Journal of Applied Horticulture, 15(2): 114-116, 2013

Performance of novel insecticides for management of onion thrips (*Thrips tabaci* L.)

Durga Singh*, R.P.S. Shaktawat and I.S. Naruka

*Krishi Vigyan Kendra and Department of Plantation and Spice Crops, College of Horticulture, Mandsaur (MP)-458001 India. *E-mail: dskhanpur@rediffmail.com*

Abstract

Onion thrips (*Thrips tabaci* L.) is a major pest of onion (*Allium cepa* L.) of family *Alliaceae* in India and widely spread in summer season. For the control of its infestation, the crop is sprayed intensively with insecticides. In order to find out the most efficient and eco-friendly method of thrips control, an experiment was conducted at Shajapur (M.P.) during the year 2007 and 2008 to assess the thrips population. Thrips population was counted at 15 days interval. Thrips population was peaked in February when they reached the maximum mean values ranging between 15.30 and 153.45 thrips per plant. The seven treatments of insecticides *i.e.* fipronil 5 % SC, lambda-cyhalothrin 5 % EC, lambda-cyhalothrin 4.9 % CS, thiacloprid 21.7 % SC, deltamethrin 11 % w/w EC, malathion 50 % EC were applied at 30, 45 and 60 days after transplanting of onion crop for management of onion thrips. Among all the insecticides applied fipronil 5 % SC and lambda-cyhalothrin 4.9 % CS was the most effective insecticide in reducing the thrips population and increasing the weight of exportable bulb and yield of onion as compare to control and other insecticides. Fipronil 5 % SC treatment reduced the thrips population by 98.56 percent over control and increased the bulb yield by 124.90 percent compared with control.

Key words: *Thrips tabaci,* onion, fipronil, lambda-cyhalothrin, thiacloprid, deltamethrin, malathion

Introduction

Onion is the most important bulb crop in India, largely used as spices and for culinary purpose. It is cultivated on an area of 554.15 thousand ha with the production of 7729.13 thousand tonnes during the year 2009-10. Onion thrips is the most important insect pest of onion if uncontrolled and can reduce yield, damage bulb skins and transmit damaging viral diseases. Thrips (*Thrips tabaci* L.) feeds on sap of leaf epidermal cells that become air-filled and thereby exhibit silvery appearance that is characteristic of damage by this insect (Jones and Jones, 1974). Infested leaves become twisted and young susceptible onion plants killed by heavy thrips attack (Lewis, 1973). Thrips prefer dry, hot climates and tend to flock to areas with consistently suitable conditions. Raheja (1973) observed that damage by thrips in early stages of crop growth are more important and likely to result in substantial reduction in yield. Onion yield can be reduced by 40-50 % by infestation of thrips (Shelton *et al.*, 2003). Thrips larvae are pale yellow and feed at the base of onion leaves. The entire life cycle of onion thrips can be completed in about three to four weeks during the summer and multiple generations occur on onion (Whitney, 2004). Introduction of synthetic chemical insecticides has increased onion production but onion growers currently have limited insecticides to control this pest. The Australian Pesticides and Veterinary Medicines Authority (APVMA) have made a permit for the pyrethroid chemical lambda-cyhalothrin available for onion thrips control on bulb onion. While this addition of an insecticide in the synthetic pyrethroid group strengthens the ability of onion growers to control thrips, it's important that use of a broad range of insecticides be maintained. The research indicated that insecticide applications for onion thrips resulted in increased yields of value more than the cost of insecticide application (Leonard Gianessi, 2009). Use of synthetic and other insecticides has been reported from almost throughout the world so it was necessary to evaluate the efficacy of the new and existing insecticides for the management of thrips population and their influence on yield of onion in onion growing regions of India.

Materials and methods

To test the efficacy of different insecticides against onion thrips, an experiment was conducted at Krishi Vigyan Kendra, Shajapur (M.P.). Agrifound Light Red variety of onion was sown in the month of December, 2007 and 2008 with the spacing of 15 x 10 cm in a plot of 3.6 x 1.8 m. The experiment was laid out in randomized block design (RBD) with seven treatments replicated three times. The treatments were lambda-cyhalothrin 5% EC, fipronil 5 % SC, lambda-cyhalothrin 4.9 CS, thiacloprid 21.7 % SC, deltamethrin 11 % w/w EC, malathion 50 % EC and control. Production practices were carried out uniformly in all the plots. The crop was under observation for the incidence of thrips. For thrips population, pre-spray data were recorded and the crop was sprayed at 30, 45 and 60 days after transplanting (DAP)with knapsack sprayer as per treatments. The post-spray data were recorded, after 7 days of each spray by counting the number of thrips (adults + nymphs) on 10 randomly selected plants in each plot. Yield data were recorded at harvest by weighing the 20 bulbs and calculating gross weight of onion bulbs in each plots and converted it into yield (q/ha).

Results

The post-spray data regarding the population of thrips on onion after 30 days has been presented in Table 1. Results reveal that all the insecticides were found significantly effective in reducing

the thrips population as compared to control. The two year pooled data of 7 days after spray of 30 DAP showed that there were no thrips / plant in treatment fipronil 5 % SC and were 15.30 thrips/ plant in treatment control. Data observed after 7 days of 30 days spray showed that application of fipronil 5 % SC significantly reduced the thrips population as compared to lambda-cyhalothrin 4.9 CS, lambda-cyhalothrin 5% EC, thiacloprid 21.7 % SC and deltamethrin 11 w/w EC. Thus, fipronil 5 % SC was the most effective insecticide in reducing the thrips population as compared to other insecticides tested.

The pooled data observed at 7 days after spray at 45 DAP revealed that the thrips population in plots treated with fipronil 5 % SC, lambda-cyhalothrin 5 % EC, lambda-cyhalothrin 4.9 CS, deltamethrin 11 w/w EC and malathion 50 % EC were 98.90, 98.29, 97.64, 96.84, 89.75 and 81.87 % lower, respectively as compared to the check plot (136.98 thrips/plant). Results further showed that fipronil 5 % SC performed best in controlling the thrips population than other insecticide used.

Further, data of thrips population were also observed before and after 7 days of spray at 60 DAP in onion. Pooled data recorded after 7 days of spray at 60 DAP reveal that the minimum 2.20 thrips/plant were observed with fipronil 5 % SC followed by lambda-cyhalothrin 5 % EC, lambda-cyhalothrin 4.9 CS, thiacloprid 21.7 % SC, deltamethrin 11 w/w EC, malathion 50 % EC and control plot and were 2.62, 3.52, 4.28, 15.08, 25.20 and 153.45 thrips / plant, respectively.

The pooled data of 20 bulbs of onion showed that application of fipronil 5 % SC, lambda-cyhalothrin 5 % EC, lambda-cyhalothrin 4.9 CS deltamethrin 11 w/w EC, malathion 50 % EC significantly

Table 1. Effect of insecticides on the population of thrips before and after spray at 30, 45 and 60 DAP in onion crop

Treatments	Before spray 30 DAP			7 days after spray		
	2007	2008	Pooled	2007	2008	Pooled
Fipronil 5 % SC	0.23 (0.86)	0.27 (0.87)	0.25 (0.87)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Lambda-cyhalothrin 5 % EC	0.13 (0.80)	0.17 (0.82)	0.15 (0.81)	0.00 (0.71)	0.03 (0.73)	0.02 (0.72)
Lambda-cyhalothrin 4.9 CS	0.17 (0.81)	0.20 (0.83)	0.18 (0.82)	0.00 (0.71)	0.03 (0.73)	0.02 (0.72)
Thiacloprid 21.7 % SC	0.10 (0.77)	0.17 (0.82)	0.13(0.80)	0.00 (0.71)	0.03 (0.73)	0.02 (0.72)
deltamethrin 11 %w/w EC	0.17 (0.81)	0.20 (0.83)	0.18 (0.82)	0.17 (0.82)	0.17 (0.82)	0.17 (0.82)
Malathion 50 % EC	0.10 (0.77)	0.13 (0.79)	0.12(0.78)	0.17 (0.82)	0.20 (0.83)	0.18 (0.83)
Control	0.17 (0.81)	0.20 (0.83)	0.18(0.82)	15.27 (3.97)	15.33 (3.98)	15.30 (3.98)
LSD (*P*=0.05)	NS	NS	0.10	0.03	0.10	0.05
	Before spray 45 DAP			7 days after spray		
	2007	2008	Pooled	2007	2008	Pooled
Fipronil 5 % SC	5.87 (2.52)	5.47 (2.44)	5.67 (2.48)	1.60 (1.45)	1.40 (1.38)	1.50 (1.41)
Lambda-cyhalothrin 5 % EC	7.60 (2.85)	7.33 (2.80)	7.47 (2.82)	2.33 (1.68)	2.33 (1.68)	2.33 (1.68)
Lambda-cyhalothrin 4.9 CS	14.53 (3.88)	14.33 (3.85)	14.43 (3.87)	3.20 (1.92)	3.23 (1.93)	3.22 (1.93)
Thiacloprid 21.7 % SC	16.50 (4.12)	16.20 (4.08)	16.35 (4.10)	4.30 (2.19)	4.33 (2.20)	4.32 (2.19)
Deltamethrin 11 %w/w EC	18.57 (4.37)	18.87 (4.40)	18.72 (4.39)	14.00 (3.81)	14.07 (3.82)	14.03 (3.81)
Malathion 50 % EC	32.27(5.73)	32.20 (5.72)	32.23 (5.72)	24.50 (5.00)	25.17 (5.07)	24.83 (5.03)
Control	81.20 (9.04)	83.17 (9.15)	82.18 (9.09)	138.13(11.77)	135.87 (11.68)	136.98 (11.73)
LSD (*P*=0.05)	0.04	0.15	0.07	0.06	0.08	0.05
	Before spray 60 DAP			7 days after spray		
	2007	2008	Pooled	2007	2008	Pooled
Fipronil 5 % SC	6.77 (2.69)	6.47 (2.64)	6.62 (2.67)	2.10 (1.61)	2.30 (1.67)	2.20 (1.64)
Lambda-cyhalothrin 5 % EC	8.17 (2.94)	8.20 (2.95)	8.18 (2.95)	2.60 (1.76)	2.63 (1.77)	2.62 (1.77)
Lambda-cyhalothrin 4.9 CS	16.60 (4.14)	16.10 (4.07)	16.35 (4.11)	3.43 (1.98)	3.60 (2.02)	3.52 (2.00)
Thiacloprid 21.7 % SC	21.40 (4.68)	21.40 (4.68)	21.40 (4.68)	4.33 (2.20)	4.23 (2.18)	4.28 (2.19)
Deltamethrin 11 %w/w EC	35.57 (6.00)	35.73 (6.02)	35.65 (6.01)	15.10 (3.95)	15.07 (3.95)	15.08 (3.95)
Malathion 50 % EC	59.63 (7.76)	58.00 (7.65)	58.82 (7.70)	25.20 (5.07)	25.20 (5.07)	25.20 (5.07)
Control	133.47 (11.57)	133.00 (11.55)	133.23 (11.56)	152.57 (12.37)	154.33 (12.44)	153.45 (12.41)
LSD (*P*=0.05)	0.03	0.15	0.07	0.04	0.05	0.03

Figure in parenthesis are square root transformed value.

Table 2. Effect of insecticides on the yield of onion

Treatments	Weight of 20 bulbs (g)			Bulb yield (q/ha)		
	2007	2008	Pool	2007	2008	Pool
Fipronil 5 % SC	2263.33	2246.67	2,263.33	422.03	416.67	419.35
Lambda-cyhalothrin 5 % EC	2066.67	2116.67	2,066.67	346.67	339.51	343.09
Lambda-cyhalothrin 4.9 CS	2133.33	2066.67	2,133.33	329.70	324.07	326.89
Thiacloprid 21.7 % SC	2066.67	2000.00	2,066.67	307.07	293.21	300.14
Deltamethrin 11 %w/w EC	1783.33	1800.00	1,783.33	281.37	282.92	282.15
Malathion 50 % EC	1633.33	1616.67	1,633.33	249.47	257.20	253.34
Control	1416.67	1366.67	1,416.67	187.71	185.19	186.46
LSD (*P*=0.05)	219.91	219.91	153.85	5.55	17.05	8.87

increased the size of onion and produced 846.67, 650, 716.67, 650, 366.67 and 216.67 g higher weight of 20 bulb as compared to control, respectively. The overall results of weight of 20 bulb show that among the insecticides tested, fipronil 5 % SC was the most effective insecticides followed by lambda-cyhalothrin 5 % EC, thiacloprid 21.7 % SC, deltamethrin 11 w/w EC and malathion 50 % EC.

The pooled data of yield of onion bulb were significantly higher in all the treated plots as compared to control. The application of fipronil 5 % SC and lambda-cyhalothrin 5 % EC were the most effective insecticides in increasing the yield of onion followed by lambda-cyhalothrin 4.9 CS, thiacloprid 21.7 % SC, deltamethrin 11 w/w EC and malathion 50 % EC. Application of fipronil 5 % SC produced 22.22, 28.28, 39.71, 48.62 65.52 and 124.90 % higher bulb yield as compared to lambda-cyhalothrin 5 % EC, lambda-cyhalothrin 4.9 CS, thiacloprid 21.7 % SC, deltamethrin 11 w/w EC and malathion 50 % EC and control, respectively.

Discussion

Pooled data of two consecutive years showed that performance of spray of different insecticides was better than control. Among insecticides, fipronil 5 % SC and lambda-cyhalothrin 4.9 CS were consistently the most effective insecticide for protecting onion crop from onion thrips. Similar results were also reported by Vogel and Bouma (1997) who studied the effectiveness of various insecticides applied as seed-coating to control *Thrips tabaci* under field condition. Similar findings were also reported by Nawrocka (2003) against controlling the onion thrips through lambda-cyhalothrin. Khan *et al*. (2001) revealed that all insecticides reduced the pest population but among the insecticides applied Carbosulfan was the most effective, followed by profenofos, methomyl and pirimiphos-methyl, while mineral oil was the least effective in controlling the pest. Among the insecticides tried in this experiment for the management of onion thrips, fipronil treatment had a knockdown effect on onion thrips with the highest decrease in thrips population by 79.80 % and higher yield than the control.

Acknowledgement

We thank Dr. R. Umath, Programme Coordinator, KVK, Shajapur (MP) for providing facilities and help during the investigation.

References

Jones F.G. and M.G. Jones, 1974. *Pests of Field Crops*. Edward Arnold, London.

Khan, N.A., M.A. Khan and M.G. Rabbani, 2001. Evaluation of different insecticides for the control of thrips (*Thrips tabaci* Lind) attacking onion bulb crop. *Sarhad J. Agric.,* 17(1): 107-109.

Leonard Gianessi, 2009. The benefits of insecticides use: Onion. *Crop Life Foundation. Washington*.

Lewis, T. 1973. *Thrips: Their Biology, Ecology and Economic Importance.* Academic Press, London.

Nawrocka, B. and S. Vidal, 2003. Economic importance and the control method of *Thrips tabaci* Lind on onion. *Bulletin-OILB/SROP,* 26(3): 321-324.

Raheja, A.K. 1973. Onion Thrips and their control in northern Nigeria. *Samaru Agric. News,* 15(2): 82-86.

Shelton, A.M., B.A. Nault, J. Plate and J.Z. Zhao, 2003. Regional and temporal variation in susceptibility to lambdacyhalothrin in onion thrips, *Thrips tabaci* (Thysanoptera: Thripidae), in onion fields in New York. *J. Econ. Ento.,* 96(6): 1843-1848.

Whitney S. Cranshaw, 2004. *Onion Thrips*. Extension Services of Nebraska, Colorado, Wyoming or Montana.

Vogel, A. Ester R. de and E. Bouma, 1997. Controlling *Thrips tabaci* (Lind.) in leek by film-coating seeds with insecticides. *Crop Prot*., 16(7): 673-677.

Received: November, 2012; Revised: February, 2013; Accepted: April, 2013