

## Survey to assess the status of black thrips incidence across major chilli growing areas of Karnataka

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### Abstract

A roving survey was conducted from January to March 2024 across eight major chilli growing districts of Karnataka that are Mysuru, Kolar, Raichur, Bellary, Dharwad, Haveri, Belagavi and Bagalkot to assess *Thrips parvispinus* infestation and percentage leaf curl index (PLI) in 64 fields from 32 villages across 16 taluks. In each field, thrips populations were recorded from 50 randomly selected plants by tapping growing tips and flowers onto a white paper board, while leaf curl symptoms were assessed using a 0-4 visual rating scale. The average thrips population was 11.11 per plant, with a mean PLI of 64.91 per cent, indicating significant crop impact. The highest infestation was recorded in Raichur (14.73 thrips per plant, PLI 77.62%), Haveri (14.72 thrips per plant, PLI 80.17%) and Bellary (12.58 thrips per plant, PLI 81.71%), showing severe susceptibility. Moderate infestation was observed in Belagavi (12.89 thrips per plant, PLI 71.22%), Dharwad (12.35 thrips per plant, PLI 69.57%) and Bagalkot (12.17 thrips per plant, PLI 68.93%). Mysuru (2.83 thrips per plant, PLI 37.53%) and Kolar (3.94 thrips per plant, PLI 30.47%) had lower infestation, possibly due to environmental or pest management factors. Infestation peaked during flowering (11.96 thrips per plant, PLI 65.73%) followed by fruit initiation (10.81 thrips per plant, PLI 68.51%) and harvesting (8.81 thrips per plant, PLI 55.94%). Symptoms included leaf curling, stunted growth, malformed growing points and defoliation. These findings highlight the need for effective integrated pest management (IPM) strategies, particularly during early growth stages, to mitigate thrips damage and improve chilli yield.

**Keywords:** Chilli, roving survey, black thrips, incidence and leaf curl index (LCI)

### Introduction

Chilli (*Capsicum annum* L.), a key commercial crop of the Solanaceae family, is widely cultivated for its economic and nutritional value. India, the largest producer and exporter, contributes nearly 36 per cent of global production, with major chilli growing states including Andhra Pradesh, Telangana, Karnataka, Madhya Pradesh and Maharashtra. Rich in vitamins A, C and E, along with capsaicin, chilli offers significant medicinal benefits such as pain relief and anti-inflammatory properties (Saleh, 2018)<sup>[1]</sup>.

However, chilli cultivation faces major challenges from biotic stresses, particularly insect pests. Among them, thrips cause severe damage, with nearly 25 insect pests reported on chilli crops in India. *Scirtothrips dorsalis* has long been a major pest, but the emergence of the invasive *Thrips parvispinus* (Karny) or Black Thrips, has worsened the threat.

First reported in India on papaya in Bengaluru, *T. parvispinus* has since spread to various host plants, including chilli, beans, eggplant, and potato, as well as ornamentals like Anthurium and Chrysanthemum. Feeding damage by larvae and adults leads to stunted growth and significant yield losses (Patel, 2022)<sup>[2]</sup>. Recent outbreaks in Andhra Pradesh, Telangana, and Karnataka have resulted in 40-80 per cent damage in affected chilli growing areas (Timmanna *et al.*, 2023)<sup>[3]</sup>. The spread of invasive thrips is exacerbated by globalization and climate adaptability, with *T. parvispinus* posing a serious risk beyond its currently affected regions.

Understanding the prevalence of *T. parvispinus* is essential for effective management. This study, Survey to Assess the Status of Black Thrips Incidence across Major Chilli Growing Areas of Karnataka, aims to evaluate its distribution and severity. Systematic surveys will provide crucial insights for developing targeted pest management strategies, ensuring sustainable chilli production in the region.

### Materials and Methods

A roving survey was carried out to assess the extent of thrips infestation and also leaf curl index in major chilli growing areas of Karnataka *viz.*, Mysuru, Kolar, Raichur, Bellary, Dharwad, Haveri, Belagavi and Bagalkot (Table 1 and plate 1). In each district, two talukas and in each taluka two villages were selected, further two fields were selected in each village. Totally, 64 chilli fields were visited from all eight districts to assess the extent of thrips infestation and leaf curl index (LCI).

In each field, the population of black thrips were recorded from 50 randomly selected plants by tapping growing tips and flowers on a white paper board. The fallen thrips including adults and nymphs were counted visually. The mean population of thrips per plant was worked out for each field separately. In each field randomly 25 plants were selected on which the upward curling symptoms caused by thrips on leaves was recorded based on visual rating scale of 0-4 (Gopal, 2019)<sup>[4]</sup>. Based on the leaf curl symptoms, the percent leaf curl index (PLI) was calculated as per the formula given by Niles (1980).

LCI/Grade (0-4)	Category	Symptoms
0.	Immune (I)	No symptoms (No curling, completely healthy plant).
1.	Resistant (R)	1-25 per cent leaves per plant show curling, less damage.
2.	Moderately Resistant (MR)	26-50 per cent of leaves per plant show curling, moderately damaged.
3.	Susceptible (S)	51-75 per cent of leaves per plant show curling, heavy damage, malformation of growing points and reduction in plant height.
4.	Highly Susceptible (HS)	> 76 per cent of leaves per plants show curling, severe and complete destruction of growing points and a drastic reduction in plant height, defoliation and severe malformation.

Per cent Leaf curl Index (PLI)	Sum of scores of all plants	× 100
	Total no of plants x No. of score category	



Plate 1: Symptoms of damage on flower, leaves and whole plant

**Results and Discussion:** The results of a roving survey conducted across eight major chilli growing districts of Karnataka namely Mysuru, Kolar, Haveri, Bellary, Raichur, Belagavi and Bagalkot during January to March 2024. A total of 64 fields of 32 villages were surveyed from sixteen taluks of eight districts are presented below. The survey aimed to assess the extent of thrips infestation and the incidence of the per cent leaf curl index (PLI).

The survey carried out during March-2024 in eight fields of Belagavi district indicated that, the overall mean number of thrips per plant recorded was 13.35. The range in the mean number of thrips per plant among eight fields was from 12.88 to 13.66. Relatively higher level of thrips infestation observed from the first field of Arabhavi, first and second field of Chamkeri (13.66, 13.64 and 13.58 thrips per plant, respectively) as compared to other fields surveyed. Whereas, the moderate number of thrips (13.32, 13.34 and 13.46 thrips per plant) were recorded from second field of Arabhavi and Sindikurbet and first field of Yankanchi, respectively. However, the second field of Yankanchi and first field of Sindikurbet recorded the lowest number of thrips per plant (12.88 and 12.96 respectively) as compared to other fields surveyed. The average percentage leaf curl index across all eight fields in Belagavi district was recorded at 70.85, indicating susceptibility. Affected plants exhibited curling, malformed growing points and reduced plant height (Table 1).

Results from the survey carried out during February-March 2024 in eight fields of Dharwad district indicated that, the mean number of thrips per plant was 13.35. Among eight fields, the mean number of thrips per plant was ranged from 11.80 to 14.18. Relatively higher infestation was observed from the first field of Dharwad rural and Karadikoppa and second field of Garag (14.18, 13.76 and 13.44 thrips per plant, respectively) as compared to other fields surveyed. Whereas, the moderate number of thrips (13.36 and 13.34) per plant were recorded from second field of Dharwad rural and first field of Hebsur, respectively. However, the first field of Garag, second field of Karadikoppa and Hebsur recorded the lowest number of thrips per plant of 11.8, 13.06 and 13.09, respectively as compared to other fields

surveyed. The average percentage leaf curl index was recorded at 70.08, indicating susceptibility. Similarly, all eight fields in the Dharwad district showed signs of susceptibility, with plants displaying leaf curling, malformed growing points and reduced plant height (Table 2).

Outcome of the survey conducted during March-2024 in eight fields of Bagalkot district indicated that, the overall mean number of thrips per plant recorded was 13.35. The range in the mean number of thrips per plant among eight fields was from 12.82 to 13.82. Relatively higher level of thrips infestation observed from the second field of Tulasigeri, first field of Yedahalli and second field of Bavalatti (13.82, 13.68 and 13.56 thrips per plant, respectively) as compared to other field surveyed. Whereas, the moderate number of thrips of 13.36 and 13.48 thrips per plant were recorded from first field of Tulasigeri and second field of Yedahalli, respectively. However, the second field of Bevur, first field of Bevur and Bavalathi recorded the lowest number of thrips per plant of 12.82, 12.98 and 13.10, respectively as compared to other fields surveyed. An average leaf curl index of 70.91 was recorded, indicating susceptibility across all eight fields in the Bagalkot district. Affected plants exhibited leaf curling, malformed growing points and reduced plant height (Table 3).

Findings from the survey administered during February - 2024 in eight fields of Haveri district indicated that, the overall mean number of thrips per plant recorded was 14.72. The range in the mean number of thrips per plant among eight fields was from 13.44 to 15.86. Relatively higher level of thrips infestation observed from the first field of Bisalhalli, second field of Bisalhalli and Mudur (15.86, 15.62 and 15.32 thrips per plant, respectively) as compared to other field surveyed. Whereas, the moderate number of thrips of 14.08, 14.72 and 14.96 thrips per plant were recorded from second field of Belakeri and Allapur, first field of Mudur respectively. However, the first field Allapur and Belakeri was recorded the lowest number of thrips per plant of 13.44 and 13.76, respectively as compare to other fields surveyed. In respect to results of PLI indicated that, the average of PLI was recorded 80.17 which indicates that

the chilli plants cultivated in these areas are highly susceptible for black thrips as these plants showed the symptoms such as curling, severe and complete destruction of growing points, drastic reduction in plant height, defoliation and severe malformation (Table 4).

Results from the survey conducted during February -2024 in eight fields of Bellary district indicated that, the overall mean number of thrips per plant recorded was 12.58. The range in the mean number of thrips per plant among eight fields was from 9.76 to 15.16. Relatively higher level of thrips infestation observed from the first field of Kodal and Siddammanhalli, (15.16 and 13.56 thrips per plant, respectively) as compared to other field surveyed. Whereas, the moderate number of thrips of 13.06, 13.06, 12.64 and 12.24 thrips per plant were recorded from first field of Kudathini and Taluru, second field of Siddammanhalli and Kodal respectively. However, the second field Kudathini and Taluru was recorded the lowest number of thrips per plant of 9.76 and 11.16, respectively as compare to other fields surveyed. In respect to results of PLI indicated that, the average of PLI was recorded 81.71 which indicates that the chilli plants cultivated in these areas are highly susceptible for black thrips as these plants showed the symptoms such as curling, severe and complete destruction of growing points, drastic reduction in plant height, defoliation and severe malformation (Table 5).

Result of the survey carried out during February -2024 in eight fields of Raichur district indicated that, the overall mean number of thrips per plant recorded was 14.73. The range in the mean number of thrips per plant among eight fields was from 13.2 to 15.96. Relatively higher level of thrips infestation observed from the first field of Gabbur and second field of Shakwadi, (15.96 and 15.40 thrips per plant, respectively) as compared to other fields surveyed. Whereas, the moderate number of thrips of 14.94, 14.86, 14.58 and 14.40 thrips per plant were recorded from second field of Ganmur, first field of Shakhavadi, second field of Shakapur and first field of Ganmur respectively. However, the second field of Gabbur was recorded the lowest number of thrips per plant of 13.20 as compared to other fields surveyed. In respect to results of PLI indicated that, the average of PLI was recorded 77.62 which indicates that the chilli plants cultivated in these areas are highly susceptible for black thrips as these plants showed the symptoms such as curling, severe and complete destruction of growing points, drastic reduction in plant height, defoliation and severe malformation (Table 6).

Data from the survey conducted during February -2024 in eight fields of Mysuru district indicated that, the overall mean number of thrips per plant recorded was 2.83. The range in the mean number of thrips per plant among eight fields was from 1.64 to 4.92. Relatively higher level of thrips infestation observed from the second field of Tenkanakoppalu and first field of Yelachahalli, (4.92 and 3.64 thrips per plant, respectively) as compared to other field surveyed. Whereas, the moderate number of thrips of 3.10, 2.72, 2.54 and 2.16 thrips per plant were recorded from second field of Yelachalli, first field of Kommegowdan, Koppalu, first field of Karaknalli and first

field of Tenkanakoppalu respectively. However, the second field Kommegowdan, Koppalu and second field of Karaknalli was recorded the lowest number of thrips per plant of 1.64 and 1.96, respectively as compare to other fields surveyed. With respect to results of PLI indicated that, the average of PLI was recorded 37.53 which indicates that the chilli plants cultivated in these areas are Moderately Resistant for black thrips as these plants showed the symptoms such as curling and moderately damaged (Table 7).

Survey findings from the period of January -2024 in eight fields of Kolar district indicated that, the overall mean number of thrips per plant recorded was 3.94. The range in the mean number of thrips per plant among eight fields was from 2.46 to 6.00. Relatively higher level of thrips infestation observed from the second field of Gudipalli and first field of Vaddahalli (6.00 and 5.42 thrips per plant, respectively) as compared to other field surveyed. Whereas, the moderate number of thrips of 4.64, 3.54, 3.38 and 3.2 thrips per plant were recorded from first field of Mogilahalli, second field of Mogilahalli, first field of Gudipalli and second field of Vaddahalli respectively. However, the first and second field of Chaldiganahalli was recorded the lowest number of thrips per plant of 2.46 and 2.94, respectively as compare to other fields surveyed. With respect to results of PLI indicated that, the average of PLI was recorded 30.47 which indicates that the chilli plants cultivated in these areas are Moderately Resistant for black thrips as these plants showed the symptoms such as curling and moderately damaged (Table 8).

In 2024, an analysis of *Thrips parvispinus* (black thrips) infestation and the per cent leaf curl index (PLI) was conducted across several chilli growing districts in Karnataka. The average number of thrips across the surveyed regions was found to be 11.11 per sample, with a mean PLI of 64.91 per cent. This suggests a significant impact of thrips on chilli crops throughout the state (Table 9).

Among the surveyed districts, Haveri reported the highest infestation rate with 14.72 thrips per sample and a PLI of 80.17 per cent. Similarly, Raichur had a high thrips count of 14.73 and a PLI of 77.62 per cent. Notably, Bellary exhibited a somewhat lower thrips population of 12.58 but had the highest PLI at 81.71 per cent, indicating a substantial impact on leaf curling in this region (Table 9).

In districts like Mysore and Kolar experienced much lower thrips populations and PLI levels. Mysuru had an average thrips count of 2.83 with a PLI of 37.53 per cent and Kolar shown a thrips population of 3.94 and a PLI of 30.47 per cent. These lower values suggest a comparatively lesser impact of black thrips in these districts, possibly due to different environmental conditions or pest management practices (Table 9).

The districts Belagavi, Dharwad and Bagalkot reported similar thrips populations (around 13.03) and PLI values close to 70 per cent, indicating moderate levels of thrips infestation and PLI incidence. This analysis underscores the varying levels of thrips infestation and its associated effects on chilli crops across Karnataka, with the highest impact observed in Haveri, Raichur and Bellary (Table 9).

**Table 1:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Belagavi district during 2024

Taluk	Village	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Athani	Chamkeri	Field 1	13.64	72.78
		Field 2	13.58	70.24
		Mean	13.61	71.51
	Yankanchi	Field 1	13.46	67.52
		Field 2	12.88	71.04
		Mean	13.17	69.28
Gokak	Arabhavi	Field 1	13.66	69.76
		Field 2	13.32	71.52
		Mean	13.49	70.64
	Sindikurbet	Field 1	12.96	72.96
		Field 2	13.04	71.02
		Mean	13.00	71.99
Grand Mean			13.31	70.85

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 2:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Dharwad district during 2024

Taluk	Village	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Dharwad	Dharwad rural	Field 1	14.18	71.68
		Field 2	13.36	69.44
		Mean	13.77	70.56
	Garag	Field 1	11.80	68.16
		Field 2	13.44	68.80
		Mean	12.62	68.48
Hubli	Hebsur	Field 1	13.34	70.72
		Field 2	13.90	71.04
		Mean	13.62	70.88
	Karadikoppa	Field 1	13.76	68.96
		Field 2	13.06	71.84
		Mean	13.41	70.40
Grand Mean			13.35	70.08

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 3:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Bagalkot district during 2024

Taluk	Village	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Bagalkot	Bevur	Field 1	12.98	71.52
		Field 2	12.82	72.32
		Mean	12.90	71.92
	Tulsigeri	Field 1	13.36	70.40
		Field 2	13.82	70.41
		Mean	13.59	70.40
Bilagi	Yedahalli	Field 1	13.68	71.04
		Field 2	13.48	70.04
		Mean	13.58	70.54
	Bavalatti	Field 1	13.10	71.04
		Field 2	13.56	70.56
		Mean	13.33	70.80
Grand Mean			13.34	70.91

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 4:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Haveri district during 2024

Taluk	Village	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Hangal	Mudur	Field 1	14.96	79.28
		Field 2	15.32	80
		Mean	15.14	79.64
	Allapur	Field 1	13.44	80.96
		Field 2	14.72	81.44
		Mean	14.08	81.20
Byadgi	Bisalhalli	Field 1	15.86	80.64
		Field 2	15.62	77.12
		Mean	15.74	78.88
	Belakeri	Field 1	13.76	82.72
		Field 2	14.08	79.20
		Mean	13.92	80.96
Grand Mean			14.72	80.17

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 5:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Bellary district during 2024

Taluk	Village	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Bellary	Kudathini	Field 1	13.06	81.76
		Field 2	9.76	84.80
		Mean	11.41	83.28
	Siddammanhalli	Field 1	13.56	80.96
		Field 2	13.06	82.88
		Mean	13.31	81.92
Sandur	Talur	Field 1	12.64	81.76
		Field 2	11.16	80.32
		Mean	11.90	81.04
	Kodal	Field 1	15.16	75.84
		Field 2	12.24	85.36
		Mean	13.70	80.60
Grand Mean			12.58	81.71

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 6:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Raichur district during 2024

Taluk	Village	No. of field	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Raichur	Ganmur	Field 1	14.40	78.08
		Field 2	14.94	76.16
		Mean	14.67	77.12
	Shakhavadi	Field 1	14.86	79.36
		Field 2	15.40	79.36
		Mean	15.13	79.36
Devdurga	Gabbur	Field 1	15.96	76.32
		Field 2	13.20	77.60
		Mean	14.58	76.96
	Shakapur	Field 1	14.56	76.64
		Field 2	14.58	77.44
		Mean	14.57	77.04
Grand Mean			14.73	77.62

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 7:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Mysore district during 2024

Taluk	Village	No. of field	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Mysore	Karaknalli	Field 1	2.54	30.40
		Field 2	1.96	28.64
		Mean	2.25	29.52
	Yelachahalli	Field 1	3.64	46.88
		Field 2	3.10	43.04
		Mean	3.37	44.96
Hunsur	Tenkanakoppalu	Field 1	2.16	35.28
		Field 2	4.92	52.96
		Mean	3.54	44.12
	Kommegowdan, Koppalu	Field 1	2.72	31.84
		Field 2	1.64	31.20
		Mean	2.18	31.52
Grand Mean			2.83	37.53

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 8:** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded on chilli in Kolar district during 2024

Taluk	Village	No. of filed	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Srinivasapura	Mogilahalli	Field 1	4.64	34.56
		Field 2	3.54	24.80
		Mean	4.09	29.68
	Chaldiganahalli	Field 1	2.46	23.68
		Field 2	2.94	28.00
		Mean	2.70	25.84
Mulabagilu	Vaddahalli	Field 1	5.42	30.24
		Field 2	3.20	33.44
		Mean	4.31	31.84
	Gudipalli	Field 1	3.38	34.32
		Field 2	6.00	34.72
		Mean	4.69	34.52
Grand Mean			3.94	30.47

Thrips population recorded from 50 randomly selected plants in each field  
 Incidence of leaf curl recorded by observing 25 randomly selected plants from each field

**Table 9:** Black thrips, *Thrips parvispinus* and Per cent Leaf curl Index observed in the farmers' fields of chilli growing districts of Karnataka during 2024

Districts	Mean no. of thrips	Per cent Leaf curl Index (PLI)
Belagavi	13.31	70.85
Dharwad	13.35	70.08
Bagalkot	13.34	70.91
Haveri	14.72	80.17
Bellary	12.58	81.71
Raichur	14.73	77.62
Mysuru	2.83	37.53
Kolar	3.94	30.47
Mean	11.11	64.91

**Note:** Mean of 8 fields surveyed in each district

Incidence of thrips infestation and per cent leaf curl index (PLI) across different stages of the chilli crop: During the flowering stage, 42 fields were surveyed, revealing an average of 11.96 thrips per plant. The PLI was recorded at 65.73 per cent, indicating a substantial degree of leaf curl during this critical growth phase. This high thrips population at flowering could be due to increased foliage that provides more feeding sites, which also correlates with the plant's heightened vulnerability to pest attacks. The presence of a large number of thrips at this stage not only affects leaf health but may also have downstream effects on the plant's ability to flower and set fruit, ultimately influencing yield (Table 10).

At the fruit initiation stage, 13 fields were examined, with an observed average of 10.81 thrips per plant. Despite a reduction in thrips population compared to the flowering stage, the PLI actually increased slightly to 68.51 per cent. This indicates that even a lower number of thrips can continue to exert significant stress on the plants, as leaf curling remains severe. The sustained damage at this stage can impair nutrient transport, reduce photosynthetic efficiency and potentially delay or deform fruit development

which could impact the quality and quantity of the chilli yield (Table 10).

In the harvesting stage, 9 fields were assessed, showing a further decrease in thrips population, averaging 8.81 thrips per plant. Correspondingly, the PLI also dropped to 55.94 per cent, reflecting a lower incidence of leaf curling. This reduction might be attributed to the plant reaching a more mature, less susceptible state, or it could be due to environmental factors that are less conducive to thrips survival. Although the thrips population and PLI decrease at this stage, the cumulative damage caused during earlier stages could still affect the overall health and productivity of the crop (Table 10).

On average, across all crop stages, the thrips population was 10.52 per plant with a mean PLI of 63.39 per cent. These results underscore the importance of monitoring and managing thrips throughout the chilli crop's life cycle, particularly during the flowering and fruit initiation stages when the plants are most susceptible. Effective pest management strategies during these stages could help mitigate the extent of leaf curling, thereby supporting healthier plant development and potentially improving yields at harvest (Table 10).

**Table 10.** Incidence of black thrips, *Thrips parvispinus* and Per cent Leaf curl Index recorded at different crop stages of chilli across major chilli growing areas of Karnataka

Crop stage	No. of fields	No. of thrips plant <sup>-1</sup>	Per cent Leaf curl Index (PLI)
Flowering stage	42	11.96	65.73
Fruit initiation stage	13	10.81	68.51
Harvesting stage	9	8.81	55.94
Mean		10.52	63.39

Among all eight districts surveyed, the analysis of *Thrips parvispinus* infestation and per cent leaf curl index (PLI) across Karnataka's major chilli growing districts revealed significant variability in thrips populations (Fig. 1). The average thrips count across surveyed areas was 11.11 per sample, with a mean PLI of 64.91 per cent, suggesting a substantial statewide impact on chilli crops. Haveri reported the highest infestation with 14.72 thrips per sample and a PLI of 80.17 per cent, while Raichur similarly showed high levels with 14.73 thrips per sample and a PLI of 77.62 per cent. Although Bellary had a slightly lower thrips population of 12.58 thrips per sample, it recorded the highest PLI at 81.71 per cent, indicating severe leaf curl in this region. In contrast, Mysuru and Kolar had much lower thrips populations (2.83 and 3.94 thrips per sample, respectively) and corresponding PLI values of 37.53 per cent and 30.47 per cent suggesting a reduced impact, possibly due to differing environmental conditions or

effective pest management. The districts of Belagavi, Dharwad and Bagalkot reported similar thrips count (around 13.03 thrips per sample) and PLI values close to 70 per cent, indicating moderate levels of infestation and impact.

Similar kind of thrips infestation observed when Lodaya *et al.* (2022) [5] surveyed on the invasive pest *Thrips parvispinus* in chilli crops, following its reports in South Indian states like Andhra Pradesh, Telangana and Karnataka. The survey revealed the presence of this black thrips in nearly all villages of Anand, Vadodara, Kheda, Chhotaudepur, Panchmahal and Mahisagar districts of middle Gujarat, except for Ahmedabad, Botad and Dahod. Thrips numbers ranged from 0.00 to 8.75 per flower, with the highest incidence in Chhotaudepur (6.25-8.75 thrips per flower), followed by Anand, Vadodara, Kheda, Panchmahal and Mahisagar.

Similar results were also observed by Patel *et al.* (2022) [2] when surveyed in major chilli growing areas in Anand

district, Gujarat and identified the incidence of *T. parvispinus*. The survey recorded high populations of invasive thrips, with 14-16 thrips per flower per plant in the chilli fields of Umreth taluk. The lower populations of 4-6 thrips per flower per plant were found in the chilli fields of Anand, Anklav, Borsad, Petald, Sojitra and Tarapur taluks. Similar observations were found with Veeranna *et al.* (2022) [6]

when surveyed in the major chilli growing areas of Warangal and Mulugu districts in Telangana to assess pest infestation, identify thrips species and recommend control measures. They identified the newly invasive exotic species, *Thrips parvispinus* (Karny) and reported severe infestations leading to significant flower drop and upward leaf curling. In the Darmapuram and Parakal blocks of Mulugu district,

100 per cent crop loss was attributed to this pest's feeding and flower drop. The survey recorded infestations of 10-13 male and 18-25 female thrips per flower, resulting in flower drop rates of 30-100 per cent.

Consistent findings were documented by Timmanna *et al.* (2023) [3] surveyed in North and central India and obtained the similar results focusing on thrips in chilli and capsicum. They observed high infestation levels of 8-12 thrips per flower on chilli crops in Madhya Pradesh (Khargone, Khandwa, Satna, Narasinghpur and Dhar) and on capsicum hybrids in Haryana (Ambala, Panchkula and Panipat) grown in greenhouses. The lower infestations of 1-3 thrips per flower were observed in chilli crops in Chattisgarh (Bastar, Sarangarh-Bilaigarh, Balod Bazar and Durg).

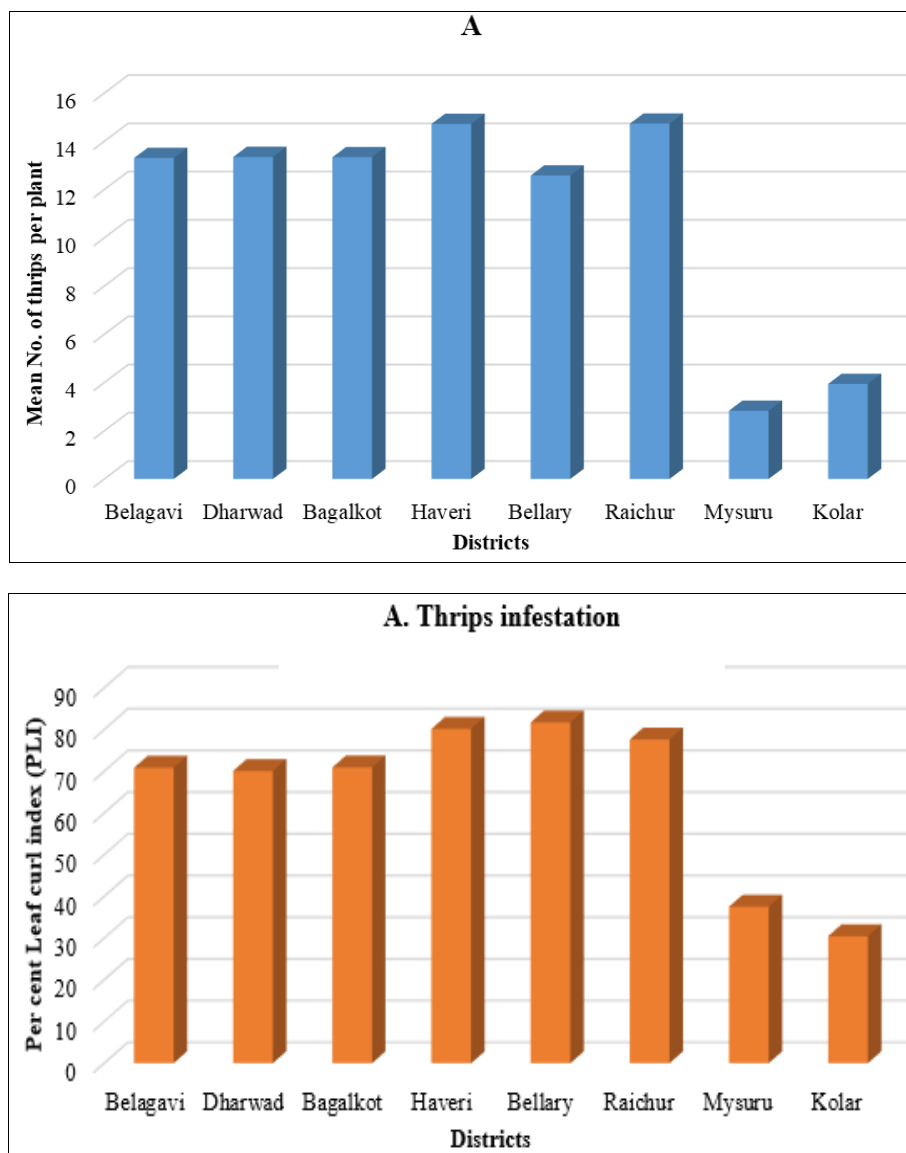


Fig 1: Black thrips infestation and PLI incidence on chilli growing districts of Karnataka

**Conclusion**

Raichur and Haveri recorded the highest thrips infestations, while Mysore and Kolar reported the lowest, among all the surveyed districts. Highest thrips populations was recorded from the field where crop was at flowering stage followed by fruit initiation and harvesting stage. However, PLI incidence was recorded maximum during fruit initiation stage than other two stages.

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