

## EFFICACY OF NEWER CHEMICALS AGAINST MUSTARD APHID

Rohit Bhati<sup>1</sup> and R.C. Sharma<sup>2\*</sup>

<sup>1-2</sup>Department of Entomology, Narendra Deva University of Agriculture and Technology,  
Narendra Nagar (Kumarganj), Faizabad, Uttar Pradesh, India-224229

E-mail: rohitbhatiluharli@gmail.com

### ABSTRACT

Acephate 75 SP @ 350 g a.i./ha was most effective to pest control as this resulted in more reduction in population of mustard aphid. Higher seed yield was obtained from Fipronil 5 SC @ 50 g a.i./ha (15.56 q/ha) and higher return based on C:B ratio (1:6.8) with Thiamethoxam 25 WG @ 25 g a.i./ha. However, imidacloprid 17.8 SL @ 20 g a.i./ha and clothianidine 50 WDP @ 15 g a.i./ha were moderately effective.

**Keywords:** Efficacy, aphid, chemical, Brassica crop.

### INTRODUCTION

*Brassica* oilseed crops are the major *Rabi* oilseed crops grown in India, which are collectively referred to as rapeseed-mustard. Aurvedic Samhitas describes the use of 'Sarson' in India. In Sanskrit literature, 'sorson' seeds have been described as antiseptic (Das, 1997). They occupy a prominent place being next in importance to groundnut both in area and production, meeting the fat requirement of about 50 per cent population in the states of Uttar Pradesh, Punjab, Rajasthan, Madhya Pradesh, Bihar, Orissa, West Bengal and Assam (Singh, 1999). *Brassica* crops account for 30 per cent of the total oilseeds production and 13 per cent of the country's gross cropped area. Mustard seed is the second largest produced oilseed in the world with an area of 37.0 m ha, with the production of 63.09 m tonnes and the productivity of 18.50 q/ha. In India it had the area of 6.3 m ha with production of 7.6 m tonnes and productivity of 11.90 q/ha. India contributes 28.3% and 19.8% in world acreage and production. India produced around 7.4 mt of

rapeseed-mustard next to China (11-12 mt). Among the entire oilseed crops producing states in India and in U.P. the area under cultivation is 6.39 lakh ha, with production of 7.9 lakh metric tonnes and productivity of 12.36 q/ha. (Anonymous, 2013). Several insect-pests attack and cause damage to these crops. About 38 insect species were reported to be associated with the *Brassica* oilseed crops (Bakhetia and Sekhon, 1989). Out of which, *Lipaphis erysimi* (Kalt.) (Mustard aphid), *Athalia proxima* Klug. (Mustard sawfly), *Bagrada hilaris* Kirk. (Painted bug), *Chromatomyia horticola* Goureau (Leaf miner) and *Spilarctia obliqua* Walker (Bihar hairy caterpillar) are the pests of major importance. Among these, *L. erysimi* is one of the most destructive insect (Rai, 1976). Which is responsible for causing severe reduction in seed yield varying from 15.0 to 73.3% (Anonymous.1987; Bakhetia *et al.*1989; Rohilla *et al.*, 1990).

### MATERIAL AND METHODS

The experiment was laid out by growing a popular variety 'NDYR-8' following recommended practices at 'Students' Instructional Farm' in Narendra Deva University of Agriculture & Technology Faizabad during Rabi 2013-14

### **Physiographic situation of the location:**

The Students' Instructional Farm of Narendra Deva University of Agriculture and Technology is situated in Faizabad district of eastern Uttar Pradesh, India, Faizabad lies from 26.47<sup>0</sup>N latitude and 81.12<sup>0</sup>E longitude at an altitude of 133 meters from the mean sea level. The location is situated almost in the centre of Indo-Gangetic belt, having 5091 sq. km area, which forms at distinct subdivision of India. The nearest sea is the Bay of Bengal, which is at a more than 800 km. distinct from the study site. The soil type of the area is sandy to loam textured, alkaline type typical to Gangetic plain.

### **Climate:**

The climate of eastern Uttar Pradesh (Faizabad) is monsoonic with extremes of temperature. It has characteristics seasons *i.e.* summer, rainy and winter. The region comes under sub-humid and sub-tropical climate receiving mean annual rainfall of about 1200 mm. About 80 per cent of the total rainfall is received from mid June to end of September and the period is known as monsoon months. The winter months are very cold, whereas summer months are hot and dry. Westerly hot winds start from the end of April and continue till the onset of monsoon.

### **Field preparation:**

The experimental field was given light irrigation for retention of good moisture by the soil for better germination of seeds. The field was ploughed twice with tractor drawn disc harrow and twice with cultivator followed by planking to pulverize the soil and to level the field.

### **Fertilizer application:**

The recommended doses of fertilizers (80 kg ha<sup>-1</sup> N, 40 kg ha<sup>-1</sup> P<sub>2</sub>O<sub>5</sub> and 40 kg ha<sup>-1</sup> K<sub>2</sub>O) were applied in the form of Urea, Single Super

Phosphate and Murate of Potash, respectively. Half dose of nitrogenous fertilizer and full dose of phosphorus and potash were applied in furrows as basal dressing at the time of sowing. Remaining half dose of nitrogenous fertilizer was given at top dressing in two split doses, one after first irrigation and second at the time of flowering.

### **Sowing:**

The seeds were sown on 24<sup>th</sup> November 2008 during *Rabi*, 2013-14. The sowing was done in rows of 30 cm apart in plot size of 4.2 x 3 m<sup>2</sup>. The recommended agronomic practices were followed to raise the crop of good stand.

### **Crop management:**

In order to maintain 10 cm distance between two plants in a row, thinning of plants was done at 15 days after sowing. To remove all the weeds, one hand weeding was given. Two irrigations *i.e.* first at 30 days after sowing and second at 60 days after sowing were given. Weeding and hoeing were done after irrigation with the help of hand hoe as on inter culture operation.

### **Observations:**

Mustard crop was regularly monitored at weekly intervals for recording the incidence of insect-pest occurring from germination to harvest stage of the crop in experimental plots. The incidence of insect-pest was recorded on 10 tagged plants from each plot by following 10 cm central twig of plant.

### **Observations on weather variables:**

The data on whether variables such as temperature, relative humidity, rainfall and sunshine hours during *Rabi* 2013-14 were obtained from the agro-meteorological department.

### **Experiment:**

#### **Efficacy of new chemicals against mustard aphid on mustard**

8 treatments were taken according to details as follows:

**Chemicals for testing their effectiveness against mustard aphid:**

Treatment No.	Treatments	Doses
T <sub>1</sub>	Fipronil 5 SC	50 g a.i./ha
T <sub>2</sub>	Thiamethoxam 25 WG	25 g a.i./ha
T <sub>3</sub>	Imidacloprid 17.8 SL	20 g a.i./ha
T <sub>4</sub>	Acetamiprid 20 SP	10 g a.i./ha
T <sub>5</sub>	Acephate 75 SP	350 g a.i./ha
T <sub>6</sub>	Clothianidine 50 WDP	15 g a.i./ha
T <sub>7</sub>	Dimethoate 30 EC	300 g a.i./ha
T <sub>8</sub>	Control (water spray only)	

**Application of treatments**

**Layout plan:**

Treatment	:	8
Replication	:	3
Plot size	:	4.2 x 3m <sup>2</sup>
Spacing	:	30 x 15 cm
Design	:	RBD
Date of sowing	:	24.11.08

**Pre-treatment and post-treatment observation:**

The population of mustard aphid was recorded one day before of spray as pre-treatment observation and post-treatment observations were taken at 3, 7 and 10 days after spray.

**Seed yield:**

Seed yield of mustard was taken on the basis of individual plot and expressed in kg plot<sup>-1</sup> and converted into q ha<sup>-1</sup>.

**Determination of cost : benefit ratio:**

The cost:benefit ratio was determined for each treatment by using the following formula:

Cost: benefit ratio = Value of saved yield over control (Rs./ha)/Total cost of protection (Rs./ha)\*

\*Total cost of protection included cost of test materials + labour charges + sprayer charges.

**Statistical analysis :**

The data obtained from the experiments were statistically analysed in appropriate programme by the Computer with desired transformation in a Randomized Block Design (RBD) as outlined by Gomez and Gomez (1976).

**RESULTS AND DISCUSSION**

Effectiveness of management treatments against mustard aphid revealed that the chemical control with Acephate 75 SP @ 350 g. a.i./ha was the most effective treatment followed by Thiamethoxam 25 WG 25 g. a.i./ha. Imidacloprid 17.8 SL @ 20 h. a.i./ha and Clothianidine 50 WDP @ 15 g. a.i./ha were moderate effective in comprision of acephate and thiamethoxam (Table-1). Fipronil found least effective in comaprision of all other insecticides for management of mustard aphid. Parmar and Kapadia (2007) also found Acephate 75 SP @ 350 g. a.i./ha and Imidacloprid 17.8 SL @ 20 h. a.i./ha most effective against mustard aphid.

The present findings are also in accordance with the findings of Verma 2008 who found Acetamiprid, Dimethoate and Imidacloprid effective in reducing the aphid density. Singh and Verma (2008) also found acetamiprid, dimethoate and imidacloprid effective in reducing the aphid density.

The effectiveness of management treatments against mustard aphid on the basis of seed yield showed with the Fipronil 5 SC @ 50 g. a.i./ha was found most effective with maximum seed yield (15.56 q ha<sup>-1</sup>) was obtained in chemical control with Fipronil 5 SC @ 50 g. a.i./ha was found most effective followed by Imidacloprid 17.8 SL @ 20 g. a.i./ha with yield (15.42q ha<sup>-1</sup>)

**Table No. 1: Age-Wise Comparison of BMI and Haematological parameters (N=121)**

Mustard aphid (Av. no. /10cm twig/plant)						
Tr. No.	Chemical name	Doses	Pre treatment 1DBS	Post treatment		
				3 DAS	7 DAS	10 DAS
T <sub>1</sub>	Fipronil 5 SC	50 g a.i./ha	65.50	9.83	23.43	0.63
T <sub>2</sub>	Thiamethoxam 25 WG	25 g a.i./ha	53.75	0.4	0.96	0
T <sub>3</sub>	Imidacloprid 17.8 SL	20 g a.i./ha	59.75	1.06	0.43	0
T <sub>4</sub>	Acetamiprid 20 SP	10 g a.i./ha	63.00	3.50	1.16	1.83
T <sub>5</sub>	Acephate 75 SP	350 g a.i./ha	54.00	0.33	0	0
T <sub>6</sub>	Clothianidine 50 WDP	15 g a.i./ha	51.50	1.53	3.20	0.23
T <sub>7</sub>	Dimethoate 30 EC	300 g a.i./ha	55.00	2.13	3.46	0
T <sub>8</sub>	Control (water spray only)		55.75	62.70	33.75	3.56
SEm ±			0.27	0.11	0.10	0.02
CD (0.05)			0.81	0.33	0.29	0.08

1. DBS-Days Before Spray 2. DAS-Days After Spray

**Table-2. Effect of newer chemicals on yield of mustard during Rabi, 2013-14**

Tr. No.	Treatments	Doses	Yield (kg/plot)	Yield (q/ha)	Per cent Increase in yield
T <sub>1</sub>	Fipronil 5 SC	50 g a.i./ha	1.86	15.56	37.94
T <sub>2</sub>	Thiamethoxam 25 WG	25 g a.i./ha	1.78	14.86	31.74
T <sub>3</sub>	Imidacloprid 17.8 SL	20 g a.i./ha	1.85	15.42	36.70
T <sub>4</sub>	Acetamiprid 20 SP	10 g a.i./ha	1.69	14.16	25.53
T <sub>5</sub>	Acephate 75 SP	350 g a.i./ha	1.60	13.38	18.61
T <sub>6</sub>	Clothianidine 50 WDP	15 g a.i./ha	1.71	14.28	26.60
T <sub>7</sub>	Dimethoate 30 EC	300 g a.i./ha	1.61	13.42	18.97
T <sub>8</sub>	Control (water spray only)		1.35	11.28	
SEm ±			0.081	0.649	
CD (0.05)			0.247	1.968	

**Table-3. Cost : benefit ratio of different treatments during Rabi, 2013-14**

Tr. No.	Treatments	Cost of insecticide (Rs/ha)	Total cost of protection (Rs/ha)	Saved yield over control (Q/ha)	Value of saved yield (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	C:B ratio
T <sub>1</sub>	Fipronil 5 SC	1400	1940	4.28	13054	47458	45518	1:6.7
T <sub>2</sub>	Thiamethoxam 25 WG	1050	1590	3.58	10919	45323	43733	1:6.8
T <sub>3</sub>	Imidacloprid 17.8 SL	1500	2040	4.14	12627	47031	44991	1:6.1
T <sub>4</sub>	Acetamiprid 20 SP	1200	1740	2.88	8784	43188	41448	1:5.0
T <sub>5</sub>	Acephate 75 SP	3200	3740	2.10	6405	40809	37069	1:1.7
T <sub>6</sub>	Clothianidine 50 WDP	1100	1640	3.00	9150	43554	41914	1:5.5
T <sub>7</sub>	Dimethoate 30 EC	3000	3540	2.14	6527	40931	37391	1:1.8
T <sub>8</sub>	Control (water spray only)	-	-	-	-	-	-	-

Market price of mustard Rs.3050/q, Sprayer rent =30, Labour charge = 120/ day

(Table-2). Acephate 75 SP 350 g. a.i./ha was found least effective in comparison of fipronil and imidacloprid based on yield. Rana *et al.*(2008) They also recorded higher yield by using thiamethoxam and imidacloprid.

Highest cost: benefit ratio (1:6.8) was obtained from chemical control with Thiamethoxam 25 WG @ 25 g. a.i./ha followed by Fipronil 5 SC @ 50 g. a.i./ha with (1:6.7) (Table-3). Acephate 75 SP @ 10 g. a.i./ha and Dimethoate 30 EC @ 300 g. a.i./ha were found as less economic in comparison of thiamethoxam and fipronil based on C:B ratio.

### REFERENCES

1. Anonymous (1987). Annual Progress Report, Rapeseed-Mustard, 1986-87. All India Co-ordinated Research Project on Oilseeds, Directorate of Oilseeds Research, Rajendra Nagar, Hyderabad, India.
2. Anonymous (2013). Economic Survey of India, Economic Division. Ministry of Finance, Govt. of India, New Delhi.
3. Bakhetia, D.R.C and Sekhon, B.S. (1989). Insect-pests and their management in rapeseed-mustard. *J. Oilseeds Res.*, **6**: 269-299.
4. Das, P.C. (1997). Oilseed Crops of India. Kalyani Publishers, New Delhi, 273 p.
5. Parmar, G.M. and Kapadia, M.N. (2007). Field efficacy of mycoinsecticides and chemical insecticides against mustard aphid in mustard. *Indian J. of Plant Protection*. **32**(2): 339-341.
6. Rai, B.K. (1976). Pests of oilseed crops in India and their control. *I.C.A.R.*, New Delhi, pp. 131.
7. Rana, S.C.; Singh, R.K.; Babu, P.B. and K.S. (2008). Evaluation of some newer insecticides against mustard aphid on seed crop of raddish. *Seed Research*. **36**(1):112-114.
8. Rohilla, H. R.; Singh, H. and Kumar, P. R. (1990). Preliminary screening of national varieties of *Brassica juncea* (L.) (Czern and Coss.) against mustard aphid, *Lipaphis erysimi* (Kalt.). *J. Oilseeds Res.*, **7** (2) : 81-83.
9. Singh, C. (1999). Rapeseed and Mustard. In : Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 301-313 p.
10. Singh, R.K. and Verma, R.A. (2008). Relative efficacy of certain insecticides against mustard aphid on Indian mustard. *J. agric. Sci.*, **78**(9): 821-823.

\*\*\*\*\*