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Population dynamics of mustard aphid, *Lipaphis erysimi* (kalt.) on mustard in relation to weather parameters

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The population dynamics of mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard in relation to weather parameters was studied at Students' Instructional Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during the *Rabi* 2009-2010 and 2010-2011crop season. This study will provide an opportunity to face the pest challenge by manipulating the manageable ecological parameters in the form of planting or harvesting time adjustment, varietal selection, correct time of pesticide application, etc. The natural appearance of mustard aphid population was started from 2nd week of January during the both year and reached its peak in 8th standard week with 219.07/10cm terminal shoot and 199.10/10cm terminal shoot during 2009-2010 and 2010-2011. Studies indicated that mustard aphid incidence was higher when maximum and minimum temperature ranged between 9.30 to 25.90^{0}C and 8.20 to 25.20^{0}C, relative humidity during hours 64.75 and 67.6 per cent, rainfall 0.4 and 1.4 mm and sunshine hours 7.50 and 7.20 during 2009-2010 and 2010-2011, respectively. Mustard aphid population was build up showed a non significant positive correlation with maximum temperature (^{0}C), humidity, rainfall, sunshine and non-significant negative correlation with minimum temperature during both the year.

Key words : *Lipaphis erysimi*, Seasonal incidence, Population fluctuations, Correlation

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INTRODUCTION

Rapeseed mustard is one of the important oleiferous crops and constitute major source of edible oil for the human consumption and cake for animals. Every effort is being made to raise yield of this crop by adopting modern agriculture practices, such as the use high yielding varieties, heavy manuring and assured irrigation in order to meet the growing demands of oils. These composite efforts are, however, nullified if crop is not protected from the reveges of insect-pests. More than three dozen of insect-pests are known to be associated with rapeseed mustard crop in India (Backhetia and Sekhon, 1989). Among these, mustard aphid, *Lipaphis erysimi* (Kalt) is the most serious pest of this crop and is considered to be the limiting factor in the successful cultivation of mustard causing 35 to 73 per cent reduction in yield (Rai, 1961; Rohilla *et al.,* 1987). It is therefore, essential to keep thius pest under control so as to reap profitable harvest. A number of synthetics insecticides have been recommended to combat this pest but without much success.

The ecological approach to the pest management suggests to use pesticides only when and where necessary. Therefore, for ensuring an effective and economical management of this serious pest, the present studies were undertaken for studying its population fluctuations in relation to weather parameter. These studies will provide an opportunity to face the pest challenge by manipulating sowing time, varietals selection, correct timing of pesticidal application besides other management practices.

RESEARCH METHODOLOGY

Field experiments were conducted at Students' Instructional Farm, N.D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during the two consecutive years from 2009-2010 and 2010-2011. The Varuna (*B. juncea*) was sown on November 20 in both the study years, and the effect was studies on the incidence of aphid on this crop. The experiments were laid out in Randomized Block Design (RBD) with four replications, each in 4m x 3m plot size. The spacing between row to row and plant to plant was 30 cm and 15 cm, respectively. All the recommended agronomic

practices were followed to raise the crop except plant protection measures.

Regular observations on the population of mustard aphid were recorded throughout the growing season of the crop. The crop was monitored regularly for initial incidence as well as for population count of mustard aphid. For recording population count of mustard aphid, 10 plants were randomly selected from each plot and the population of mustard aphid was recorded at weekly interval by removing aphids from 10 cm top portion of the terminal shoot of each plant with the help of camel hair brush on a white paper sheet. The meteorological parameters *viz.*, temperature (^{0}C) (maximum, minimum), relative humidity (%), rainfall (mm) and sunshine (hrs) were recorded daily. Mean values of previous seven days data of the above parameters were computed for seven day, the day of observation. Correlation coefficient were determined to find out the relationship of mustard aphid on crop with temperature (^{0}C) (maximum, minimum), relative humidity (%), rainfall (mm), sunshine (hrs).

RESEARCH FINDINGS AND ANALYSIS

The influence of various environmental factors on the population build up of *L. erysimi* during 2009-2010 and 2010-2011 are presented in Table 1 and 2. The results of the study revealed that *L. erysimi* initiated its active from the second week of January (2nd standard week) during both the study year. The population of mustard aphid increased gradually and reached its peak (175.52/10 cm terminal shoot/plant) and (184.85/10 cm terminal shoot/plant) in the fourth week of February (8th standard week) in both the years. During this period, the minimum and maximum temperature ranged from 9.30 to 25.90^{0}C and 8.20 to 25.20^{0}C during 2009-2010 and 2010-2011, respectively and relative humidities were 64.75 per cent and 67.60 per cent. Rainfalls 0.40 mm and 1.40 mm, sunshine 7.5 hours and 8.00 hours were during 2009-2010 and 2010-

Table 1: Population dynamics of mustard aphid *Lipaphis erysimi* in relation to weather parameter during *Rabi* 2009-2010

Standard weeks	Temperature (^{0}C)		R.H. (%)	Rainfall (mm)	Sunshine (hrs)	Number of aphids/plant
	Max.	Min.				(Varuna)
2	15.60	7.60	82.30	5.40	3.50	2.05 (1.65)
3	15.30	7.70	86.65	0.00	0.90	3.30 (1.94)
4	17.30	5.40	78.50	0.00	3.20	10.68 (3.33)
5	25.00	7.10	65.55	0.00	6.70	27.90 (5.32)
6	25.00	9.50	70.90	9.70	4.70	47.83 (6.93)
7	23.80	11.80	69.05	15.40	5.50	129.90 (11.40)
8	25.90	9.30	64.75	0.40	7.50	175.52 (13.26)
9	29.20	12.50	56.50	0.00	7.40	25.80 (6.01)
10	30.30	13.10	54.25	0.00	7.10	12.33 (3.56)
11	32.10	13.40	55.60	0.00	7.90	6.17 (2.58)
12	34.40	16.50	46.45	0.00	7.10	1.60 (1.44)

Figures given in parentheses are square root transformed values

Table 2: Population dynamics of mustard aphid *Lipaphis erysimi* in relation to weather parameter during *Rabi* 2010-2011

Standard weeks	Temperature (^{0}C)		R.H. (%)	Rainfall (mm)	Sunshine (hrs)	Number of aphids/plant
	Max.	Min.				(Varuna)
2	14.30	2.50	85.70	0.00	1.40	2.10 (1.60)
3	22.10	5.20	57.40	0.00	6.14	3.07 (1.88)
4	19.50	4.60	77.80	1.30	3.80	10.68 (3.33)
5	23.50	6.00	70.55	0.00	4.30	20.05 (4.52)
6	26.20	7.40	70.40	0.00	7.80	29.75 (5.49)
7	25.20	11.40	74.40	7.50	5.00	82.35 (9.09)
8	25.20	8.20	67.60	1.40	7.20	184.85 (13.66)
9	27.00	10.50	61.80	5.00	8.00	29.20 (5.42)
10	25.30	8.60	68.50	8.90	6.60	11.75 (3.49)
11	31.40	12.10	53.40	0.00	8.20	6.22 (2.58)
12	35.10	14.00	42.60	0.00	7.70	0.11 (0.77)

Figures given in parentheses are square root transformed values

Table 3: Correlation coefficient between weather factor and mustard aphid population on mustard during *Rabi* 2009-2010 and 2010-2011

Years	Temperature (^{0}C)		R.H. (%)	Rainfall (mm)	Sunshine (hrs)
	Max.	Min.			
2009-2010	0.0749	-0.0568	0.0376	0.4613	0.3108
2010-2011	0.0027	-0.1086	0.2439	0.2888	0.1763

2011, respectively. Thereafter, aphid population started declining with increase in temperature from 8th standard week till the harvest of crops in both the study years (Table 1 and 2). The present findings are in conformity with the observations of Uttam *et al.* (1993) who reported the mustard aphid population reached at peak in February.

The present findings are agree with the observations of Ansari and Lal (2008) who reported the mustard aphid cause the varying levels of infestation on different *Brassica* species in different crop seasons.

The correlation worked out between aphid population and environmental factors presented in Table 3 showed a significant positive correlation with maximum temperature (^{0}C), relative humidity (%), rainfall (mm), sunshine (hrs) and non significant negative correlation with minimum temperature, during both the year. These findings are in line with the observations made by Kulat *et al.* (1996) and Sinha *et al.* (1989) who reported negative and non significant correlation with maximum, minimum temperature and humidity.

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