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Population dynamics and Efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood) in *Kharif*

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Abstract
This field trail was conducted at the central field, Department of entomology SHUATS, Prayagraj during *Kharif* August to November 2019 entitled Efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood) in *Kharif*. Seven treatments were taken against the chilli thrips, *Scirtothrips dorsalis i.e.,* T_1 Fipronil 5 SC, T_2 Buprofenzin 25 SC, T_3 Thiamethoxam 25 WG, T_4 Imidacloprid 17.8 SL, T_5 Flubendamide 24% SC, T_6 Triazophos, T_7 Indoxacarb 14.5 SC were evaluated against chilli thrips *Scirtothrips dorsalis.* Among the seven treatments T_4 Imidacloprid (95.83%) has significantly superior treatment followed by Thiamethoxam (93.82%), Fipronil (92.86%), Buprofezin (91.74%), Indoxacarb (89.36%), Triazophos (88.10%), Flubendamide (86.39%) was found to be least effective against the chilli thrips. The plot which is treated with the Imidacloprid (175 q/ha) followed by Thiamethoxam (110 q/ha), (105 q/ha), Buprofezin (100 q/ha), Indoxacarb (95 q/ha), Triazophos (82.5 q/ha), Flubendamide (75 q/ha) as compared to control T_0 (62.5 q /ha). The highest yield was noticed in Imidacloprid 17.8L (175 q/ha). followed by Thiamethoxam 25 WG (110 q/ha).

Keywords: *Capsicum annuum*, efficacy, insecticides, *Scirtothrips doraslis*

Introduction
Chilli, (*Capsicum annuum* Linnaeus) popularly known as 'Mirch' in Hindi, belongs to the family Solanaceae originated from the latin American region and currently used throughout the world as a spice and is an important condiment crop grown in Gujarath. It was introduced in india by the portuguese in the 16th century and since then it had rapidly spread throughout the country (Anonymous, 2015) [1]. From ancient time chillies have been used as food, spice and household medicine for several common problems such as high cholesterol, high blood pressure, pain to a jont, skin problem, relief of pain in neuropathy, counter irritant in treatment of rheumatism, lumbago and used as carminative, appetizer, stomachic and beverages. Capsicum is derived from the Greek word "Kapsimo" meaning "to bite". The therapeutic effect of chilli is due to capsaicin, protein, fixed oil, thiamine and ascorbic acid (Pawar *et al*., 2011) [11]. Chilli (*Capsicum annuum* Linnaeus) is an important spice cum vegetable crop commonly used in the indian dietary. It is grown throughout the year as a cash crop and used in green and red ripe dried stage for their pungency, colour and other ingredients in all culinary preparations of rich and poor alike to impart taste, flavour and colour. Nutritionally, it is a rich source of vitamins A, B and C. Capsaicin an alkaloid responsible for the pungency in chillies has medicinal properties and prevents heart attack by dilating the blood vessels (Gill, 1989) [5]. India is the largest consumer and exporter of chilli in the world with a production of 1492 million tonnes from an area of 775 thousand hectares during 2014 (Anonymous, 2014) [2]. In India, it is intensively cultivated in Andhra pradesh, Maharastra, karnataka, Tamil Nadu, Rajasthan and in hilly areas of Uttar Pradesh (Kumari *et al*., 2001) [6]. India has emerged today as the foremost producer and exporter of chillies contributing to almost one fourth of the world's production. In India, chilli is grown in an area of 7.43 L ha, with a production of 14.53 L tonnes (Agricultural Statistics at a glance, 2015) [3]. The important chilli growing states in India are Andhra Pradesh, Orissa, Maharashtra, Karnataka and also in several other states as a round the year crop. In Andhra Pradesh, chilli is cultivated in an area of 1.89 L hectares with a production of 2.08 L tons. Guntur district in Andhra Pradesh alone contributes to over 35% of the area under chilli crop in India.

Guntur district in Andhra Pradesh is traditionally a chilli growing district with an area of 63,573 ha with high input usage under monocropping conditions. Further, intensive cultivation of input responsive high yielding varieties and hybrids and sole reliance on insecticides are the common features of chilli cultivation in the guntur district. The excessive dependence on insecticides, their over use and abuse have accelerated insect control problems through the development of insecticide resistance (Reddy *et al*., 1992) [13]

Materials and Methods

The present investigation will be conducted at the Agricultural Research Farm of Sam Higginbottom university of Agriculture, Technology and Science Prayagraj, Uttar Pradesh during *Kharif* season 2019. In a ramdomised block design with eight treatments, using variety Suryamukhi in a plot size of (2m x 2m) at a spacing of (45x30cm) with the recommended package of practices excluding plant protection. The spraying was done after the population reaching its ETL (5 thrips/plant). The observation of the pests was recorded from three tender leaves of five randomly selected plants from each net plot area and three leaves (top, middle, and bottom) from each plant were selected. The average percent reduction of pest population of two sprays was worked out by using Henderson and Tilton's formula described as under:

Preparation of Insecticidal Spray Solution's

The spray solution of the desired concentration will be prepared by adopting the following formula:-

$$V = (C \times A) \div a.i\%$$

Where,
V = Volume/ weight of formulated insecticide required.
C = Concentration required.
A = Volume of solution to be prepared.
a.i % = given percentage of active ingredient.

Population reduction

The population of chilli thrips was recorded on 3rd, 7th and 10th day after insecticidal application.

$$\text{Per cent reduction in population} = 100 \times \left[1 - \frac{Ta \times Cb}{Tb \times Ca}\right]$$

Where,
T_a = Number of insects after treatment
T_b = Number of insects before treatment
C_a = Number of insects in untreated check after treatment
C_b = Number of insects in untreated check before treatment

Result and Discussion

The present study on the incidence of chilli thrips, *Scirtothrips dorsalis* population with the weather parameter in the experimantal region as in table no. 1 and figure no. 1. Thrips occurence in the rainy season started from 36th standard week with an average population of 1.4 insect/3 leaves. The pest population has increased gradually reaches the peaks level *i.e.*, 16.2 insect/3 leaves at 46th standard week. Then after that the pest population reduction was observed due to the fall of maximum and minimum temperature as optimum weather conditions has decreased. The probable reason may be the occurence of the chilli thrips, *Scirtothrips dorsalis* due to good weather factors like temperature, relative humidity, rainfall, wind velocity, sunshine hours during this experimental period. The multiplication of pest population is more at maximum temperature, decreasing of pest population gradually. Barot *et al.* (2012) [4] proved that the infestation of thrips started from 1st week after transplanting *i.e.* last week of August (35th standard week) and remained in the field till to the crop maturity (3rd week of February) in the range of 0.50 to 10.54 with an average of 4.37 thrips/twig. Thrips attained first (8.80 thrips/twig), second (5.66 thrips/twig) and third as well as the highest peak (10.54 thrips/twig) during 2nd week of November, 3rd week of December and 3rd week of February, respectively. Meena *et al.* (2013) [10] results revealed that the incidence of thrips (*Scirthothrips dorsalis* Hood), were appeared on the chilli crop soon after transplanting, The peak population of thrips (14.5 and 14.7/ 3 leaves/ plant) was recorded in the first week of October. Reddy *et al.* (2017) [14] studied the thrips *Scirtothrips dorsalis* (Hood) incidence was observed from transplanting to harvesting stage and the highest thrips population was recorded during January 3rd week (3rd standard week) with 24.82 thrips per five leaves. Rajput *et al.* (2017) [12] a field experiment was conducted to study the population dynamics of major insect pests infesting chilli (*Capsicum annum* L.). Results revealed that the incidence of thrips (*Scirtothrips dorsalis* Hood) was commenced during the second week of August and reached the peak during the third week of September (9.50 thrips/3 leaves).

Table 1: To study the seasonal incidence of chilli thrips {*Scirtothrips dorsalis* (Hood)} in *Kharif* season 2019

Standard weeks	Per cent infestation	Temperature		Humidity		Rainfall (mm)	Wind Velocity (k/hr)	Sunshine (Hr/day)
		Max.	Min.	Morning	Evening			
33	0	35.65	28.14	94.42	56.85	6.68	1.31	5.45
34	0	33.32	27.11	94.28	62.14	19.82	1.32	2.45
35	0	34.57	27.57	91.57	66.85	13.85	1.44	5.57
36	1.4	35.08	28.08	68.14	58.71	1.74	1.58	5.82
37	2.2	33.74	28.48	68.14	58.71	1.74	1.58	5.62
38	4.2	33.62	27.57	68.14	58.71	1.74	1.58	3.91
39	5	30.91	26.42	94.14	7.42	31.31	1.37	2.85
40	5.8	30.34	23.28	93.42	71.14	21.03	1.24	1.54
41	6.2	34.04	24.71	91	49.28	0.91	1.27	6.88
42	8.4	33.62	24.85	90.57	57.71	0	1.41	6.51
43	9.8	31.91	23	90.71	62.14	0	1.26	6.28
44	12	33.11	21.51	90.28	58.85	0	1.10	6.58
45	14.8	33.34	21.6	90.42	57.71	0	1.02	6.58
46	16.2	32.42	19.88	90.42	58.57	0	1.06	7.34
47	15.6	31.51	16.02	90.57	59.28	0	1.09	7.65

48	14.2	30.88	15.4	91.71	61.0	0	1.96	6.17
49	8.6	30.6	14.8	92.0	63.57	6.6	1.02	8.45
50	6.2	32.49	13.2	92.0	61.0	0	1.02	8.25
	R value	-0.523	-0.698	0.281	-0.170	-0.465	0.740	0.499
	T value	2.453	3.904	1.172	0.69	2.103	4.398	2.305
	Result	S	S	NS	NS	NS	S	S

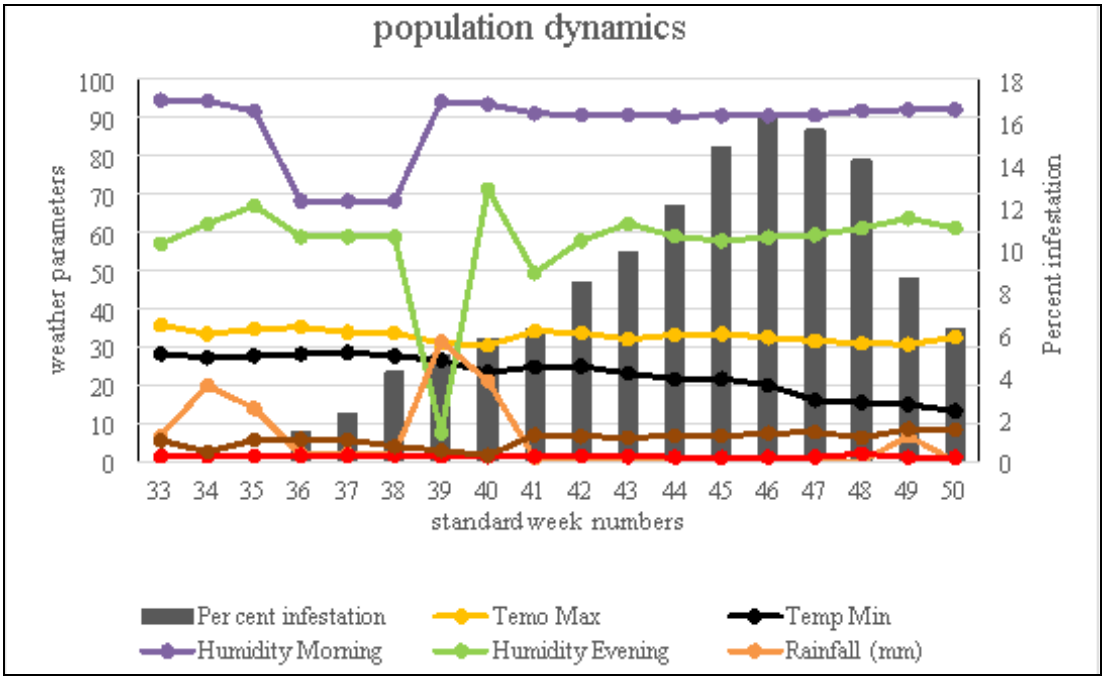

Fig 1: Graphical representation of seasonal incidence of chilli thrips, *Scirtothrips dorsalis* (Hood) during *Kharif* 2019.

Table 2: Efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* on chilli (1st spray) (Per cent infestation /3 leaves)

S.No.	Treatments	Mean Population of the thrips / 3 leaves per plant					
		1 Day Before Spray	3 DAS	7 DAS	10 DAS	MEAN	% Reduction Of Chilli Thrips Over Control
T_1	Fipronil 5SC	8.20	0.86	1.06	1.26	1.06	90.17
T_2	Buprofezin 25 % SC	8.06	1.06	1.26	1.46	1.26	88.32
T_3	Thiamithoxam 25 WP	7.86	0.73	0.93	1.33	0.93	91.38
T_4	Imidacloprid 17.8 SL	7.80	0.46	0.66	0.86	0.66	93.88
T_5	Flubendamide 20 % WG	7.80	1.73	1.93	2.13	1.93	82.11
T_6	Triazophos40 EC	7.66	1.53	1.66	1.86	1.68	84.43
T_7	Indoxacarb 14.5 % SC	7.46	1.33	1.53	1.73	1.53	85.82
T_0	Control	8.33	9.73	11	11.6	10.79	-
Over all mean		7.89	2.17	2.50	2.77	2.48	-
F-Test		NS	S	S	S	S	-
S.Ed.(±)		0.244	0.405	0.277	0.173	0.228	-
C.D. (P = 0.05)		NS	0.869	0.595	0.372	0.490	-

DAS= Days after spray

Table 3: Efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* on chilli (2nd spray) (Per cent infestation/3 leaves)

S. No.	Treatments	Mean Population of the thrips/3 leaves per plant					
		1 Day Before Spray	3 DAS	7 DAS	10 DAS	Mean	% Reduction Of Chilli Thrips Over Control
T_1	Fipronil 5 SC	7.4	0.66	0.86	1.06	0.86	94.66
T_2	Buprofezin 25 % SC	7.33	0.86	0.93	1.13	0.97	93.97
T_3	Thiamithoxam 25 WP	7.2	0.53	0.73	0.93	0.73	95.43
T_4	Imidacloprid 17.8 SL	7.66	0.26	0.46	0.66	0.46	97.14
T_5	Flubendamide 20 % WG	7.6	1.53	1.73	1.93	1.73	89.26
T_6	Triazophos 40 EC	7.6	1.33	1.53	1.73	1.53	90.50
T_7	Indoxacarb 14.5 % SC	7.8	1.13	1.33	1.53	1.33	91.74
T_0	Control	11.66	14	16.33	18	16.11	-
Over all mean		8.03	2.53	2.98	3.37	2.96	-
F-Test		NS	S	S	S	S	-
S.Ed.(±)		1.362	0.306	0.176	0.075	0.525	-
C.D. (P = 0.05)		NS	0.656	0.377	0.160	1.127	-

DAS= Days after spray.

Table 4: Efficacy of selected insecticides against chilli thrips, {*Scirtothrips dorsalis* (Hood)} on chilli (*Capsicum annuum* Linnaeus) during *Kharif* season 2019. First and second spray (Overall mean)

S. No.	Treatments	1st spray Mean	2nd spray Mean	Over all mean	% Reduction Of Chilli Thrips Over Control
T_1.	Fipronil 5 SC	1.06	0.86	0.96	92.86
T_2.	Buprofezin 25% SC	1.26	0.97	1.11	91.74
T_3.	Thiamithoxam 25 WP	0.93	0.73	0.83	93.82
T_4.	Imidacloprid 17.8 SL	0.66	0.46	0.56	95.83
T_5.	Flubendamide 20 % WG	1.93	1.73	1.83	86.39
T_6.	Triazophos 40 EC	1.68	1.53	1.60	88.10
T_7.	Indoxacarb 14.5 % SC	1.53	1.33	1.43	89.36
T_0.	Control	10.77	16.11	13.45	-
Overall mean		2.48	2.96	2.72	-
F- Test		S	S	S	-
S.Ed (±)		0.228	0.525	1.382	-
C.D. (P=0.05)		0.490	1.127	3.268	-

Among all the treatments Imidacloprid recorded the highest reduction percentage of *Scirtothrips dorsalis* (Hood) pest population *i.e.*, (95.83%) as compared to the control treatment followed by Thiamethoxam (93.82%), Fipronil (92.86%), Buprofezin (91.74%), Indoxacarb (89.36%), Triazophos (88.10%), Flubendamide (86.39%) was least effective among all treatments. Mahaveer *et al.* (2015) [8] by their experiment he revealed Imidacloprid 17.8 SL sprayed twice recorded the significant highest marketable yield of chilli. Mandi and Senapati (2009) [9] reported that thiomethaxam has effective in the control the thrips in chilli. Sangle *et al.* (2017) [15] was found in the plots treated with imidacloprid followed by thiamethoxam has effective result in the chilli thrips. Khanzada *et al.* (2018) [7] by the experiment thrips population very lowest population was observed in the treatment of Imidacloprid.

Conclusion

The overall results of the present study revealed that the thrips population was recorded in the 16.2 insect/3 leaves at 46th standard week of November. This may be probably due to the favorable weather conditions prevailing for the pest during the month. Imidacloprid recorded highest reduction percentage of *Scirtothrips dorsalis* (Hood) pest population *i.e.*, (95.83%) as compared to the control treatment followed by Thiamethoxam (93.82%), Fipronil (92.86%) and all other treatments stood well superior to the control. Thus, this Knowledge of population dynamics of the pests and the insecticides will the in devising a sustainable pest management strategy for the farmers.

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