Reprint **ISSN 1923-7766 (Web Version)**

International Journal of Experimental Agriculture

(Int. J. Expt. Agric.)

Volume: 4 **Issue: 3** **September 2014**

Int. J. Expt. Agric. 4(3): 30-33 (September 2014)

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ISSN-1923-7766 (Online)
Int. J. Expt. Agric. 4(3):30-33(September 2014)

INTEGRATED MANAGEMENT OF THRIPS TO ENHANCE SEED YIELD OF ONION

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Accepted for publication on 28 August 2014

ABSTRACT

Hossain MM, Khalequzzaman KM, Fahim AHF, Ahmed RN, Islam MS (2014) Integrated management of thrips to enhance seed yield of onion. *Int. J. Expt. Agric*. 4(3), 30-33.

The field experiment was conducted at SRC, Bogra during Rrabi season of 2013-14 to evaluate the efficacy of bio-rational and synthetic insecticides against thrips infestation to enhance seed yield of onion. The treatments were T_1= White sticky trap @ 40 trap/ha; T_2= Biopesticide-Bioneem (Azadiractin 3EC) @ 2ml/litre of water; T_3= Biopesticide-Bioneem (Azadiractin 3EC) @ 2ml/litre of water + White sticky trap @ 40 trap/ha; T_4= Thiamethoxam (Actara 25WG) @ 0.2g/litre of water + White sticky trap@ 40 trap/ha; T_5= Alternate spraying of Biopesticide- Spinosad (Tracer 45SC) @ 0.4ml/litre of water and Bioneem (Azadiractin 3EC) @ 2ml/litre of water and T_6= Untreated control. Alternate spraying of Biopesticide- Spinosad (Tracer 45SC) @ 0.4ml/litre of water and Bioneem (Azadiractin 3EC) @ 2ml/litre of water offered the lowest thrips population (1.92 thrips/ plant and 2.65 thrips /umbel). The highest percentage of thrips population (86.37% in plant and 73.76% in umbel) reduction over control was also obtained from alternate spraying of Biopesticide- Spinosad and Bioneem (Azadiractin 3EC) treated plot followed by Bioneem (Azadiractin 3EC) + White sticky trap treated plot (73.88% and 57.82%). The highest onion seed yield (383.3 kg/ha) and marginal benefit cost ratio (9.55) was also obtained from alternate spraying of Biopesticide- Spinosad and Bioneem (Azadiractin 3EC) treated plot. So, alternate spraying of Biopesticide-Spinosad and Bioneem (Azadiractin 3EC) may be recommended for effective management of thrips in seed onion production.

Key words: *thrips, management, seed yield, onion*

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most economically important spice crops in Bangladesh. Average seed yield of these crops is very low as compared to other countries due to many causes. The major insect pest of onion is the onion thrips (*Thrips tabaci* Lindeman) in Bangladesh that causes yield reduction by feeding on the epidermal cells of the plant, thus reducing the photosynthetic ability of the plants. Onions thrips feeding on onions often leaves silvery injury wounds, often flecked with dark fecal spots. Feeding by the onion thrips is also known to result in stunted plants but cause greater damage to seed onions by feeding on onion florets resulting in destruction of the pedicels of the blossoms and the flower parts (Elmore 1949). Onion thrips are found damaging onion plants before they head although this species together with the western flower thrips occurs in and is thought to damage seed heads (Willcox *et al.* 1949). Onion thrips and western flower thrips are both reported to damage onions grown for seeds (Willcox *et al.* 1949). Bailey (1938) reported that thrips can reduce onion seed crops by as much as 50% in years of severe infestation. Thrips population increase rapidly under hot, dry conditions and can lead to economic crop loss. Both adults and nymphs of *thrips tabaci* feed mainly near the base of the inner and intermediate leaves of onion bulbs (Schmutterer *et al.* 1969). Young onion plants are more susceptible to thrips attack (Schmutterer *et al.* 1969; Lewis 1973). Some plant products have pesticide properties against sucking pests (Parmar 1995; Schmutterer and Singh, 1995; Haris 2001; Sharma 2007). Spinosad 45 SC @ 125 ml/ha was effective against thrips (Prasad and Khalid, 2009). The newer molecules, Indoxacarb 14.5 SC @ 500 ml/ha, acetamiprid 20 SP @ 200 g/ha and combined product of Indoxacarb 14.5 SC + Acetamiprid 7.7% SC @ 500 ml/l were at par with each other reduce thrips population (Nandihalli 2009). Growers are basically depending on chemical insecticides use for the management of onion thrips in our country. But effective control of this pest is extremely difficult because of the shape of onion leaves (Mau and Kessing, 1991). The rapid build up of thrips resistance to insecticides is due to the number of generation per year (Jensen 1995). According to David (1986), the application of commonly used insecticides aimed at checking sucking pests like thrips and aphids caused resurgence of chilli mite. Moreover, chemical insecticides are often failure to offer desired level of control against this pest. From the above facts, the experiment was designed to asses the efficacy of bio-rational and synthetic insecticides against thrips infestation to enhance seed yield of onion.

MATERIALS AND METHODS

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogra during Rabi season of 2013-14. The experimental plot was prepared with five ploughings and cross ploughings followed by laddering to break the clods as well as level the soil. The weeds and stubbles of previous crops were collected and removed from the soil. The unit plot size was 3m x 2.5m. Treatments were assigned in a randomized complete block design (RCBD) with three replications. BARI Onion 1 was used as test crop for this trial. Onion bulb was planted on 25 November 2013, maintaining 20 cm x 15 cm spacing. The treatments were T_1= White sticky trap @ 40 trap/ha; T_2= Biopesticide-Bioneem (Azadiractin 3EC) @ 2ml/litre of water; T_3= Biopesticide-Bioneem (Azadiractin 3EC) @ 2ml/litre of water + White sticky trap @ 40 trap/ha; T_4= Thiamethoxam (Actara 25WG) @ 0.2g/litre of water + White sticky trap@ 40 trap/ha; T_5= Alternate spraying of Biopesticide-Spinosad (Tracer 45SC) @ 0.4ml/litre of water and Bioneem (Azadiractin 3EC) @ 2ml/litre of water and T_6= Untreated control.

In addition to 5t/ha of cow dung, the crop was fertilized with $N_{115}P_{55}K_{75}S_{20}Zn_4B_{1.5}Mo_1$ kg/ha. The entire amount of cow dung P, S, B, Zn, Mo, ¼ N and ¼ K were applied during land preparation. The rest N was applied in three equal splits at 30, and 50 and 70 days after planting (DAP). The rest K was applied in three equal splits at 30, 50 and 70 DAP (Anonymous 2010). The insecticides and biopesticides were sprayed three times at 10 days interval. To control purple blotch disease, the crop was sprayed with `Rovral' @ 2g/L of water at 30, 40 and 55 DAP. The crop was harvested on 8 April 2014. To enhance pollination, sprays were done at afternoon. Thrips population was counted at 10 days interval starting from the first appearance of infestation. The first spray was applied when the thrips population was observed at economic threshold level (6-10 thrips per plant, Hazara *et al*. 1999). Number of thrips (both nymphs and adults) was recorded at three days after treatment application from 20 randomly selected plants and 10 umbels in each plot by keeping a white paper below the plants and umbels, and then shaking both of them with fingers. All recommended agronomic practices were followed to raise the crops. Data on crop yield was also recorded immediately after harvest. The recorded data were analyzed and mean values were adjusted and separated by Duncan's Multiple Range Test (DMRT) according to Gomez and Gomez (1984). Percent thrips population reduction over untreated control was calculated using following formula (Dutta *et al*. 2014):

Percent thrips population reduction over untreated control

$$= \frac{\text{Mean value of control} - \text{Mean value of the treatments}}{\text{Mean value of control}} \text{x} 100$$

RESULTS AND DISCUSSION

Effectiveness of different management approaches on thrips population and onion seed yield

Effectiveness of different management approaches on thrips population and onion seed yield are presented in Table 1. All the management options significantly reduced thrips population compared to control plot. After treatment application, the lowest number of thrips (1.92 thrips/plant) was observed from alternate spraying of Biopesticide-Spinosad and Bioneem treated plot which was statistically similar to Bioneem + White sticky trap treated plot (3.68 thrips/plant) and maximum number of thrips population (14.09 thrips/plant) was recorded from control plot. On the other hand, significantly the lowest number of thrips (2.65 thrips/umbel) was observed from alternate spraying of Biopesticide-Spinosad and Bioneem treated plot followed by Bioneem + White sticky trap (4.26 thrips/umbel) and Thiomethoxam + White sticky trap (4.77 thrips/plant) treated plot and maximum number of thrips population (10.10 thrips/umbel) was recorded from control plot. The highest percentage of thrips population reduction per umbel (73.76%) over control was observed from alternate spraying of Biopesticide-Spinosad and Bioneem treated plot followed by Bioneem + White sticky trap treated plot (57.82%) and Thiomethoxam + White sticky trap treated plot (52.77%).

It was evident from the result that alternate spraying of Biopesticide-Spinosad and bioneem was highly effective against onion thrips. The findings are in conformity with those of Vekaria and Patel (2000) and Chandel *et al.* (2006) who reported significant results with certain plant products for the control of bugs, beetles and aphids. Prasad and Khalid (2009) reported that Spinosad 45 SC @ 125 ml/ha was effective against thrips. In most cases, Sticky white trap significantly reduced thrips population densities, but not necessarily to a level that would be considered adequate.

The highest onion seed yield (383.3 kg/ha) was obtained from alternate spraying of Biopesticide-Spinosad and Bioneem treated plot followed by Bioneem + White sticky trap treated plot (323.3 kg/ha) and Thiomethoxam + White sticky trap treated plot (303.3 kg/ha) and the lowest seed yield (160 kg/ha) was found from control plot. On the other hand, the highest onion seed yield increased (47.42%) over control was obtained from alternate spraying of Biopesticide-Spinosad and Bioneem treated plot followed by Bioneem + White sticky trap treated plot (24.35%) and Thiomethoxam + White sticky trap treated plot (16.65%). Mandal *et al.* (2008) reported 16.91 to 27.07% increase in yield of cotton over control due to use of biopesticides.

Table 1. Efficacy of different management approaches for the control of thrips in onion

Treatments	Mean thrips population/plant	% reduction over control	Meanthrips population/umbel	% reduction over control	Seed yield (kg/ha)	% yield increase over control
White sticky trap	9.42b	33.14	7.84b	22.38	276.7bc	6.42
Bioneem	7.23bc	48.69	5.40c	46.53	283.3bc	8.96
Bioneem + White sticky trap	3.68d	73.88	4.26cd	57.82	323.3b	24.35
Thiomethoxam + White sticky trap	4.82cd	65.79	4.77cd	52.77	303.3bc	16.65
Spinosad and Bioneem	1.92d	86.37	2.65d	73.76	383.3a	47.42
Untreated control	14.09a	-	10.10a	-	260.0c	-
CV (%)	16.45	-	13.70	-	6.80	-

Mean followed by the same letter (s) in the same column do not differ significantly from each other at 5% level by DMRT

Economic analysis of different management approaches against thrips in onion

The marginal benefit-cost ratio (MBCR) as worked out based on the expenses incurred and value of crops obtained from the treated plot for the control of thrips in onion is presented in Table 2. It was noted that expenses incurred referred to those only on pest control. The highest marginal benefit-cost ratio (9.55) was obtained from the plots alternately treated with Spinosad (Tracer 45 SC) and Bioneem followed by Bioneem + White sticky trap treated plot (3.86) and Thiomethoxam + White sticky trap treated plot (3.66) which was similar findings of Dutta *et al*. (2014).

Table 2. Economic analysis of different management approaches against thrips in onion

Treatments	Yield (kg/ha)	Gross income (Tk)	Additional yield over control (kg/ha)	Additional income over control (Tk/ha)	Pest management cost (Tk/ha)	Net income (Tk/ha)	MBCR
White sticky trap	276.7	332040	16.7	20040	9200	10840	2.18
Bioneem	283.3	339960	23.3	27960	17200	10760	1.63
Bioneem + White sticky trap	323.3	387960	63.3	75960	19700	56260	3.86
Thiomethoxam + White sticky trap	303.3	363960	43.3	51960	14200	37760	3.66
Spinosad and Bioneem	383.3	459960	123.3	147960	15500	132460	9.55
Untreated control	260.0	312000	-	-	-	-	-

MBCR= Marginal benefit-cost ratio

[Price of onion seed = 1200 TK/ kg, Cost of Bioneem @ 200Tk/100ml, Cost of White sticky trap @ 60 Tk/trap, Cost of Spinosad (Tracer 45SC) @ 1750Tk/75ml, Cost of Thiomethoxam @ 40 Tk/4g; Cost of spray: Two laborers/spray/ha @ Tk. 180/labour/day; Spray volume required: 500L/ha]

CONCLUSION

From the above study, it may be concluded that alternate spraying of Biopesticide-Spinosad and Bioneem showed better performance against thrips control in onion with higher seed yield (383.3 kg/ha) and marginal benefit-cost ratio (9.55). So, alternate spraying of Biopesticide-Spinosad and Bioneem (Azadiractin 3EC) may be recommended for effective management of thrips in seed onion production.

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