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Survey for incidence of chilli thrips and mites at different districts of Karnataka

Pawankumar, MH Tatagar and GK Ramegouda

Abstract
The survey was carried in September and December for chilli thrips and mite for their incidence as well as LCI at selected districts of Haveri, Kolar and Bengaluru urban at greenand red chilli stage Karnataka, India. During the survey at green chilli stage the peak incidence as well as LCI was found in Haveri district compared to other districts such as Kolar and Bengaluru rural and they least incidence and LCI was recorded in Bengaluru urban. Whereas survey carried out at red chilli stage in different taluks of Haveri district it has found that moreincidence and LCI was recorded in Shiggoan taluk compared to other taluks whereas least incidence and LCI was noticed in Haveri taluk.

Keywords: Haveri, Kolar, Bengaluru rural, *Scirtothrips dorsalis*, *Polyphagotarsonemus latus* and Chilli

Introduction
Chilli (*Capsicum annuum* L.) is a member of Solanaceae family which represents a diverse plant group. India is the world's largest producer, consumer and exporter of chillies in the world. India has the largest area in the world. India produced 2096 metric tons of dry chilli over an area 8.40 lakh ha during 2016 (Anon., 2017) [2]. The major chilli growing states in India are Andhra Pradesh (57%), Karnataka (12%), Madya Pradesh, Orissa, West Bengal, Rajasthan and Tamil Nadu. In Karnataka, chilli is grown on an area of 89,556 ha with a production about 1,11,547 tons and is being grown as a rainfed as well as irrigated conditions in Dharwad, Haveri, Koppal, Ballary, Raichur, Gulbarga and Belgaum districts (Anon., 2014) [1].

In Karnataka, thrips, mites and whiteflies have been identified as key sucking pests of chilli of which leaf curl caused by mite and thrips is serious. Yield loss due to these thrips and whiteflies has been estimated up to the tune of 50 per cent (Ahmed *et al.*,1987; Kandaswamy *et al.*, 1990) [3, 8]. The yield loss due to chilli mite may go up to 96.39 per cent (Borah, 1987) [4] Incidence of leaf curl disease complex up to 80.23 per cent has been reported in Karnataka (Venkatesh *et al.*, 1998) [10]. About 21.29 per cent crop losses due to mite infestation and 30-50 per cent due to thrips have been reported (Jeyarani and Chandrasekaran, 2006) [7].

Due to monoculture of chilli, pest buildup is so much that farmers have to resort to minimum of five to six chemical sprays in rainfed areas (Haveri, Dharwad and Gadag districts) and more than 20 to 30 sprays in irrigated belts (Bellary, Raichur and Gulbarga districts). In spite of that, it has become very difficult to manage these pests and the cost of cultivation has increased enormously making chilli cultivation non profitable besides increasing the pesticide residues on produce and in the environment. In addition to this, these pesticidal sprays have become a threat to chilli ecosystem causing resurgence of pest and destruction of natural enemy fauna. Repeated application of commonly used pesticides against thrips and aphids has resulted in pest resurgence of *P. latus* on chilli (David, 1986) [5].

Decreased field efficiency of chemical insecticides and ever increasing demand for organically grown chilli produce in the local as well as global market lead to the search for environment friendly alternatives to manage chilli thrips and mites. In this background, the present investigation was undertaken with the following objectives.

Material and Methods
Survey was carried out for the incidence of thrips and mite in different districts of Karnataka *viz.*, Haveri, Kolar and Bengaluru Rural. Survey was conducted twice in these areas during September to December months, one at green stage and another at red chilli stage to record

observations on the incidence of thrips, mites and leaf curl as explained earlier.

In Haveri district five villages per taluk were selected for survey from Haveri, Savanur and Shigaon taluks (Table 5 and 8). In Kolar district seven villages (Table 6) were surveyed while from Bengaluru urban district only four villages from Bengaluru North taluk were surveyed (Table 7). In each village, five fields were selected isolated at least one to two km from each other in all the four directions of the village for the survey. In each field, observations were from all four corners leaving two to five meters from the edge and from the middle of the field. Incidence was recorded as per the procedure explained earlier from five (small plot ≤ 0.2 ha) or ten (big plot >0.2 ha) random plants depending the plot size from three leaves on top, middle and bottom of the plant and leaf curl damage was scored visually on a zero to four scale. Survey was accomplished twice at green and red chilli stage only in Haveri district while, only at green chilli stage in Kolar and Bengaluru Urban district. Apart from these, ancillary data on the details of farmers, cropping pattern, cropping system, soil type, variety/hybrid, fertilizers, pesticides and frequency of pesticides applied were collected.

Results

Based on the survey carried out in different villages of Haveri taluk of Haveri district at green chilli stage (Table 5) it is found that, the mean number of thrips per leaf was 0.15 and it ranged from 0.1 to 0.3 thrips per leaf which was lowest in Guttal and highest in Varadahally, respectively. In other villages' *viz*., Agadi, Karjagi and Basapur the population was 0.13, 0.16 and 0.20 thrips per leaf, respectively. In Savanur taluk of Haveri district, thrips incidence ranged from 0.20 to 0.36 per leaf and was least in the Teggihally village (0.20 thrips/leaf) and the highest was in Gundur (0.36 thrips/leaf). Whereas, in other villages such as, Nandihally, Mannur and Hosaneeralagi, thrips incidence was 0.33, 0.26 and 0.23 per leaf, respectively with an overall mean 0.27 thrips per leaf in Savanuru taluk.In the Shiggoan taluk, incidence of thrips ranged from 0.16 (Shiggoan) to 0.40 (Chikkanellur) per leaf and overall mean thrips incidence per plant was 0.24 per leaf in Shiggoan taluk. The grand mean thrips incidence in Haveri district was 0.22 per leaf.

The thrips damage (LCI) assessed by visual scores at green chilli stage in Haveri taluk ranged from 0.4 (Guntal) to 1.4 (Varadahally) with a mean of 0.76 (Table 5). Where in Savanur taluk it was fairly higher and ranged from 1.1 (Teggihally) to 1.7 (Gundur) with a mean for taluk of 1.40. The LCI due to thrips was highest in the Shiggoan taluk (1.50) which ranged from 1.2 (Shiggoan) to 1.8 (Chikkanellur). The thrips damage measured as LCI for Haveri district was 1.22.

In Kolar district, seven villages representing three taluks were surveyed (Table 6). In Kolar taluk the thrips incidence at the green chilli stage ranged from 0.06 (Ajappanahalli) to 0.30 (Chadumanahalli) thrips per leaf with a mean of 0.16 thrips per leaf. It was 0.26 in Giranalli of Malur while it was only 0.10 in Lakshmisagar of Srinivasapura taluk. In Kolar district, only Namadhari variety was grown throughout the surveyed villages and the overall mean thrips incidence for Kolar district was 0.16 thrips per leaf. The thrips damage score in terms of LCI for Kolar district was 0.87 and was 0.86 for Kolar taluk which varied from 0.40 (Ajappanahalli) to 1.40 (Chadumanahalli). It was 0.08 in Sreenivasapura and 0.60 for Malur taluk (Table 6).

In Bengaluru urban district, survey was made in four villages only from Bengaluru north taluk where the thrips incidence was least in Hessaraghatta (0.03 thrips/leaf) on variety Arka Meghana and was highest at Lakshmipura cross (0.10 thrips/leaf) on the variety, Ujawal (Table 7). The overall mean thrips incidence for Bengaluru north taluk is 0.06 thrips per leaf. In Bengaluru north district the thrips damage in terms of LCI ranged from 0.10 (Hessarghatta) to 0.60 (Lakshmipura cross) (Table 7) with a mean of 0.32.

Mites population and leaf curl at green chilli stage

Among the different villages of Haveri taluk surveyed, incidence of mite ranged from 0.06 to 0.16 per leaf (Table 5) and it was lowest in Agadi and Guttal (0.06 mite/leaf) on Tejaswini and highest in Varadahally (0.16 mite/leaf) on Byadagi Dabbi with an overall mean of 0.11 mites per leaf. In the Savanur taluk, the mite incidence ranged from 0.10 to 0.16 per leaf and was least in Gundur and Teggihally villages (0.10 mite/leaf) and highest in Hosaneeralagi and Mannur villages (0.16 mite/leaf) and overall mean mite incidence in Savanur taluk was 0.12 per leaf. In Shiggoan taluk also the population of mite almost similar to that in other taluks of Haveri district which ranged from 0.06 (Nellur) to 0.16 (Bankapur) mite per leaf. The mean mite incidence for the Shiggoan taluk was 0.11 mite per leaf. The grand mean of mite per leaf in Haveri district was 0.10.

The downward leaf curl measured at green chilli stage as LCI in Haveri taluk was 0.58 which ranged from 0.30 (Guttal) to 1.20 (Vardahally) (Table 5). In Savanur taluk it was a little bit high (0.74) with a range of 0.50 (Gundur) to 1.0 (Hosaneeralgi). In the Shiggoan taluk it ranged from 0.4 (Neelur) to 1.1 (Bankapur) with a mean 0.64.

The mean mite per leaf in Kolar taluk was 0.07 which ranged from zero (Ajappanahalli) to 0.16 (Chatrakodahalli). It was 0.03 in Srinivaspura taluk and 0.06 in Malur taluk with a grand mean of 0.06 mites per leaf in the green chilli stage (Table 6). The mean LCI due to mites in Kolar district was 0.18 and for the kolar taluk it was 0.20 which ranged from zero (Ajappanahalli) to 0.60 (Chatrakodahalli) (Table 6). The LCI due to mites in Malur and Sreenivaspura taluks was 0.20 and 0.10, respectively.

In Bengaluru urban district the mite population at green chilli stage ranged zero (Hessarghatta) on Arka Meghana (Table 7) to a maximum of 0.06 mite/leaf (Lakshmipura cross) on variety Ujwal with a mean of 0.03 for Bengaluru north taluk. The mite induced downward curling LCI in Bengaluru north taluk was 0.32 which ranged from 0.10 (Hessarghatta) to 0.60 0 (Lakshmipura cross) (Table 7) at green chilli stage.

Thrips population and leaf curl at red chilli stage

Survey for the incidence of thrips at red chilli stage was carried out only in Haveri district. In Haveri taluk thrips incidence ranged from 0.80 to 2.20 with a mean of 1.52 thrips per leaf (Table 8) and it was lowest in Guttal (0.80 thrips/leaf), where the cultivar grown was Tejaswini, a private hybrid and highest in Varadahally (2.20) on Byadagi Dabbi. In the Savanur taluk thrips on chilli ranged from 1.90 (Teggihally) to 2.73 (Gundur) per leaf with a mean of 2.29, which is fairly higher than that in Haveri taluk. Thrips incidence was the highest in Shiggoan taluk (2.41) among the three surveyed taluks of Haveri district which ranged from 1.80 (Shiggoan) to 2.76 thrips per leaf (Chikkanellur).

The upward curling due to thrips at red chilli stage in Haveri district was 2.36 LCI which was maximum for Shiggoan taluk

(2.70) and minimum for Haveri taluk (1.86) (Table 8). In Haveri taluk it ranged from 1.3 (Guttal) to 2.5 (Varadhally). In Savnuru taluk it ranged from 2.10 (Teggihally) to 3.00 (Gundur). The higher incidence was recorded in villages with Tejaswini hybrid compared to Byadagi Dabbi. Highest LCI due to thrips was recorded for the Shiggoan taluk which ranged from 2.0 (Shiggoan) to 3.20 (Chikkanellur) with a mean of 2.70.

Mites population and leaf curl at red chilli stage

Among the five villages of Haveri taluk surveyed, incidences of mite population ranged from 0.36 mite per leaf on Tejaswini (Guttal) to a maximum of 1.40 mite per leaf (Varadahally) on Byadagi Dabbi with a mean of 0.60 mite per leaf.In Savanur taluk, the chilli mite population was 0.66 mite per leaf which ranged from 0.40 (Gundur) to 0.26 mite per leaf (Hosaneeralagi). Among the three surveyed taluks of Haveri district, incidence to chilli mite was maximum in Shiggoan taluk (0.82 mite/leaf) with a range of 0.46 (Nellur) to 1.36 mites per leaf (Bankapur).

The downward curling measured as LCI due to mites at red chilli was 1.24 for the Haveri district with the taluk means of 1.12, 1.22 and 1.40 for Haveri, Savanur and Shiggaon, respectively. In Haveri taluk it was minimum and ranged from 0.70 (Guttal) to 2.20 (Vardahally). In case of Savanur it was maximum of 1.50 at Hosaneeralgi to a minimum of 0.9 at Gundur village. In the Shiggoan taluk it was relatively maximum in the district with a minimum of 1.00 (Neelur) to 2.00 (Bankapur).

Table 1: Survey for incidence of thrips and mites on chilli at green chilli stage in Haveri district during *kharif* 2015

SI. No.	Taluk	Village	Variety Hybrid	Thrips/leaf	Mites/leaf	LCI due to	
						Thrips	Mite
1.	Haveri	Varadahally	B. dabbi	0.30	0.16	1.40	1.20
2.		Agadi	Tejaswini	0.13	0.06	0.60	0.40
3.		Guttal	Tejaswini	0.10	0.06	0.40	0.30
4.		Karjagi	Tejaswini	0.16	0.09	0.60	0.40
5.		Basapur	Tejaswini	0.20	0.10	0.80	0.60
		Mean		0.15	0.09	0.76	0.58
1.	Savanur	Mannur	B. dabbi	0.26	0.16	1.40	0.90
2.		Nandihally	B. dabbi	0.33	0.13	1.60	0.60
3.		Teggihally	B. dabbi	0.20	0.10	1.10	0.70
4.		Gundur	B. dabbi	0.36	0.10	1.70	0.50
5.		Hosaneeralgi	B. dabbi	0.23	0.16	1.20	1.00
		Mean		0.27	0.12	1.40	0.74
1.	Shiggaon	Bankapur	B. dabbi	0.23	0.16	1.40	1.10
2.		Chikkanellur	B. dabbi	0.40	0.10	1.80	0.40
3.		Shiggaon	B. dabbi	0.16	0.13	1.20	0.70
4.		Maur	B. dabbi	0.23	0.10	1.60	0.60
5.		Nellur	B. dabbi	0.20	0.06	1.50	0.40
		Mean		0.24	0.11	1.50	0.64
Grand Mean (Haveri district)				0.22	0.10	1.22	0.65

Table 2: Survey for incidence of thrips and mites on chilli at green chilli stage in Kolar district

Sl. No.	Taluk	Village	Variety/Hybrid	Thrips/leaf	Mites/leaf	LCI due to	
						Thrips	Mites
1.	Kolar	Vadaguru	Namdhari (NS 436)	0.10	0.10	0.60	0.20
2.		Ajappanahalli	Namdhari (NS 436)	0.06	0.00	0.40	0.00
3.		Chadumanahelli	Namdhari (NS 436)	0.30	0.03	1.40	0.10
4.		Doddahosahalli	Namdhari (NS 436)	0.16	0.06	0.70	0.10
5.		Chatrakodahalli	Namdhari (NS 436)	0.20	0.16	1.20	0.60
		Mean		0.16	0.07	0.86	0.20
1.	Srinivasapura	Lakshmisagar	Namdhari (NS 436)	0.10	0.03	0.80	0.10
1.	Malur	Giranalli	Namdhari (NS 436)	0.26	0.06	1.00	0.20
Grand Mean (Kolar district)				0.16	0.06	0.87	0.18

Table 3: Survey for incidence of thrips and mites on chilli at green chilli stage in Bengaluru urban district during *kharif* 2015

Sl. No.	Village	Variety/Hybrid	Thrips/leaf	Mites/leaf	LCI due to	
					Thrips	Mite
1.	Shivakote	Ujawal	0.06	0.03	0.40	0.40
2.	Doddabyalakere	Ujawal	0.06	0.03	0.20	0.20
3.	Lakshmipur cross	Ujawal	0.10	0.06	0.60	0.60
4.	Hessarghatta	Arka Megahan	0.03	0.00	0.10	0.10
Mean Bengaluru North Taluk			0.06	0.03	0.32	0.32

Table 4: Survey for incidence of thrips and mites on chilli at red chilli stage in Haveri district during *kharif* 2015

Sl. No.	Taluk	Village	Variety/Hybrid	Thrips/leaf	Mites/leaf	LCI due to	
						Thrips	Mite
1.	Haveri	Varadahally	B. dabbi	2.20	1.40	2.50	2.20
2.		Agadi	Tejaswini	1.30	0.46	1.70	1.00
3.		Guttal	Tejaswini	0.80	0.36	1.30	0.70
4.		Karjagi	Tejaswini	1.50	0.40	1.80	0.80
5.		Basapur	Tejaswini	1.80	0.43	2.00	0.90
		Mean		1.52	0.60	1.86	1.12
1.	Savanur	Mannur	B. dabbi	2.40	0.83	2.60	1.40
2.		Nandihally	B. dabbi	2.50	0.50	2.70	1.10
3.		Teggihally	B. dabbi	1.90	0.53	2.10	1.20
4.		Gundur	B. dabbi	2.73	0.40	3.00	0.90
5.		Hosaneeralgi	B. dabbi	1.93	0.96	2.20	1.50
		Mean		2.29	0.66	2.52	1.22
1.	Shiggaon	Bankapur	B. dabbi	2.70	1.36	3.00	2.00
2.		Chikkanellur	B. dabbi	2.76	0.50	3.20	1.10
3.		Shiggaon	B. dabbi	1.80	0.70	2.00	1.30
4.		Maur	B. dabbi	2.20	1.10	2.50	1.60
5.		Nellur	B. dabbi	2.60	0.46	2.80	1.00
		Mean		2.41	0.82	2.70	1.40
Grand Mean (Haveri district)				2.07	0.69	2.36	1.24

Chilli thrips, *S. dorsalis*

The survey carried out during *kharif* 2015 in different villages of Haveri, Bengaluru rural, Kolar at green and red chilli stage revealed that leaf curl damage as well as incidence due to thrips was more in Byadagi Dabbi compared to other cultivars *viz.*, Tejaswini, Namadri, Ujawal, Arka Meghan during the season (Tables 5, 6, 7 and 8). In Haveri district, especially in Varadahally, the incidence as well as LCI due to thrips was more on Byadagi Dabbi compared to Tejaswini grown in other villages such as Agadi, Guttal, Karjagi and Basapur Fig. 1). Similarly studies have been documented by Hosamani (2007) [6] where in the incidence was more on Byadagi Kaddi compared to Guntur variety. Tejaswini being a private hybrid bred for green chilli is known to be tolerated leaf curl has been reinforced with the current findings with least thrips and mite populations as well as LCI (Fig. 1). Incidence of thrips and LCI due to thrips was more during *kharif* 2015 in all the villages of Savanur and Shiggaon taluks of Haveri district surveyed on the variety, Byadagi Dabbi. Velayudhan *et al.* (1985) [9] reported the thrips incidence throughout the year which was reduced during July-September due to heavy rains. While, in the current study, in majority of surveyed area the rainfall was scanty during July to September months making the conditions favourable for thrips and mites build up.

The trend in thrips population and leaf curl damage due to thrips in Kolar district was little different from that of Haveri district and relatively less (Table 6). Here the major variety grown was a private hybrid, Namdhari –NS 436 which is tolerant to thrips and mainly produced for green chilli. Among the three districts, the incidence of chilli thrips and LCI due to it was least in Bengaluru urban district and the varieties observed here were also diverse (Ujawal & Arka Meghana). The least incidence is may be due to another important factor is the isolated chilli fields and discontinuity might have limited the pest buildup or spread compared to a single crop over a wide area in Haveri district and moderately discontinuous chilli crop in Kolar district.

Chilli mite, *P. latus*

Survey in Haveri district clearly indicated a higher incidence of mite and leaf due to mite (Fig. 1). Mite incidence as well LCI was relatively higher in Savanur taluk than Shiggaon and Haveri taluks at green chilli stage (Table 5) while, at red chilli stage (Table 8) it was higher in Shiggaon taluk followed by Savanur taluk. While in Kolar district the mite incidence was as low that observed in Haveri taluk but, the LCI was very less (Table 6, Fig. 3) may be due to the Namdhari hybrid, NS 436 which is tolerant to chilli curl as claimed by the company. On the other hand, the mite population and the LCI due to mite was very low and is almost negligible in Bengaluru urban district is mainly attributable due to discontinuity in the chilli crop, scattered and small holdings might have put a hold on the mite buildup besides the diversity of improved varieties being grown. Among the varieties /hybrids observed, Byadagi Dabbi registered higher mite population and LCI than Tejaswini, Namadhri- NS-436, Ujawal and Arka Meghana (Fig. 2) during both the green and red chilli stages. Namdhari-NS-436 and Ujawal, which were predominant in the study areas of Kolar and Bengaluru are being tolerant to mite and are being grown exclusively for the green chilli might be the reason for lower mites population and LCI in Kolar and Bengaluru districts as seen with Tejaswini in Haveri disrtict. Compared to the density of mites reported by Hosamani (2007) [6] across major chilli growing areas of northern Karnataka the mite population observed in the current study is relatively low. Study has clearly shown that the variety Byadagi Dabbi is more prone to mite menace than the rest of the varieties/hybrids being commercially grown for red of green chilli purpose both in north and southern parts of Karnataka. The regular or excess monsoon during the growing season of 2015 might have put a hold on the pest buildup in chilli during 2015-16 in the study area comprising of Haveri, Savanur, Shiggaon, Kolar, Srinivasapura, Malur and Bengaluru north taluks. Velayudhan *et al.* (1985) [9] have also reported that rainfall had a significant effect on the population of mites.

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