RESEARCH ARTICLE

EFFECTIVENESS OF SOME INSECTICIDE MOLECULES AGAINST ONION THRIPS

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Abstract: The experiment was conducted at Horticultural Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G) during Rabi season 2020-2021 to study efficacy of different insecticides against thrips on onion crop revealed Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1 as most effective treatment followed by Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 300 ml ha-1 Whereas Lambda Cyhalothrin 5% EC @ 300 ml ha-1 was least effective as it recorded highest thrips population per plant. The highest bulb yield were registered by Lambda cyhalothrin + fipronil 5% ZC @ 400 ml (11.19 t/ha) and the miximum benefit cost ratio (1: 8.07) was recorded with same insecticide.

Keywords: Bio efficacy, *Thrips tabaci,* Insecticides, Management, Onion

INTRODUCTION

Onion (*Allium cepa* L.) is one of the important vegetable (bulb) crop. It belongs to the Alliaceae family and the extensively grown herbaceous biennial vegetable crop with cross-pollinated and monocotyledonous conduct having diploid chromosomes number 2n=2x=16 (Shiberu and Mahammed, 2014). It is a brief duration horticultural crop (Brewster, 1990)grown at low latitudes.It possibly originated from Central Asia between Turkmenistan and Afghanistan in which a number of its family nonetheless develop inside the wild. Onion from Central Asia, the intended onion ancestor had likely migrated to the Near East (Grubben and Denton, 2004; Bagali *et al*., 2012).Onion thrips, *Thrips tabaci* L., belonging to order Thysanoptera and circle of relativesThripidae, Adult thrips are pale yellow or brown in colour approximately 1-1.2-inch long.Their wings haven't any veins and are fringed with lengthy hairs. Nymphs resembleadults except that they are smaller and shortage wings(Gupta, 2015). Since thrips management is complicated by the lack of natural parasites and the existence of numerous other host plants on which the pest thives, insecticides are the most effective tools for thrips control (Brewster,1994).

MATERIALS AND METHODS

A field experiment was conducted at Horticulture Research Farm at IGKV, Raipur (C.G.) during Rubi 2020-21 under field condition to determine the bioefficacy of selected insecticides against thrips *Thrips tabaci* Lindeman on onion crop. Eight insecticides were evaluated for the management of *Thrips tabaci* L. Pre-treatment observations were recorded on 5 randomly selected plants a day prior to insecticidal application while, post treatment observations were recorded after 1st, 3rd, 7th, and 10th days of spraying. On the basis of post treatment population, the effective insecticide were ranked.Finally, estimation yield of onion bulb and then assessment of cost benefit ratio of each treatment were done.

The experimental design

Experimental Design: Randomized Block Design (RBD), Replications: Three, Treatments: Eight,Plant Spacing: 10 cm (P x P) × 15cm (R x R), Plot size: 2m x 2m.

Treatment detail

T1 Lambda Cyhalothrin5%+Fipronil12.5% ZC 300ml
T2 Lambda Cyhalothrin5%+Fipronil12.5%ZC 400ml
T3 Lambda Cyhalothrin 5% EC 300ml
T4 Lambda Cyhalothrin 5% EC 400ml
T5 Fipronil 5%SC 750ml
T6 Fipronil 5%SC 1000ml
T7 Fipronil 80% WG 75g
T8 Control

RESULTS AND DISCUSSION

First spray

The average thrips population in the pretreatment observation varied from 15.33 to 16.46 per plant, and was nearly uniform in all treatments, including the untreated control, with nosignificant variations between treatments.All of the tested insecticide doses were significantly superior to the untreated control in post-treatment observations (1st, 3rd, 5th, 7th and 10th days after first spray).After the first day of spraying, Lambda Cyhalothrin 5% + Fipronil12.5% ZC@ 400 ml ha-1 was found to be the most effective treatment and had the lowest thrips population (12.66 thrips per plant).Followed byLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1 (13.46 thrips per plant),Fipronil 80% WG @ 75 g ha-1(13.86 thrips per plant), Fipronil 5%SC@ 1000 mlha-1

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(14.33 thrips per plant),Fipronil 5%SC@ 750 mlha-1 (14.73 thrips per plant),Lambda Cyhalothrin 5% EC@ 400 mlha-1 (15.13 thrips per plant), Lambda Cyhalothrin 5% EC@ 300 mlha-1 (15.93 thrips per plant),respectively in the order of their toxicity/ effectivityand significantly superior to untreated control (15.86).After third day of first spray, the thrips population on onion crop ranged from 12.53 to 15.93 consistent with plant.In Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1, the minimum thrips population was 12.53 thrips per plant. Followed viaLambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1(13.33 thrips per plant),Fipronil 80% WG @ 75 g ha-1(13.53 thrips per plant), Fipronil 5%SC@ 1000 mlha-1(14.13 thrips per plant), Fipronil 5%SC@ 750 mlha-1(14.26 thrips per plant), Lambda Cyhalothrin 5% EC@ 400 mlha-1(14.93 thrips per plant), Lambda Cyhalothrin 5% EC@ 300 mlha-1(15.06 thrips per plant)and noticed as significantly superior to untreated control (15.93 thrips per plant).After fifth days of 1st spray the thrips population on onion crop ranged from 10.13 to 16.06thrips per plant.Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1was shown to be the most effective therapy, comparable toLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1 (10.86 thrips per plant).Followed via Fipronil 80% WG @ 75 g ha-1 (10.93 thrips per plant), Fipronil 5%SC@ 1000 mlha-1 (11.13 thrips per plant),Fipronil 5%SC@ 750 mlha-1 (11.73 thrips per plant), Lambda Cyhalothrin 5% EC@ 400 mlha-1 (11.93 thrips per plant) and Lambda Cyhalothrin 5% EC@ 300 mlha-1 (12.66 thrips per plant) and noticed as significantly superior to untreated control (16.06 thrips per plant).After seventh days of 1st spray, the plot handled with Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1recorded least (4.13) thrips population in step with plant and it become at par withLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1 (4.73 thrips per plant), Fipronil 80% WG @ 75 g ha-1 (5.06 thrips per plant) and Fipronil 5%SC@ 1000 mlha-1,(5.73 thrips per plant) accompanied by using Fipronil 5%SC@ 750 mlha-1 with 6.06 thrips per plant, Lambda Cyhalothrin 5% EC@ 400 mlha-1 and withLambda Cyhalothrin 5% EC@ 300 mlha-1 6.73 and 6.93 thrips per plant. While,all the treatments were significantly superior to untreated control (16.13 thrips per plant).After tenth days of 1st spray, the plot dealt with Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1observed the lowest thrips population (5.93 thrips per plant). It became statically at par withLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1 (6.26 thrips per plant) andFipronil 80% WG @ 75 g ha-1 (6.33 thrips per plant), Followed byFipronil 5%SC@ 1000 mlha-1 (7.06 thrips per plant), Fipronil 5%SC@ 750 mlha-1 (7.33 thrips per plant),Lambda Cyhalothrin 5% EC@ 400 mlha-1 (8.06 thrips per plant),Lambda Cyhalothrin 5% EC@ 300 mlha-1 (8.33 thrips per plant),and noticed as significantly superior to untreated control (16.26 thrips per plant).

Second spray

The thrips population varied from 14.13 to 16.46 in the pre-treatment observation, with no significant differences across the treatments.All of the tested insecticide doses were significantly superior to the untreated control plot in post-treatment observations (1st, 3rd, 5th, 7th, and 10th days after second spray).After 1st day of second spray, the plot dealt with Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1recorded least thrips population (10.06 thrips per plant) andLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1 recorded the best remedy but it became at par with (10.46 thrips per plant), Fipronil 80% WG @ 75 g ha-1 (11.06 thrips per plant),Fipronil 5%SC@ 1000 mlha-1 (11.13 thrips per plant),Fipronil 5%SC@ 750 mlha-1 (11.86 thrips per plant), Lambda Cyhalothrin 5% EC@ 400 mlha-1 (11.93 thrips per plant) and Lambda Cyhalothrin 5% EC@ 300 mlha-1 (12.33 thrips per plant) andnoticed as significantly superior to untreated control (16.66 thrips per plant).After 3rd day of 2nd spray, the thrips population on onion crop ranged from 9.13 to 17.06 per plant.Among the examined insecticides the minimum thrips population turned into observed in Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1with 9.13 thrips per plant and it changed into at par with Lambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1(9.93 thrips per plant), Fipronil 80% WG @ 75 g ha-1 (10.73 thrips per plant), Fipronil 5%SC@ 1000 mlha-1 (10.93 thrips per plant),Fipronil 5%SC@ 750 mlha-1(11.53 thrips per plant), Lambda Cyhalothrin 5% EC@ 400 mlha-1(11.66 thrips per plant), Lambda Cyhalothrin 5% EC@ 300 mlha-1 (12.13 thrips per plant) while,all the treatments were significantly superior to untreated control (17.06 thrips per plant).Similar tendencies of supremacy were observed in the fifth day following insecticide application, with Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1outperforming all other treatments with a population of 7.13 thrips per plant.It become at par withLambda Cyhalothrin 5% + Fipronil12.5%ZC@ 300 ml ha-1,Fipronil 80% WG @ 75 g ha-1,Fipronil 5%SC@ 1000 mlha-1, Fipronil 5%SC@ 750 mlha-1,Lambda Cyhalothrin 5% EC@ 400 mlha-1,Lambda Cyhalothrin 5% EC@ 300 mlha-1, with the population of 7.93, 8.06, 8.26, 9.66, 10.93, 11.13, thrips per plant However, all the treatments were significantly superior to untreated control (17.66 thrips per plant).After 7th days of 2d spray, minimum larval population was recorded in Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1 1.26 thrips population per plant and it changed into at par with Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 300 ml ha-1, Fipronil 80% WG @ 75 g ha-1, Fipronil 5%SC@ 1000 ml ha-1, Fipronil 5%SC@ 750 ml ha-1, Lambda Cyhalothrin 5% EC @ 400 ml ha-1, lambda-cyhalothrin 5% EC

@ 300 ml ha-1, with the population of, 2.06, 3.33, 4.13, 5.33, 6.26, 7.33 thrips per plant. And noticed as significantly superior to untreated control (19.86 thrips per plant).All the tested insecticides have been found notably advanced over untreated control plot after 10th day of 2d spray of insecticides. Among the treatments, Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1 turned into recorded the excellent treatment minimized the thrips population (1.93 thrips per plant) observed by means of Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 300 ml ha-1 (2.33 thrips per plant), Fipronil 80% WG @ 75 g ha-1 (3.46 thrips per plant), Fipronil 5%SC@ 1000 ml ha-1 (4.86 thrips per plant), Fipronil 5%SC@ 750 ml ha-1 (5.73 thrips per plant), lambda-cyhalothrin 5% EC @ 400 ml ha-1 (6.33 thrips per plant), Lambda Cyhalothrin 5% EC @ 300 ml ha-1 (7.46 thrips per plant). And noticed as significantly superior to untreated control (20.66 thrips per plant).The order of effectiveness of insecticide on the basis of reduction in thrips population in both the spray was found to beLambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1>Lambda Cyhalothrin 5% + Fipronil12.5%ZC @ 300 ml ha-1>Fipronil 80% WG @ 75 g ha-1 >Fipronil 5%SC@ 1000 ml ha-1> Fipronil 5%SC@ 750 ml ha-1>lambda-cyhalothrin 5% EC @ 400 ml ha-1>Lambda Cyhalothrin 5% EC @ 300 ml ha-1.The results are in conformity with, Shinde (2004) found that lambda cyhalothrin was the most successful and cost-effective treatment for suppressing thrips populations in the field. In present investigation also lambda cyhalothrin is one of the effective treatments in controlling thrips.Similar results were also obtained by Ludger and Jean (2005).Ambekar and Nayakwadi (2008) also reported effectiveness of lambda cyhalothrin and fipronil against onion thrips. Hosamani *et al*. (2012) who reported that fipronil 5% SC was most effective treatment for thrips populationreducing.

Table 1. Bioefficacy of different insecticide against onion thrips after First spray.

Notation	**Treatments**	**Dose (g or ml/ha)**	**pretreatments**	**Post treatments**				
				1DAS	3DAS	5DAS	7DAS	10DAS
T1	Lambda Cyhalothrin5%+Fipronil12.5% ZC	300ml	15.86 (4.10)	13.46 (3.80)	13.33 (3.78)	10.86 (3.44)	4.73 (2.39)	6.26 (2.69)
T2	Lambda Cyhalothrin5%+Fipronil12.5%ZC	400ml	15.66 (4.08)	12.66 (3.69)	12.53 (3.67)	10.13 (3.33)	4.13 (2.26)	5.93 (2.63)
T3	Lambda Cyhalothrin 5% EC	300ml	15.46 (4.05)	15.93 (4.11)	15.04 (4.00)	12.66 (3.68)	6.93 (2.81)	8.33 (3.05)
T4	Lambda Cyhalothrin 5% EC	400ml	15.33 (4.04)	15.13 (4.01)	14.93 (3.99)	11.93 (3.59)	6.73 (2.78)	8.06 (3.01)
T5	Fipronil 5%SC	750ml	16.33 (4.16)	14.73 (3.96)	14.26 (3.90)	11.73 (3.56)	6.06 (2.65)	7.33 (2.88)
T6	Fipronil 5%SC	1000ml	15.46 (4.05)	14.33 (3.91)	14.13 (3.89)	11.13 (3.48)	5.73 (2.59)	7.06 (2.83)
T7	Fipronil 80% WG	75g	16.46 (4.17)	14.86 (3.85)	13.53 (3.81)	10.93 (3.45)	5.06 (2.46)	6.33 (2.70)
T8	Control	-	15.73 (4.09)	15.86 (4.10)	15.93 (4.11)	16.06 (4.13)	16.13 (4.13)	16.26 (4.15)
	S.Em±		0.03	0.05	0.03	0.07	0.04	0.06
	CD at 5%		NS	0.17	0.09	0.22	0.14	0.18

Note : * Figure in parenthesis are square root transformed value.

Table 2. Bioefficacy of different insecticide against onion thrips after second spray.

Notation	Treatments	Dose (g or ml/ha)	Pretreatments	Post treatments				
				1DAS	3DAS	5DAS	7DAS	10DAS
T1	Lambda Cyhalothrin5%+Fipronil12.5%ZC	300ml	14.46 (3.93)	10.66 (3.38)	9.93 (3.30)	7.93 (2.98)	2.06 (1.74)	2.33 (1.82)
T2	Lambda Cyhalothrin5%+Fipronil12.5%ZC	400ml	14.13 (3.89)	10.06 (3.32)	9.13 (3.18)	7.13 (2.85)	1.26 (1.50)	1.93 (1.70)
T3	Lambda Cyhalothrin 5% EC	300ml	14.53 (3.94)	12.33 (3.65)	12.13 3.62)	11.13 (3.48)	7.33 (2.88)	7.46 (2.90)
T4	Lambda Cyhalothrin 5% EC	400ml	14.66 (3.95)	11.93 (3.59)	11.66 (3.55)	10.93 (3.45)	6.26 (2.69)	6.33 (2.70)
T5	Fipronil 5%SC	750ml	14.46 (3.93)	11.86 (3.58)	11.53 (3.54)	9.66 (3.26)	5.33 (2.91)	5.73 (2.59)
T6	Fipronil 5%SC	1000ml	14.73 (3.96)	11.13 (3.48)	10.93 (3.45)	8.26 (3.04)	4.13 (2.26)	4.86 (2.42)
T7	Fipronil 80% WG	75g	14.46 (3.93)	11.06 (3.47)	10.73 (3.42)	8.06 (3.01)	3.33 (2.08)	3.46 (2.09)
T8	Control	-	16.46 (4.17	16.66 (4.20)	17.06 (4.25)	17.66 (4.32)	19.86 (4.56)	20.66 (4.65)
	S.Em±		0.05	0.04	0.04	0.05	0.04	0.05
	CD at 5%		NS	0.14	0.12	0.17	0.14	0.28

Note : * Figure in parenthesis are square root transformed value.

Bulb yield

The yield of onion bulb of different treatments have been presented in (Table 4.3.3) which revealed that the highest bulb yield were registered by Lambda cyhalothrin + fipronil 5% ZC @ 400 ml (11.19 t/ha) followed Lambda cyhalothrin + fipronil5% ZC @ 300 ml (11.15 t/ha), Fipronil 80%WG @ 75g (11.12 t/ha),Fipronil 5%SC@ 1000 ml (10.85 t/ha),Fipronil 5%SC @ 750 ml (10.46 t/ha), Lambda cyhalothrin 5%EC @ 400 ml (9.99 t/ha), Lambda cyhalothrin 5%EC @ 3000 ml (9.94 t/ha). The lowest yield was harvested from untreated check plots (8.88t/ha) as shown in (Table 4.3.3). The present finding are contrary with the Wagh *et al*. (2016) recorded the maximum bulb yield in fipronil 5%SC treated plots. Ludger and Jean (2005)who reported that highest bulb yield in Lambdacyhalothrin 5% EC treated plots. Hosmani *et al*. (2010) who reported that fipronil 80 WG @ 60 ha^{-1} was effective in increased onion yield.

Table 3. Yield and economics of various insecticides for the management of *Thrips tabaci* L.

Treatments	Bulb yield (Tonn/ha)	Increased yield over control (q/ha)	Price of increased yield over control (q/ha)	Cost of treatment (Rs. /ha)	Net profit (Rs. /ha)	Cost Benefit ratio
Lambda cyhalothrin5% + fipronil12.5% ZC	11.15	2.27	22700	2550	20200	1:7.92
Lambda cyhalothrin5% + fipronil12.5% ZC	11.19	2.31	23100	2550	20600	1:8.07
Lambda cyhalothrin	9.94	1.06	10600	2405	8245	1:3.42

5%EC						
Lambda cyhalothrin 5%EC	9.99	1.11	11100	2405	8745	1:3.63
Fipronil 5%SC	10.46	1.58	15800	2692	13158	1:4.88
Fipronil 5%SC	10.85	1.97	19700	2692	17058	1:6.33
Fipronil 80%WG	11.12	2.24	22400	2,550	19900	1:7.80
Control	8.88	-	-	-	-	-

Labour cost = 3 labour/ha@ Rs. 300/day
Total labour cost/ha (Two spray) = 2250 Rs.
Price of onion bulb = 10000 Rs. /Tonn
Cost of treatment = Cost of labour + cost of insecticide.

The C:B ratio of different insecticidal treatments applied for the management of *Thrips tabaci L.*has been worked out. The highest cost benefit ratio was found in treatment Lambda cyhalothrin + fipronil 5% ZC @ 400 ml (1:8.07) followed Lambda cyhalothrin + fipronil5% ZC @ 300 ml (1:7.92), Fipronil 80%WG @ 75g (1:7.80),Fipronil 5%SC@ 1000 ml (1:6.33),Fipronil 5%SC @ 750 ml (1:4.88), Lambda cyhalothrin 5%EC @ 400 ml (1:3.63), Lambda cyhalothrin 5%EC @ 3000 ml (1:3.42) as shown in (Table 4.3.3). The present finding is also conformed with the result of Birhade *et al*., (2017) who reported that highest cost benefit ratio (1:6:52) in Lambda cyhalothrin 5% EC treated plots. Pandey *et al*., (2013) who reported that highest cost benefit ratio (1:11.55) in in fipronil 5%SC treated plots.

CONCLUSION

Efficacy of different insecticides against thrips on onion crop revealedLambda Cyhalothrin 5% + Fipronil12.5%ZC @ 400 ml ha-1as most effective treatment followed byLambda Cyhalothrin 5% + Fipronil12.5%ZC @ 300 ml ha-1WhereasLambda Cyhalothrin 5% EC@ 300 mlha-1was least effective as it recorded highest thrips population per plant. The highest bulb yield were registered by Lambda cyhalothrin + fipronil 5% ZC @ 400 ml (11.19 t/ha) and the miximum benefit cost ratio (1: 8.07) was recorded with same insecticide.

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