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BIO-EFFICACY OF DIFFERENT INSECTICIDES AGAINST MUSTARD APHID *LIPAPHIS ERYSIMI* (KALT.) ON MUSTARD UNDER FIELD CONDITIONS

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ABSTRACT

Bioefficacy of eight different insecticides with different concentrations were evaluated against mustard aphid (*Lipaphis erysimi*) during 2010-2011. Among the different treatments, imidacloprid 17.8 SL @ 0.003% and 0.002% concentrations proved effective with more than 90 percent aphid mortality and on other hand acetamiprid (0.002%) and acephate (0.056%) showed less than 50% mortality. The cost benefit ratio was found maximum in case of imidacloprid (0.003%) with 1:18 and minimum in case of fipronil (0.008%) with 1:2.2. This study could be useful in formulating measures on best chemical control of mustard aphid.

Key words : *Efficacy, Insecticides, mustard aphid, cost benefit ratio.*

Mustard aphid, *Lipaphis erysimi* (Kalt.) is one of the major pests responsible for reduction in yield of rapeseed–mustard. Heavy yield losses (11-96%) to the rapeseed-mustard by *L. erysimi* in various agro-climatic regions of India have been reported by various workers (1). Earlier, number of insecticides have been evaluated and recommended against this pest by many workers. However, in the present study also newer insecticide molecule neo-nicotinoids has been evaluated for the control of mustard aphid along with conventional insecticides already in use.

MATERIALS AND METHODS

The experiment was conducted during *rabi* 2010-2011 at research farm of CCS Haryana agriculture university, Hisar, in RBD and replicated three times in a plot of 6 x 3m length. The crop variety RH-30 was raised under recommended agronomic practices at 30cm row to row and 10-15cm plant to plant spacing. There were 12 insecticide treatments including the control with different concentrations. Spraying was done at full flowering stage by using Knapsack sprayer when the pest attained above the ETL level. Population of mustard aphid was recorded from 10 cm top central portion of 10 randomly selected and tagged plants in each plot, one day before and 3,5,7 and 10 days after spray. Overall percent aphid mortality after 10 days of spray was calculated for each treatment. The mean yield and cost benefit ratio was also calculated for each treatment.

RESULTS AND DISCUSSION

Considering the overall percent aphid mortality 10 days after spray all the insecticidal treatments were significantly better than control and water spray. Imidacloprid (both @0.003% and 0.002%) was found significantly superior over the other treatments with 92.7 and 90.4 percent aphid mortality, respectively after 10 days of spray. Almost similar reports (more than 90 percent mortality) were given by (2, 3, 4) with imidacloprid at different concentrations. Methyl demeton (0.025%) resulted in 87.2 percent aphid mortality. 88 to 100 percent aphid mortality with methyl demeton after 3 and 7 days of spray also reported by (2, 4, 6). Dimethoate (0.03%) was also found effective next to methyl demeton resulted in 87percent aphid mortality, almost similar results were also observed by (6, 7, 8). Thiamethoxam (0.004%), Thiamehoxam (0.003%) showed 84.4 and 81.8 percent aphid mortality over control. similar results also reported with thiamethoxam by (4, 9, 10). Malathion (0.05%) also showed aphid mortality of 80 percent over control which was similar to the results of (4, 8). Fipronil (0.008%) showed more than 70 percent aphid mortality compared to control. More than 70 percent aphid mortality also reported by (3). Acetamiprid (0.002%) and Acephate (0.056%) resulted in less than 50 per cent mortality compared to other treatments. However (7) reported more than 90 percent aphid mortality which is contradictory to the present results. The difference in aphid mortality may be due to the effect of different concentrations (chemical), days of spray of chemical and abiotic factors prevailing during the crop season. However there was significant increase in number of aphids in case of treatments receiving water spray, this indicates that water spray may have increased the humidity and further increased pest survival. The order of effectiveness of these insecticides based on efficacy

Table-1: Insecticides/treatments used against mustard aphid

Sr. No.	Common name	Formulation	Dosage
1.	Imidacloprid	17.8 SL	100 ml/ha (0.003%)
2.	Imidacloprid	17.8 SL	75 ml/ha (0.002%)
3.	Thiamethoxam	25 SG	100 g/ha (0.004%)
4.	Thiamethoxam	25 SG	75 g/ha (0.003%)
5.	Methyl demeton	25 EC	625 ml/ha (0.025%)
6.	Dimethoate	30 EC	625 ml/ha (0.03%)
7.	Malathion	50 EC	625 ml/ha (0.05%)
8.	Fipronil	5 SC	1000 g/ha (0.008%)
9.	Acetamiprid	20 SP	50 g/ha (0.002%)
10.	Acephate	75 SP	466 g/ha (0.056%)
11.	Water spray	-	625 ml/ha
12.	Control (No spray)	-	-

is: Imidacloprid (0.003%) > imidacloprid (0.002%) > Methyldemeton(0.025%) > Dimethoate (0.03%) > Thiamethoaxam (0.004%) > Thiamethoxam (0.003%) > Malathion (0.05%) > Fipronil (0.008%) > Acephate (0.056%) > Acetamiprid (0.002%).

Economics

Under present studies imidacloprid (0.003%) and Imidacloprid (0.002%) resulted in higher yields of 16.08 and 15.8q/ha with 18.2 and 16.1 per cent increase in yield over control. Similarly 18.09q/ha yield also reported in plots treated with imidacloprid (3). Among the other effective chemicals Methyl demeton treated plots gave 15.2q/ha with 11.7 percent increase in yield over control. similar yield of 15.7q/ha yield with methyl demeton (0.025%) also reported by (11). Dimethoate (0.03%) resulted in 15.1q/ha yield, However (12) reported low yield of 11.09 q/ha. The Yields obtained was different may be due to the effect of abiotic factors prevailing during the crop season and concentrations used. Yields were reduced with water spray may be due to increase in humidity.

Cost Benefit Ratio

Cost benefit ratio was highest (1:18.0) in case of imidacloprid (0.003%) followed by imidacloprid (0.002%) with 1:17.9, respectively and minimum (1:2.2) with Fipronil. Similarly (3) also revealed maximum cost benefit ratio (1:22.0) with imidacloprid and minimum (1:7.2) with fipronil. Under present condition fipronil showed less cost benefit ratio may be because of high cost of chemical.

Table-2: Bio-efficacy of different insecticides against mustard aphid.

Treatments	Mean* number of aphids one day before spray	*Mean number of aphids days after spray				Overall mean number of aphids	Per cent aphid mortality 10days after spray
		3	5	7	10		
Imidacloprid 17.8SL (0.003%)	20.7(4.6)	11.0(3.5)	7.1(2.8)	4.8(2.4)	1.5(1.6)	6.1(2.6)	92.7
Imidacloprid 17.8SL (0.002%)	21.3(4.7)	11.6(3.5)	7.2(2.9)	4.9(2.4)	2.0(1.7)	6.4(2.7)	90.4
Thiamethoxam 25 SG (0.004%)	21.2(4.7)	12.9(3.7)	10.4(3.4)	7.2(2.9)	3.3(2.1)	8.5(2.9)	84.4
Thiamethoxam 25 SG (0.003%)	20.9(4.6)	13.4(3.8)	10.3(3.4)	7.5(2.9)	3.8(2.2)	8.6(3.1)	81.8
Methyl demeton 25 EC (0.025%)	20.4(4.6)	12.1(3.6)	8.6(3.0)	5.1(2.5)	2.6(1.9)	7.1(2.8)	87.2
Dimethoate 30 EC (0.03%)	21.7(4.7)	12.6(3.7)	9.9(3.3)	5.7(2.6)	2.8(1.9)	7.7(3.0)	87.0
Malathion50 EC (0.05%)	21.6(4.7)	13.3(3.8)	10.2(3.3)	8.2(3.0)	4.2(2.3)	8.9(3.1)	80.5
Fipronil 5SC (0.008%)	20.4(4.6)	16.4(4.2)	13.4(3.8)	9.7(3.3)	5.9(2.6)	11.3(3.5)	71.0
Acetamiprid 20 SP (0.002%)	20.7(4.6)	18.2(4.4)	13.5(3.8)	12.5(3.7)	10.9(3.4)	13.6(3.8)	48.0
Acephate 75 SP (0.056%)	21.4(4.7)	14.6(3.9)	11.9(3.6)	10.9(3.4)	10.4(3.4)	12.0(3.6)	49.7
Water spray	21.0(4.6)	23.8(5.0)	24.9(5.1)	25.9(5.2)	26.6(5.3)	25.3(5.1)	-
Control	21.6(4.7)	23.5(4.9)	25.5(5.1)	26.4(5.2)	27.2(5.3)	25.6(5.1)	-
S. E.(m)	(0.04)	(0.08)	(0.08)	(0.07)	(0.07)	(0.05)	-
CD 5%	(NS)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	-

*Based on 10 cm top twig each from 30 plants (10 plants in 3 repeats)
Figures in parentheses are $\sqrt{n+1}$ values

Table-3: Economics of different insecticides against mustard aphid.

Treatments	Dose/ha	Mean Yield (Kg/ha)	Per cent increase in yield over control	Cost* of Insecticide (Rs/ha)	Expenditure on insecticide application (Rs/ha)	Gross income (Rs/ha)	Net return over control (Rs/ha)	Cost benefit ratio
Imidacloprid 17.8 SL	0.003%	1608	18.2	110	260	31900	4700	1:18.0
Imidacloprid 17.8 SL	0.002%	1580	16.1	82.5	232	31368	4168	1:17.9
Thiamethoxam 25 SG	0.004%	1570	15.4	300	450	30950	3750	1:18.3
Thiamethoxam 25 SG	0.003%	1540	13.2	225	375	30425	3225	1:18.6
Methyl demeton25 EC	0.025%	1520	11.7	281	431	29969	2769	1:16.4
Dimethoate 30 EC	0.03%	1510	11.0	213	363	29837	2637	1:17.2
Malathion 50 EC	0.05%	1560	14.7	218	368	30832	3632	1:19.8
Fipronil 5 SC	0.008%	1540	13.2	960	1110	29690	2490	1:12.2
Acetamiprid 20 SP	0.002%	1530	12.5	100	250	30350	3150	1:12.6
Acephate 75 SP	0.056%	1500	10.2	303	453	29547	2347	1:15.1
Water spray	-	1380	1.4	_	150	27450	250	1:1.6
Control		1360	-	_	_	27200	-	
C.D at 5%	-	11.08	-	-	-	-	-	-
S.E(m)	-	3.72	-	-	-	-	-	-

*Imidacloprid 17.8SL = 1100/lit, Thiamethoxam 25SG = 3000/KG, Methyldemeton 25EC = 450/lit,
Dimethoate 30EC = 342/lit, Malathion 50 EC = 350/lit, Fipronil 5 SC = 960/lit,
Acetamiprid 20 SP = 2000/Kg, Acephate75 SP = 650/Kg, Rate of mustard = Rs. 2000/q,
Labor cost = 150/ha/day

REFERENCES

1. Bakhetia, D.R.C. (1987). Insect pests of rapesed-mustard and their management. *Plant protection in field crops.* Rajendranagar, Hyderabad, India.pp.249-259.
2. Kumar, A.; Jandial, V.K. and Parihar, S.B.S. (2007). Efficacy of different insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard under field conditions. *International Journal of Agriculture Sciences, 3(2) :* 90-91.
3. Singh, S.P. and Singh, Y.P. (2009). Bio-efficacy of pesticides against mustard aphid. Annals of Plant Protection Science, *17 (1) :* 240.
4. Rohilla, H.R.; Bhatnagar, P. and Yadav, P.R. (2004). Chemical control of mustard aphid with newer and conventional insecticides. *Indian Journal of Entomology, 66(1):* 30-32.
5. Kumar, A.; Jandial, V.K. and Parihar, S.B.S. (2007 b). Efficacy of different insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard under field conditions. *International Journal of Agriculture Sciences, 3(2) :* 90-91.
6. Bandral, R.S. (2005). Field-weathered toxicity of some insecticides to *Lipaphis erysimi. Annals of Plant Proection Sciences, 13(1) :* 213-269.
7. Singh, R.K. and Verma R.A. (2008). Relative efficacy of certain insecticides against mustard aphid Lipaphis erysimi (Kalt.) on Indian mustard (*Brassica juncea*). *Indian Journal of Agriculture Sciences, 78(9) :* 87-89.
8. Sinha, R.P.; Kumari, K. and Singh, S.N. (2001). Relative efficacy and persistence of toxicity of insecticides against mustard aphid. *Indian Journal of Entomology, 63(2) :* 186-191.
9. Lal, O.P.; Sinha, S.R. and Srivastava, Y.N. (2002). Evaluation of some promising insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) on cabbage under field condition. *Journal of Entomological Research, 26 (2) :* 169-173.
10. Rana, S.C.; Kumar, R.; Singh, P.B and Babu, K.S. (2008). Evaluation of some newer insecticides against mustard aphid on seed crop of radish. *Seed Research, 36(1):* 112-114.
11. Gami, J.M.; Bapodra, J.G. and Rathod, R.R. (2002). Chemical control of mustard aphid, Lipaphis erysimi Kaltenbach. *Indian Journal Plant Protection, 30 (2) :* 180-183.
12. Saxena, A.K and Jakhmola, S.S. (1992). Relative efficacy and economics of insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.). *Jawharlal Nehuru Krishi Vishwa Vidyalya Research journal, 26(2) :* 74-76.