

## BIO-EFFICACY OF SOME PLANT LEAF EXTRACTS AGAINST MUSTARD APHID, *LIPAPHIS ERSYSIMI* KALT. ON INDIAN MUSTARD, *BRASSICA JUNCEA*

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**Abstract:** The bio-efficacy of four plant leaf extracts viz., apple of sodom, *Calotropis procera* Aiton; Mexican poppy, *Argemone mexicana* Linnaeus; Mexican marigold, *Tagetes minuta* Linnaeus and Indian neem, *Azadirachta indica* were tested against mustard aphid, *Lipaphis erysimi* on Indian mustard, *Brassica juncea*. The highest per cent aphid reduction during first, second and third spray were 28.79, 40.52 and 59.32 at 1 : 10 g/ml; 34.70, 44.49 and 66.14 at 1 : 5 g/ml and 53.88, 64.84 and 100.00 at 1 : 2.5 g/ml with Indian neem. However, Mexican marigold was also effective at highest concentration (1 : 2.5 g/ml) and reduced 96.38 per cent *L. erysimi*. All the treatments of plant leaf extracts showed insecticidal activity, but Indian neem followed by Mexican marigold reduced the aphid population to a great extent.

**Key words:** apple of sodom, Indian neem, leaf extract, *Lipaphis erysimi*, Mexican marigold, Mexican poppy

### INTRODUCTION

Rapeseed-mustard is most important source of edible oil for human consumption. India is the second largest producer of rapeseed-mustard after China. To increase the productivity of this commodity various modern techniques of agricultural practices such as use of high yield varieties, and heavy manuring were used (Srivastava and Guleria 2003). Rapeseed-mustard is highly vulnerable to attack of various insect pests. In this regard, Bhaketia and Sekhon (1989) reported more than three dozens insect pest associated with this crop. Among them, mustard aphid, *Lipaphis erysimi* Kalt. is thoroughly studied as serious insect pest of this crop (Ali and Rizvi 2008a; Ali *et al.* 2009).

Most of the farmers are not aware with the ill effect of chemical pesticides and still using most of the systemic and organic insecticides to control this insect pest (Ali and Rizvi 2007). Injudicious and continuous use of insecticides may be deleterious to agro-ecosystem, public health and create residual problems (Ali and Rizvi 2008b). Therefore, in recent years many scientists have switched to use of botanicals as well as plant extracts instead of chemical insecticides for the control of insect pest of agricultural importance. The botanicals are more compatible with the environmental components, eco-friendly with plant health and non-hazardous to human beings. Therefore, in present investigations the bio-efficacy of four plant leaf extracts were tested against mustard aphid, *L. erysimi* on Indian mustard, *Brassica juncea*.

### MATERIALS AND METHODS

The plant leaf extracts were prepared as per suggestions of Singh (2004). The leaves of Apple of sodom (*Calotropis procera* Aiton), Mexican poppy (*Argemone mexicana* Linnaeus) and Mexican marigold (*Tagetes minuta* Linnaeus) and Indian neem (*Azadirachta indica*) were collected from the field of Agricultural Sciences, Aligarh Muslim University, Aligarh, India. They were dried in the laboratory of Plant Protection under shaded area. Thereafter, to make the fine powder of them, the dried leaves were crushed with the help of mortar and pestle as well as mixer grinder. Further, three concentrations of these leaf extracts (1 : 10, 1 : 5 and 1 : 2.5 g/ml) were made by dissolving the fine leaf powers in the distilled water as per their weight and volume. Side by side, Indian mustard, *B. juncea* were grown in micro plot sized 3x4 meter (each replicated thrice) in the experimental field during rabi (winter) season of 2005–2006. The infestation of aphid appeared naturally in the second week of November. They were collected and identified as *L. erysimi* from the Laboratory of Aphidology, in the department of Zoology, University of Kalyani, West Bengal.

To test the bio-efficacy of leaf extracts against *L. erysimi* on *B. juncea*, three concentrations (1 : 10, 1 : 5 and 1 : 2.5 w/v) of each extract were applied with the help of simple hand spray (500 ml), on randomly selected Indian mustard plants of one month age (each replicated thrice) in the experimental field. The plants were covered with the polythene at three sides before spraying to avoid the

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Table 1. Bio-efficacy of various plant extracts against mustard aphid, *L. erysimi* Kalt. on Indian mustard, *B. juncea*

S. No.	Treatments	Conc. w/v [g/ml]	No of aphids/10 cm terminal shoot										Yield [kg/ha]
			initial population	1st spray		population at 7th day	2nd spray		population at 15th day	3rd spray			
				after 24 h	% reduction		after 24 h	% reduction		after 24 h	% reduction		
1.	Neem	1:10	14.00	9.97	28.79	41.85	27.33	34.70	32.85	15.15	53.88	978.80	
2.	Apple of sodom	1:10	13.15	11.67	11.25	38.67	31.50	16.54	39.67	27.33	31.11	751.10	
3.	Mexican poppy	1:10	14.15	11.67	17.53	40.25	32.15	20.12	36.33	21.67	40.35	843.50	
4.	Mexican marigold	1:10	13.97	10.87	22.19	43.33	30.67	29.22	33.75	17.33	48.65	926.50	
5.	Control	-	13.33	25.67	-	71.27	67.33	-	56.67	43.25	-	621.00	
	CD (p < 0.05)	-	-	0.36	-	-	0.94	-	-	1.65	-	15.64	
1.	Neem	1:05	13.87	8.25	40.52	33.33	18.50	44.49	27.50	9.67	64.84	1088.40	
2.	Apple of sodom	1:05	12.67	10.33	18.47	37.00	28.67	22.51	37.67	23.67	37.16	811.60	
3.	Mexican poppy	1:05	13.67	10.67	21.95	36.67	27.33	25.47	35.45	18.85	46.83	908.30	
4.	Mexican marigold	1:05	14.65	9.97	31.95	34.33	21.85	36.35	31.33	13.57	56.69	993.10	
5.	Control	-	12.67	23.33	-	66.27	62.33	-	49.87	37.67	-	654.50	
	CD (p < 0.05)	-	-	1.04	-	-	1.61	-	-	1.49	-	16.84	
1.	Neem	1:2.5	14.33	5.83	59.32	24.60	8.33	66.14	13.67	0.00	100.00	1440.00	
2.	Apple of sodom	1:2.5	12.00	9.15	23.75	35.33	21.15	40.14	29.33	12.67	56.80	1008.00	
3.	Mexican poppy	1:2.5	13.67	9.33	31.75	33.67	18.50	45.05	26.40	9.85	62.69	1066.90	
4.	Mexican marigold	1:2.5	13.33	7.33	45.01	29.50	11.67	60.44	18.50	0.67	96.38	1403.80	
5.	Control	-	11.67	23.33	-	58.33	61.45	-	45.67	33.33	-	704.10	
	CD (p < 0.05)	-	-	1.17	-	-	1.25	-	-	0.70	-	18.54	

extract on other plants in the field. Three sprays of each concentration were applied at one-week intervals after the appearance of *L. erysimi*. The per cent reduction of aphid population was recorded after 24 h of the spray. The observations were taken on the 10 cm terminal shoot of the Indian mustard plants (Bakhetia and Sekhon 1989). To compare the effectiveness of plant leaf extracts, a control (water spray) was also run simultaneously. The data obtained was subjected to one-way ANOVA by using MINITAB for Windows software and the statistical difference was determined at 5% level of significance.

## RESULTS AND DISCUSSION

Among different plant leaf extracts, Indian neem significantly ( $p < 0.05$ ) reduced maximum aphid population followed by Mexican marigold during first (28.79 and 22.19%; 40.52 and 31.95%; 59.32 and 45.01%), second (34.70 and 29.22 %; 44.49 and 36.35%; 66.14 and 60.44%) and third (53.88 and 48.65%; 64.84 and 56.69%; and 100.00 and 96.38%) spray at each tested concentration (1 : 10, 1 : 5 and 1 : 2.5 g/ml, respectively) (Table 1). The different leaf extracts of plants affects various physiological systems of mustard aphid through different mechanisms. For confirmation of this statement, Day *et al.* (2005) made electron microscopic study of cuticular and antennal sensilla of mustard aphid after spraying the leaf extract of *Eupatorium adenophorum* and found prominent swellings in some sensilla and shrinkage in others. Other observations on the successful use of neem (Azadirachtin) for control of aphid on various crops are Tang *et al.* (2002) on *Toxoptera citricida* on citrus; West and Mordue (2004) on *Rhopalosiphum padi* on cereals and Lowery and Isman (2006) *Nasonovia ribis-nigri* on lettuce.

The total yield of Indian mustard was recorded significantly ( $p < 0.05$ ) maximum i.e. 1440.00 and 1405.80 kg/ha on plants treated with Indian neem as well as Mexican marigold respectively at 1:2.5 g/ml concentration (Table 1). These findings show resemblance with the work of Singh (2004). He reported that the plant extract of marua (*Ocimum basilicum*) gave the highest yield of mustard with maximum reduction of *L. erysimi* population, among the plants extracts of Indian neem (*A. indica*), datura (*Datura stramonium*), marua (*O. basilicum*), and aak (*C. procera*).

Therefore, the present study revealed that all the treatments showing insecticidal activity against mustard aphid but the leaf extract of Indian neem followed by Mexican marigold plants have been proved the best spray for managing *L. erysimi* population and achieving high yield of Indian mustard.

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## POLISH SUMMARY

### SKUTECZNOŚĆ BIOLOGICZNA NIEKTÓRYCH WYCIĄGÓW Z LIŚCI ROŚLIN W STOSUNKU DO MSZYCY KAPUSTNICZY WIEŁOŻERNEJ *LIPAPHIS ERYSIMI* KALT. NA GORCZYCY INDYJSKIEJ *BRASSICA JUNCEA*

Badano skuteczność biologiczną wyciągów z liści roślin: *Calotropis procera* Aiton, *Argemone mexicana* Linnaeus, *Tagetes minuta* Linnaeus, *Azadirachta indica*, przeciwko mszycy kapustnicy wielożernej *Lipaphis erysimi*, na gorczycy indyjskiej, *Brassica juncea*. Najwyższy procent redukcji mszycy podczas pierwszego, drugiego i trzeciego opryskiwania wynosił: 28,79, 40,52 i 59,32, przy stężeniu 1:10 g/ml; 34,70 oraz 44,79 i 66,14, przy stężeniu 1:5 g/ml i 53,88, 64,84 i 100,00, przy stężeniu 1:2,5 g/ml dla *A. indica*. Jednak *T. minuta* był także skuteczny przy najwyższym stężeniu – 1:2,5 g/ml i zredukował 96,38% *L. erysimi*. Wszystkie zabiegi wyciągami z liści wykazywały aktywność owadobójczą, ale *A. indica*, a następnie *T. minuta* zredukowały populację mszyc w największym stopniu.