COMPARATIVE STUDY OF A BIOPESTICIDE WITH SOME SYNTHETIC PESTICIDES USED AGAINST MUSTARD APHIDS (*Lipephis erysimi* Kalt)

Shakeel Ahmad[*], Imtiaz Ali Khan[*], Zahid Hussain[**], Syed Ishfaq Ali Shah[*] and Maaz Ahmad[***]

ABSTRACT

The experiment was conducted to compare effectiveness of (BtA) *Bacillus thuringiensis* and *Abamectin* @ 1gm/l with chlorpyrifos @ 5ml/l, megamos @ 1.25 ml/l and trend @ 4ml/l in controlling aphids (*Lipaphis erysimi)* on mustard *(Eruca sativa)* at Agricultural Research Farm, NWFP Agricultural University, Peshawar during 2004-05. These compounds were first sprayed to the point of runoff when the density of the aphids reached to 10 per leaf and repeated at 15 days after the first spray. There were 5 treatments along with one control and replicated 4 times. On mustard after two sprays all the pesticides (being non significant from one another) resulted in significant control of aphids over the check. Mean yield of mustard seed was significantly higher in chlorpyrifos treatment with 581 kg/ha, against 477 kg/ha in BtA treatment.

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

INTRODUCTION

Mustard crop known as sarson (*family Cruciferae*) is a commonly grown oilseed crop in Pakistan. Among the different sarson varieties grown are *Brassica campestris, B. napus, B. juncea* and *Eruca sativa*. Generally, rapeseed refers to *B. campestris* and *B. napus*. While mustard includes *B. juncea, B. nigra, B. carinata, E. sativa* and *Sinapis alba* (Nazir, 1994). In Pakistan, during 2003-04 the total area under cultivation of rapeseed and mustard was 279.8 thousand hectares with total annual production of 238.5 thousand tones. In NWFP total area under cultivation was 207 thousand hectares with a production of 90 tones/hectares (Agric. Stat. of Pak. 2003-04).

Different insect pests including aphids, cabbage butterflies, whiteflies, loopers, painted bugs, green bugs, armyworms and pollen beetles attack mustard crop (Hashmi, 1994). Aphid (*Lipaphis erysimi* Kalt.) (Homoptera, Aphididae) is one of the most important pests of mustard. Aphids feed on flower buds, shoots and pods. The pest is most abundant from December to March. The pest breeds parthenogenetically and the female may give birth to hundreds of nymphs. About 45 generations are completed in a year. Both the nymph and adult suck the cell sap from all green parts of the plant and have special preferences for the inflorescence. The extensive loss of cell sap results not only in low vigor but also inhibits plant growth. Due to sucking of cell sap by aphids honey dew is produced and the fungus sooty mould grows on these honey dew which results to the production of different fungus diseases. The infested leaves and pods turn pale, wilt and curl up, and thus yield is adversely affected (Israr, 1986).

The use of chemical pesticides for the control of crop pests and diseases is increasingly in question due to their detrimental side effects on humans and environment. There are several 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 mustard crop and the damage caused by the above-mentioned insect pests to the crop, the current experiment was designed to compare the effectiveness of a biopesticide and some synthetic pesticides against aphids on mustard.

MATERIALS AND METHODS

The experiment was carried out at Agricultural Research Farm of NWFP Agricultural University Peshawar during 2004-05. The following pesticides were sprayed at the dose mentioned against each, first when the density of the aphids reached 10 aphids leaf^{-1} and sprayed again at 15 days interval. For this experiment "Raya Anmol variety" of mustard was grown in the research farm. The experiment was laid out in randomized complete block design with four replications and five treatments including the control. The plot size was 5x4m^2. Uniform agronomic practices were given to all treatments. Ten plants were randomly selected from each treatment for data recording.

[*] Department of Entomology, NWFP Agricultural University Peshawar – Pakistan
[**] Department of Weed Science, NWFP Agricultural University Peshawar – Pakistan
[***] Department of Soil and Environmental Sciences, NWFP Agricultural University Peshawar – Pakistan

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

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 on Mustard against Mustard Aphids

Mean density of aphids plant^{-1} from treatment with chlorpyrifos, BtA, megamos, trend was 6.04, 8.97, 7.41, 8.20 against 26.26 in the non treated check plot as shown in Table I. All the pesticides gave significant reduction in pest population over the check. Among pesticides chlorpyrifos, megamos and trend (being non significant from one another) gave significant control over the BtA.

Second Spray on Mustard against Mustard Aphids

Mean density of aphids plant^{-1} after second spray with chlorpyrifos, BtA, megamos, trend was 5.4, 8.38, 6.67, 7.23, respectively against 28.89 aphids per leaf in the check as shown in Table II. Statistical analysis of the data showed that all the pesticides (being non significant from one another) gave significant control (reduction) of aphids over the check.

Yield of Mustard Crop

The mean yield of mustard obtained was 581 kg/ha from chlorpyrifos followed by 536.3 kg/ha from megamos, 504 kg/ha from trend and 477 kg/ha from BtA treatment against 408 kg/ha from the check plot as shown in Fig 1. Statistical analysis of the data showed that yield of mustard was significantly higher from chlorpyrifos spray.

Among the different pesticides tested against mustard aphid's chlorpyrifos and megamos gave higher reduction in *L. erysimi* population after first and second pesticidal applications. While minimum reduction in *L. erysimi* was recorded in trend and BtA treatments. Upadhyay and Agrawal (1993) tested monocrotophos (0.04%), phosphamidon (0.03%), methyl-demeton (0.025%), dimethoate (0.03%), endosulfan (0.05%), cypermethrin (0.3%) and chlorpyrifos (0.05%) against *L. erysimi* on mustard. All the pesticides afforded 100% mortality one day after treatment except dimethoate.

Kumar *et al.* (1996) studied the efficacy of 19 insecticides against *L. erysimi* on mustard in Utter Pradesh, India. All insecticides tested significantly reduced the pest population up to 94.1% on leaves and 99.3% on inflorescence. Chlorpyrifos (0.05%), methyl-o-demeton (0.05%) and monocrotophos (0.04%) as spray were the most effective, while malathion (0.05%) was least effective. Basavaraju *et al.* (1995) found that one spray of oxydemeton-methyl (0.04%) or acephate (0.10%) was effective against *L. erysimi* in an IPM program. Sikha *et al.* (1999) studied the efficacy of deltamethrin, phosphamidon, dimethoate, oxydemeton-methyl and fluvalinate at 3 different (0.025%), (0.05%) and (0.07%) concentrations against *L. erysimi* in jorhat, India. He concluded that oxydemeton-methyl showed the least effectivenss. While the best reduction of *L. erysimi* population was observed with fluvalinate.

The minimum *L. erysimi* reduction recorded with the biopesticide imported from china after both the applications might be due to the fact that it contains *Bacillus thuringiensis* as the active ingredient (Lee *et al.* 2000), which might not tolerate such high temperature and other environmental conditions in Pakistan, and that is why it was not able to reduce pest population as compared to the synthetic insecticides. Mustard seed yield was also significantly different among the different treatments, where maximum yield was recorded in Chlorpyrifos treatment, while lower yield in the BtA treatment.

Baral and Sethi (1997) conducted field trials during rabi season of 1996 in West Benegal, India. To determine the efficacy and persistent of chlorpyrifos (0.05%), monocrotophos (0.05%), fenvalerate (0.01%), phosphamidon (0.04%), endosulfan (0.06%) and dimethoate (0.04%) against *L. erysimi*, infesting mustard. Two sprays of each insecticide were applied in the field. Chlorpyrifos and endosulfan gave a good level of control, while in the laboratory phosphamidon and chlorpyrifos were highly

persistent. The highest seed yield was obtained using chlorpyrifos followed by phosphomidon.

CONCLUSION

Chlropyrifos shows the best results in the crop of mustard against the control of *Lipaphis erysimi.* BtA shows the poor results as compare to synthetic pesticides i.e. chlorpyrifos, trend and megamos.

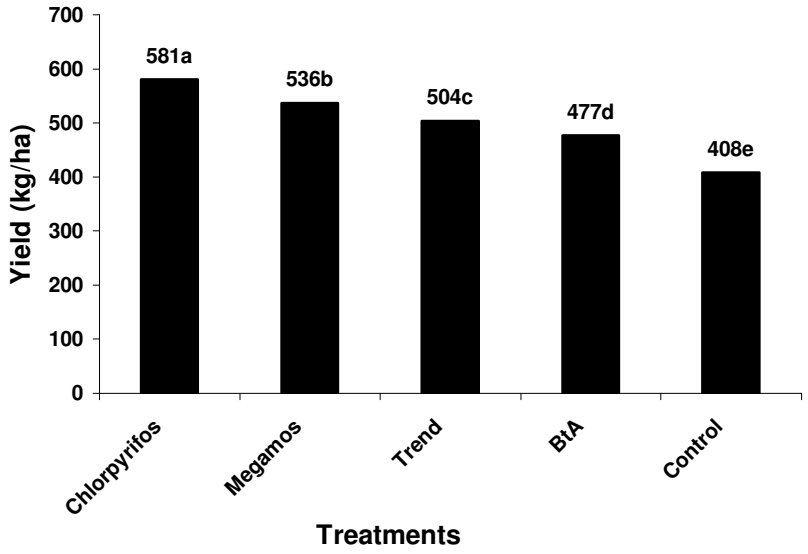

Fig 1. Mean yield of mustard (kg/ha) after chemical treatment against aphids.

Table I. ***Mean density of aphids plant^{-1} on mustard after 1st spray***

	Mean Density of Mustard Aphids/plant						
		Post treatment					
Treatment	*Pre-treatment*	*24 hr (% Red)*	*48 hr (% Red)*	*72 hr (% Red)*	*1 week (% Red)*	*2 weeks (% Red)*	*M.D. (%red)*
Chlorpyrifos	23.48	3.31d (94.3)	1.90b (91.8)	2.16b (91.0)	9.73b (58.68)	16.10c (31.3)	6.04c (73.48)
BtA	25.05	13.34b (87.84)	3.39b (87.68)	3.66b (86.71)	12.01b (56.44)	22.30b (19.0)	8.97b (64.31)
Megamos	25.54	1.91cd (92.4)	2.18b (91.5)	2.50b (90.2)	10.43b (59.26)	20.05b (21.5)	7.41bc (70.79)
Trend	26.14	2.53c (90.3)	2.89b (89.2)	2.94b (88.9)	10.98b (58.01)	21.80b (16.4)	8.20bc (68.54)
Control	24.66	26.24a	25.79a	27.51a	30.72a	31.72a	26.26a
LSD Value	N.S	0.6182	1.502	4.098	3.501	2.800	2.777

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

Table II. ***Mean density of aphids on mustard plant after 2nd spray***

	Mean Density of Mustard Aphid/plant						
		Post treatment					
Treatment	*Pre - treatment*	*24 hr (% Red)*	*48 hr (% Red)*	*72 hr (% Red)*	*1 week (% Red)*	*2 weeks (% Red)*	*M.D. (% red)*
Chlorpyrifos	*26.65*	0.71b (97.3)	1.02c (96.1)	1.75c (93.4)	8.55c (67.9)	14.96d (40.87)	5.4b (86.9)
BtA	27.27	2.19b (92.22)	2.83b (89.7)	3.90c (85.6)	11.55b (57.6)	21.4b (21.4)	8.38b (69.6)
Megamos	25.95	1.06b (95.9)	1.73b (93.3)	2.35bc (90.9)	9.77bc (62.5)	18.46c (29.5)	6.67b (74.31)
Trend	27.27	1.15b (95.8)	2.02 b (92.5)	2.58bc (90.5)	10.65b (60.2)	19.76bc (27.6)	7.23b (73.52)
Control	24.95	28.63a	28.42a	30.20a	29.44a	36.36a	28.89a
LSD Value	N.S	2.536	1.186	1.628	1.970	2.630	1.813

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

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