

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.703.118>

Seasonal Incidence and Influence of Environmental Factors on the Aphid Complex on Cabbage (*Brassica oleracea* var. *capitata* L.) Crop

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ABSTRACT

Studies on seasonal incidence of aphid (*Brevicoryne brassicae* L.), infesting cabbage (*Brassica oleracea* var. *capitata* L.) work was carried out at College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during 2015-16 and 2016-17. The *Brevicoryne brassicae* L. damage was observed with a varying degree of infestation. The peak population of aphid, *Brevicoryne brassicae* L., was observed 172.5 / 20 plants and 140.45/ 20 plants in month of February during both years (2015-16 and 2016-17), respectively. Thereafter population started declining. Correlation studies revealed that maximum ($r = -0.19$, $r = 0.31$), minimum ($r = -0.15$, $r = -0.33$) and average ($r = -0.18$, $r = -0.32$) temperature had non significantly negative association with aphids infesting cabbage during both years (2015-16 and 2016-17), respectively. The association between aphids of cabbage and relative humidity ($r = 0.34$, $r = 0.39$) as well as sunshine hours ($r = -0.13$, $r = 0.26$) was not established during years, 2015-16 and 2016-17 respectively. There was no definite relationship between aphid population in cabbage and rainfall in both years with their correlation values ($r = -0.13$ and $r = 0.26$), respectively.

Keywords

Population dynamics,
Aphid, Cabbage,
Correlation, Weather
parameters

Article Info

Accepted:

10 February 2018

Available Online:

10 March 2018

Introduction

India is the world's second largest producer of vegetables next to China. The total production of vegetable in India is 16.66 million tons and the total area is about 95.75 million ha (Anonymous, 2015-16). Cabbage (*Brassica oleracea* var. *capitata* L.) is a popular leafy green vegetable. Cabbage is a good yielding and remunerative *rabi* vegetable crop. The crop is attacked and devastated by an array of insect-pests. This crop is attacked by 375 species of insects (Oatman and Plantner, 1969). One of the major constraints of not

attaining higher yield of crucifers is the damage caused by insect pests. The major insect pests, which cause maximum yield losses in cabbage are Diamond back moth (DBM), *Plutella xylostella* L.; Cabbage butterfly, *Pieris brassicae* L.; leaf webber, *Crociodolomia binotalis*; cabbage borer, *Hellula undalis* Fab., mustard aphid, *Lipaphis erysimi* (Kalt.) and cabbage aphid, *Brevicoryne brassicae* L., In India, the area under cabbage cultivation is around 3.69 lakh hectare with 79.49 lakh tones production and average yield of 21.5MT/ha during 2010-11 (Anonymous 2011). The cabbage aphid has

been observed as the most destructive and wide spread throughout the world (Sharma and Bhalla, 1964). The estimated loss in yield due to aphid, *L. erysimi* in cabbage crop was 47.1 to 96.0 per cent (Bakhetia, 1986 and Suri *et al.*, 1988).

The aphids, due to their sucking propensities devitalize the plant tissues leading to yield reduction and their presence reduce the quality of cabbage heads. The physiological development of the host plant has been shown to influence the pattern of aphid infestations within a plant (Ibbotson and Kennedy 1950). Kennedy (1958) stated that the apex leaves, as sites of protein synthesis, and the oldest leaves which were going leaf proteolysis, were frequently preferred sites for aphid attack because of high soluble nitrogen levels. This hypothesis has been supported by observations on the distribution of the green peach aphid (GPA), *Myzus persicae* (Sulzer), and the cabbage aphid, *Brevicoryne brassicae* (L.), on a variety of host plants.

Materials and Methods

Cabbage cv. Golden Acre was sown in 100 m² area by adopting 60 × 45 cm spacing, divided into two plots each measuring 10×10 m, at the experimental area of Indira Gandhi Agricultural University, Raipur (C.G.) during rabi seasons, 2015-2016 and 2016-2017. No insecticidal treatment was applied at any stage of the crop growth. Observation of aphid was recorded from two leaves /plant covering three regions /leaf on randomly selected twenty plants from each plot at weekly interval using one square inch template made of card board. Observations on population of aphids on twenty randomly selected cabbage plants in each experimental field from pest appearance until harvest of crops at weekly interval. It was then, correlated with weather parameters viz., maximum temperature, minimum temperature, relative humidity, rainfall and

sunshine hours. The data on the pest incidence were statistically analysed for the seasonal incidence and then computed with correlation co-efficient studies to see the effect of different abiotic factors on the population of aphids.

Results and Discussion

Aphids first appeared in 52th SMW. (Standard Meteorological Week) during both years (2015-2016 and 2016-2017). The population of aphids reached at its peak of 172.5 / 20 plants in 6th standard week during 2015-16, while it was 140.45/ 20 plants in 6th S.M.W. during 2016-17 (Table 1 and 2).

Severity of aphid incidence was higher on first year as compared to second year. Atwal and Sethi (1963) noted the peak population of aphids in the month of January and then the population decreased. Similarly, Roy (1975) observed that the population of this pest gradually rise until it reached the peak in January month after which it declined. Patel (2002) has also reported that the maximum activity period of aphid was during December to January at Raipur (C.G.). These reports are in accordance with present findings.

The correlation coefficient analysis (Table 3 and 4) revealed that maximum ($r = -0.19$, $r = 0.31$), minimum ($r = -0.15$, $r = -0.33$) and average ($r = -0.18$, $r = -0.32$) temperature had non significantly negative association with aphids infesting cabbage during both years (2015-16 and 2016-17), respectively. The association between aphids of cabbage and relative humidity ($r = 0.34$, $r = 0.39$) as well as sunshine hours ($r = -0.13$, $r = 0.26$) was not established during both years, 2015-16 and 2016-17 respectively. There was no definite relationship between aphids population in cabbage and rainfall during 2015-16 and 2016-17 with their correlation values ($r = -0.13$ and $r = 0.26$, respectively).

Table.1 Weather parameters and aphid population during *rabi* season, 2015-2016

SMW	Date of observation	Temperature (°C)			Relative humidity (%)			Sun shine (Hours)	Rainfall (mm)	Aphids / 20 plants
		Maximum	Minimum	Average	Morning	Evening	Average			
52 th	29/12/2015	25.79	12.00	18.895	87.86	39.83	63.845	4.61	0.14	0.55
1 st	05/01/2016	30.77	11.99	21.38	81.57	27.29	54.43	8.09	0.00	4.35
2 nd	12/01/2016	29.63	11.37	20.5	87.29	25.00	56.145	6.80	0.00	12.475
3 rd	19/01/2016	28.40	14.20	21.3	86.29	43.86	65.075	5.41	0.00	59.35
4 th	26/01//2016	26.07	8.64	17.355	91.14	34.00	62.57	7.47	0.29	80.525
5 th	02/02/2016	30.89	14.03	22.46	87.14	35.14	61.14	8.37	0.00	129.2
6 th	09/02/2016	31.30	14.28	22.79	77.00	26.61	51.805	8.79	0.00	172.5
7 th	16/02/2016	31.81	19.30	25.555	80.43	41.43	60.93	5.15	0.07	141.725
8 th	23/02/2016	34.77	18.99	26.88	72.71	28.86	50.785	7.80	0.00	112.7
9 th	02 /03 /2016	33.13	20.90	27.015	79.29	41.14	60.215	2.63	0.00	78.925
10 th	09/03/2016	30.73	20.57	25.65	76.00	27.00	51.5	7.25	0.09	29.125
11 th	16/03/2016	33.84	20.57	27.205	62.63	29.86	46.245	6.76	0.41	25.675
12 th	23/03/2016	40.12	23.22	31.67	59.35	26.77	43.06	7.44	0.00	20.275
13 th	30 /03/2016	40.44	23.47	31.955	60.00	22.57	41.285	9.22	0.00	20.475
14 th	06/04/2016	41.10	24.34	32.72	60.05	17.90	38.975	8.47	0.00	7.525
Seasonal Mean		32.59	17.19	24.89	76.58	31.15	53.86	6.95	0.07	59.69

SMW= Standard Meteorological Week

Table.2 Weather parameters and aphid population during *rabi* season, 2016-2017

SMW	Date of observation	Temperature (°C)			Relative humidity (%)			Sun shine (Hours)	Rainfall (mm)	Aphids / 20 plants
		Maximum	Minimum	Average	Morning	Evening	Average			
52 th	25/12/2016	27.8	9.5	18.65	85.4	26.3	55.85	7.6	0	2.575
1 st	01/01/2017	29	12.07	20.535	89.71	33.86	61.785	6.39	0	12.65
2 nd	08/01/2017	28.24	12.66	20.45	86.14	33.71	59.925	6.69	0.8	69.55
3 rd	15/01/2017	27.73	10.46	19.095	83.14	26	54.57	8.23	0	74.9
4 th	22/01/2017	29.84	13.21	21.525	84.29	28.29	56.29	8.66	0	80.1
5 th	29/01/2017	29.89	13.33	21.61	79	27.71	53.355	8	0	101
6 th	05/02/2017	31.63	12.94	22.285	83.86	24.29	54.075	9.6	0	140.45
7 th	12/02/2017	31.19	16.19	23.69	79.57	34.29	56.93	6.37	0.8	123.975
8 th	19/02/2017	33.89	15.29	24.59	75	18.14	46.57	10.24	0	78
9 th	26/02 /2017	33.54	14.53	24.035	68.29	15.29	41.79	10.06	0	69.25
10 th	05/03/2017	33.81	19	26.405	67.29	30.29	48.79	7.3	0.79	47.6
11 th	12/03/2017	32.2	17.19	24.695	60.86	21.43	41.145	8.26	0	27.9
12 th	19/03/2017	35.17	18.96	27.065	65.14	18.14	41.64	9.07	0	22.6
13 th	26/03/2017	40.4	22.61	31.505	60.86	13.57	37.215	8.93	0	20.5
14 th	02/04/2017	41.43	25.87	33.65	52.71	16.14	34.425	8.37	0	15.5
Seasonal Mean		32.38	15.59	23.99	74.75	24.50	49.62	8.25	0.16	59.10

SMW= Standard Meteorological Week

Table.3 Simple correlation coefficient (r) between meteorological parameters and Aphids population during *rabi* 2015 -16

Weather data	Temperature (°C)			Relative humidity (%) Average	Sunshine (hours)	Rainfall (mm)
	Maximum	Minimum	Average			
Aphid population	-0.19	-0.15	-0.18	0.34	0.02	-0.13

Non-significant correlation

Table.4 Simple correlation coefficient (r) between meteorological parameters and Aphids population during *rabi* 2016 -17

Weather data	Temperature (°C)			Relative humidity (%) Average	Sunshine (hours)	Rainfall (mm)
	Maximum	Minimum	Average			
Aphid population	-0.31	-0.33	-0.32	0.39	0.13	0.26

Non-significant correlation

Results of correlation coefficients (r) are agreed with many workers who recorded negative influence of rainfall on aphid population (Ashfaq *et al.*, 2007; Nasir & Ahmad 2001). Sachan and Srivastava (1972) showed that relative humidity of 60.7 to 72.3 per cent favours the multiplication of aphids on cabbage. Findings are slightly contradict with the reports of Bhat *et al.*, (2012) who recorded positive non-significant correlation with both maximum and minimum temperature on population build-up of aphids in four varieties of cabbage during 1998-99 at Kashmir Valley whereas Patra *et al.*, (2012) reported negative influence of temperature, and rainfall on population build-up of aphid at Meghalaya condition. Results may be corroborated with the findings of Zaz (2001) who reported that the aphid population exhibited non-significant negative correlations with overall temperature in cabbage.

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How to cite this article:

Bhagat, P., Y.K. Yadu and Dubey, V.K. 2018. Seasonal Incidence and Influence of Environmental Factors on the Aphid Complex on Cabbage (*Brassica oleracea* var. *capitata* L.) Crop. *Int.J.Curr.Microbiol.App.Sci*. 7(03): 995-1000.
doi: <https://doi.org/10.20546/ijcmas.2018.703.118>