

Integrated management of aphid in mustard

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Abstract: Management of mustard aphid (*L. erysimi* Kalt.) using zetpowder, neem kernel extract, neem oil and one chemical insecticide Malataf 57EC and their integration was studied at Regional Agricultural Research Station, Bangladesh Agricultural Research Institute, Rahmatpur, Barisal during rabi season of 2007-2008 and 2008-2009. The highest aphid population was 250 per plant observed in the 3rd week of January in 2008, 2009. Among the treatments as expected Malataf 57 EC reduced the highest aphid population (98.53%) with the highest BCR (5.00) followed by Neem kernel extract + Zet powder (70%) and Neem oil + Zet powder (69.91%) and Neem kernel extract (65.15%) recorded at 7 days after spray over the pre-treatment count. Zetpowder gave the second highest BCR (4.00) followed by Neem kernel extract (2.63), Zetpowder+Neem oil (2.20) and Zetpowder+ Neem kernel extract(2.14).

Key words: Integrated, Management Aphid, Mustard.

Introduction

Bangladesh is principally an agricultural country and produces good number of oilseed crops like mustard, sesame, groundnut, linseed, niger, safflower, sunflower, soybean, castor, etc. The first three are considered as the major oil crops. The oleiferous *Brassica* (rapeseed and mustard) which is commonly termed as mustard play an important role in vegetable oil production of the world. It is the (FAO, 2003; Pizza and Foslia, 2001; Walker and Booth, 2001). This crop supplies about 13.2% of the world's edible oil (Downey and Robbelen, 1989).

Bangladesh has to import huge amount of vegetable oil and oil seed every year to meet up the deficiency. Mustard is the major oil seed crop in Bangladesh. It covered about 70% of the total oil seed production of Bangladesh. The yield of this crop in Bangladesh is found much lower than the other countries due to low yield potential of local varieties and its poor management practices. Oil seed Research Centre (ORC) of BARI has developed some advanced promising varieties/line of rape- mustard which possess the high yield potential and less pest susceptible and less high oil content (44%).

Mustard aphid (*Lipaphis erysimi* Kalt.) is the most destructive pest of mustard and a major limiting factor for successful cultivation of the crop in this country (Islam *et al.*, 1991, Begum, 1995; Biswas *et al.*, 2000, Biswas and DAS 2000). The pest is also serious in India, Pakistan, USA and many other countries of the world. Both the nymphs and adults suck sap from leaves, inflorescence and pods; resulting the plant shows stunted growth, flowers wither and pod formation is hindered. The losses of mustard due to aphids varied from 35-90 percent depending upon the season. The control of aphids in Bangladesh is principally carried out by the conventional use of insecticides which created may problems in the agro-ecosystem (Bhaduri *et al.*, 1989). Farmers spray insecticides in their field indiscriminately. So it causes resistance of the pest, destruction of beneficial organisms and environmental pollution. So it is necessary to find ecologically sound and environmentally safe methods for pest control. Botanicals are comparatively less toxic, naturally available materials, less expensive, less hazardous, biodegradable and also safe for beneficial organisms. Ahmed (1984) listed 2121 plant species possessing pest control properties. Researchers isolated and identified several chemical compounds from leaves and seeds of many plants and screened and identified out

for insect deterrents and growth inhibitors. Neem seed kernel extracts containing azadiractin, salanin and meliontriol have extensively been studied and demonstrated for insect pest control efficacy (Sexena *et al.*, 1981; Haque and Islam, 1988). These neem products are distasteful or repelled to the insect and may reduce the insect infestation. 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 carried out during the period from rabi season of 2007-2008 to 2008-2009 at the field of Oilseed Research Centre, Regional Agricultural Research station, Bangladesh Agricultural Research Institute (BARI), Rahmatpur, Barisal, The experiment was laid out in a following randomized complete block design (RCBD) with three replications. Fertilizers were applied at 280-175-95-170-6-12 kg/ha of urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate and borax respectively, as recommended for Bangladesh (Anon, 2004). One half amount of urea and full dose of all other fertilizers were incorporated into the soil at the time of final land preparation. Other half of urea was applied as top dressing after 30 days sowing (flowering stage) was done. During land preparation, cowdung was applied at 10 ton/ha. The unit plot size was 3 m X 4 m. The spacing maintained for Mustard entries was 30 cm row to row and 10 cm seed to seed distances. The mustard variety BARI Sarisha-11 were sown in 28 November, 07, 08, 09. Intercultural operations, such as irrigation was given twice, weeding and mulching were done as and when necessary as per recommendation of Mondall and wahhab (2000). Six treatments namely, Zet powder @5g/l, Neem kernal extract(2.5%), neem kernal extract+ Zet powder, Neem oil 5ml/l +Zet powder Malataf 57 EC@ 2ml/l and untreated control were evaluated against mustard aphid under field condition. Three hundred fifty gram (350g) neem seed kernal was crushed and added to 10 litre of water and kept over night and sieved with fine net. Then the solution was ready for spray. Four gram(4g) detergent powder (Zet powder) added to 1litre of water stirring and sieved with fine net. Four (4) ml neem oil added to 1 litre of water with 4 g zet powder stirring and sieved then the solution was ready for spray. Botanicals and insecticide were

applied on January 24, 2007, 2008, 2009 at the pod formation stage of the crop with the help of knapsack sprayer. Randomly 10 plants were selected per plot for counting aphid populations. Both adult and nymph populations were counted on the top of 10cm twigs or inflorescence of the plant before 2, 5 and 7 days after spray in all the treatments. The crop was harvested on 15-03-08, 09. Seed yield of different treatments were recorded. Data were compiled and analyzed statistically. Benefit cost ratios (BCR) of different treatments were also calculated.

Results and Discussion

Initially aphids appeared on the mustard crop in the 2nd week of January at the flowering and pod formation stage of the crop (50 DAS) and continued their infestation up to 4th 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 3rd week of February in 2008 and 2009. The highest aphid population was 260 aphid/ plant observed in the last week of January in 2008 and 2009 and then declined gradually (Table 1) (Fig. 1). Almost similar information was made by Kaul and Das (1986) and Biswas and Das (2000) in this country.

Table 1. Incidence of aphid population in mustard 07-08 and 08-09 at Barisal

Duration (Date)	Aphids/plant
1-7 January	20
8-14 January	60
15-21 January	140
22-28 January	260
29 Jan- 03 Feb.	160
04-11 Feb.	80

Before spray, the mean aphid population per plant ranged 180 to 240. These variations in aphid population were not significant indicating homogenous distribution of population. After spray the number of aphid decreased in the treated plots while in significantly increased in untreated plot. Untreated plot had the highest population (450 aphids/plant) (Table 2).

Neem products and Zetpowder significantly reduced the aphid population (65.15-70%) after 7 days of spray and then reappeared. But in Malataf 57 EC treated plot aphid did not reappeared up to 7 days after spray. As expected, Malataf 57 EC gave the highest reduction of aphid (98.53%) followed by Neem kernel extract + Zetpowder (Table 3). The significantly highest yield (1200 kg/ha) was obtained on the Malataf 57 EC treated plots followed by Neem kernel + Zetpowder treated plots (1080 kg/ha). The significantly lowest seed yield (750 kg/ha) was obtained from untreated plots (Table 3). The highest BCR (5.00) was obtained from Malataf 57 EC treated plot followed by Ztpowder treated plot (4.00) (Table 4).

This result revealed that neem formations and Zetpowder are effective in checking the aphid population in mustard only up to 5-7 days after spray. Their performance was inferior to Malataf 57 EC treated plots. Almost similar results were obtained by Prasad (1995) in India. Morde and Blackwell (1993) reported that antifeedant and insect growth regulatory effect are present in azadirachtin and neem product which can be used for insect management. Islam et al. (2006) reported that about 50% mortality of *Spilarctia oblique* occurred in jute plant when applied 5% concentration of neem oil in Bangladesh. Result revealed that although botanicals fail to reduce 100% aphid population but it safe for natural enemies specially the coccinellid predators and also safe for environmental pollution.

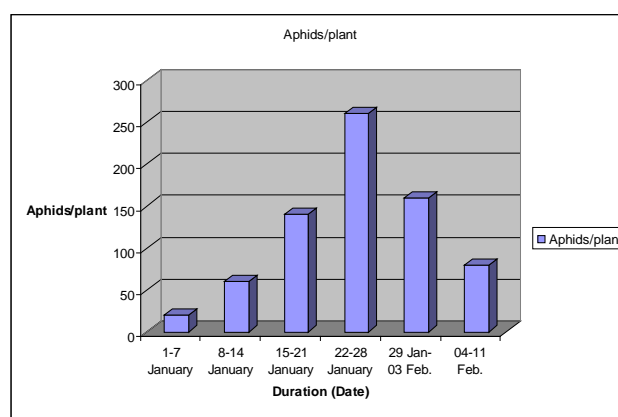


Fig. 1. Incidence of aphid population in mustard

Table 2. Efficacy of some plant materials against mustard aphid (*L. erysimi*) 2007-2008 and 2008-2009 at Barisal

Treatment	Aphid population/plant(10 cm twig/plant)			
	Before spray	2 DAS	5 DAS	7 DAS
Zetpowder 4g/l	180b	70 b	55c	80b
Neemkernel extract(2.5%)	220a	80 b	70b	80b
Neemkernel extract(2.5%)+Zet powder	200a	60 b	50c	70c
Neem oil+Zet powder	190b	55 c	50c	65c
Malataf 57EC 2ml/l	240a	10 d	0d	0d
Untreated control	210a	260 a	350 a	450a

Data were recorded on average of 10 plants; Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT; DAS= Days After Spray

Table 3. Efficacy of some plant materials against mustard aphid (*L. erysimi*) 2007-2008 and 2008-2009 at Barisal

Entries	Percent population reduction over pretreated				
	2 DAS	5 DAS	7 DAS	Average	Yield(kg/ha)
Zetpowder 4g/l	61.11c	69.00b	55.00c	61.69	1000c
Neemkernel extract (2.5%)	63.64c	68.18b	63.64b	65.15	1040b
Neemkernel extract(2.5%)+Zet powder	70.00b	75.00b	65.00b	70.00	1080b
Neem oil+Zet powder	71.05b	73.68b	65.78b	69.91	1070b
Malataf 57 EC 2ml/l	95.00a	100.00a	100.00a	98.53	1200a
Untreated control	+23.80	+66.67	+114.29	+68.00	750d

Data were recorded on average of 10 plants; (+)Percent increase in aphid population; Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT.

Table 4. Economics of different plant materials spraying against mustard aphids 2007-2008 and 2008-2009 at Barisal

Treatment	Yield (kg/ha)	Increased yield over untreated (kg/ha)	Cost of insecticides & spray (kg/ha)	Addition. Income (k/ha)	Net income Tk./ha	BCR
Zet powder 4g/l	1000c	250	2000	10000	8000	4.00
Neem kernel extract(2.5%)	1040b	290	3200	11600	8400	2.63
NKE+Zet powder	1080b	330	4200	13200	9000	2.14
Neem oil +Zet P	1070b	320	4000	12800	8800	2.20
Malataf 57EC2ml/l	1200a	450	3000	18000	15000	5.00
Untreated control	750d	-	-	-	-	-

Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT; BCR= Net income/ Management cost
Price of mustard seed =40Tk./kg, cost of neem oil=200 Tk./litre; Cost of neem seed kernel= 50Tk./Kg, cost of Malataf EC=400Tk./litre; Cost of labour=120Tk./labour day. Three labours and 1litre of malataf 57EC @ 2ml/l being required for 1hectare of crop field sprayed in one time. One machine spray volume= 10 litre required 200 sqm field spraying in one time. Other variable costs were same in all the treatment.

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