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Population dynamics of Cabbage aphid, *Lipaphis erysimi* on cabbage crop (*Brassica oleracea* var. *capitata* L.)

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Abstract

Studies on the seasonal prevalence of cabbage aphid, *Lipaphis erysimi* (Kaltenbach) in relation to weather parameters were conducted, in Jabalpur, Madhya Pradesh during *Rabi* season from Sept., 2017 to March, 2018. The Seasonal fluctuations of pest population indicated that, incidence of aphids, *Lipaphis erysimi* were initiated in the vegetative stage when the crop age was about 75 days during fourth week of November (48th SW) with 2.10 aphids/head and its feeding continued on the lower surface of leaves till harvesting of the crop. There was increase in population in subsequent weeks and the peak aphid population was recorded in first week of February (5th SW) with a population of 34 aphids/plant. Average temperature exerted significant negative relationship ($r = -0.50^*$) with aphid population.

Keywords: Seasonal abundance, population dynamics, *Lipaphis erysimi*, cabbage aphid, cabbage

Introduction

Vegetables are grown in every part of our country under varied agro-climatic conditions. More than 40 kinds of vegetables belonging to different groups, namely, solanaceous, cucurbitaceous, leguminous, cruciferous (Cole crops), root crops and leafy vegetables are grown in India. Cabbage (*Brassica oleracea* L. var. *capitata* L.) is one of the most popular winter vegetables grown in India. In India, a total of 37 insect pests have been reported to feed on cabbage (Lal, 1975) [8]. Though an important vegetable crop, cabbage is known to be infested by several insect pests viz., tobacco caterpillar, *Spodoptera litura* Fabricius; diamondback moth, *Plutella xylostella* Linnaeus; cabbage leaf webber, *Crocodylomia binotalis* Zeller; aphids, *Brevicoryne brassicae* Linnaeus and *Lipaphis erysimi* Kalt; painted bug, *Bagrada cruciferum* Kirk.; and flea beetle, *Phyllotreta cruciferae* Goeze (Rao and Lal, 2005). Though several insect pests infest the cabbage, Cabbage aphid is considered as key pest (Bhalla, 1990; Barwal, 1997). The aphid infestation not only deteriorates the quality of the crop but also the yield. Direct injury results in the loss of plant vigour and stunted growth. Aphids alone cause 9-96 per cent reduction in yield (Singh and Sharma, 2012) [12]. These aphids are widely distributed throughout the world on all Brassica crops (Yue B and Liu, 2000) [17]. Plant produced many volatile compounds which guide them towards their host (Kumar *et al.* 2017 and Kumar *et al.* 2017) [6].

Method and Material

Studies on Population dynamics of Cabbage aphid, *Lipaphis erysimi* On Cabbage Crop (*Brassica oleracea* var. *capitata* L.) were conducted at Vegetable seed production farm, Maharajpur, JNKVV, Jabalpur (M.P.) during the *Rabi* season from Sept., 2017 to March, 2018. Population of aphid's larvae was recorded from untreated plant having plot size of 10m × 40m with spacing 60cm × 50cm (Row × plant).

Observations were recorded on 20 randomly selected plants in a week. It was initiated after germination and was taken up to the harvesting of the crop. Correlation and regression of the abiotic factors on *Lipaphis erysimi* were worked out by using the formula as suggested by Snedecor and Cochran (1967).

$$\text{Correlation 'r'} = \frac{\Sigma XY - \Sigma X \Sigma Y / n}{\sqrt{\{\Sigma X^2 - (\Sigma X)^2 / n\} \{\Sigma Y^2 - (\Sigma Y)^2 / n\}}}$$

$$\text{Regression Y} = a + b x \quad (R^2)$$

Result and Discussion

Aphids, *Lipaphis erysimi* Kalt. sucked the cell sap from the lower surface of leaves either in colonies or individual nymph as well as adult, which resulted in curling of leaves or

appearance of discoloured spots on the foliage. In severe infestation aphid covered lower and upper surface of the leaf. Such infested plants gradually wilted, the leaves became yellowish to brownish and failed to form a head and the plant usually died. Owing to feeding on cell sap, the vitality of plants is greatly reduced. The plants also resulted in stunted growth and reduction in yield. The nymphs and adults were mostly found on the underside of leaves.

Table 1 shows the fluctuation in *Lipaphis erysimi* population throughout the season in different weeks. The incidence of aphids, *Lipaphis erysimi* were initiated in the vegetative stage of plant when the crop age was about 75 days' during fourth week of November (48th SW) with 2.10 aphids/head and its feeding continued on the lower surface of leaves. There was increase in population in subsequent weeks and the peak aphid population was recorded in first week of February (5th SW) with a population of 34 aphids/head, when maximum, minimum and average temperatures were 38.30 °C, 8.20 °C and 18.25 °C, respectively, whereas morning, evening and average relative humidity were 85.2%, 30.20% and 57.70%, respectively and rainfall was zero.

Average relative humidity and minimum temperature showed positive correlation ($r= 0.22, 0.19$) and Temperature maximum, temperature average, rainfall, morning and evening relative humidity showed negative correlation ($r= -$

0.07, -0.24, -0.04, -0.47 respectively) all of these were found statically non-significant. Average temperature was found significant negative correlation ($r= -0.50^*$) with aphid population (Fig 1).

The regression equation being

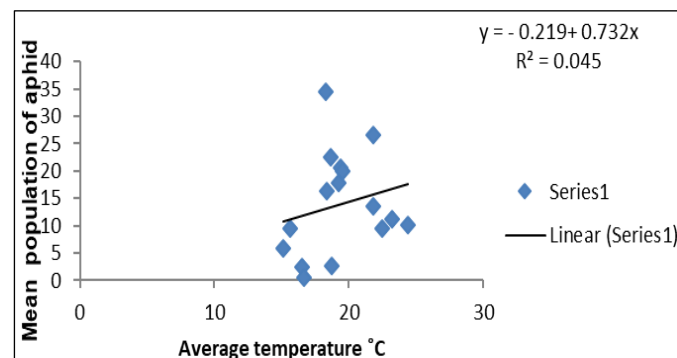


Fig 10: Regression of average temperature on aphid infesting cabbage

From the above equations, it may be expressed that with every unit increase in average temperature there was an increase of 0.73 *L. erysimi* per head respectively.

Table 1: Seasonal abundance of *L. erysimi* on cabbage crop with weather parameter

Standard Week	Duration	Cabbage Aphid (<i>Lipaphis erysimi</i>) Average population		Weather factors					
		Per Plant	Per 20 Plant	Tem. Max	Tem. Min.	Sunshine	Rainfall	Rh Morning	Rh. Evening
Nursery									
37	11 Sep. to 17 Sep.	0.00	0.00	31.7	23.6	1.9	18	89	65
38	18 Sep. to 24 Sep.	0.00	0.00	33	23.9	6.7	3.8	92	64
39	25 Sep. to 1 Oct.	0.00	0.00	29.9	23.5	4.6	52.4	94	83
40	2 Oct. to 8 Oct.	0.00	0.00	31.9	23.9	7.3	24.2	93	64
Transplanting									
41	09 to 15 Oct.	0.00	0.00	31.5	21.3	8	0	88	51
42	16 to 22 Oct.	0.00	0.00	31.5	15.4	9.3	0	91	32
43	23 to 29 Oct.	0.00	0.00	31.7	15.6	8.8	0	82	29
44	30 Oct. to 05 Nov.	0.00	0.00	29.7	12.3	8.7	0	87	34
45	06 to 12 Nov.	0.00	0.00	29.7	10.6	8.1	0	91	24
46	13 to 19 Nov.	0.00	0.00	28.3	8.1	8.1	0	88	24
47	20 to 26 Nov.	0.00	0.00	28.8	8.4	8.3	0	87	22
48	27 Nov. to 03 Dec.	2.10	42.00	28.8	8.7	8.7	0	89	27
49	04 to 10 Dec.	2.00	40.00	25.1	7.9	6.2	0	93	43
50	11 to 17 Dec.	0.00	0.00	26.1	7.3	7.8	0	91	28
51	18 to 24 Dec.	5.40	108.00	24.7	5.5	7.4	0	91	30
52	25 to 31 Dec.	8.90	178.20	25.7	5.6	8.6	0	88	29
1	01 to 07 Jan.	17.35	347.00	28.75	9.7	7.81	0	79.6	29.5
2	08 to 14 Jan.	22.00	440.00	24.67	12.6	9.11	0	88.2	29.2
3	15 to 21 Jan.	20.00	400.00	28.4	10.4	9.32	0	87.57	30
4	22 to 28 Jan.	26.00	520.00	31	12.7	9.15	0	74.7	24.7
5	29 Jan. to 04 Feb.	34.00	680.00	28.3	8.2	9.9	0	85.2	30.2
6	05 to 11 Feb.	19.50	390.00	26.6	12.4	5.4	0	81	51.85
7	12 to 18 Feb.	15.76	315.20	25.2	11.5	6.4	2.6	91.28	44.85
8	19 to 25 Feb.	13.00	260.00	31.2	12.5	9.8	0	80.28	28.42
9	26 Feb. to 04 March	10.66	213.20	32.4	14	8.9	2.1	79	26.14
10	05 to 11 March	8.90	178.00	30.88	14.07	6.87	0	75	32.85
11	12 to 18 March	9.70	194.00	33.32	15.44	7.41	0.11	74.42	29.57

The incidence of aphids, *Lipaphis erysimi* were initiated in the vegetative stage when the crop age was about 75 days' during fourth week of November (48th SW) with 2.10 aphids/head and its feeding continued on the lower surface of leaves till harvesting of the crop. There was increase in population in subsequent weeks and the peak aphid population was

recorded in first week of February (5th SW) with a population of 34 aphids/plant.

This finding is in accordance with that of Chandra and Kushwaha (1988) [1] and Veda and Shaw (1988) [16] and Devi et al. (1995) and Patel (2002) [10] who have also reported the

appearance of aphid on cabbage, which are more or less in accordance with the finding of the present investigation.

Sinha *et al.* (1989)^[14] and Sinha *et al.* (1990)^[15] and Kuo and Kuo (1993)^[7] and Kulat *et al.* (1997)^[4] have also reported that the maximum activity period of aphid was during November-December to February period and increased in January-February and reached peak numbers in mid-February. Which are similar as reported in the present investigation. This supports the finding of the present investigation.

Conclusion

The incidence of aphids, *Lipaphis erysimi* were initiated in the vegetative stage when the crop age was about 75 day's during fourth week of November (48th SW) with 2.10 aphids/head and its feeding continued on the lower surface of leaves till harvesting of the crop. There was increase in population in subsequent weeks and the peak aphid population was recorded in first week of February (5th SW) with a population of 34 aphids/plant. Average temperature affects the aphid population.

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