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ASSESSMENT OF INSECTICIDAL ALTERNATION AGAINST ONION THRIPS (*THRIPS TABACI* LINDEMAN) IN MALWA REGION, MADHYA PRADESH

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ABSTRACT

The experiment was carried out in rabi season of 2014-15 at experimental farm, College of Agriculture, Indore (M.P.) in randomized block design with eight treatments and 3 replications on onion variety Pusa red. Each treatment was made of two insecticides for their alternate use in each spray with three sprays at 11 days interval. After all the sprays insect population reduction and foliage loss was recorded. Results revealed that the average population reduction of three sprays was maximum in T6- fipronil 5 SC @ 50 g.a.i./ ha and thiamethoxam 25 WG @ 15 g.a.i. / ha (31.25%) followed with T3- imidacloprid 17.8 SL @ 15 g.a.i. /ha and beta-cyfluthrin 2.45 SC @ 15 g.a.i. /ha (24.83%) whereas minimum was recorded in T7- spinosad 45%SC @ 73 g.a.i./ha and difenthiouron 50 WG @ 300 g.a.i./ha (18.99%). Further the overall maximum insect population reduction was noted in T6 (69.2%) followed by T3 (62.7%) and lowest in T7 (46.5%). Further the minimum foliage loss was observed in T6 (21.8%) followed by T3 (22.9%), and maximum in T5 (26.1%). The onion bulb yield and cost benefit ratio were highest in T6 (241.66 kg ha^{-1} and 2.23) followed by T3 (233.74 kg ha^{-1} and 1:2.20) whereas it was lowest in T7 (166.66 kg ha^{-1} and 1.45).

Key words: Onion, *Thrips tabaci* Lindeman, Assessment and Insecticidal alternation

INTRODUCTION

Onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae), is a global pest of onion, and the principal vector of *Iris yellow spot virus* (IYSV) that cause 100% crop losses(Montano *et al*, 2012).Further onion is the most economically important monocot besides grasses. The crop suffers severe damage from onion thrips, a cosmopolitan and polyphagous insect pest (Boateng *et al.,* 2014).The pest status of onion thrips can be attributed to its polyphagous nature, high reproductive rate, short generation time, high survival of cryptic (non feeding prepupa and pupa) instars, ability to reproduce without mating (parthenogenesis), ability to transmit plant pathogens, and development of resistance to insecticides (Diaz-Montano *et al.,*, 2011). Extensive feeding by onion thrips not only results in plant stunting and reduced bulb weight, but it also predisposes onion plants to various fungal and bacterial pathogens and transmits Iris yellow spot virus (IYSV) (Bunyaviridae: *Tospovirus*), which further exacerbates the damage they cause and can ultimately result in complete crop failure. Owing to the irruptive outbreaks of onion thrips in onion fields, insecticides have been the primary mode to control this pest (Nault and Shelton, 2010). Yet, over-reliance on certain insecticides in the organophosphate, carbamate, and pyrethroid classes has led to resistance development in populations of onion thrips (Shelton *et al*, 2006). Alternation of insecticides to insure the desired effectiveness against pests is already in tradition. Viewing to the above situations, an experiment was planned to test the insecticides of various group in their alternation.

MATERIAL AND METHODS

The experiment was carried out in randomized block design with eight treatments and 3 replications in *rabi* season of 2014-15 at experimental farm, College of Agriculture, Indore (M.P.). Onion variety Pusa red was transplanted on 29th November, 2014 with 10 cm and 20 cm plant to plant and row to row spacing, respectively. Insecticidal spray was started at the ETL of insect @ 600 litre water/ hectare in net plot size of 4m x 3m with knapsack sprayer fitted with a duromist nozzle. Each treatment was made of two insecticides for their alternate use in each spray with three sprays at 11 days interval. The treatments were T_{1-} Untreated check, T_{2-} dimethoate 30 EC @ 250 g.*a.i.* /ha. and cypermethrin 25 EC @ 15 g.*a.i.* /ha, T_{3-} imidacloprid 17.8 SL 15 g.*a.i.* /ha and beta-cyfluthrin 2.45 SC 15 g.*a.i.* /ha, T_{4-} acetamprid 20 SP @15 g.*a.i.* /ha and lambda-cyhalothrin 9.5

ZC@15 g.*a.i.* /ha, T_{5}- thiacloprid 21.7 SC@ 65 g.*a.i.* /ha and lambda-cyhalothrin 9.5 ZC @15 g.*a.i.* /ha, T_{6} -fipronil 5 SC@ 50 g.*a.i.* /ha and thiamethoxam 25 WG @ 15 g.*a.i.* /ha, T_{7} - spinosad 45%SC @ 73 g.*a.i.* /ha and difenthiuron 50 WG @ 300 g.*a.i.* /ha and T_{8} - triazophos 40 EC@ 250 g.*a.i.* /ha and deltamethrin 10 EC @ 15 g.*a.i.* /ha. Thrips population was counted one day before and 11 days after each spray from five randomly selected plants of each plot using hand lens. Per cent population reduction was calculated for each spray, averaged for three sprays and finally overall population reduction was calculated based on pretreatment observation and last observation of third and last spray. Per cent leaf infestation was also observed visually from the same five randomly selected plants of each plot during last observation of each spray by observing the yellowing of leaves and weathering appearance on plants and averaged. The yield of the onion was recorded in each plot and converted into yield (kg.) per hectare. The cost benefit ratio was also calculated. The data obtained form the observations for each character were tabulated and analyzed statistically.

RESULTS AND DISCUSSIONS

After first spray the least thrips population was recorded in fipronil 5 SC @ 50 g.*a.i.*/ ha (16.2) and differed significantly with rest of the treatments (Table 1). The next best treatment was T3- imidacloprid 17.8 SL @ 15 g.*a.i.* /ha (19.2) and found to be at par with T2 dimethoate 30 EC @ 250 g.*a.i.* /ha (21.06). Remaining treatments exhibited comparatively less effectiveness. Similarly the maximum reduction in insect population was recorded in T6 fipronil 5 SC (45.6%) followed by T3 imidacloprid 17.8 SL (36.6 %). In second spray with the alternate insecticidal treatment, minimum population was noted in T6- thiamethoxam 25 WG @ 15 g.*a.i.* / ha (13.9). The maximum population reduction was noted in T3- beta-cyfluthrin 2.45 SC (26.7%) followed by T6- thiamethoxam 25 WG (14.3%). After third spray, lowest insect population was noted in treatment T6- fipronil 5 SC @ 50 g.*a.i.*/ ha (09.2) and found significantly superior to rest of the treatments. Further, treatment T3-imidacloprid 17.8 SL @ 15 g.*a.i.* /ha (11.3) ranked second and found at par with T4-acetamprid 20 SP @ 15 g.*a.i.* /ha (13.5). In relation to population reduction it was again observed highest in T6- fipronil 5 SC (33.8 %) but followed with T4-acetamprid 20 SP (27.8 %). The average population reduction of three sprays revealed that it was maximum in T6 (31.2%) followed with T3 (24.8%) whereas minimum was recorded in T7 (19.0 %). Overall insect population reduction was noted maximum in T6- fipronil 5 SC @ 50 g.*a.i.*/ ha and thiamethoxam 25 WG @ 15 g.*a.i.* / ha (69.5%) followed with T3- imidacloprid 17.8 SL @ 15 g.*a.i.* /ha and beta-cyfluthrin 2.45 SC @ 15 g.*a.i.* /ha (62.7%) and T4-acetamprid 20 SP @ 15 g.*a.i.* /ha and lambda-cyhalothrin 9.5 ZC@ 15 g.a.i. /ha(58.7%), while it was calculated minimum in T7- spinosad 45%SC @ 73 g.*a.i.*/ha and difenthiouron 50 WG @ 300 g.*a.i.*/ha (46.5%). The findings of Singh *et al.,* (2013), Kumar *et al.,* (2013), Krishna Moorthy *et al.,* (2013), Patil *et al.,* (2009) and Reddy *et al.,* (2007) are in the line of agreement as they reported the highest efficacy of fipronil in their studies. Further Reddy *et al.,* (2005), Mandi and Senapati (2009) and Agale *et al.,* (2010) found the most effectiveness of thiamethoxam against chilli thrips in reducing the pest population and supported the present study. Furthermore the results of Sarangi and Panda (2004) showed the effectiveness of thiamethoxam as seedling root dip against chilli thrips (*Scirtothrips dorsalis* Hood) which is also in support of present investigation.

In present study (Table 2) the foliage loss ranged between 37.7 and 42.9%.It was noted minimum in T6- fipronil 5 SC @ 50 g.*a.i.*/ ha and thiamethoxam 25 WG @ 15 g.*a.i.* / ha (21.8%) followed with T3- imidacloprid 17.8 SL @ 15 g.*a.i.* /ha and beta-cyfluthrin 2.45 SC @ 15 g.*a.i.* /ha (22.9%), and maximum in T5- thiacloprid 21.7 SC @ 65 g.*a.i.*/ha and lambda cyhalothrin 9.5 ZC @ 15 g.*a.i.*/ha (26.1%). Montano *et al.,* (2011), Montano *et al.,* (2012) and Boateng *et al.,* (2014) reported similar results. In respect of onion bulb yield and cost benefit ratio, it was noted highest in T6 as 241.66 q ha^{-1} and 2.23 followed by T3 as 233.74 q ha^{-1} and 2.20 whereas it was recorded lowest in T7 as 166.66 q ha^{-1} and 1.45. Krishna Moorthy *et al.,* (2013)

Table 1: Effect of treatments on thrips population

Treatments**	Thrips population							Average population reduction (%) of three sprays	Overall population reduction (%)
	After 1st spray			After 2nd spray		After 3rd spray			
	Pre-treatment	11 DAS	Population reduction (%)	11 DAS	Population reduction (%)	11 DAS	Population reduction (%)		
T1	23.8 (4.90)*	29.81 (5.50)	-	34.81 (5.90)	-	30.65 (5.60)	-	-	-
T2	31.92 (5.70)	21.06 (4.60)	34.02	18.81 (4.40)	10.68	14.72 (3.90)	**21.74**	22.14	53.88
T3	30.35 (5.60)	19.25 (4.40)	**36.57**	14.11 (3.80)	**26.70**	11.31 (3.40)	19.84	**27.70**	**62.73**
T4	32.82 (5.80)	21.02 (4.60)	**35.95**	18.77 (4.40)	10.70	13.54 (3.70)	**27.86**	**24.83**	**58.74**
T5	30.63 (5.60)	22.10 (4.80)	27.84	19.15 (4.40)	13.34	15.16 (4.00)	20.83	20.67	50.50
T6	29.87 (5.50)	**16.25** (4.10)	**45.59**	13.92 (3.80)	**14.33**	9.21 (4.10)	**33.83**	**31.25**	**69.16**
T7	31.39 (5.60)	23.28 (4.90)	26.83	20.26 (4.60)	12.97	16.78 (4.20)	17.17	18.99	46.54
T8	32.25 (5.70)	24.12 (5.00)	25.20	20.75 (4.60)	**13.97**	16.10 (4.10)	22.40	20.52	50.07
S Em±		**0.08**		**0.09**		**0.10**			
CD (p=0.05)	**NS**	**0.24**		**0.27**		**0.31**			
CV %		**6.08**		**7.42**		**8.30**			

**The values in parentheses are square root transformed value, DAS = Days after spray*

*****T1**- Untreated check, **T2** – Dimethoate 30 EC @ 250 g.a.i./ha and Cypermethrin 25 EC @ 15 g.a.i./ha, **T3** – Imidacloprid 17.8 SL @ 15 g.a.i./ha and beta-cyfluthrin 2.45 SC @ 15 g.a.i./ha, **T4** – Acetamprid 20 SP@ 15 g.a.i. / ha and lambda- cyhalothrin 9.5 ZC@ 15 g.a.i. / ha. **T5**- Thiacloprid 21.7 SC@ 65 g.a.i / ha and lambda- cyhalothrin 9.5 ZC@ 15 g.a.i / ha, **T6** –Fipronil 5 SC @ 50 g.a.i. / ha and thiamethoxam 25 WG@ 15 g.a.i. / ha, **T7** – Spinosad 45 SC @ 73 g.a.i / ha and difenthiouron 50 WG @ 300 g.a.i./ ha, T8 – Trizophos 40 EC @ 250 g.a.i./ ha and deltamethrin 10 EC @ 15 g.a.i. / ha.*

Table 2: Effect of treatments on foliage loss due to onion thrips

Treatments	Foliage loss				Overall foliage loss (%)	Onion bulb yield (q ha^{-1})	Cost benefit ratio
	Pre-treatment	After 1st spray	After 2nd spray	After 3rd spray			
		11 DAS	11 DAS	11 DAS			
T1	41.08 (39.86)	45.2 (42.24)	52.47 (46.42)	56.73 (48.90)	51.46	121.80	-
T2	38.60 (38.41)	29.6 (32.97)	24.96 (29.98)	**21.55** (27.65)	**25.37**	177.77	1.57
T3	39.70 (39.06)	**28.69** (32.40)	**23.70** (29.12)	20.58 (26.99)	**24.32**	233.74	2.20
T4	38.28 (38.22)	30.33 (33.40)	24.38 (29.60)	**19.48** (26.20)	24.73	226.80	2.08
T5	42.10 (40.45)	32.29 (34.60)	27.29 (31.50)	21.82 (27.80)	27.13	188.88	1.66
T6	37.66 (37.86)	**27.42** (31.60)	**25.52** (30.35)	**17.85** (24.99)	**23.59**	241.66	2.23
T7	41.33 (40.1)	32.27 (34.60)	26.22 (30.80)	20.09 (26.63)	26.19	195.83	1.68
T8	42.95 (40.9)	30.2 (33.30)	26.95 (31.27)	21.10 (27.34)	26.08	166.66	1.45
S Em±		**1.31**	**1.16**	**1.03**		9.50	
CD at 5 % (p=0.05)	**NS**	**3.93**	**3.29**	**3.09**		28.23	
CV %		**7.15**	**7.25**	**7.15**		9.83	

**The values in parentheses are angular transformed (arc sin) values, DAS = Days after spray*

reported economic yield with the application of fipronil against onion thrips. Patil *et al.,* (2009) against thrips. Sarangi and Panda (2004) recorded with thiamethoxam the better green chilli yield and benefit-cost ratio against chilli thrips, *S. dorsalis.* Moraes *et al.,* (2006) concluded that the thiamethoxam effectively harvested highest seed cotton yield with higher dosage of fipronil 5% SC @ 800 g/ha applied controlled thrips infesting groundnut and gained higher crop yield. Mehra and Singh (2013) recorded the highest garlic bulb yield with thiamethoxam after imidacloprid.

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