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Seasonal incidence of cabbage aphid, *Lipaphis erysimi* (*Kalt.*) (Hemiptera: Aphididae) in Meerut region, Uttar Pradesh

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Abstract
A field study was conducted on incidence of cabbage aphid, *Lipaphis erysimi* (Kalt.) in two different brassica spp. viz., *Brassica oleracea* and *Brassica juncea* during rabi season of 2012-2013 (Crop Research centre, (CRC) Sardar Vallabhbhai Patel university of Agriculture and technology, Modipuram, Meerut). The initial population of aphid appeared in first week of November (44 standard week) and reached its maximum level of 95.40 aphid plant^{-1} during third week of December (50 standard week) when the temperature and relative humidity ranged from 20.57°*C* to 11.21°C and 73.71 to 37.42 per cent, respectively. The population of aphid was found to be decreased very fast during 5th and 6th standard week. The correlation study of aphid with abiotic factors revealed positive relationship with temperature and relative humidity during cropping season.

Keywords: abiotic factors, cabbage, *Lipaphis erysimi*, seasonal incidence

1. Introduction
After China, India is the second largest producer of vegetable with annual production of 81.00 mt from 5.12 million hectares of land. But due to heavy incidence of insect pests and high population in the country the per capita availability of vegetables is only 140 g/day, when compared to 300 g of recommendations [1]. At present vegetables constitute only 8- 10 per cent of total food intake of Indians who are mostly vegetarians. The cabbage is the most important Cole crop of India, and occupies 389.62 thousand ha production 10,838.11 thousand mt /ha and productivity 27.81 mt/ha**.** In Uttar Pradesh, cabbage is grown on 1.98 thousand/ ha area with 62.64 thousand mt ha^{-1} productivity [2]**.** Cabbage is an excellent source of vitamin K, vitamin C, and vitamin B6. It is also a very good source of manganese, dietary fiber, potassium, vitamin B1, foliate and copper [3]. Although the crop has got huge domestic requirement, a number of limiting factors have been attributed for low productivity. Among them, the chief constraint in the production of cabbage is damage caused by pest complex right from germination till harvesting stage [4, 5] listed 51 insect pests to damage cruciferous crops throughout the world.
In India, a total of 37 insect pests have been reported to feed on cabbage [6]. Among the insect pests, aphids alone cause 9-96 per cent reduction in yield [7]. These aphids are widely distributed throughout the world on all *Brassica* crops [8]. Plant produced many volatile compounds which guide them towards their host [9, 10]. The nymph and adult suck the sap from leave and they also know to transmit a number of disease. Owing to the high fecundity and short generation period, it can reach population densities much higher than the economic threshold levels of 50-60 aphids/10 cm top central twig of plant making them intractable to control [11]. For the management of this notorious pest, at present, farmers have no other option but to spray insecticides which have their own adverse effects. Over 98% of sprayed pesticides reach a destination other than their target species, because they are sprayed or spread within whole agricultural ecosystem. Continuous application of similar pesticides may increase pest resistance and out beak of secondary pests or resurgence [12]. Monitoring of pest population and relative abundance of natural enemies is an important component of an area-wide pest control which overcome pesticide residue problem [13]. Abiotic factors including temperature, relative humidity, rainfall and total sunshine greatly influence the population of insect pests [11]. Keeping this in view, the present experiment was formulated to find out effects of abiotic factors on seasonal incidence of aphid in cabbage ecosystem.

2. Materials and Methods

2.1 Experimental Site: The present study was conducted at the experimental Crop Research centre, (Chirori farm) of Sardar Vallabhbhai Patel university of Agriculture and technology Modipuram, Meerut 250110 (U.P.) during rabi season, Oct-2012- Feb 2013 in a Randomized Block Design (RBD) per plot of size 5.5 m x 4.5 m and Row to row and plant to plant spacing was 55 cm and 45 cm, having three replications and light treatment. It is situated between 29º 01 N latitude, 77º 45 E latitude at an altitude of 237 meters above the sea level (MSL). The Golden Acre variety of cabbage *Brassica oleracea* Var. *Capitata* L planting was done by manually on October 15 and 26 at Crop Research centre, (CRC).

2.2 Aphid observations: Population of cabbage aphid and mustard aphid was recorded from six randomly selected plants form each plot, i.e. on three plants from each of the middle two rows. Weekly meteorological data on temperature (minimum and maximum in degree centigrade), relative humidity (%) and rainfall (mm) hours were recorded from Department of Soil Science, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110 (U.P.) during the period of experimentation.

2.3 Statistical Analysis: The correlation coefficient between aphid population and weather parameters was done by excel.

3. Results and Discussion

The population of cabbage aphid was found continues with different numbers and the initially appeared in first week of November (44 standard week) with adult/6 plants and maximum level of 95.40 aphid /plant during third week of December (50 standard week), when the temperature and relative humidity ranged from 20.57°C to 11.21°C (mean 15.89°C) and 73.71 to 37.42 per cent (55.56 %) respectively. However, lowest population of aphid 7.11 was recorded in the (6 standard week) when the maximum and minimum temperature 20.92 °C and 8.21 °C respectively, relative humidity 52.64 per cent and rainfall were recorded 0.00 mm. The population of aphid decreased very fast during 5th and 6th standard week (Figure 1). The aphid, *L. erysimi* (Kalt) appeared in November on cauliflower, cabbage and mustard crop and peaked during last week of January to first week of February reported by [14]. The population of *Lipaphis erysimi* maximum (95.4%) aphids per six plant during the 2nd week of February when the temperature and relative humidity were 10.8-27.5 degrees C and 31.5-86.2%, respectively reported by [15]. aphid population was negatively correlated with temperature sensing by [16]. The coefficient of correlation of the among aphid population with the temperature (max. r^2 = 0.20 and mini. r^2 = 0.031) and relative humidity (r^2 = 0.003) indicated positive relationship during crop season (Figure 2. A, B, C and D). The similar experiment conducted by [11] on population dynamic of *Myzus persicae* revealed significant positive correlation between aphid population and maximum temperature. The population growth and development of *M. persicae* on potato in India highly fluctuated where its build-up was highest in early Rabi and lowest in Kharif.

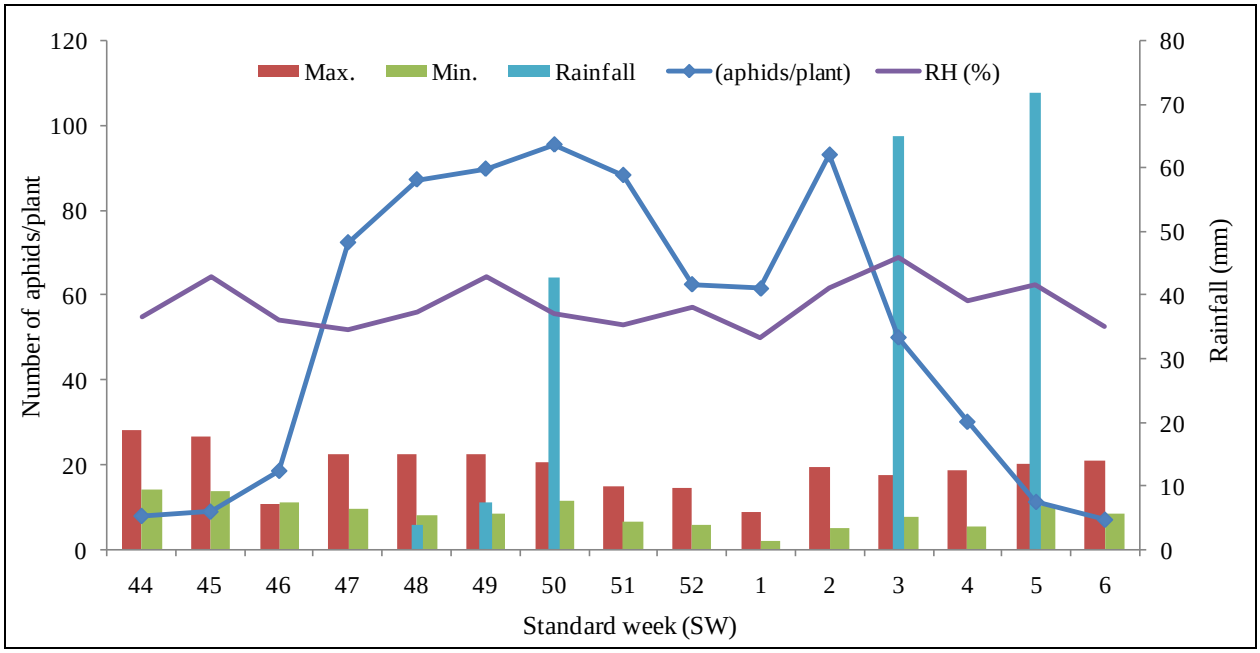

Fig 1: Meteorological data with aphid population

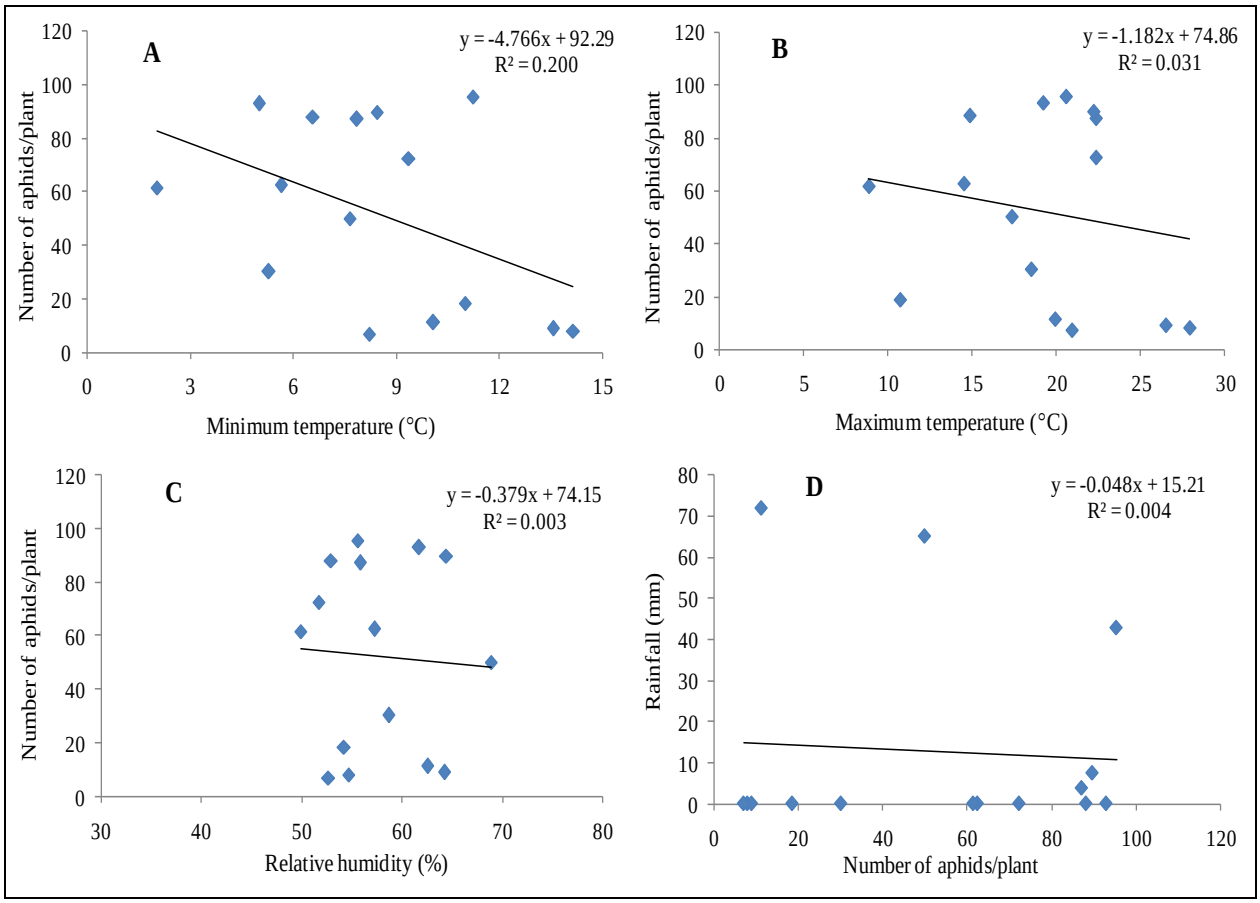

Fig 2: Relationship of aphid population with different abiotic factors.

4. Conclusion

The maximum density of aphid population coincides with its flowering stage. Statistically negative significant correlation was found between aphid population with temperature and relative humidity. So, it can be concluded that the population of aphid was increased with decreasing temperature and vice-versa. This information can be used in formulating population modules for pest management

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