

Integrated Management of Aphid (*Lipaphis erysimi* Kalt.) In Mustard

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Abstract: Studies were made on the management on mustard aphid (*Lipaphis erysimi*) using Jet powder, Neem Kernel extract, Jet powder + Neem Kernel extract with two chemical insecticide Aktara® 25WG and Diazinon® 60EC and their integration was studied at Agricultural Research Station, Comilla, during the winter season of 2008-2009. The highest aphid population was 84 per plant was observed in the 2nd week of January in 2009. Among the treatments on an average Aktara reduced the highest aphid population (92%) with the highest BCR (4.20) followed by Diazinon® (89%) and Neem Kernel extract + Jet powder (65%). Diazinon® 60EC gave the second highest BCR (3.83) followed by Jet powder (3.62) and Neem kernel extract + Jet powder (3.07). The highest yield (1568 kg ha⁻¹) was also found in Aktara treated plot which was statistically similar to Diazinon® treated plot (1485 kg ha⁻¹) and the lowest yield (840 kg ha⁻¹) was found in control plot.

Key words: Aphid • Pesticide • Neem extract • BCR • Yield • Canola

INTRODUCTION

Bangladesh and elsewhere Mustard aphid, *Lipaphis erysimi* (Kalt) is the most serious and destructive pest of mustard and a major limiting factor for successful cultivation of mustard seed production [1-4]. This aphid species infests a number of economically important crops Particularly under cruciferae family. The pest is also serious in India, Pakistan, USA and many other country of the world. Both nymphs and adults of this pest cause damage to mustard plants from early vegetative to siliqua maturity stage [5] resulting the plant shows stunted growth, flowers wither and pod formation is hindered. Although aphid is a minute insect it may destroy the plants even quicker than larger insects and adversely affects market value on cruciferous crops. The yield reduction of mustard due to aphids varied from 30-40% in our country depending upon the season [2, 3, 6]. High incidence of the pest can sometimes cause complete loss of the crop in mustard, severely infested plants often fail to bear siliqua or end up very poor pods [7]. Farmers spray insecticides in their field indiscriminately. So, it causes resistance of the pest, destruction of beneficial organisms and environmental pollution [8], control of aphids by any measure is a difficult task because of their rapid growth, mode of reproduction, polymorph nature and wide adaptation. So, it is necessary to find

ecologically sound and environmentally safe methods for pest control. Botanical pesticides are comparatively less expensive, perform low toxicity, naturally available plant materials, less hazardous, biodegradable and also safe for beneficial organisms. Ahamed [9] listed 2121 plant species possessing pest control properties, Researchers isolated and identified several chemical compounds from leaves and seeds of many plants and screened out for insect deterrents and growth inhibitors [10]. Neem seed kernel extracts containing azadiractin, salanin and meliontriol have extensively been studied and demonstrated for insect pest control efficacy [11]. The inhibitory effect on neem product has been reported earlier by Haque and Islam [12]. These neem products are distasteful or repelled to the insect and may reduce the insect infestation [13]. Information using botanicals for the control of mustard aphid in Bangladesh is scanty. Therefore, the present study was undertaken to find out the most effective plant materials with their integration for the management of mustard aphid.

MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Centre, Bangladesh Agricultural Research Institute (BARI), Comilla, Bangladesh during the winter season of 2008-2009. Seeds of mustard variety BARI

Sarisha-15 were sown on November 17, 2008 in 3m × 4m size plots following RCB design with three replications. Fertilization and other intercultural operations were done uniformly for raising the crop as per recommendation of Oilseed Research Centre, BARI. Six treatments namely, T₁= Jet powder @ 4 g L⁻¹, T₂= Neem Kernal Extract (2.5%), T₃= Jet powder + Neem Kernal Extract, T₄=Aktara® 25WG @ 0.2 g L⁻¹, T₅= Diagonon® 60EC @ 2 ml L⁻¹ and T₆ = untreated control. Three hundred fifty gram (350 g) neem seed kernal was crushed and added to 10 litre of water and kept overnight and sieved with fine net. Then the solution was ready for spray. Four gram (4 g) detergent powder (Jet powder) added to 1 litre of water stirring and sieved with fine net. Treatments were evaluated against aphid under field condition. Botanicals and insecticide were applied on January 14, 2009 at the pod formation stage (60 days after sowing) of the crop with the help of Knapsack sprayer. Randomly 5 plants were selected per plot for counting aphid populations. Both adult and nymph population was counted on the top of 10 cm twigs or inflorescence of the plant before spray and 2,5, and 7 days after spraying in all the treatments. Number of aphid population per plant was also counted at 7 days interval starting from 33 days after sowing up to last harvest. The crop was harvested on February 09, 2009 (84DAS). Seed yield of different treatments were recorded. Percent population reduction over pretreated, Increase yield over pretreated, net income and benefit cost ratio (BCR) of different treatments were also recorded. Data were compiled and analyzed statistically by using computer based software MSTST-C. The treatment means were compared by Duncan's Multiple Range Test [14].

RESULTS AND DISCUSSION

It is mentionable here that no aphid was encountered on mustard plant even up to 22th December 2008 (35 days after sowing). Aphid was observed initially on the mustard crop in the 1st week of January at the flowering and pod formation stage of the crop (50 DAS) and continued their infestation up to 3rd week of January at the pre-maturity stage (70 DAS). Initially aphid population was low at the early part of January but it increased gradually up to second week of January in 2009. The highest aphid population was 84 aphids per plant observed at 60 days after sowing and then declined gradually (Fig 1). Almost similar information was made by Biswas and Das [4] in this country. Infestation on aphid on mustard was not so high perhaps because of low temperature, foggy weather and an amount of coccinellid predator (Lady bird beetle) observed.

Significant variation of aphid population was found before spraying of insecticides when aphid population ranges 52-84 during that period (Table 1). After spraying the number of aphid decreased until 5 days after spraying (DAS) in all the treated plots while it significantly increased in untreated plot. On the other hand, aphid population increased at 7 days after spraying in all the treated plots except Aktara® 25WG and Diazinon® 60EC treated plot. It indicated that there was some residual effect of Aktara® 25WG and Diazinon® 60EC, hence aphid population decreased. Untreated plot had the highest population (84 aphids per plant).

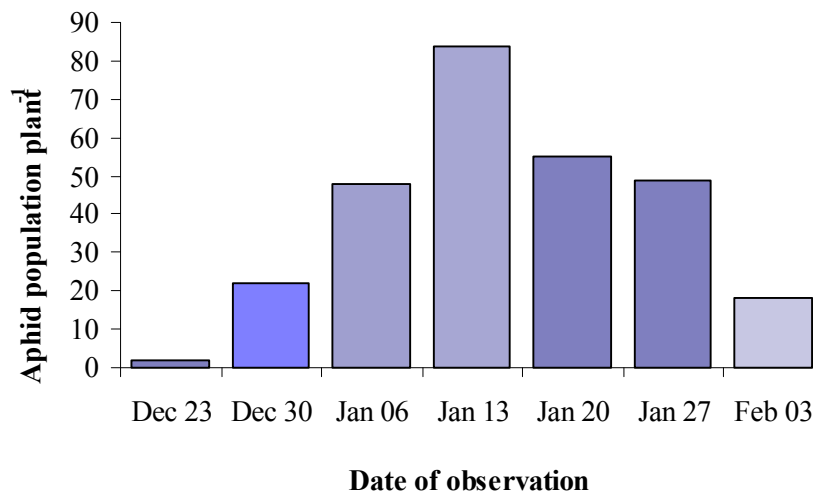


Fig. 1: Incidence of aphid population in mustard in 2008-2009 at ARS, Comilla

Table 1: Efficacy of some plant materials against mustard aphid (*L. erysimi*) during winter 2008-2009 at ARS, Comilla

Treatments	Aphid population plant ⁻¹ (10 cm twig/plant)			
	Before spray	2 DAS	5 DAS	7 DAS
T ₁ (Jet Powder)	52.67	39.67	30.67 c	37.33 c
T ₂ (Neem karnel extract)	84.00	61.67	48.33 b	51.00 b
T ₃ (Jet powder + NKE)	65.33	26.67	18.33 d	24.33 d
T ₄ (Aktara® 25WG)	78.33	18.67	0.00 e	0.00 e
T ₅ (Diazinon® 60 EC)	79.00	22.67	3.67 e	0.00 e
T ₆ (Control)	65.00	76.00	81.67 a	91.67 a
CV (%)	11.72	12.86	19.78	19.47
LSD	14.28	9.059	10.37	11.42

Data were recorded on average of 10 plants

DAS=Days after Spraying

Means followed by the same letters do not differ significantly at 5% level by DMRT.

Table 2: Efficacy of some plant materials against mustard aphid (*L. erysimi*) during winter 2008-09 at ARS, Comilla

Treatments	Percent population reduction over pretreated				
	2 DAS	5 DAS	7 DAS	Average	Yield (kg ha ⁻¹)
T ₁ (Jet Powder)	23.77 c	41.19 c	29.20 c	31.38	1225c
T ₂ (Neem karnel extract)	26.20 c	41.76 c	38.42 c	35.46	1270c
T ₃ (Jet powder + NKE)	59.42 b	71.47 b	62.61 b	64.50	1437b
T ₄ (Aktara® 25 WG)	75.89 a	100.00 a	100.0 a	91.96	1568a
T ₅ (Diazinon® 60 EC)	71.32 a	95.75 a	100.0 a	89.02	1485ab
T ₆ (Control)	+17	+26	+41	+29	839.9d
CV (%)	15.64	15.20	13.10		5.47
LSD	11.53	15.24	12.42		122.9

Data were recorded on average of 10 plants

DAS=Days after Spraying

Means followed by the same letters do not differ significantly at 5% level by DMRT.

Table 3: Economics of different plant materials spraying against mustard aphids during Winter 2008-09 at ARS, Comilla

Treatment	Seed Yield (kg ha ⁻¹) untreated (kg ha ⁻¹)	Yield Increase over spray (Tk/ha)	Cost of insecticide and income (Tk/ha)	Addition	Net income (Tk/ha)	BCR
T ₁ (Jet Powder)	1225 c	385	2500	11550	9050	6.62
T ₂ (Neem karnel extract)	1270 c	430	3300	12900	9600	2.90
T ₃ (Jet powder + NKE)	1437 b	597	4400	17910	13510	3.07
T ₄ (Aktara® 25 WG)	1568 a	728	4200	21840	17640	4.20
T ₅ (Diazinon® 60 EC)	1485 ab	645	4400	19350	15350	3.83
T ₆ (Control)	839.9 d	-	-	-	-	-
CV (%)	5.47					
LSD	122.9					

Means followed by the same letters do not differ significantly at 5% level by DMRT

BCR=Net income ÷ Management cost

Price of Jet powder =130.00 Tk./kg

Price of Mustard seed = 30.00 Tk./kg

Cost of Neem seed karnel = 50.00 Tk./kg

Cost of Aktara® 50WG @7600 Tk./kg

Cost of Diazinon® 60EC @ 900 Tk./L

Cost of labour 150 Tk./labour /day, Four labours and 1 L of Aktara® 2 g/10 L and Diazinon® 60 EC being required for 1 hectare of crop field sprayed in one time. One machine spray volume = 10 litre required 200 sq. m field spraying in one time. Other variable costs were same in all the treatments.

1\$ dollar = 69.5 Tk. (approx.)

Neem karnel and Jet powder significantly reduced the aphid population 71.47% at 5 days after spraying and then reappeared. But in Aktara® 25 WG and Diazinon® 60EC treated plot aphid did not reappeared up to 7 days after spraying. Aktara® 25WG showed the highest reduction of aphid (92%) followed by Diazinon® 60EC (89%) and Neem karnel + Jet powder (65%). The significantly highest yield (1568 kg ha⁻¹) was obtained on the Aktara treated plots which was identical to Diazinon® 60EC (1485 kg ha⁻¹) treated plot (Table 2). The significantly lowest seed yield (840 kg ha⁻¹) was obtained from untreated plots due to higher infestation of aphid. The highest BCR (4.2) was obtained from Aktara® 25 WG treated plot followed by Diazinon® 60EC treated plot (3.83) and jet powder treated plot (3.62) (Table 3) and the lowest BCR was obtain from neem kernel treated plot (2.90).

This result revealed that Neem formulation and Jet powder are effective in checking the aphid population in mustard only up to 5 days after spray. This performance was inferior to Aktara® 25Wg Diazinon® 60EC treated plots. Almost similar results were obtained by Prasad [15] in India. The inhibitory effect on neem product was present has been reported earlier by Islam *et al.* [16]. Azadirachtin chemical present in neem seed or neem oil which is distasteful or repelled to the insect and may reduced the infestation [13]. Results revealed that although botanicals fail to reduce 100% aphid population but it safe for natural enemies specially the Coccinellid predators and safe for environmental pollution.

CONCLUSION

Although chemical insecticide are still remaining the key tools of insect pest management but jet powder and neem formulation are eco-friendly management technique for managing mustard aphid. About 65% aphid population can be reduced by application of these materials.

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