INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 9 | ISSUE 1 | APRIL, 2016 | 129-132

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

RESEARCH PAPER

DOI : 10.15740/HAS/IJPP/9.1/129-132

Bio-efficacy of biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard crop under field condition

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ARITCLE INFO

Received : 25.01.2015
Revised : 14.02.2016
Accepted : 28.02.2016

KEY WORDS :
Aphid, Biopesticides, Dimethoate, *Lipaphis erysimi* Kalt., Malathion, Neem oil

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ABSTRACT

The experiment was conducted on bio-efficacy of Biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) at research farm Department of Entomology, SHIATS Allahabad during Rabi season of 2012-2013. Bio-efficacy of Biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard revealed that treatments of Dimethoate 30 EC followed by spraying of Malathion 50 EC and Neem oil (0.5%) were found more effective for control of *Lipaphis erysimi* Kalt., respectively. Whereas, the descending order of treatments were Neem oil > NSKE > Tobacco Leaf extract > *Bacillus thuringiensis* > *Beauveria bassiana* > *Metarhizium anisopliae*. The least effective treatment was *Verticillium lecanii*. Maximum infestation was recorded in control.

How to view point the article : Kumar, Sachin and Kumar, Ashwani (2016). Bio-efficacy of biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard crop under field condition. *Internat. J. Plant Protec.*, **9**(1) : 129-132.

INTRODUCTION

Rapeseed and mustard are one of the most important oilseed crop of India belong to genus *Brassica* of family *cruciferae*. Rapeseed or mustard oil is the most important edible oil in north India which is difficult to be replaced by any other oils. The oil content of most of the types ranges between 30-48 per cent; however, in white mustard it is hardly 25-33 per cent. Mustard seed oil has a specific gravity of 0.90 with iodine value raging from 87 to 122. Saponification value varies between 170 and 200 (Nagaraj, 1995). Composition of Brassica oil- oil 31-44 per cent, cake protein 37-44 per cent, ash in cake 5-9 per cent, iodine value 74-98, refractive index 1.4612 to 1.4662. Oldest use of rapeseed oil was as a lamp oil. The oil is also used as medicinal remeaies to cure stomach problems and skin diseases. Now the oil is used mainly for industrial and edible purposes (Reddy, 2009). The estimated area, production and yield of rapeseed-mustard in the world was 34.19 million hectares (m ha), 63.09 million tonnes (mt) and 1,850 kg / ha, respectively, during 2012-13 (*http://www.dacnet.nic.in*). There are at least

38 insect associated with *Brassica* crop. Dimond back moth, saw fly and aphids are the major pest on *Brassica.* Yield losses due to these pest range from 20-70 per cent (Reddy, 2009). The mustard aphid, *Lipaphis erysimi* (Kalt.) is a serious pest of mustard in India and other tropical regions in the world. Aphids remain active in North India on rapeseed mustard crop from November-March with higher population during mid February to mid March. Mustard aphid cause 65 to 96 per cent loss in seed yield (Bakhetia, 1984) and loss in oil content up to 15 per cent. Research workers have started searching out the effective environmentally safe eco-friendly and bio-intensive control measures which may keep the crop pest suppressed below economic threshold level (ETL). Different control measure is recommended to control this pest among which chemical control is the most important. The chemical insecticides have been found more or less toxic to a number of Parasitoids and Predators (Singh *et al*., 2007). The bio-agents are more compatible with the environmental components, eco-friendly with plant health and non-hazadous to human being (Singh and Lal, 2012) The present investigation was undertaken to evaluate the comparative bio-efficacy of biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard crop under field condition.

MATERIAL AND METHODS

To determine the "Bio-efficacy of biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard crop under field condition" was carried out at the Agriculture research farm, Department of Entomology, SHIATS, Allahabad during *Rabi* season 2012-13. The cultivar Varuna (T59) was sown in simple R.B.D. with ten treatments, replication thrice in the plot size 4m× 4m having line to line and plant to plant spacing as 50 cm and 10 cm, respectively. The spraying of treatment was done with the help of knapsack sprayer. Total two sprays were applied to protect crop from aphid (*Lipaphis erysimi* Kalt.) infestation. Sprays of insecticides were carried out at an interval of 15 days. The treatments were Neem oil, NSKE, Tobacco Leaf extract, *Beauveria bassiana*, *Metarhizium anisoplia*, *Verticillium lecanii*, *Bacillus thuringiensis*, Dimethoate 30 EC, Malathion 50 EC, and untreated control. The per cent infestation of aphid population was recorded one day before and after 1st,

Table 1: Bio-efficacy of biopesticides and certain chemical insecticides against mustard aphid (*Lipaphis erysimi* Kalt.) on mustard crop during *Rabi* 2012-2013

Treat. No.	Treatments	Av. % infestation of mustard aphid (Av. no. / 10 cm central twig / plant)*								Mean
		1st spray				2nd spray				
		1DBS	1 DAS	3 DAS	7 DAS	10 DAS	1DBS	1 DAS	3 DAS	7 DAS	10 DAS	
T_0	Control (water spray)	94.00	95.87	96.00	96.67	98.07	99.13	99.93	100.80	101.73	28.53	89.70
T_1	Neem oil 5ml/lit.	92.67	90.47	66.67	45.87	50.93	61.13	51.27	44.93	29.33	10.27	48.72
T_2	NSKE 50g/ lit.	92.07	91.53	72.80	49.40	54.27	61.80	54.73	48.00	30.20	10.93	51.49
T_3	Tobacco leaf extracts 10g/ lit.	92.40	92.00	85.13	52.47	57.60	65.87	60.07	54.13	35.80	11.00	56.03
T_4	*Beauveria bassiana* $1x10^8$cfu/gm 2.5g/ lit.	93.40	93.40	88.80	73.47	77.87	72.60	80.33	71.33	42.67	11.73	67.46
T_5	*Metarhizium anisopliae* 10^6-10^8spore load/ml 2.5g/ lit.	91.67	93.67	89.93	77.87	81.20	81.20	83.33	73.67	49.67	11.80	70.15
T_6	*Verticillium lecanii* 10^6-10^8spore load/ml 2.5ml/ lit.	92.33	94.80	92.40	78.80	81.33	82.27	83.80	75.47	49.73	11.87	71.03
T_7	*Bacillus thuringiensis* 7.5 WP 2g/ lit.	92.87	93.33	86.87	70.93	72.27	78.73	74.33	67.87	40.27	11.07	64.62
T_8	Dimethoate 30 EC 2ml/ lit.	93.33	87.67	47.87	31.53	40.60	60.33	49.00	29.80	11.80	7.07	38.17
T_9	Malathion 50 EC 2.5ml/ lit.	91.80	88.93	52.73	37.80	45.73	60.07	50.60	35.27	16.20	8.93	42.03
	F- test	NS	S	S	S	S	S	S	S	S	S	S
	S. E ±	1.06	0.45	0.82	0.53	0.70	0.61	0.51	0.48	0.44	0.34	3.89
	C. D. (P = 0.05)	2.22	0.95	1.73	1.11	1.48	1.28	1.08	1.02	0.91	0.72	8.80

Av .no. / 10 cm central twig / plant on based on aphid population on 30 plants taking 10 plant per replication NS=Non significant
DBS: Day before spray, DAS: Day after spray

3rd, 7th and 10th days of the spray. The observation was taken on the 10 cm central twig of 10 randomly selected tagged plants per plot. To compare the effectiveness of biopesticides and chemical insecticides was also run simultaneously by statistical analysis.

RESULTS AND DISCUSSION

Overall mean per cent population infestation after two spray during 2012 is presented in Table 1. The statistically analysis of data on per cent population infestation of aphid (*Lipaphis erysimi* Kalt.) over control on Over all mean after spraying revealed that all the treatments were significantly superior over control. The data revealed that Dimethoate 30 Ec and Malathion 50 Ec were found highly effective for control of *Lipaphis erysimi* Kalt. they registered 38.17 and 42.03 minimum infestation of aphid per plant, respectively. They were followed by the Neem oil (5ml/l), NSKE (50g/l), Tobacco leaf extracts (10ml/lit.) and *Bacillus thuringiensis* (2g/lit.) they registered 48.72, 51.44, 56.03 and 64.62 aphid infestation per plant, respectively. Other treatments were effective *Beauveria bassiana* (67.46), *Metarhizium anisopliae* (70.15) and least effective treatment *Verticillium lecanii* (71.03). Maximum infestation was recorded in control (89.70). From above results are accordance with consideration of Men *et al.* (2002) who reported that spray of Dimethoate was effectively controlled *Lipaphis erysimi* and also similar results obtained by Gour and Pareek (2003) and Reza *et al.* (2004) reported that highest mean aphid mortality during the first spraying. Bana *et al.* (2011) also concluded that Malathion as one of the best effective treatment. The other authors, whose findings are similar with the present investigation, are Menna *et al.* (2003). Gupta and Rai (2006) also reported that among botanicals, neem product was found to be effective in comparison to other indigenous materials. Rai and Singh (2008) concluded that, for the management of mustard aphid NSKE 5 per cent should be recommended which is safe, eco-friendly botanical. Saranya *et al.* (2010) reported that Among the five entomopathogenic fungi, *V. lecanii*, *H. thompsonii* and *B. bassiana* were found to be the promising virulent isolates for controlling aphid population. The other findings similar with the present are, Jeong Jun *et al.* (2011); Kaur *et al.* (2012); Suresh *et al.* (2012) and AI-Alawi and Obeidat (2014).

Ackonowledgement :

Authors are acknowledge thanks to Prof. M.S. Mishra and Prof. S. Ahmad, Ex Head of the Dept. of Plant Pathology and Entomology, SHIATS, Allahabad for guidance and Suggestions during my work.

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