

# Population dynamics of mustard aphid on different *Brassica* cultivars under terai agro-ecological conditions of West Bengal

S. Choudhury and S. Pal<sup>1</sup>

Department of Agril Entomology, Uttar Banga Krishi Viswavidyalaya, Pundibari, West Bengal- 736 165, India

<sup>1</sup>Regional Research Station, U.B.K.V., Kalimpong, Darjeeling, West Bengal-734301, India.

## ABSTRACT

Experiments were conducted at the Instructional Farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar during rabi season of 2002-03 and 2003-04 to study the population dynamics of mustard aphid on seven popular rapeseed-mustard cultivars. The incidence of aphid commenced from 52<sup>nd</sup> to 2<sup>nd</sup> standard week with a very low population levels on all the cultivars. The aphid (*Lipaphis erysimi*) population attained peak level from 7<sup>th</sup> to 9<sup>th</sup> standard week. The correlation coefficients between aphid population and different abiotic factors revealed contradictory results. Except for a few instances the weather parameters showed low order of associations with aphid population. Thus, the ecological factors exhibited little impact on the population build up of mustard aphid. The degree of infestation and the rates of population change of the aphids on different *Brassica* cultivars seem to be governed by varietal characteristics of different germplasms. *Brassica campestris* varieties as a group harboured relatively higher populations of the aphid than *Brassica juncea* varieties.

**Keywords:** Mustard aphid, population dynamics, abiotic factors, correlation, cultivars

## Introduction

Rapeseed-mustard constitutes an important group of oilseed crops next only to groundnut and contributes substantially to the Nation's requirement of edible oils. Amongst the various insect pests invading these crops, mustard aphid, *Lipaphis erysimi* Kalt., is considered the most serious and responsible for a yield loss ranging from 35.4 to 96 percent depending upon seasons (Bakhetia, 1986). A continuous monitoring of this pest under field condition is essential for devising a suitable pest management strategy. The present study was, hence, taken up to know the population dynamics of mustard aphid on different *Brassica* cultivars.

## Materials and Methods

The field experiments were carried out on seven different cultivars of rapeseed-mustard during rabi seasons of 2002-03 and 2003-04 at the instructional farm of Uttar Banga Krishi Viswavidyalaya, Pundibari. The varieties viz. Binoy (B-9), Jhumka (NC-1), Swarna (RAUDY-89-118) belonged to *Brassica campestris* var. yellow sarson; Pusa Bold, Varuna (T-59), Seeta (B-85) belonged to *B. juncea* and the local cultivar represented *B. campestris* var. toria. Seeds of each variety were sown on 27<sup>th</sup> November and 4<sup>th</sup> December during 2002 and 2003 respectively in 4 × 3 m<sup>2</sup> plots at a spacing of 30 × 10 cm in Randomized Block Design with three replications. Recommended agronomic practices were followed in raising the crop. No plant protection measure was taken throughout

the crop season.

Observations on aphid incidence were recorded at weekly intervals starting from the initial appearance to final disappearance of the pest by removing aphid from 10 cm top portion of the terminal shoot with the help of camel hair brush on a white paper sheet. Then the numbers of aphids were counted. Meteorological data on temperature, relative humidity and rainfall were obtained during the period of experimentation. Simple correlation coefficients were worked out between the weather parameters and mean aphid population on each variety.

## Results and Discussion

During the first year (2002-03) the initial appearance of aphid was recorded on 25<sup>th</sup> December (Table 1). The peak level of aphid infestation on all the varieties of yellow sarson reached on 12<sup>th</sup> February. In case of Indian mustard such as Pusa Bold and Varuna, population of aphid reached the peak later i.e. on 26<sup>th</sup> February, whereas on Seeta the peak was observed too early on 1<sup>st</sup> January. On the local variety aphid population reached its peak on 22<sup>nd</sup> January. During second year (2003-04) initiation of aphid infestation was recorded on 15<sup>th</sup> January (Table 3). The aphid population reached the peak on all yellow sarson varieties on the same time i.e. 19<sup>th</sup> February. In Indian mustard such as Pusa Bold and Varuna aphid population reached its peak on 4<sup>th</sup> March but on Seeta the population reached its peak on 26<sup>th</sup> February, while an early peak was

noticed on 22<sup>nd</sup> January in local cultivar (toria). The observations on seasonal incidence of mustard aphid are in conformity with the findings of earlier workers (Prasad and Phadke, 1980; Vekaria and Patel, 1999; Singh and Lal, 1999; Dogra *et al.* 2001 and Prasad, 2003). But Singh *et al.* (1990) reported that the peak activity period of the aphid remained confined to January and first fortnight of February. Similar claims were made by Prasad and Pradhan (1971) and Srivastava and Srivastava (1972).

The correlation coefficients between aphid population and abiotic parameters could not establish a clear cut trend in relationship of aphid population with environmental factors (Table 2 & 4). Except for a few instances the abiotic parameters show a low order of association with aphid population. This observation is in conformity with the reports of Lal and Bhajan (2003) and Dogra *et al.* (2001). Earlier Roy (1975) from West Bengal also observed that the weather factors such as the maximum and minimum temperatures and the relative humidity had very little impact on colony size of mustard aphid during crop season. Contrary to the present findings, Gami *et al.* (2002) observed that aphid population registered significant negative correlation with maximum and minimum temperatures. In our present study none of the weather parameters alone was responsible for the multiplication and growth of the aphid. It is assumed that for a major part of the rabi season, the meteorological parameters remained conducive for the rapid multiplication of this aphid. Moreover, the degree of infestation and the rates of population change of the aphids on different varieties seemed to be governed by varietal characteristics. On every variety aphid population reached peak level coinciding with its flowering stage. So, the varieties of *Brassica campestris* attained peak population earlier than *B. juncea*. This observation is in contradiction with Prasad and Phadke (1980) who observed that though different brassica varieties widely differ on their dates of onset of flowering and maturity, the peak in the aphid population remained around a single date on all the varieties. The variety Swarna harboured highest aphid population during both the seasons followed by Jhumka. It was further observed that *B. campestris* varieties as a group harboured relatively higher populations of aphid than *B. juncea* varieties. This might be due to the fact that during mid February when yellow sarson varieties attained the peak aphid population, the indian mustard/rai varieties were yet to reach the full flowering stage and thus escaped the onslaught of aphid infestation. These observations are in conformity with those of Prasad and Phadke (1980) who observed that late flowering varieties escape a portion of peak aphid infestation during the flowering period. Teotia and Lal (1970) and Kalra *et al.* (1987) have also reported that aphid infestation was higher on yellow sarson varieties than on Indian mustard or rai varieties.

## Literature Cited

- Bakhetia DRC Arora R. 1986 Control of insect pests of toria, sarson and rai. *Indian Farming* **36**(4): 41-44.
- Dogra Indira Devi Nirmala Desh Raj. 2001 Population build up of aphid complex (*Lipaphis erysimi* Kalt., *Brevicoryne brassicae* Linn. and *Myzus persicae* Sulzer) on rapeseed, *Brassicae campestris* var. brown sarson vis-à-vis impact of abiotic factors. *Journal of Entomological Research* **25**: 21-25.
- Gami LM Bapodra JG Rathod RR. 2002 Population dynamics of mustard aphid [*Lipaphis erysimi* (Kaltenbach)] in relation to weather parameters. *Indian Journal of Plant Protection* **30**: 202-04.
- Kalra VK Singh Harvir Rohilla HR. 1987 Influence of various genotypes of *Brassica* on the biology of mustard aphid, *Lipaphis erysimi* (Kalt.). *Indian Journal of Agricultural Sciences* **57**: 277-79.
- Lal MN Bhajan Ram. 2003 Population dynamics of mustard aphid. In: *Proceedings of the National Symposium on Frontier Areas of Entomological Research*. November 5-7, 2003, IARI, New Delhi, India, pp. 71-72.
- Prasad SK. 2003 Studies on population dynamics of mustard aphid, *Lipaphis erysimi* on mustard in relation to some meteorological factors. *Indian Journal of Entomology* **65**: 569-78.
- Prasad SK Pradhan S. 1971 Distribution and sampling of mustard aphid, *Lipaphis pseudobrassicae* (Davis). *Indian Journal of Entomology* **33**: 260-71.
- Prasad YK Phadke KG. 1980 Population dynamics of *Lipaphis erysimi* (Kalt.) on different varieties of *Brassica* species. *Indian Journal of Entomology* **42**: 54-63.
- Roy P. 1975 Population dynamics of mustard aphid, *Lipaphis erysimi* (Kaltenbach) (Aphididae: Hemiptera) in West Bengal. *Indian Journal of Entomology* **37**: 318-21.
- Sinha RP Yazdani SS Verma GD. 1990 Population dynamics of mustard aphid *Lipaphis erysimi* Kalt. (Homoptera: Aphididae) in relation to ecological parameters. *Indian Journal of Entomology* **52**: 387-92.
- Singh SS Lal MN. 1999 Seasonal incidence of mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard crop. *Journal of Entomological Research* **23**: 165-67.
- Srivastava AS Srivastava JL. 1972 Ecological studies on the aphid, painted bug and saw fly attacking mustard and rape in India. *Plant Protection Bulletin. F.A.O.*, **20**: 136.40 c.f. *Review of Applied Entomology* **61**: 803; 1973.
- Teotia TPS Lal OP. 1970 Differential response of different varieties and strains of oleiferous *Brassicae* to aphid, *Lipaphis erysimi* Kalt. *Labdev Journal of Science and Technology* **8B**: 219-26.
- Vekaria MV Patel GM. 1999 Succession of important pests of mustard in North Gujarat. *Indian Journal of Entomology* **61**: 356-61.

**Table 1**Population of *Lipaphis erysimi* on *Brassica* cultivars (Rabi 2002-03)

Date	Standard Week	Pusa bold	Varuna	Seeta(B <sub>85</sub> )	Binoy(B-9)	Jhumka	Swarna	Local	Temp.°C		R.H. (%)		R.F.(mm.)
									Max.	Min.	Max.	Min.	
25.12.02	52	0.33	0.67	0.03	0.50	1.40	3.20	6.67	26.0	7.4	96.29	35.29	0
01.01.03	1	16.20	19.10	39.30	13.50	12.30	16.60	5.90	26.1	7.8	95.29	39.43	0
08.01.03	2	14.20	9.10	26.20	7.90	8.30	10.70	6.30	24.1	10.0	90.00	70.00	0
15.01.03	3	7.50	8.40	19.20	4.20	6.40	3.60	14.80	20.1	8.5	93.00	85.50	0
22.01.03	4	3.50	0.37	7.70	16.63	48.20	10.20	52.13	23.9	7.7	95.00	71.00	0
29.01.03	5	0.67	0.30	12.70	23.80	63.40	27.90	32.27	20.4	7.0	96.00	75.00	0
05.02.03	6	6.30	4.70	8.30	28.30	67.20	52.60	20.80	22.7	10.4	88.00	71.00	0
12.02.03	7	7.43	5.23	11.80	49.40	72.00	124.16	9.80	24.3	7.0	89.00	65.00	0
19.02.03	8	14.80	13.63	9.53	11.73	19.96	63.03	7.23	25.5	7.0	89.00	68.00	7.00
26.02.03	9	38.90	43.60	25.80	4.16	27.93	33.90	0.06	25.0	11.5	87.00	76.00	0
05.03.03	10	19.80	19.50	10.30	-	-	14.07	-	28.7	14.7	90.00	70.00	12.00
12.03.03	11	13.96	9.10	2.26	-	-	-	-	26.4	11.0	90.00	50.00	0

**Table 2**

Correlation coefficients between aphid population and weather parameters (Rabi 2002-03)

Brassica Cultivars	Weather Parameters				
	Temp.°C		R.H. (%)		R.F. (mm.)
	Max.	Min.	Max.	Min.	
Pusa bold	0.430	0.585*	-0.621*	0.155	0.254
Varuna	0.373	0.513	-0.517	0.131	0.229
Seeta (B <sub>85</sub> )	-0.080	0.006	-0.007	0.063	-0.176
Binoy (B-9)	-0.153	-0.285	-0.240	0.121	-0.103
Jhumka	-0.329	-0.087	-0.227	0.332	-0.163
Swarna	-0.001	-0.251	-0.529	0.097	-0.008
Local	-0.448	-0.289	0.372	0.297	-0.186

\*Significant at 5% level

**Table 3**  
Population of *Lipaphis erysimi* on *Brassica* cultivars (Rabi 2003-04)

Date	Standard Week	Pusa bold	Varuna	Seeta(B-85)	Binoy(B-9)	Jhumka	Swarna	Local	Temp.°C		R.H. (%)		R.F.(mm.)
									Max.	Min.	Max.	Min.	
15.01.04	2	5.50	2.33	5.80	3.90	3.83	5.30	6.20	23.9	8.4	89.00	72.00	0
22.01.04	3	8.87	5.67	9.63	4.63	4.07	8.57	12.10	23.1	10.1	92.00	57.00	0
29.01.04	4	3.30	2.23	5.30	2.33	7.30	5.37	6.10	23.9	10.3	74.00	61.00	0
05.02.04	5	0.53	0.27	0.20	0.87	1.00	0.83	0.80	23.4	8.1	90.00	60.00	0
12.02.04	6	0.23	1.20	0.23	1.67	8.53	7.90	2.20	23.5	8.5	89.00	61.00	0
19.02.04	7	0.47	9.33	2.80	38.00	71.60	74.47	5.80	27.1	9.6	91.00	53.00	0
26.02.04	8	48.17	33.47	17.23	21.60	49.20	49.20	8.60	28.4	14.1	90.00	56.00	0
04.03.04	9	58.70	61.93	4.53	-	-	48.50	-	29.3	13.9	91.00	51.00	0
11.03.04	10	17.73	59.57	4.53	-	-	-	-	29.6	15.5	92.00	58.00	9.00
18.03.04	11	13.30	21.00	3.20	-	-	-	-	31.6	17.4	90.00	58.00	0

**Table 2**  
Correlation coefficients between aphid population and weather parameters (Rabi 2003-04)

Brassica Cultivars	Weather Parameters				
	Temp.°C		R.H. (%)		R.F. (mm.)
	Max.	Min.	Max.	Min.	
Pusa bold	0.573	0.581	0.243	-0.504	0.035
Varuna	0.760*	0.748*	0.348	-0.525	0.583
Seeta (B <sub>85</sub> )	0.147	0.288	0.038	-0.113	-0.057
Binoy (B-9)	0.853*	0.422	0.306	-0.494	-
Jhumka	0.906*	0.504	0.252	-0.639	-
Swarna	0.861*	0.571	0.341	-0.694	-
Local	0.220	0.571	0.097	-0.208	-

\*Significant at 5% level, \*\*Significant at 1% level