STUDY OF A BIOPESTICIDE IN COMPARISON WITH SOME SYNTHETIC PESTICIDES USED AGAINST THRIPS IN GARLIC CROP

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ABSTRACT

The experiment was carried out to compare the effectiveness of (BtA) *Bacillus thuringiensis* and *Abamectin* @ 1gm/l with chlorpyrifos @ 5ml/l, megamos @ 1.25 ml/l and trend @ 4ml/l in controlling thirps (*Thrips tabaci)* on garlic *(Allium sativum)* at the NWFP Agricultural University, Peshawar during 2004-05. These compounds were first sprayed to the point of runoff when the density of the thrips on garlic reached 4 per leaf and repeated at 15 day of the first spray. There were 5 treatments along with one control and replicated 4 times. On garlic, all the pesticides gave significant reduction of thirps over the non treated check plot. Among pesticides chlorpyrifos, megamos and trend (being significant from one another) gave significant control over BtA. Mean yield of garlic was significantly higher in megamos treatment 4853 kg/ha, against 4395 kg/ha in BtA.

Key words: Biopesticide, synthetic pesticide, aphids, garlic.

INTRODUCTION

Garlic (*Allium sativum* Linn.) is widely grown as vegetable in plain areas of Pakistan. During 2003-04, it was grown on an area of about 6900 hectares with production of 56.500 tones. In NWFP, it was cultivated on 2000 hectares with a production of 22,300 tones (Agric. Stat. 2003-04). Garlic is attacked by a number of insect pests among which thrips (*Thrips tabaci* Lind.) (Thysanoptera, Thripidae) are most important. It is a cosmopolitan pest and is considered as a major pest of garlic and onion. Damage is caused by the nymphs and adults with their rasping and sucking mouth parts (Atwal, 1976).

Adults *T. tabaci* are slender, yellowish brown insects and measure about 1mm in length. The female lives for 2-4 weeks and lays 50-60 kidney shaped eggs singly in slits, made in the leaf tissue with sharp ovipositors. The egg hatch in 4-9 days and the nymphs start feeding on plant juices by lacerating the leaf tissue. On onion and garlic they are usually congregated at the base of leaf or in the flowers. The nymph pass through 4 stages and are full-fed in 4-6 days, after which they descend to ground and pupate at the depth of 25 mm. The pre-pupal and pupal stages last 1-2 and 2-4 days, respectively. Several generations are completed in a year. The attacked leaves become curled, wrinkled, and gradually dry up. Heavily infested plants do not form bulbs nor the flowers produce seed (Atwal, 1976). *T. tabaci* feeding on onion and garlic leaves may aid in development of purple blotch disease (Arantha, 1980). The use of synthetic chemical pesticides for the control of pests and diseases is generally avoided due to their detrimental side effects on man and his environment. There are some alternative measures to conventional methods; one of which is the use of biopesticides. Biopesticides contain microorganisms as the active ingredients. These biopesticides are extracted from living organisms using various processes that do not alter their chemical composition (Lee *et al*. 2000).

Keeping in view the importance of rapeseed, mustard and garlic crops and the damage caused by the above-mentioned insect pests to these crops, the current experiments were designed to compare the effectiveness of a biopesticide and some synthetic pesticides against aphids on rapeseed and mustard, and thrips on garlic.

MATERIALS AND METHODS

The present experiment was carried out at Agricultural Research Farm of NWFP Agricultural University Peshawar during 2004-05. The following pesticides were sprayed at the concentrations mentioned below, first when the density of the thrips on garlic reached 4 per leaf. The spray was repeated after 15 days interval.

Trade Name	*Common Name*	*Concentration*
Biopesticide	BtA	1gm/l.
Larsban	Chloropyrifos	5ml/l.
Actamaprid	Trend	4ml/l.
Methamidophos	Megamos	1.25ml/l.
Control	--	--

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For this experiment "Swat variety" of garlic was grown in the research farm. The experiment was laid out in randomized complete block design with three replications and treatments. The plot size was 6x4m^2. Uniform agronomic practices were applied to all treatments including the control. Ten plants were randomly selected from each treatment for data recording. Density of various insect pests/plant was recorded and chemical treatment was carried out after the pests reached their respective economic threshold levels i.e. 3-4 thrips per central leaf of plant. In case of garlic a third spray was also used after another two weeks. Data of pests density was recorded 24 hours before and then 24, 48 and 72 hours and then at weekly intervals of chemical treatments. The pesticides application and data recording schedules in this experiment were the same as per rapeseed experiment.

Statistical Analysis

The data were analyzed using MSTATC computer software and means were compared using LSD test at 5% level of significance.

RESULTS AND DISCUSSION

First Spray against Thrips on Garlic

Table I show that reduction of thrips from megamos was maximum and statistically significant over all the other treatments. This was followed by trend and chloripyrifos (these 2 being non significant from one another). Among the 4 treatment BtA was least effective in reducing thrips population. All the pesticides gave significantly higher reduction of thrips over the non treated check plot.

Second Spray against Thrips on Garlic

Mean density of thrips from second spray with chlorpyrifos, BtA, megamos and trend was 3.31, 4.37, 2.71, 3.19 against 7.78 the non treated check plot (Table II) All the pesticides gave significant reduction in pest population over the check. Among the pesticides chlorpyrifos, megamos and trend (being non significant from one another) gave significant control over the BtA.

Third Spray against Thrips on Garlic

All the pesticides gave significant reduction of the thrips over the non treated check plot (Table III). The reduction of the thrips from megamos was maximum and statistically significant over all the other treatment. This was followed by trend and the chlorpyrifos. Among the four treatments BtA gave significantly minimum reduction in thrips population.

Yield of Garlic Crop

Mean yield of garlic from spray against thrips on garlic was 4853 kg/ha from megamos followed by 4717 kg ha^{-1} from trend, 4509 kg ha^{-1} from chlorpyrifos and 4395 kg ha^{-1} from the BtA treatment against 3718 kg ha^{-1} from the non treated check plot as given in Fig 1. Statistical analysis of the data showed that yield of thrips was significantly high from megamos spray.

Among the different pesticides tested against garlic thrips and aphids, megamos and trend gave higher reduction in *T. tabaci* population after first, second and third pesticidal applications. While minimum reduction in *T. tabaci* was recorded in chlorpyrifos and biopesticide treatments. Heungens *et al.* (1989) presented the result of trials with about 30 insecticides in sprays against *T. tabaci* in green house in Belgium. According to them mortality ranged from 29.1 to 96.30, where acepahate, methamidophos, omethoate and chlorpyrifos were the best pesticides.

Akubult and Zumreoglu (1992) evaluated chlorpyrifos (0.05%), dimethoate (0.03%) and methamidophos (0.015%) for the control of *T. tabaci* on tobacco. Application of all three insecticides resulted in at least 90% mortality of the pest. According to Mohnan and Nanjan (1993) dimethoate (0.006%) applied at 20-day intervals was the most effective in controlling infestation of *T. tabaci* on garlic, compared with acephate (0.005%), furathiocarb (0.005%), demeton-o-methyl (0.004%) and (0.02%) neem oil. Minimum reduction recorded of *T. tabaci* in plots treated with biopesticides might be due to the fact that it contains *Bacillus thuringiensis* (BtA) (Tabashnik *et al.* 1997), which is environmentally benign insecticide derived from *Bacillus thuringiensis* (BtA) has a short life and loses its effectiveness very early. The yield of garlic was also significantly different among the different treatments. The maximum yield was recorded in megamos treatment, while lower yield in the BtA treatment. In control, yield of garlic was the lowest.

CONCLUSION

The experiment was conducted to compare the effectiveness of a biopesticide with different synthetic pesticides against insect pests of garlic. The research was conducted in the Agricultural Research Farm Malakandher of NWFP Agricultural University Peshawar during 2004-2005. The insecticides were applied three times against thrips (*Thrips tabaci* Lind.) in garlic. Among the different pesticides tested against garlic thrips megamos and trend gave higher reduction in *T. tabaci* population after first, second and third pesticidal applications. While minimum reduction of the pest were recorded in BtA treatment.

Among the treated plots density of the pest on garlic was lower in the megamos treatment with 0.28, 0.50, 0.87, 1.36, 2.32 and 0.97, 1.26, 1.94, 3.74, 5.61 and

3.38, 4.50, 5.77, 7.20, 10.45 thrips/leaf, while it was higher in the BtA treatment with 0.97, 1.20, 1.52, 1.78, 2.78 and 2.78, 3.13, 3.81, 6.05, 6.09 and 7.92, 9.07, 9.97, 10.90, 13.12 thrips/leaf after 24, 48 and 72 hours as well as after 1st week and 2nd weeks of first, second and third chemical treatments. Mean density of thrips/leaf over the entire two weeks period was lower in the megamos treatment with 1.46 thrips/leaf (51.3% reduction) and 2.71 (44.64% reduction) and 5.02 (69.77% reduction), while it was higher in BtA treatment with 1.65 (47.8% reduction) and 4.37 (32.35% reduction) and 10.11 (40.84% reduction). In control, density of the pest increased from 3.13 to 3.83 with thrips/leaf (18.2% increase) and from 7.15 to 7.73 (7.5% increase) and19.09 to 20.53 (3.06% increase), respectively.

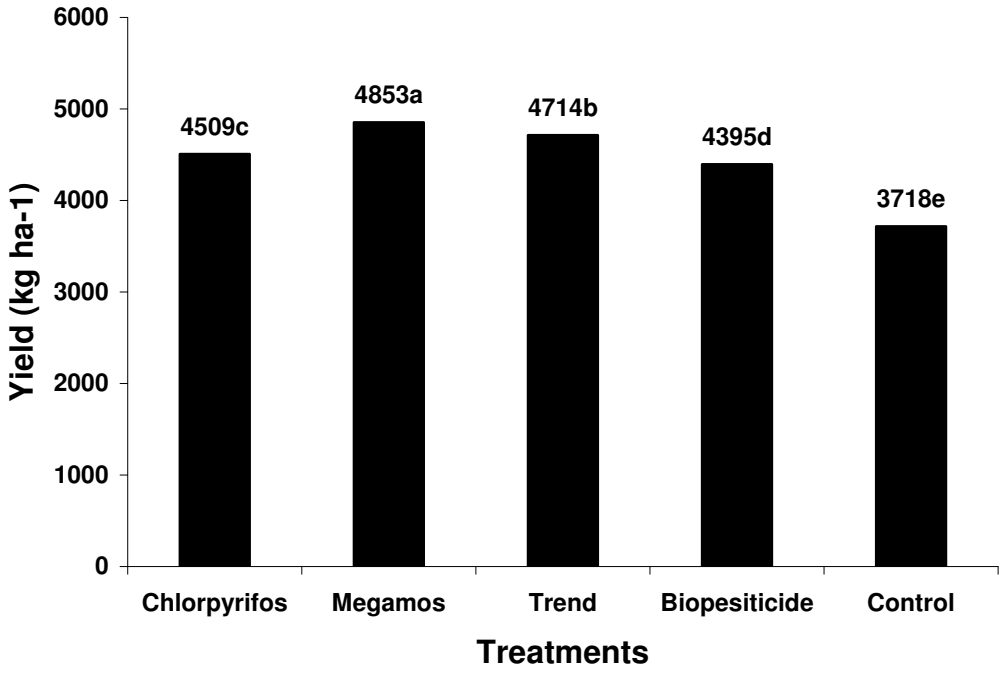

Fig 1. ***Mean yield of garlic (kg ha^{-1}) after chemical treatment against thrips.***

Table I. ***Mean density of thrips/leaf on garlic after 1st spray***

	Mean density of thrips/leaf						
		Post treatment					
Treatment	*Pre-treatment*	*24 hr (% Red)*	*48 hr (% Red)*	*72 hr (% Red)*	*1 week (% Red)*	*2 weeks (% Red)*	*M.D. (% red)*
Chlorpyrifos	3.00	0.75b (75)	0.93b (69)	1.3bc (56.7)	1.65 (45)	2.65b (11.7)	1.46bc (51.3)
BtA	3.17	0.97b (69.3)	1.2c (62)	1.52b (51.9)	1.78 (43.7)	2.78b (12)	1.65b (47.8)
Megamos	2.83	0.28b (92.6)	0.50b (86.9)	0.87c (77.3)	1.33 (65.3)	2.32c (21.1)	1.05d (72.6)
Trend	2.93	0.40b (86.3)	0.8b (76)	1.17bc (86.3)	1.37 (53.2)	2.52bc (13.9)	21.23cd (58.02)
Control	3.23	3.13a	4.29a	3.68a	3.87	3.83a	3.60a
LSD Value	N.S	0.7389	1.941	0.4416	N.S	0.2793	0.3420

Means followed by dissimilar letters within a column are significantly different at 5% level of significance (LSD test).

Table II. ***Mean density of thrips/leaf on garlic plant after 2nd spray***

Treatment	*Mean density of thrips/leaf*						
		Post treatment					
	Pre - treatment	*24 hr (% Red)*	*48 hr (% Red)*	*72 hr (% Red)*	*1 week (% Red)*	*2 weeks (% Red)*	*M.D. (% red)*
Chlorpyrifos	5.98	1.61c (73.03)	2.0c (66.8)	2.68c (55.18)	4.66c (22.07)	5.29c (11.53)	3.31bc (44.64)
BtA	6.46	2.78b (56.96)	3.13b (82.5)	3.81b (41.02)	6.05b (37.3)	6.09bc (5.72)	4.37b (32.35)
Megamos	6.90	0.98c (85.94)	1.26d (81.73)	1.94d (84.92)	3.74c (45.8)	5.61bc (18.7)	2.71c (60.72)
Trend	6.8	1.49c (78.1)	1.70cd (75)	2.40cd (64.7)	4.20c (38.23)	6.22b (8.5)	3.19c (53.08)
Control	7.1	7.15a	7.47a	7.55a	7.70a	7.73a	7.78a
LSD Value	N.S	0.8751	0.6630	0.6495	1.115	0.9243	1.134

Means followed by dissimilar letters within a column are significantly different at 5% level of significance (LSD test).

Table III. ***Mean density of thrips/leaf on garlic plant after 3rd spray***

Treatment	*Mean density of thrips/leaf*						
		Post treatment					*M.D. (% red)*
	Pre - treatment	*24 hr (% Red)*	*48 hr (% Red)*	*72 hr (% Red)*	*1 week (% Red)*	*2 weeks (% Red)*	
Chlorpyrifos	17.69b	5.25c (70.32)	6.4c (62.82)	7.33c (58.56)	8.4c (52.51)	12.27b (30.6)	7.90c (55.34)
BtA	17.09b	7.92b (53.65)	9.07b (46.92)	9.97b (41.66)	10.90b (36.22)	13.12b (23.2)	10.11b (40.84)
Megamos	16.61b	3.38d (79.7)	4.5e (72.9)	5.57d (65.26)	7.2d (56.65)	10.45c (37.1)	5.02e (69.77)
Trend	16.77b	3.67d (78.11)	4.9d (70.8)	6.13d (63.44)	7.8cd (53.5)	11.03c (34.2)	6.65d (60.34)
Control	19.90a	20.09a	20.23a	20.50a	20.50a	21.0a	20.53a
LSD Value	1.746	0.5017	0.2663	1.151	0.9945	1.028	0.8098

Means followed by dissimilar letters within a column are significantly different at 5% level of significance (LSD test).

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