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Bioefficacy of insecticides against onion thrips (*Thrips tabaci* Lindeman) and their influence on yield of onion bulb

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Abstract
Field experiments were undertaken at the Department of Agril. Entomology, Post Graduate Institute, MPKV, Rahuri, Maharashtra, India to study the bioefficacy of imidacloprid + spirotetramat @ 75+75 g a.i./ha along with certain commonly used insecticides *viz.*, fipronil @ 30 g a.i./ha, dimethoate @ 200 g a.i./ha, lamda-cyhalothrin @ 15 g a.i./ha, profenophos @ 250 g a.i./ha, flonicamide @ 75 g a.i./ha and chlorpyriphos @ 200 g a.i./ha against onion thrips, *Thrips tabaci* Lindeman, during 2020-21. Study revealed that fipronil @ 200 g a.i./ha was significantly superior over other treatments and was most effective to control thrips population (3.26 thrips/plant). It was followed by dimethoate @ 200 g a.i./ha (5.40 thrips/plant) and profenophos @ 250 g a.i./ha (5.92 thrips/plant).

Keywords: bioefficacy, onion, thrips, fipronil, spirotetramat + imidacloprid

Introduction
Onion crop belongs to the most popular bulb family Alliaceae and has special qualities which add taste and flavor to the food also has medicinal values as it contains "allyl propyl disulphide" which is volatile compound and acts as a gastric stimulant. It is also rich in flavonoids and alkenyl cysteine sulphoxides which help in preventing heart disease and other ailment to human being (Gareh *et al*., 2002) [5]. The crop attacked by number of pests among all, thrips are found to be the major pest and reported upto 50% crop losses (Nault and Shelton, 2012) [9]. Nymphs and adult are damaging stages causes white streaks and silvery patches on leaves due to rasping and sucking type of feeding. These are serves as vector for diseases like "yellow spot virus" which is tospovirus causes adverse effect on bulb and seed yield in onion. Onion thrips found throughout the year but population of thrips found more during *Rabi* season from November to May (Butani and Verma, 1976) [2]. Thrips are difficult to control due to their mobile stages and hide in leaf sheath, hence they escape from spray. So, considering the economic importance of pest and crop value, studies were planned to study the bioefficacy of combination of spirotetramat + imidacloprid along with certain commonly used insecticides like fipronil @ 30 g a.i./ha, dimethoate @ 200 g a.i./ha, Profenophos @ 250 g a.i./ha, lambda-cyhalothrin @ 15 g a.i./ha, flonicamide @ 75 g a.i./ha and chlorpyriphos @ 200 g a.i./ha.

Materials and Methods
Field efficacy of insecticides against onion thrips, *Thrips tabaci* L. conducted on Instructional Farm of Department of Agricultural Entomology, Post Graduate Institute, MPKV (19.3491^0)N, 74.6461^0 E), Rahuri, during *Rabi* season: 20-2021. The Transplanting was done on 24th December 2020 of N-2-4-1 variety with distance of 15 cm x10 cm in RBD.
First insecticides application was done as incidence of thrips observed at 35 days after transplanting and subsequent applications were given at an interval of 10 days. Spraying and monitoring of thrips population was done early in the morning. Population of thrips recorded on five randomly selected plants in each plot. Precount was taken at one day before spray of insecticides and observations taken at 1, 3, 5 and 10 days after each application as postcount. The data on average survival of thrips population were transformed into ($\sqrt{x} + 0.5$) and then data were subjected to statistical analysis as suggested by Panse and Sukhatme (1985) [10].

Treatment details

Tr. No.	Treatments	Dose (g a.i./ha)	Dose ml or g/ha
T1	Chlorpyriphos 20 EC	200	1000
T2	Dimethoate 30 EC	200	666
T3	Fipronil 5 SC	30	600
T4	Lamda-cyhalothrin 5 SC	15	300
T5	Profenophos 50 EC	250	500
T6	Spirotetramat 120 SC + Imidacloprid 120 SC	75 + 75	625
T7	Flonicamid 50 SG	75	150
T8	Untreated Control	-	-

Result and Discussion

The data regarding thrips population before application of insecticides revealed that population of thrips was uniform throughout the experimental treatments, since average population of thrips was statistically significant. The average pre-treatment population of thrips was 20.10 to 22.70 thrips/plant, it indicates that necessary control measures.

Pooled data obtained from field efficacy (Table 1) revealed that plot treated with fipronil @ 30 g a.i./ha (3.26 thrips/plant & 86.62% reduction over control) recorded minimum incidence of thrips indicating their significance over other treatments. It was followed by dimethoate @ 200 g a.i./ha (5.40 thrips/plant) and profenophos @ 250 g a.i./ha (5.92 thrips/plant). While treatment lambda-cyhalothrin @ 250 g a.i./ha (6.39 thrips/plant) and spirotetramat + imidacloprid @ 75+75 g a.i./ha (6.50 thrips/plant) found to be at par with each other were next to follow in controlling thrips population. Effectiveness of insecticides was studied on the basis of thrips infestation recorded at 1, 3, 5 and 10 DAS. Pooled data used to comparing the efficacy of insecticides. The present findings are in conformity with Jennifer *et al.* (2005) [7] who reported, effectiveness of fipronil in reducing thrips population. The results are in close agreement with Pandey *et al.* (2013) [11], Wagh *et al.* (2016) [21], Sule (2006) [20] and Hosamani *et al.* (2012) [6]. Similar observations were also recorded by Patil and Patil (2018) [15], Reddy *et al.* (2005) [17], Rupal *et al.* (2002) [18], Reddy *et al.* (2007) [16]. In the present study, dimethoate @ 200 g a.i./ha was next in the order of effectiveness. These findings are in agreement with Zaman (1989) [22] and Chandramohan and Najan (1993) [3], Reddy *et al.* (2005) [17] and Asghar *et al.* (2018) [1] who reported dimethoate to be effective against thrips. The present findings are also supported Eijaz *et al.* (2014) [4] who reported that dimethoate was most effective against okra thrips.

However, these results contradict Key and Herron (2010) [8] reported ineffective of dimethoate against chilli thrips.

The treatment profenophos @ 250 g a.i./ha was next in the order of effectiveness in present studies. These findings are in line with Shrinivas *et al.* (2012) [19], Pandey *et al.* (2014) [12] and Patel *et al.* (2001) [14] who reported effectiveness of profenophos against thrips. On the contrary, profenophos was ineffective against onion thrips according to Patel and Patel (2012) [13].

Table 1: Biofficacy of insecticides against thrips, *Thrips tabaci* in onion

Sr. No.	Treatments	Dose (ga.i./ha)	Precount	No. of thrips/plant												Pooled mean	Per cent reduction over control
				1st Spray				2nd Spray				3rd Spray					
				1DAS	3DAS	5DAS	10DAS	1DAS	3DAS	5DAS	10DAS	1DAS	3DAS	5DAS	10DAS		
1	Chlorpyriphos 20 EC	200	20.60 (5.03)	7.50^{f} (2.70)	8.20^{e} (2.95)	10.10^{e} (3.25)	14.20^{f} (3.83)	6.20f (2.59)	7.00^{e} (2.74)	9.00^{f} (3.08)	12.50^{e} (3.61)	4.20^{e} (2.17)	5.00^{f} (2.34)	7.20^{f} (2.77)	9.80^{e} (3.21)	7.89^{f} (3.30)	67.63
2	Dimethoate 30 EC	200	20.50 (5.02)	4.80^{b} (1.79)	4.90^{b} (2.32)	7.30^{b} (2.79)	10.40^{b} (3.30)	3.10^{b} (1.90)	3.80^{b} (2.07)	6.10^{b} (2.57)	9.90^{b} (3.22)	1.10^{b} (1.26)	1.50^{b} (1.41)	2.60^{b} (1.76)	5.70^{b} (2.49)	5.40^{b} (2.82)	77.85
3	Fipronil 5 EC	30	20.30 (5.00)	2.00^{a} (1.44)	2.40^{a} (1.70)	4.40^{a} (2.21)	9.20^{a} (3.11)	0.30^{a} (0.89)	0.90^{a} (1.18)	3.00^{a} (1.87)	7.30^{a} (2.79)	0.13^{a} (0.80)	0.80^{a} (1.13)	1.80^{a} (1.51)	3.80^{a} (2.07)	3.26^{a} (2.30)	86.62
4	Lamda-cyhalothrin 5 SC	15	21.70 (5.15)	6.00^{d} (2.23)	6.10^{c} (2.57)	8.80^{d} (3.10)	12.20^{d} (3.56)	4.60^{d} (2.26)	5.30^{c} (2.4)	7.20^{d} (2.77)	10.70^{c} (3.35)	2.80^{d} (1.81)	3.00^{d} (1.87)	4.50^{d} (2.24)	8.70^{d} (3.03)	6.39^{d} (3.02)	73.78
5	Profenophos 50 EC	250	20.30 (5.01)	5.20^{c} (2.00)	5.70^{c} (2.49)	8.60^{c} (2.93)	11.30^{c} (3.43)	3.90^{c} (2.10)	4.80^{c} (2.30)	6.90^{c} (2.72)	10.30^{b} (3.29)	1.60^{c} (1.45)	2.20^{c} (1.64)	3.10^{c} (1.90)	7.10^{c} (2.76)	5.92^{c} (2.93)	75.71
6	Spirotetramat+ imidacloprid 240 SC	75+75	22.70 (5.25)	6.20^{d} (2.26)	6.40^{c} (2.63)	8.90^{d} (3.11)	12.20^{d} (3.56)	4.80^{d} (2.30)	5.40^{cd} (2.43)	7.30^{d} (2.79)	11.00^{c} (3.39)	2.90^{d} (1.84)	3.20^{d} (1.92)	4.60^{d} (2.26)	8.80^{d} (3.05)	6.50^{d} (3.04)	73.33
7	Flonicamide 50 SG	75	21.00 (5.07)	7.30^{e} (2.51)	7.50^{d} (2.83)	10.60^{f} (3.40)	13.20^{e} (3.70)	5.40^{d} (2.43)	6.10^{d} (2.57)	8.20^{e} (2.95)	11.60^{d} (4.48)	3.50^{e} (2.00)	4.00^{e} (2.12)	6.40^{e} (2.63)	9.80^{e} (3.21)	7.29^{e} (3.2)	70.09
8	Untreated Control	-	20.10 (4.97)	21.00^{g} (4.57)	21.30^{f} (4.67)	21.90^{g} (4.73)	22.00^{g} (4.74)	24.00^{d} (4.95)	24.60^{f} (5.01)	24.90^{g} (5.04)	25.80^{f} (5.13)	26.80^{f} (5.22)	27.10^{g} (5.25)	27.30^{g} (5.27)	27.30^{f} (5.27)	24.38^{g} (5.43)	-
S.E. ±			0.06	0.05	0.03	0.04	0.04	0.05	0.05	0.04	0.03	0.06	0.07	0.03	0.04	0.03	-
C.D. @ 5%			NS	0.17	0.11	0.13	0.12	0.15	0.16	0.12	0.10	0.18	0.21	0.10	0.13	0.10	-

*(Figures in the parenthesis are √x+0.5) *DAS: Days after Spray

*Values indicated with same alphabets do not differ significantly at p = 0.05

Table 2: Influence of insecticides on yield of onion bulb

Treatment details		Dose g a.i./ha	Mean		Per cent increase in yield over control
			Kg/Plot	t/ha	
T_1	Chlorpyriphos 20 EC	200	18.13	20.15	35.41
T_2	Dimethoate 30 EC	200	20.46	22.74	52.82
T_3	Fipronil 5 SC	30	21.15	23.50	57.93
T_4	Lambda-cyhalothrin 5 EC	15	19.08	21.20	47.31
T_5	Profenophos 50 EC	250	19.72	21.92	42.47
T_6	Spirotetramat 120 + Imidacloprid 120 SC	75+75	18.90	21.00	41.10

T_7	Flonicamid 50 SG	75	18.36	20.40	37.01
T_8	Untreated control	-	13.39	14.88	-
S. E. ±			0.18	-	-
C. D. at 5%			0.55	-	-

Effect of insecticides on yield of onion

It showed the all insecticidal treatment obtained higher yield than the untreated control. The average marketable yield of onion bulb ranged in between 23.50 and 14.88 t/ha. While highest bulb yield recorded in plot treated fipronil @ 30 g a.i./ha (23.50 t/ha) and recorded 57.93 per cent increase in yield over untreated control. The second best treatment in order of recording good yield was dimethoate @ 200 g a.i./ha with 22.74 t/ha and recorded 52.82 per cent increase in yield over untreated control. Subsequent treatments in order of yield were profenophos @ 250 g a.i./ha (21.92 t/ha), lambda-cyhalothrin @ 15 g a.i./ha (21.20 t/ha), spirotetramat + imidacloprid @ 75+ 75 g a.i./ha (21.00 t/ha), flonicamide @ 75g a.i./ha (20.40 t/ha) and chlorpyriphos @ 200 g a.i./ha (20.15 t/ha).

Conclusion

The present study concluded, fipronil @ 30 g a.i./ha (3.26 thrips/plant) was the most superior over other treatments to control the thrips population and also reported highest (23.50 t/ha) yield of bulb.

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