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Short communications

Invasion of *Thrips parvispinus* (Karny) in Kerala

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Abstract

The sucking pest complex is one of the major reasons for the lower production of chilli in India. Recent addition to this pest complexis the invasive thrips, *Thrips parvispinus,* introduced to India during 2015**.** A roving survey conducted across Kerala from January to September 2024 confirmed the presence of *T. parvispinus* in all districts affecting chilli and other horticultural crops. Infestation symptoms included leaf discoloration, crinkling, curling, flower drop and reduced fruit set. Diagnostic characters of *T. parvispinus* were documented. This study highlights the expanding distribution and host range of *T. parvispinus* which poses a significant threat to chilli production and other crops in Kerala.

Key words: Chilli, Kerala, *Thrips parvispinus*

Thrips are a significant group of sap-sucking insects that cause considerable economic losses by directly feeding on plants and acting as vectors of dangerous plant viruses in numerous horticultural crops. Southeast Asian thrips, *Thrips parvispinus* (Karny), an invasive pest that originated in Southeast Asiahas been documented in several regions globally including India.It was first reported in India on *Carica papaya* by Tyagi et al. (2015)in Bengaluru and later it was reported on *Dahlia rosea* Cav. (Asteraceae) (Rachana et al., 2018). Thomas et al. (2022) made the first record of this species in Kerala from chilli.

A major pest outbreak was reported in the south Indian states in 2021, which led to a considerable crop loss in the chilli producing sector ranging from 80 per cent to 100 per cent (Sridhar et al., 2021). Study conducted by Johari et al., (2014) on chilli crops in Indonesia reported 23 per cent reduction in yield due to *T. parvispinus* infestation. The present study aims to assess the extent of invasion of *T. parvispinus* on chilli and other horticultural crops in Kerala.

A roving survey was carried out throughout Kerala (Fig.1) from January to September 2024. The survey was done during a period of 9 months across the 14 districts of Kerala to know the extent of spread of *T. parvispinus* on chilli crop. Five chilli plants were randomly selected from each location and terminal shoots, leaves and flowers were gently tapped on a white paper and the number of thrips per plant was recorded. Additionally, thrips samples were collected from different hosts. The collected specimens were preserved in vials containing collection fluid having 9 parts 10 per cent alcohol,

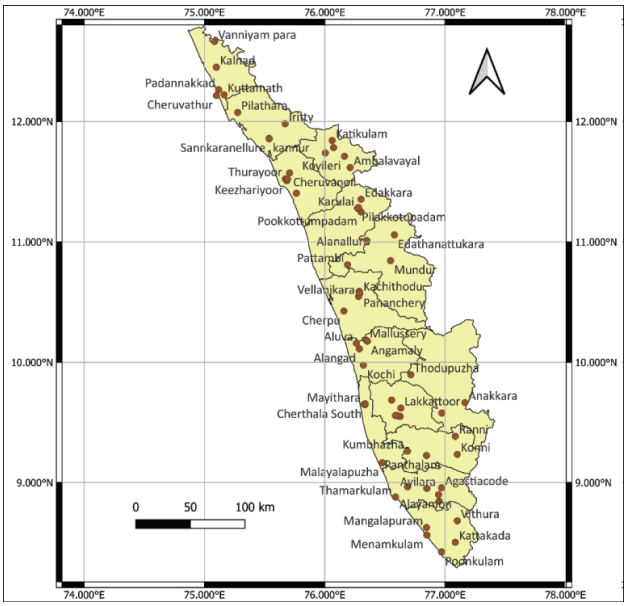

Figure1. Survey locations across Kerala

1 parts glacial acetic acid and 1 ml Triton X 100 in 1000ml of the mixture.Specimens were later mounted in Canada balsam for permanent preservation and subsequently sorted out and identified using taxonomic keys (Mound and Masumoto, 2005: Johnson et al., 2022). Photomicrographs of slide mounted adult female were captured using a ZEN 3.0 software.

Thrips collected from chilli across different location in Kerala were identified as Southeast Asian thrips, *T. parvispinus* based on distinct morphological characteristics described by

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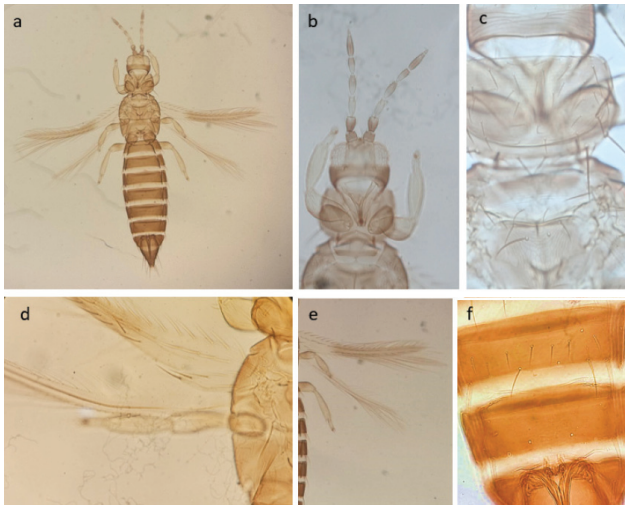

Figure 2. Thrips parvispinus; a) Adult: b) Antennae: c) Thorax: d) Clavus of wing e) Wings: f) Discal setae on V-VI sternite

Tyagi et al. (2015). The males and females of *T. parvispinus* vary in size and colour. Females of *T. parvispinus* (Fig.2) have brown body, head and thorax appearing lighter in colour than the abdomen, legs yellow and forewings brown with a pale base.

Both adults and larvae damage plants by rasping and sucking of the plant sap from flowers and under surface of leaves. It leads to the poor flower setting, withering of flowers and immature fruit drops which eventually diminishes yield (Sireesha et al., 2021). Infested plants displayed a silvery and brownish discoloration on young leaves and fruits, along with crinkling and upward curling of the leaves. As the infestation progressed, the buds and leaves became brittle, and there was an increase in flower drop (Patel et al.,2022).

As *T. parvispinus* is highly polyphagous, there is a need to monitor the presence of pest in other crops which also adds to its species displacement in chilli. In the current study *T. parvispinus* were collected from different host plants which include brinjal, tomato, turkey berry, bhindi, cowpea, cucumber, ivy gourd, pumpkin, teasel gourd, snake gourd, moringa, papaya, rose and clitoria (Table 1). The polyphagous nature of pest helps to establish in the introduced region and expanded to different geographical areas. Eventhough the pest was recorded from various host plants, the damage due to *T. parvispinus* was reported mostly in chilli.According to EPPO (2021) this species has been documented on 44 host plants encompassing various ornamental and economically significant crops. In Indonesia, it has been reported on 32 plant typeswith the highest abundance on chilli, melon, cucumber, eggplant and squash (Johari and Natalia, 2018). In India, Nagaraju et al. (2021) observed its occurrence on chilli and several weed species such as *Parthenium, Amaranthus* sp., *Axonopus* sp., *Ageratum* sp., and *Alternanthera* sp., as well as on neem and pongamia foliage. Johari et al. (2014) documented it on crops like pepper, anthurium and hoya, while Roselin et al. (2021) recorded its presence on *Brugmansia* sp. Moreover, Ranjith et al. (2022) reported it on guava and Amrutha and Rachana (2023) documented on cotton.

Table1. Host plants of *Thrips parvispinus* recorded from Kerala

SN.	Common name	Scientific name	Family
1	Chilli	*Capsicum annuum*	Solanaceae
2	Brinjal	*Solanummelongena*	Solanaceae
3	Tomato	*Solanumlycopersicum*	Solanaceae
4	Turkey berry	*Solanumtorvum*	Solanaceae
5	Bhindi	*Abelmoschusesculentus*	Malvaceae
6	Cowpea	*Vignaunguiculata*	Leguminosae
7	Cucumber	*Cucumis sativus*	Cucurbitaceae
8	Ivy gourd	*Coccinia grandis*	Cucurbitaceae
9	Pumpkin	*Cucurbitapepo*	Cucurbitaceae
10	Teasel gourd	*Momordicadioica*	Cucurbitaceae
11	Snake gourd	*Trichosanthescucumerina*	Cucurbitaceae
12	Moringa	*Moringa oleifera*	Moringaceae
13	Papaya	*Carica papaya*	Caricaceae
14	Rose	*Rosa* sp.	Rosaceae
15	Clitoria	*Clitoria ternatea*	Leguminosae

A considerable variation in thrips population was recorded across the different survey locations (Fig.1). The mean number of thrips per plant varied from 0.6 to 14.8 with lowest in Cherthala (Alappuzha) and highest in Ayilara (Kollam). Particularly high infestations were observed in Ayilara (14.8), Panamaram (13.2) and Puthuppally (12.8), where mean thrips counts exceeded 10 per plant. Moderate populations were found in Mangalapuram (5.8), Alayamon (8.8) and Vattakunnu (7)with values falling between 5 and 10. Meanwhile, significantly lower populations below 5 thrips per plant, were recorded in Menamkulam (2.6), Poonkulam (2.2) and Cherthala (0.6) (table 2).The variation in population observed across different locations may be attributed to seasonal differences during the time of collection, as well as variations in crop management practices.

Among the surveyed locations, the presence of *Scirtothrips dorsalis* (Hood) was confirmed only in Thikkodi (Lat. 11.499022p , Long. 75.62544p) in Kozhikode district. *Thrips parvispinus* on the other hand was recorded from 70 locations, highlighting its widespread distribution and dominance over *S.dorsalis*. So far *S. dorsalis* has been considered as a major sucking pests affecting chilli. In India a significant yield loss of 11 to 32 per cent (quantitative) and 88 per cent (qualitative) was reported in chilli due to *S.dorsalis* infestation (Jadhao et al., 2016)

The current study revealed that *S.dorsalis* has been completely replaced by *T. parvispinus* in chilli across Kerala. There are similar reports where *T. parvispinus* replaced *Thrips palmi* Karny populations, which was the major thrips

Table 2. Incidence of *Thrips parvispinus* on chilli in Kerala

Districts	Month of collection	Location	GPS coordinates	Mean number of *Thrips parvispinus* per chilli	Districts	Month of collection	Location	GPS coordinates	Mean number of *Thrips parvispinus* per chilli
Thiruvananthapuram	Jan. 2024	Menamkulam	8 56' N 76 84' E	2.6	Thrissur	Mar. 2024	Pananchery	10° 57' N 76° 29' E	9.6
		Poonkulam	8° 42' N 76° 97' E	2.2			Cherpu	10° 42' N 76° 16' E	5.8
		Vithura	8° 68'N 77° 10'E	3.2			Vellanikara	10° 55' N 76° 28' E	4.2
		Kattakada	8° 50' N 77° 08' E	10.6			Killannur	10° 59' N 76° 29' E	11.8
		Mangalapuram	8° 63' N 76° 85' E	5.8			Kachithodu	10° 57' N 76° 29' E	8.4
Kollam	Feb. 2024	Kundara	8° 96' N 76° 69'E	4.6	Palakkad	Mar. 2024	Pattambi	10° 81' N 76° 19' E	11.2
		Ittiva	8° 84' N 76° 95' E	3.8			Mundur	10° 84' N 76° 55' E	5.6
		Alayamon	8° 89' N 76° 95' E	8.8			Edathanattukara	11° 08' N 76° 58' E	3.6
		Ayilara	8° 95' N 76° 85' E	14.8			Alanallur	11° 01' N 76° 35' E	4.8
		Agastiacode	8° 96' N 76° 97' E	2.4			Anakkara	10° 66' N 77° 16' E	5.8
Pathanamthitta	Aug. 2024	Konni	9° 23' N 77° 10' E	3.8	Malappuram	Ap. 2024	Pookkottumpadam	11° 25' N 76° 30' E	6.4
		Ranni	9° 38' N 77° 08' E	9.4			Edakkara	11° 35' N 76° 30' E	3.6
		Panthalam	9° 22' N 76° 85' E	5.4			Karulai	11° 28' N 76° 27' E	7.4
		Kumbhazha	9° 26' N 76° 69' E	10.6			Nilambur	11° 28' N 76° 28' E	7.6
		Malayalapuzha	9° 16' N 76° 48' E	10.4			Pilakkotupadam	11° 28' N 76° 28' E	3.2
Alappuzha	Feb. 2024	Cherthala	9° 65' N 76° 33' E	0.6	Kozhikode	Mar. 2024	Thurayoor	11° 52' N 75° 67' E	5.6
		Cherthala South	9° 65' N 76° 33' E	2.6			Keezhariyoor	11° 51' N 75° 68' E	9.6
		Mayithara	9° 65' N 76° 33' E	3.4			Cheruvanor	11° 57' N 75° 71' E	4.6
		Arthunkal	9° 65' N 76° 34' E	3.8			Manhakulam	11° 52' N 75° 69' E	2.8
		Thamarkulam	8° 88' N 76° 59' E	2.6			Kodassery	11° 40' N 75° 76' E	2.6
Kottayam	Aug. 2024	Vattakunnu	9° 55' N 76° 63' E	7	Wayanad	Apr. 2024	Katikulam	11° 84' N 76° 06' E	7.6
		Puthupally	9° 56' N 76° 59' E	12.8			Porunnanore	11° 74' N 76° 00' E	3.2
		Meenadam	9° 55' N 76° 60' E	4.2			Panamaram	11° 78' N 76° 07' E	13.2
		Narakkathod	9° 56' N 76° 59' E	6.2			Ambalavayal	11° 62' N 76° 21' E	5
		Lakkattoor	9° 62' N 76° 63'E	1.6			Koyileri	11° 71' N 76° 16' E	10
Idukki	Sep. 2024	Thodupuzha	9° 89' N 76° 71'E	6.8	Kannur	Apr.2024	Sannkaranellure	11° 86' N 75° 54' E	5.4
		Arakulam	9° 68' N 76° 55' E	8.2			Pilathara	12° 07' N 75° 27' E	11.2
		Kuttikkanam	9° 58' N 76° 97' E	5.4			Iritty	11° 98' N 75° 67' E	6.8
		Kanjar	9° 81' N 76° 81'E	7.0			Kannur	11° 86' N 75° 54' E	7.4
		Kumali	9° 60' N 77° 17' E	6.1			Pathiryad	11° 86' N 75° 54' E	10.6
Ernakulam	Feb. 2024	Kochi	9° 97' N 76° 32' E	1.6	Kasaragod	May 2024	Padannakkad	12° 26' N 75° 12' E	4
		Alangad	10° 11' N 76° 29' E	5.2			Kalnad	12° 45' N 75° 09' E	2
		Aluva	10° 16' N 76° 26' E	7.2			Kuttamath	12° 22' N 75° 16' E	2.2
		Mallussery	10° 18' N 76° 34' E	3.6			Vanniyam para	12° 66' N 75° 08' E	7.8
		Angamaly	10° 17' N 76° 35' E	3.4			Cheruvathur	12° 22' N 75° 01' E	6.6

pest of vegetable crops in Indonesia (Murai et al., 2010). Population of well-established chilli thrips *S. dorsalis* Hood was displaced by *T. parvispinus* in Andhra Pradesh, Karnataka and Telangana States of India (Sridhar et al., 2021).

Competitive displacement is the most severe outcome of interspecific competition. Most of these displacements occur between closely related species and in most cases exotic species displaced native species or previously established exotic species.These displacements usually happened in the anthropologically altered habitats rather than natural (Reitz and Tremble, 2002). For confirming pest displacement information regarding competition mechanism status of pest species before and after displacement and knowledge of other mediating factors of competition are required. In our present survey we can confirm that *S. dorsalis* has been replaced by *T. parvispinus*. It is further needed to study the type of competitive mechanism between the two species whether is exploitative or inference mechanism. *T. parvispinus* is highly polyphagous and like many polyphagous homopteran insects prone to strong interspecific competitionit has been associated with several cases of species displacement. Even though interspecific competition exists in polyphagous species, there are no direct evidence for competitive displacement. This warrants further investigation on the mechanism of displacement.

Conclusion

Thrips parvispinus has emerged as a significant pest in chilli cultivation, particularly in southern Indian states causing substantial crop losses. This study confirms its presence across Kerala on chilli and other host plants highlighting its adaptability and extensive host range. The pest's rapid spread severe impact on crop yield and ability to infest diverse plant families underscore the need for effective management

strategies. Addressing this pest is crucial to safeguarding chilli production and minimizing economic losses in affected regions.

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