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Research Article

MANAGEMENT OF MUSTARD APHID *LIPAPHIS ERYSIMI* (KALT.) (HOMOPTERA: APHIDIDAE)

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Abstract

An experiment was conducted at IAAS, Lamjung to evaluate the management practices of *Lipaphis erysimi* (Kalt.) during Rabi season in 2013/14. Field experiment was laid out in a randomized block desigh (RCBD) with four replications and six treatments. The treatments were: i) *Verticillilum lecanii* @ 5gm/L of water; ii) Derisom (Karinjin) @ 2ml/L of water; iii) Margosom (Azadirachtin) @ 5ml/L of water; iv) Lemon grass oil @ 2ml/L of water; v) Dimethoate (Rogor) @2ml/L of water; and vi) Untreated control. Each plot consisted of 2 m x 2.7 m (5.4 m^2) with 360 plants (spacing RR 30 cm x PP 5 cm). Field experiment showed that the highest reduction of *Lipaphis erysimi* (Kalt.) was achieved in Dimethoate (Rogor 30 EC) followed by Derisom but these two treatments were statistically at par during almost all the spray times. Thus, Derisom (botanical) might be the best option in eco-friendly management of *Lipaphis erysimi* (Kalt.).

Keywords: Mustard aphid; derisom; margasom; *Verticillilum lecanii*; lemon grass oil; dimethoate

Introduction

Oilseed crops have been an important part of Nepalese agriculture and occupy about 6 % of the total cropped area during 2007/2008. The total area under oilseed crops in Nepal was 180,328 ha with the production of 134,286 mt. The average productivity of oilseed crops in Nepal is low (0.745 mt/ha) (MOAC, 2008) as compared to that of the world (1.28 mt/ha). Among oilseed crops of *Brassica* species, rapeseed (*Brassica campestris* L. var. *toria*) is the number one oilseed crop and has the highest acreage among all the oil crops grown in the country, i.e. 85 % (Ghimire *et al*., 2000). Low yield and high population growth rate has turned the country into edible oil importing country from an exporting one from the early seventies (Pradhan, 2008). To satisfy the increasing domestic demand, Nepal is importing edible oil worth of 10.48 billion rupees on 2007/2008 (MOAC, 2008).

More than three dozen of pests are known to be associated with various phonological stages of rapeseed-mustard crops (Bakhetia and Sekhon, 1989). Among these pests, mustard aphid, *Lipaphis erysimi* (Kalt.) is considered one of the devastating insect pests for its successful production (Raj and Lakhanpal, 1998; Bakhetia and Sekhon, 1989). In Nepal, yield loss up to 35 % was recorded in *Brassica campestris* var. *toria* (NORP, 1989/90) Aphids also transmit plant viral diseases, i.e. turnip mosaic virus, which can be managed by effective control of aphid (Chowfla and Baruah, 1990).

Farmers used to apply different type of chemicals with repeated frequency in high dose and sometimes even banned chemicals. The use of chemicals for pest control leads to such problems as environmental pollution, development of resistance to insecticides, harmful effects on non-target organisms including pollinators, pest resurgence, upsetting the balance of nature and threat to the health of man. Twenty aphid species have gained resistance to insecticides (Minks and Harrewinj, 1998) particularly to organophosphate, carbamate and pyrethroid insecticides (Drees, 1997). Realization of negative consequences of chemical pesticides and the growing consensuses in regard of health and environment, viable and sustainable alternatives other than chemical method of pest control is in search. In this search, microbial approaches with antagonistic entomopathogenic fungi (Raj and Lakhanpal, 1998) and botanicals pesticides (NARC, 1992) have been included as the best alternatives.

Materials and Methods

A field experiment was carried out at the IAAS, Lamjung during Rabi season of 2013/14. The experiment was laid out in Randomized Complete Block Design (RCBD). The experiment included six treatments replicated four times. The plot size of each treatment was 2 m x 2.7 m (5.4 m^2). Pragati variety of rapeseed was sown @ 6kg/ha on 4th November, 2013 maintaining 30 cm RR and 5 cm PP. Each plot consisted nine rows with 40 plants in each row i.e. 360 plants per plot with 12 t/ha compost and 60:40:20 kg

NPK/ha as basal dose of plant nutrients. The treatments were: i) *Verticillilum lecanii* @ 5gm/L of water; ii) Derisom @ 2ml/L of water; iii) Margosom @ 5ml/L of water; iv) Lemon grass oil @ 2ml/L of water; v) Dimethoate @2ml/L of water; and vi) Untreated control. Observations were taken from 10cm apical central shoot of inflorescence from 10 randomly selected plants of each plot. Both pre-treatment and post-treatment observations were taken for mustard aphid. Post-treatment observations were recorded after 3, 6, and 9 days of spray. In case of pre-treatment observation, it was taken 24 hours before spraying in case of 1st spray. However, in case of 2nd and 3rd spray, count taken at 9 days after each spray observation was taken as the pre-treatment population for succeeding spray.

Percentage of population reduction over control was calculated using the modified Abbots formula as given by Fleming and Retnakaran (1985).

$$PROC = [1-\{(T_a \times C_b) / (T_b \times C_a)\}] \times 100$$

Where, T_b = Population in treatment before spray,

T_a = Population in treatment after spray,

C_b = Population in control before spray,

C_a = Population in control after spray.

The data were converted into $\sqrt{(x+0.5)}$ as suggested by Gomez and Gomez (1984) and analyzed for homogeneity and further data analysis was done using SPSS 16.0.

Results and Discussion

Dimethoate @ 2ml/L gave 57 to 85% reduction of aphid population over control and was found to be the best among all the treatments followed by Derisom, Margosom, *Verticillium lecani* and Lemon grass oil, respectively. Similar results were shown by Ray (1995) and NORP (2000/01) where Dimethoate @ 0.03 % gave about 100% and 93% of mustard aphid mortality respectively. Derisom gave 51 to 82% reduction of aphid population over control at different time period of spray and its effectiveness was also found decreasing with the increasing time period. Mathur *et al*., (1990) found that the increase in concentration of Derisom (2000-3500 ppm) increased the mortality of larvae of flesh fly. Neem product, viz. Margosom was also effective in reduction of the aphid population over control. However, the efficacy of Margosom was found lower as compared to Dimethoate and Derisom. Margosom gave 38 to 64% reduction of aphid population over control. Similar findings were reported Srivastava and Guleria (2003) where 33 to 58% and 35% aphid reduction over control were found, respectively. *Verticillium lecanii* gave 28 to 50% reduction of aphid population over control. This was also similar with earlier findings of Rijal (2008), Rawat (2006) and Tanada and Kaya (1993). Lemon grass oil gave 15 to 32% reduction of aphid population over control. Sapkota (2004) found that using lemon grass extract in plant at weekly interval helped to repel sucking bug of bean.

The efficacy of Dimehtoate was found inversely proportional with the days of spray (Table 1, 2 and 3), which was supported by the finding of Mishra (1993) that aphid population/inch of inflorescence was increased with the increasing time period. Effectiveness and decreasing trend of Derisom was also supported by Rijal (2008).

Table 1: Effect of different treatments against *Lipaphis erysimi* (Kalt.) after first spray

Treatment	Pre-spray population	3DAS	PROC	6 DAS	PROC	9 DAS	PROC
V. lecanii	48.53	$53.25^{ab} \pm 8.60$	38.63	$60.35^{ab} \pm 8.28$	50.41	$78.30^{abc} \pm 7.02$	48.67
Derisom	45.70	$15.00^{cd} \pm 4.51$	81.64	$33.02^{c} \pm 5.93$	71.19	$49.70^{c} \pm 11.01$	65.41
Margosom	46.05	$30.03^{bc} \pm 9.54$	63.54	$48.20^{bc} \pm 6.92$	58.27	$67.95^{bc} \pm 6.33$	53.07
Lemon grass oil	25.73	$55.95^{ab} \pm 7.69$	21.64	$74.55^{ab} \pm 5.66$	15.55	$94.30^{ab} \pm 4.17$	16.60
Rogor	18.65	$7.80^{d} \pm 4.59$	76.61	$13.00^{d} \pm 5.35$	72.21	$19.00^{d} \pm 6.34$	67.60
Control	35.63	$63.70^{a} \pm 6.61$		$89.35^{a} \pm 4.89$		$112.00^{a} \pm 7.21$	
LSD (P = 0.05)		2.113		1.731		1.828	
CV (%)		24.59		16.42		15.03	

Table 2: Effect of different treatments against *Lipaphis erysimi* (Kalt.) after second spray

	Pre- spray	**3DAS**	**PROC**	**6 DAS**	**PROC**	**9 DAS**	**PROC**
Treatment	Pre-spray population	3DAS	PROC	6 DAS	PROC	9 DAS	PROC
V. lecanii	57.50	19.25^{c} ±2.18	28.25	23.90^{c} ±3.98	29.12	21.90^{c} ±4.44	38.14
Derisom	20.40	2.15^{e} ±1.76	77.41	3.90^{d}±1.29	67.40	6.10^{d} ±1.55	51.43
Margosom	51.00	9.30^{d} ±3.33	60.92	16.43^{c}±3.21	45.06	19.58^{c} ±4.55	37.66
Lemon grass oil	95.30	30.75^{b} ±5.90	30.85	41.70^{b}±5.94	25.38	47.23^{b}±10.56	19.51
Rogor	8.00	0.55^{e}±0.38	85.27	1.35^{d}±0.50	71.22	2.10^{e}±0.11	57.36
Control	150.50	70.23^{a} ±4.57		88.25^{a} ±8.44		92.66^{a} ±6.24	
LSD (P = 0.05)		1.050		1.248		1.338	
CV (%)		17.63		17.68		19.22	

Table 3: Effect of different treatments against *Lipaphis erysimi* (Kalt.) after third spray

Treatment	**Pre-spray population**	**3DAS**	**PROC**	**6 DAS**	**PROC**	**9 DAS**	**PROC**
V. lecanii	57.50	19.25^{c} ±2.18	28.25	23.90^{c} ±3.98	29.12	21.90^{c} ±4.44	38.14
Derisom	20.40	2.15^{e} ±1.76	77.41	3.90^{d}±1.29	67.40	6.10^{d} ±1.55	51.43
Margosom	51.00	9.30^{d} ±3.33	60.92	16.43^{c}±3.21	45.06	19.58^{c} ±4.55	37.66
Lemon grass oil	95.30	30.75^{b} ±5.90	30.85	41.70^{b}±5.94	25.38	47.23^{b}±10.56	19.51
Rogor	8.00	0.55^{e}±0.38	85.27	1.35^{d}±0.50	71.22	2.10^{e}±0.11	57.36
Control	150.50	70.23^{a} ±4.57		88.25^{a} ±8.44		92.66^{a} ±6.24	
LSD (P = 0.05)		1.050		1.248		1.338	
CV (%)		17.63		17.68		19.22	

DAS: Days after spray, PROC: Population reduction over control, CV: Coefficient of variation, LSD: Least Significant Difference, Value with the same letters in a column is not significantly different at 5% by DMRT and figures after ± indicate standard error.

Conclusion

Field study revealed that the greatest reduction of *Lipaphis erysimi* (Kalt.) was found in Dimethoate treated plot followed by Derisom, Margosom, *Verticillium lecanii* Viegas and Lemon grass oil, respectively. In general, the efficacies of these insecticides decreased with increase in time except *Verticillium lecanii*, which showed fluctuating trend. Dimethoate was found effective as well as remunerative insecticide. Derisom was also effective next to chemical and less harmful to natural enemies, bee population and natural environment. Viewing the result of Derisom in mustard aphid reduction and negative consequences of chemical, Derisom might be the viable and ecofriendly option for the control of mustard aphid.

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