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Bioefficacy of various insecticides against chilli thrips (*Scirtothrips dorsalis* Hood)

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Abstract
Filed experiment was conducted at Farmers field, Village Kesali, Ta. Gandevi, Dist. Navsari during 2015. There are two spray of fipronil 5 SC (25 mL a.i./ha), lambda-cyhalothrin 5 EC (25 mL a.i./ha), ethion 40 EC + cypermethrin 5 EC (499.5 mL a.i./ha), fenpropathrin 30 EC (150 mL a.i./ha) and fenazaquin 10 EC (50 mL a.i./ha) in chilli at 15 days interval resulted that, the treatment of fipronil 0.005 per cent (25 mL a.i./ha) and fenpropathrin 0.03 per cent (150 mL a.i./ha) found significantly superior in controlling the chilli thrips with significantly higher fruit yield (421.95 q/ha), which was at par with fenpropathrin (403.26 q/ ha). A treatment of ethion + cypermethrin 0.1 per cent (499.5 mL a.i./ha) proved as the second best treatment, though it was equally effective to fenpropathrin 0.03 per cent (150 mL a.i./ha) and lambda-cyhalothrin 0.005 per cent (25 mL a.i./ha). Fenazaquin 0.005 per cent (50 mL a.i./ha) remained least effective among all during present investigation.

Keywords: Chilli thrips, efficacy, fipronil, lambda-cyhalothrin, ethion + cypermethrin, fenpropathrin and fenazaquin.

Introduction

Chilli, (*Capsicum annuum* Linnaeus.) popularly known as *'Mirch'* in Hindi, belongs to the family Solanaceae originated from Latin American region and currently used throughout the world as a spice and is an important condiment crop grown in Gujarat. It was introduced in India by the Portuguese in 16th century and since then it had rapidly spread throughout the country [2]. From ancient time chillies has been used as food, spice and household medicine for several common problems such as high cholesterol, high blood pressure, pain to joint, skin problem, relief of pain in neuropathy, counter irritant in treatment of rheumatism, lumbago and used as carminative, appetizer, stomachic and beverages. While it's biological function is to repel herbivores animals and fungi. 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 [7]. Chilli occupies a pride place among the vegetables for its delicious taste and pleasant flavor. In India, chilli is mainly grown for its fruits which are used prior to its maturity in various culinary preparations and also in stuffing, pizza and burger. Both green and dry chillies are produced world over from the chilli crop. The cultivation of chilli has become capital intensive due to many production constrains of which the losses caused by pests in paramount. Nearly 25 insects pest have been recorded attacking chilli leaves and fruits in India, which includes thrips, aphid, whitefly, fruit borer, cutworm, plant bug and other minor insect pests, of which, thrips, *Scirtothrips dorsalis* Hood is considered as the most serious and important pest [3]. In Gujarat, thrips, aphid, cutworm, whitefly and mites have been reported to infest the chilli crop [6]. The losses caused by various pests to chilli crop can be avoided by adopting proper pest control tactics. Insecticide application is one of the management options that can substantially reduce yield losses associated with insect pests infestation. There are number of insecticides available to control these pests. Foliar applications of systemic insecticides have been found effective than soil drenches in controlling chilli thrips. To generate information regarding efficacy of synthetic insecticide against chilli thrips, "Bioefficacy of various insecticides against chilli thrips (*Scirtothrips dorsalis* Hood)" was carried out.

Material and methods: Filed experiment was conducted at Farmers field, Village Kesali, Ta. Gandevi, Dist. Navsari during 2015 and Laboratory studies were carried out at Food Quality Testing Laboratory, N. M. College of Agriculture, Navsari Agricultural University, Navsari.

Six treatments including control (water spray) were evaluated in Randomized Block Design with three replications. The seedlings of chilli cultivar SHP-4884 were transplanted during second week of January at a spacing of 60 x 60 cm having gross and net plot size of 3.0 x 6.0 m and 2.4 x 5.4 m, respectively. All the recommended agronomical practices were followed for raising the crop. Two sprays were made, first spray on appearance of pests and subsequent spray was given after 15 days using manually operated Hydraulic Knapsack Sprayer fitted with hollow cone nozzle.

Results and discussion: The data on thrips population and chilli fruit yield and their pooled are presented in Table-1 and 2.

First spray: The data on mean population before commencement of spray are consistent among different treatments (14.25 to 15.45 thrips/leaf) as the data are statistically non-significant. Moreover, there was a significant difference in the data of mean population of thrips in treated plot and untreated control, which showed efficacy of insecticidal treatments.

At 3 DAS, all the insecticidal treatments were significantly superior over untreated control. The lowest thrips population was recorded in the treatment of fipronil 0.005 per cent at 25 mL a.i./ha (0.55 thrips/leaf) and was at par with the treatment of fenpropathrin 0.03 per cent at 150 mL a.i./ha (0.55 thrips/leaf) and ethion + cypermethrin 0.1 per cent at 499.5 mL a.i./ha (0.90 thrips/leaf). Latter was also at par with the treatment of lambda-cyhalothrin 0.005 per cent at 25 mL a.i./ha (1.05 thrips/leaf). The treatment of fenazaquin 0.005 per cent at 50 mL a.i./ha (3.85 thrips/leaf) recorded significantly higher population than rest of the treatments, however it was significantly superior than untreated control.

After 5 DAS, fipronil 0.005 per cent recorded the lowest thrips population (0.55 thrips per leaf) and was also at par with the treatment of ethion + cypermethrin 0.1 per cent (1.10 thrips/leaf). Latter was also found at par with lambda-cyhalothrin 0.005 per cent (1.45 thrips/leaf). Fenpropathrin 0.03 per cent (2.50 thrips/leaf) and fenazaquin 0.005 per cent (2.70 thrips/leaf) remained equally effective against thrips, though they were significantly superior than untreated control.

At 7 DAS, significantly the lowest (1.45 thrips/leaf) population was counted in treatment of fipronil at 0.005 per cent (1.45 thrips/leaf) and ethion + cypermethrin 0.1 per cent (1.85 thrips/leaf), however latter was also at par with fenpropathrin 0.03 per cent (3.10 thrips/leaf). These was followed by lambda-cyhalothrin 0.005 per cent (4.55 thrips per leaf) and fenazaquin 0.005 per cent (5.85 thrips/leaf).

Pooled over 1st spray: It can be seen from the pooled data that, all the treatments recorded significantly the lowest population of thrips than untreated control. Wherein, fipronil at 0.005 per cent established its superiority by imparting the lowest mean thrips population (0.85thrips/leaf) and was at par with ethion + cypermethrin 0.1 per cent (1.28 thrips/leaf). The treatment of fenpropathrin 0.03 per cent (2.05 thrips/leaf) remained at par with the treatment of ethion + cypermethrin 0.1 per cent on one side and with fenpropathrin 0.03 per cent (2.05 thrips/leaf) on other side. The treatment of fenazaquin 0.005 per cent (4.13 thrips/leaf) recoded significantly higher thrips population and, thus, found least effective.

Second spray: After second spray at 3 DAS, the treatment of fipronil at 0.005 per cent (1.00 thrips/leaf) and fenpropathrin 0.03 per cent (1.15 thrips/leaf) recorded significantly the lowest thrips population than rest of all treatments. The next best treatments were ethion + cypermethrin 0.1 per cent (1.45 thrips/leaf), lambda-cyhalothrin 0.005 per cent (3.00thrips/leaf) and fenazaquin 0.005 per cent (3.15thrips/leaf).

At 5 DAS, fipronil at 0.005 per cent (1.45 thrips/leaf) recorded the lowest thrips population, however, it was at par with the treatment of fenpropathrin 0.03 per cent (2.10 thrips/leaf). The treatment of ethion + cypermethrin 0.1 per cent (2.90 thrips/leaf) was found equally effective with the treatment of fenpropathrin 0.03 per cent and lambda-cyhalothrin on either side. Fenazaquin 0.005 per cent found the least effective by recording higher thrips population (7.55 thrips/leaf).

Seven days after spraying, fipronil 0.005 per cent (7.45 thrips/leaf) and fenpropathrin 0.03 per cent (8.10 thrips/leaf) recorded significantly lowest thrips population and proved their superiority. The next best treatments were lambda-cyhalothrin 0.005 per cent (12.95 thrips/leaf), ethion + cypermethrin 0.1 per cent (14.00 thrips/leaf) and fenazaquin 0.005 per cent (15.05 thrips/leaf).

Pooled over 2nd spray: It is evident from the pooled data that, all the insecticidal treatments played significant role in minimizing the thrips population. Among them, after two sprays, treatments of fipronil at 0.005 per cent (3.30 thrips/leaf) and fenpropathrin 0.03 per cent (3.78 thrips/leaf) established their superiority to control the thrips. While, the next effective treatments found were ethion + cypermethrin 0.1 per cent (6.42 thrips/leaf) and lambda-cyhalothrin 0.005 per cent (6.50 thrips/leaf). The treatment of fenazaquin 0.005 per cent found the least effective by recording highest population (8.58 thrips/leaf) even after two sprays.

Pooled over two sprays: Glance through the data on pooled over two sprays, all the insecticidal treatments proved effective over untreated control. A non-significant result of Treatment X Period showed consistent performance of the treatments over period and sprays. It is also clear from the data that a treatment of fipronil 0.005 per cent (2.08 thrips/leaf) and fenpropathrin 0.03 per cent (2.92 thrips/leaf) found significantly superior in controlling the chilli thrips population. A treatment of ethion + cypermethrin 0.1 per cent (3.85 thrips/leaf) proved as the second best treatment, though, it was equally effective to fenpropathrin 0.03 per cent and lambda-cyhalothrin 0.005 per cent (4.43 thrips/leaf). Fenazaquin 0.005 per cent (6.36 thrips/leaf) remained the least effective among all the treatments during present investigation.

Earlier, superiority of fipronil has been proved against chilli thrips [8, 2]. Similarly, ethion and fenpropathrin superior against carmine spider mite [4]. While, the ethion + cypermethrin proved significantly effective against red mite, *Tetranychus telarius* on okra [5]. Thus, the above reports regarding efficacy of insecticides confirms the present findings.

A treatment of fenazaquin found least effective against chilli thrips during present investigation but in previous it was second best treatment on same pest and crop [9]. From this, it can be assume that the pest might have develop resistance against the chemical, which needs further investigation.

Fruit yield: The data on yield of chilli fruit (Table-2) revealed that, all the insecticidal treatments have effectively

controlled the thrips in chilli crop which ultimately reflected by increase in yield. It observed that, fipronil (0.005%) treated plot recorded highest yield (421.95 quintal/hectare) and was at par with fenpropathrin (403.26 q/ha). It was followed by treatments of lambda-cyhalothrin 0.005 per cent (375.04 q/ha), ethion + cypermethrin 0.1 per cent (328.43 q/ha) and fenazaquin 0.005 per cent (304.19 q/ha). Significantly, the lowest yield was recorded in untreated control plot with 172.84 q/ha. In past, increase in yield in fipronil treated plot in chilli was reported [7].

Conclusion

It is evident from the studies that, a treatment of fipronil 0.005 per cent (25 mL a.i./ha) and fenpropathrin 0.03 per cent (150 mL a.i./ha) found significantly superior in controlling the chilli thrips. A treatment of ethion + cypermethrin 0.1 per cent (499.5 mL a.i./ha) proved as the second best treatment, though, it was equally effective to fenpropathrin 0.03 per cent and lambda-cyhalothrin 0.005 per cent (25 mL a.i./ha). Fenazaquin 0.005 per cent (50 mL a.i./ha) remained least effective among all during present investigation.

The treatment of fipronil 0.005 per cent also resulted in significantly higher fruit yield (421.95 q/ha), which was at par with fenpropathrin 0.03 per cent (403.26 q/ ha), followed by lambda-cyhalothrin 0.005 per cent (375.04 q/ha), ethion + cypermethrin 0.1 per cent (328.43 q/h) and fenazaquin 0.005 per cent (304.19 q/h). The lowest yield was observed in untreated control plot with 172.84 q/ha.

Table 1: Bioefficacy of various insecticides against thrips

Treatment	Dose (mL a.i./ha)	No. of thrips/plant day after spray										Overall Pooled
		I Spray					II Spray					
		1DBA	3DAA	5DAA	7DAA	Pooled	1DBA	3DAA	5DAA	7DAA	Pooled	
Fipronil	25	3.98 (15.40)	1.02 (0.55)a	1.02 (0.55)a	1.39 (1.45)a	1.15 (0.85)a	4.06 (16.05)	1.22 (1.00)a	1.39 (1.45)a	2.82 (7.45)a	1.81 (3.30)a	1.48 (2.08)a
Lambda-cyhalothrin	25	3.86 (14.45)	1.24 (1.05)b	1.39 (1.45)b	2.23 (4.55)bc	1.64 (2.35)c	4.21 (17.25)	1.85 (3.00)b	2.01 (3.55)c	3.66 (12.95)b	2.51 (6.50)b	2.07 (4.43)c
Ethion + Cypermethrin	499.5	3.99 (15.45)	1.18 (0.90)ab	1.26 (1.10)ab	1.51 (1.85)a	1.27 (1.28)ab	4.14 (16.65)	1.69 (2.35)b	1.84 (2.90)bc	3.80 (14.00)b	2.44 (6.42)b	1.86 (3.85)bc
Fenpropathrin	150	3.84 (14.25)	1.02 (0.55)a	1.72 (2.50)c	1.80 (3.10)ab	1.49 (2.05)bc	4.04 (15.90)	1.28 (1.15)a	1.61 (2.10)ab	2.93 (8.10)a	1.94 (3.78)a	1.71 (2.92)ab
Fenazaquin	50	3.92 (14.85)	2.08 (3.85)c	1.79 (2.70)c	2.52 (5.85)c	2.04 (4.13)d	4.07 (16.05)	1.90 (3.15)b	2.82 (7.55)d	3.94 (15.05)b	2.88 (8.58)c	2.46 (6.36)d
Control	-	3.85 (14.35)	3.8 (14.00)d	4.01 (15.65)d	4.05 (15.90)d	3.98 (15.18)e	4.07 (16.05)	3.63 (12.85)c	4.02 (15.75)e	5.07 (25.20)c	4.24 (17.93)d	4.11 (16.56)e
S.Em ± (T)		0.10	0.06	0.10	0.17	0.09	0.11	0.12	0.09	0.11	0.09	0.09
CD at 5% (T)		NS	0.18	0.29	0.50	0.29	NS	0.37	0.28	0.33	0.28	0.32
S.Em ± (P x T)		-	-	-	-	0.10	-	-	-	-	0.09	0.11
CD at 5% (P x T)		-	-	-	-	NS	-	-	-	-	NS	NS
C.V.%		5.06	6.79	10.43	14.89	11.49	5.31	12.79	8.09	5.87	8.20	10.05

Figure in the parenthesis are original values while those outside square root transformed values (Add value = 0.5)

Table 2: Effect of different insecticide on chilli fruit yield

Sr. No.	Treatment	Fruit yield (kg/ha)	Fruit yield (q/ha)
1	Fipronil 0.005% (25 mL a.i./ha)	218.7	421.95a
2	Lambda-cyhalothrin 0.005% (25 mL a.i./ha)	194.4	375.04b
3	Ethion + cypermethrin 0.1% (499.5 mL a.i./ha)	170.3	328.43c
4	Fenpropathrin 0.03% (150 mL a.i./ha)	209.1	403.26a
5	Fenazaquin 0.005% (50 mL a.i./ha)	157.7	304.19d
6	Control (water spray)	89.6	172.84e
ANOVA			
S.E.m ±		0.91	6.99
C.D. @ 5%		2.73	21.07
C.V. (%)		4.18	4.18

Note: Treatment means with letter(s) in common are not significant at 5% level of significance in respective columns

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