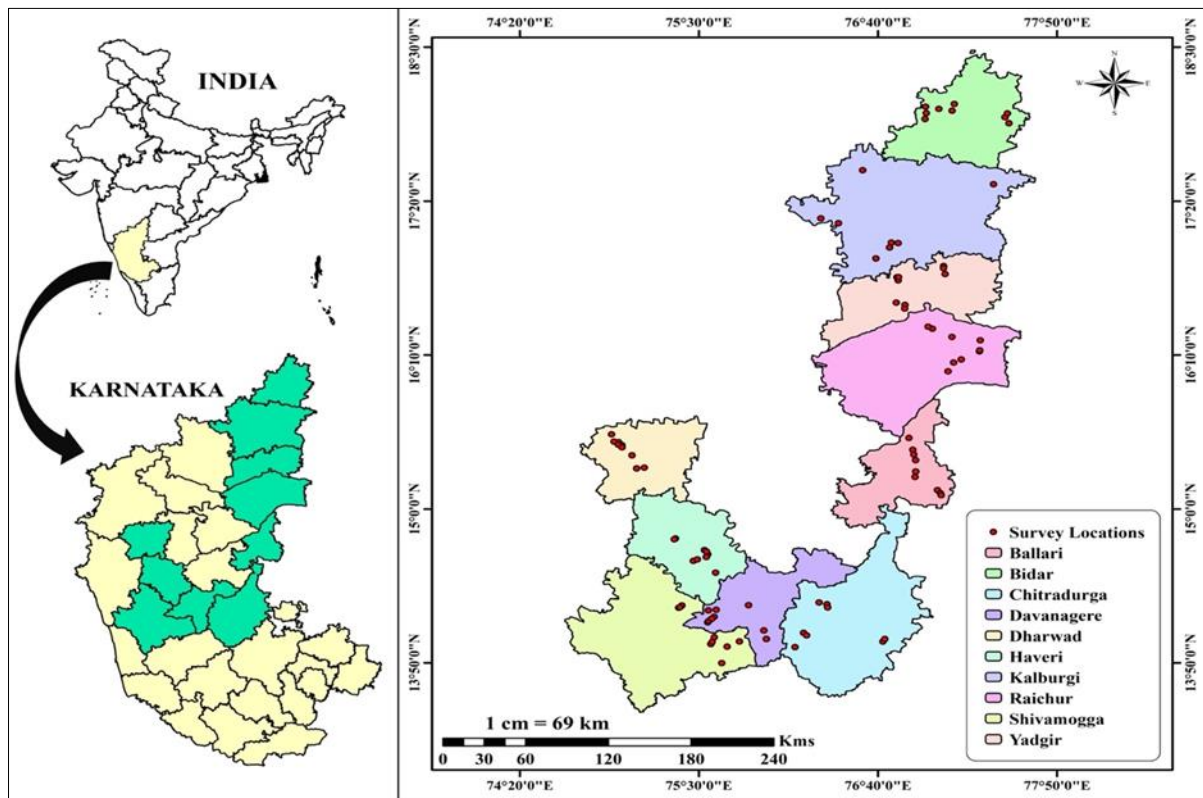


Fig 1: Survey map for documentation *Thrips parvispinus* across major chilli growing districts of Karnataka

3.2. Documentation of Invasive Thrips, *T. parvispinus* in major chilli growing districts of Karnataka

3.2.1. Bidar

Thrips parvispinus was noticed on chilli crop at vegetative, flowering and fruiting stage. In Bhalki taluk, the lowest thrips population was recorded at Bhatambra (5.12±3.05 thrips/three terminal twigs), while Koroor (9.32±4.20) and

Javalga (9.04±5.37). In Basavakalyan taluk, Hulsoor (8.48±4.23) showed lower populations, whereas Belura (16.48±6.70) and Devanal (22.04±9.61). Similarly, in Bidar taluk, the surveyed villages of Markal (18.96±8.03), Janwada (21.20±8.79) and Dadapur (20.32±7.27) showed consistently high thrips incidence (Table 2).

Table 2: Documentation of invasive thrips, *Thrips parvispinus* in major chilli growing districts of Karnataka

Districts	Talukas	Villages	Thrips/ three terminal twigs
Bidar	Bhalki	Koroor	9.32 ± 4.20
		Bhatambra	5.12 ± 3.05
		Javalga	9.04 ± 5.37
	Basavakalyan	Hulsoor	8.48 ± 4.23
		Belura	16.48 ± 6.70
		Devanal	22.04 ± 9.61
		Markal	18.96 ± 8.03
	Bidar	Janwada	21.20 ± 8.79
		Dadapur	20.32 ± 7.27
Kalburgi	Aland	Alur	12.12 ± 4.49
		Bangerga	16.52 ± 6.75
		Annur	17.56 ± 8.91
	Afzalpur	Chincholi	18.96 ± 8.96
		Mallabad	19.08 ± 7.94
		Algi B	18.80 ± 7.11
	Jevargi	Butnal	21.48 ± 5.97
		Jevargi Rural	18.60 ± 9.17
		Shakapur	14.80 ± 10.00
Shivamogga	Shivamogga	Navile	12.40 ± 7.91
		Komnal	13.72 ± 9.77
		Abbalagere	11.44 ± 5.97
	Bhadravati	Yerehalli	13.20 ± 6.37
		Veerapura	12.16 ± 8.31
		Yedehalli	10.80 ± 7.48
	Shikaripura	Anjanapur	10.04 ± 5.76
		Bendekatte	12.24 ± 6.50
		Dupadhalli	11.36 ± 6.96
Davanagere	Honnali	Madenhalli	10.44 ± 3.30
		Hosakatte	11.60 ± 3.68
		Surhonne	13.32 ± 3.35
	Nyamathi	Nyamathi	14.76 ± 4.28
		Madanabhavi	23.16 ± 5.25
		Basavapura	21.32 ± 11.4
	Channagiri	Muddenhalli	19.28 ± 5.50
		Makanayakanhalli	13.76 ± 20.5
		Kattalgere	12.84 ± 3.63
Dharwad	Dharwad	Narendra	13.68 ± 3.13
		Ettingudda	12.60 ± 3.80
		Kumbapur	14.40 ± 3.07
	Navalagund	Saidapur	11.52 ± 4.17
		Mammigatti	16.28 ± 5.68
		Garag	24.96 ± 5.83
	Hubli	Rayapur	19.12 ± 7.79
		Gabbur	20.80 ± 5.51
		Anchatgeri	21.48 ± 6.89
Chitradurga	Chitradurga	Vijapur	12.92 ± 3.80
		Kunchiganhal	14.36 ± 4.09
		Sirigere	14.00 ± 4.42
	Hiriyur	Babbur	16.84 ± 4.58
		Maskal	16.48 ± 7.76
		Dharmapur	20.12 ± 7.68
	Holalkere	Ramagiri	16.40 ± 8.23
		Gowdihalii	18.24 ± 6.42
		Chitrahalli	13.88 ± 2.65
Ballari	Ballari	Paramadevanhalli	26.04 ± 5.83
		Yalpi Kaggalu	27.32 ± 5.89
		Lingadevanhalli	26.20 ± 5.83
	Kurugodu	Kolur	24.20 ± 6.89
		Sindhgiri	24.00 ± 6.10
		Somasamudra	25.36 ± 4.47

	Siruguppa	Bhyrapura	21.16 ± 7.24
		Siruguppa	27.64 ± 4.41
		sirigeri	26.64 ± 5.77
Haveri	Haveri	Aladkatti	27.52 ± 6.31
		Hosahalli	21.68 ± 7.17
		Gourapur	20.28 ± 7.69
	Byadagi	Chatra	18.80 ± 6.92
		Kollapur	17.40 ± 6.93
		Bannihatti	16.84 ± 5.57
	Ranebennur	Hanumanmatti	20.32 ± 6.77
		Kakola	19.44 ± 7.17
		Asundi	27.08 ± 5.24
Raichur	Raichur	Raichur	16.92 ± 7.27
		Arsigera	25.60 ± 6.49
		Askihal	14.16 ± 4.97
	Manvi	Kallur	16.52 ± 5.03
		Kurdi	17.40 ± 7.27
		Aroli	25.12 ± 5.63
	Devadurga	Gabbur	13.32 ± 6.09
		Maseedpur	23.64 ± 5.53
		Ganekal	19.00 ± 6.92
Yadgiri	Yadgiri	Allipur	16.08 ± 4.50
		Kanchagarhalli	11.20 ± 4.30
		Mudnal	15.92 ± 3.42
	Shahapur	Bheemaryanagudi	13.64 ± 4.74
		Hulkal	15.16 ± 5.66
		Rajapur	16.44 ± 5.12
	Surpur	Bijaspur	14.56 ± 3.30
		Shakapur	15.76 ± 4.02
		Devikera	19.00 ± 7.34

n=25

3.2.2. Kalburgi

The *T. parvispinus* was noticed on chilli crop at vegetative and flowering stage. Survey results from Kalaburgi district showed a moderate to high incidence of *T. parvispinus* across various taluks and villages. Among the surveyed locations in Aland taluk, Alur recorded the lowest thrips (12.12±4.49 thrips/three terminal twigs), whereas Bangerga (16.52±6.75) and Annur (17.56±8.91) exhibited moderately higher population of thrips. In Afzalpur taluk, Chincholi (18.96±8.96), Mallabad (19.08±7.94) and Algi B (18.80±7.11) showed high incidence of thrips. The Jevargi taluk recorded the highest thrips population, particularly Butnal (21.48±5.97), followed by Jevargi Rural (18.60±9.17) and Shakapur (14.80±10.00) (Table 2).

3.2.3. Shivamogga

The *T. parvispinus* was observed on chilli crop at flowering and fruiting stage. In Shivamogga district, the incidence of *T. parvispinus* was generally moderate across the surveyed taluks and villages. Within Shivamogga taluk, thrips densities ranged from 11.44±5.97 thrips per three terminal twigs in Abbalagere to 13.72±9.77 in Komnal, with Navile recording 12.40±7.91. In Bhadravati taluk, Yerehalli had the highest thrips population (13.20±6.37), followed by Veerapura (12.16±8.31) and Yedehalli (10.80±7.48). The Shikaripura taluk villages recorded slightly lower thrips densities, with Anjanapur (10.04±5.76), Dupadhalli (11.36±6.96) and

Bendekatte (12.24±6.50) (Table 2).

3.2.4. Davangere

The *T. parvispinus* was noticed on chilli crop at flowering and fruiting stage. The incidence of *T. parvispinus* in Davanagere district varied considerably among villages and taluks. In Honnali taluk, thrips densities were relatively low to moderate, ranging from 10.44±3.30 thrips per three terminal twigs in Madenhalli to 13.32±3.35 in Surhonne, with Hosakatte recording 11.60±3.68. Nyamathi taluk showed higher thrips population of 14.76±4.28, Madanabhavi (23.16±5.25) and Basavapura (21.32±11.40). In Channagiri taluk, thrips populations ranged from 12.84±3.63 in Kattalagere to 19.28±5.50 in Muddenhalli, with Makanayakanhalli (13.76±20.50) (Table 4) (Table 2).

3.2.5. Dharwad

The *T. parvispinus* was noticed at flowering and fruiting stage of the chilli crop. In Dharwad taluk, thrips densities ranged from 12.60±3.80 thrips per three terminal twigs at Ettingudda to 14.40±3.07 at Kumbapur, with Narendra recording 13.68±3.13. Navalagund taluk, Saidapur showed the lowest density (11.52±4.17), while Mammigatti (16.28±5.68) showed higher thrips population. Garag recorded 24.96±5.83, the highest thrips population of thrips. In Hubli taluk, thrips population were also high, with Rayapur (19.12±7.79), Gabbur (20.80±5.51) and Anchatgeri

(21.48±6.89) (Table 2).

3.2.6. Chitradurga

The *T. parvispinus* was noticed at vegetative and flowering stage of the chilli crop. In Chitradurga district, the incidence of *T. parvispinus* varied moderately among taluks and villages. In Chitradurga taluk, thrips densities were ranging from 12.92±3.80 thrips per three terminal twigs in Vijapur to 14.36±4.09 in Kunchiganhal, with Sirigere at 14.00±4.42. In Hiriyur taluk, thrips populations were higher, with Babbur (16.84±4.58) and Maskal (16.48±7.76) showing moderate thrips population, while Dharmapur recorded 20.12±7.68. Holalkere taluk recorded moderate thrips population, with Ramagiri (16.40±8.23) and Gowdihalli (18.24±6.42), whereas Chitrahalli (13.88±2.65) exhibited relatively lower thrips population within the taluk (Table 2).

3.2.7. Bellary

The *T. parvispinus* was noticed at flowering and fruiting stage of the chilli crop. The incidence of *T. parvispinus* in Bellary district (25.39 thrips per three terminal twigs) was notably highest compared to other surveyed districts. In Bellary taluk, Yalpi Kaggalu recorded the highest population (27.32±5.89), followed closely by Lingadevanhalli (26.20±5.83) and Paramadevanhalli (26.04±5.83). In Kurugodu taluk, ranging from 24.00±6.10 in Sindhgiri to 25.36±4.47 in Somasamudra, with Kolar recorded 24.20±6.89. In Siruguppa taluk, Siruguppa had the highest thrips population (27.64±4.41), followed by Sirigeri (26.64±5.77) and Bhyrapura (21.16±7.24) (Table 2).

3.2.8. Haveri

The *T. parvispinus* was noticed at vegetative, flowering and fruiting stage of the chilli crop. In Haveri district, the mean incidence of *T. parvispinus* across surveyed villages ranged from 16.84±5.57 to 27.52±6.31 thrips per three terminal twigs, indicating a generally high population of thrips. Among the surveyed talukas, Haveri taluk recorded the highest thrips population at Aladkatti (27.52±6.31), followed by Hosahalli (21.68±7.17) and Gourapur (20.28±7.69). In Byadagi taluk, Chatra (18.80±6.92), Kollapur (17.40±6.93) and Bannihatti (16.84±5.57) indicating moderate thrips population. Ranebennur taluk, Asundi (27.08±5.24) recording very high thrips numbers, while Hanumanmatti (20.32±6.77) and Kakola (19.44±7.17) with the moderate thrips population (Table 2).

3.2.9. Raichur

The *T. parvispinus* was noticed at flowering and fruiting stage of the chilli crop. In Raichur district, *T. parvispinus* incidence varied widely across surveyed locations, ranging

from 13.32±6.09 to 25.60±6.49 thrips per three terminal twigs. In Raichur taluk, thrips populations were highest at Arsigeri (25.60±6.49), followed by Raichur (16.92±7.27) and Askihal (14.16±4.97). In Manvi taluk, thrips densities were moderate in Kallur (16.52±5.03) and Kurdi (17.40±7.27), whereas Aroli (25.12±5.63) recorded significantly higher thrips numbers. In Devadurga taluk, with Gabbur (13.32±6.09), Maseedpur (23.64±5.53) and Ganekal (19.00±6.92) showed thrips incidence (Table 2).

3.2.10. Yadgiri

The *T. parvispinus* was noticed at flowering and fruiting stage of the chilli crop. In Yadgiri district, *T. parvispinus* incidence ranged from 11.20±4.30 to 19.00±7.34 thrips per three terminal twigs. In Yadgiri taluk, thrips populations were highest at Allipur (16.08±4.50) and Mudnal (15.92±3.42), while Kanchagarhalli (11.20±4.30) recorded the lowest densities in the district. In Shahapur taluk, Rajapur (16.44±5.12) followed by Hulkal (15.16±5.66) and Bheemaranagudi (13.64±4.74). Surpur taluk showed a similar trend, where Devikera (19.00±7.34) exhibited the highest thrips population, whereas Shakapur (15.76±4.02) and Bijapur (14.56±3.30) showed slightly low thrips population (Table 2).

The above findings were concord with the findings of Manjunatha *et al.* (2001)^[12], Kumar *et al.* (2007)^[26], Sunitha *et al.* (2007)^[26], Nandini (2010)^[18], Nandini *et al.* (2012)^[17] studied the incidence of *Scirtothrips dorsalis* chilli growing areas of North Karnataka. Present findings matched with findings of Basavaraj *et al.* (2022)^[6], Hulagappa *et al.* (2022)^[9], Lodaya *et al.* (2022)^[11], Mansion and Kumar (2022)^[13], Nagdev *et al.* (2022)^[16], Patel *et al.* (2022)^[19], Rachana *et al.* (2022)^[21], Veeranna *et al.* (2022), Sethy *et al.* (2023)^[23], Timmanna *et al.* (2023)^[27], Thorat *et al.* (2023)^[28], Chatterjee *et al.* (2024)^[8], Anjana *et al.* (2025)^[1] and Raval *et al.* (2025), recorded incidence of *T. parvispinus* across the Karnataka state and India (Table 2).

3.3. Natural enemies

During the study period, documented natural enemies on chilli thrips from surveyed regions. The four coccinellids species were documented viz., *Cheilomenes sexmaculata* (Fabricius), *Coccinella transversalis* (Fabricius), *Harmonia octomaculata* (Fabricius) and *Hippodamia variegata* (Goeze) and other predators are like predatory bug and Spiders were also documented on chilli thrips (Table 1 and Plate 3). The present finding was corroborated with the findings of Asma and Hanumantharaya (2015)^[5], recorded the natural enemies like coccinellids, spiders and chrysopids in chilli growing areas.

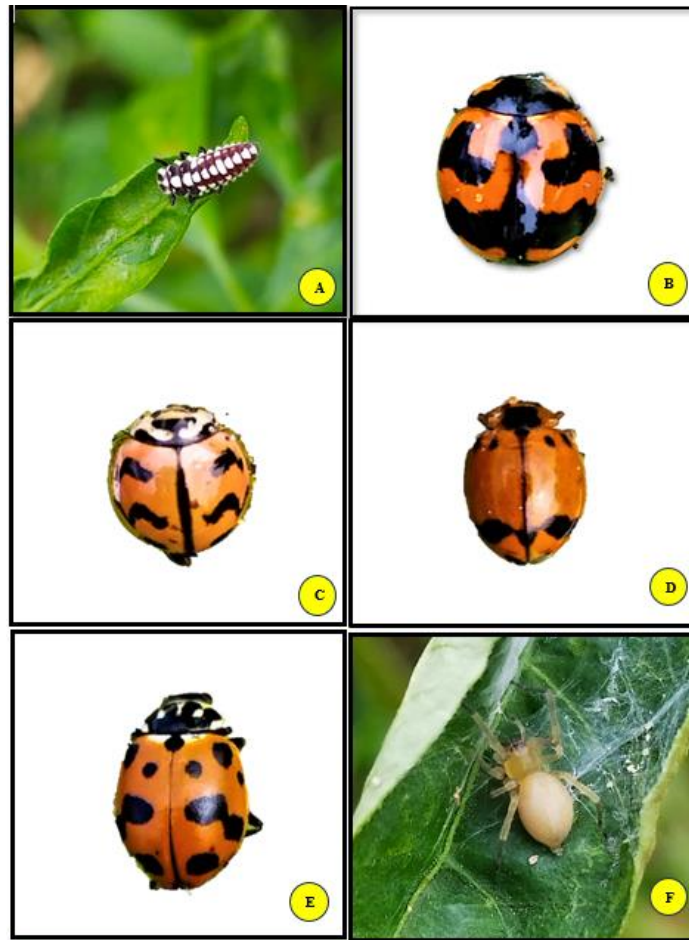


Plate 3. Natural enemies, A: Coccinellid grub, B: *Coccinella transversalis* (F.), C: *Harmonia octomaculata* (F.), D: *Cheilomenes sexmaculata* (F.), E: *Hippodamia variegata* (G.), F: Spider

4. Conclusion

During the roving survey, recorded seven thrips species on chilli host across the major chilli growing districts of Karnataka viz., *T. parvispinus* (Karny), *T. palmi*, *T. hawaiiensis* (Morgan), *T. florum* (Schmutz), *Frankliniella schultzei* (Trybom), *F. occidentalis* (Pergande) and *Megalurothrips usitatus* (Bagnall), but *T. parvispinus* (Karny) emerged as the predominant species across all surveyed locations. The population of *T. parvispinus* was studied across the different districts of Karnataka, results revealed that Ballari district show the highest incidence of *T. parvispinus* followed by Haveri, Raichur, Kalburgi and Dharwad. The moderate but considerable population was noticed in Chitradurga, Yadgiri, Davanagere and bidar. The lowest but considerable population of thrips observed in Shivamogga district. The natural enemies like four coccinellids species were documented viz., *Cheilomenes sexmaculata* (Fabricius), *Coccinella transversalis* (Fabricius), *Harmonia octomaculata* (Fabricius) and *Hippodamia variegata* (Goeze) and other predators are like predatory bug and Spiders were also documented on chilli thrips.

Competing interests

Authors Have Declared That No Competing Interests Exist.

Authors' Contributions

Authors may use the following wordings for this section: "A' and 'B K S' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the

manuscript. 'S P' and 'B H N' managed the analyses of the study. 'Author C J S and R R R' managed the literature searches..... All authors read and approved the final manuscript."

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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