



POPULATION DYNAMICS OF MUSTARD APHID *LIPAPHIS ERYSIMI* (KALT) AND ITS COCCINELLID PREDATORS

ARCHANA SHUKLA^{1*} AND ASHWANI KUMAR²

¹Department of Biological Sciences, Faculty of Science;

²Department of Entomology, Naini Agricultural Institute, Sam Higginbottom

University of Agriculture, Technology and Sciences, Prayagraj 211007, Uttar Pradesh, India

*Email: archushukla001@gmail.com (corresponding author): ORCID ID 0000-0003-0288-0251

ABSTRACT

Field experiments were conducted during 2021-2022 and 2022-2023 to determine the population dynamics of mustard aphid *Lipaphis erysimi* (Kalt) and its coccinellid predators on two mustard varieties viz. Rohini (highly susceptible) and RH0749 (least susceptible) in relation with different abiotic factors. The infestation was observed in last week of December to the first week of March, the overall mean indicates the incidence was at its peak in the second week of February. Maximum incidence of 160-120/ five plants was recorded on Rohini while 160-100/ five plants on RH0749. The predatory activities of coccinellids viz., *Cheilomenes sexmaculata* (L), *Coccinella septempunctata* (F) and *Coccinella transversalis* (F) revealed significant positive correlation with aphid incidence.

Key words: Indian mustard; *Lipaphis erysimi*; population dynamics; *Coccinellidae*; Rabi season; biotic factors; abiotic factors; Biological control; correlation coefficients; Integrated pest management.

Indian mustard *Brassica juncea* (Czern. and Coss.) is a dominating oilseed crop (Yadava et al., 2022; Kumar, 2016). It is primarily cultivated in, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh and Rajasthan (Anonymous 2019). The most voraciously feeding and reproducing aphids of mustard include *Lipaphis erysimi* (Kalt, Swati, 2005). This pest often leads to 35-96% loss or complete loss (Aguirre et al., 2023). Coccinellidae beetles are widely known preying upon an array of aphids including the Indian mustard aphid Ali and Rizvi, 2012. There are several ways to reduce the number of aphids, but ladybird beetles are the most well-known and efficient ones (Mushtaq et al., 2015). This study evaluates its population dynamics.

MATERIALS AND METHODS

The experiment was carried out two mustard varieties, viz, Rohini (highly susceptible to aphids) and RH0749 (least susceptible to aphids). These were procured from the Department of Plant Breeding and Research Genetics, Chandra Shekhar Azad University of Agriculture & Technology (CSAUA&T) Kanpur, and National Seed Corporation Limited. Field experiments were conducted in the research field, Department of Entomology SHUATS, Prayagraj during the rabi 2021-2022 and 2022-2023 The study site is located 5.4137 N and 81.8491 E. The experiment was laid out in randomized block design. The plot size was (15x25

m²) with 1x1 cm row- to- row distance. The crop was as per the standard agronomic practices cultivated.

Observations on aphid incidence were recorded soon after the appearance of the aphid from the randomly selected five plants/ plot at intervals of seven days for both varieties. The count of aphids was initially recorded on the whole plant as one single unit but later on three leaves and from the flowering stage the aphids were counted/ 10 cm top portion of the central twig described by Mathur (1986) and Pradhan (1960) manually with magnifying lens. The coccinellid counts were recorded on the whole plant simultaneously at weekly intervals. Data on humidity, temperature and sunshine were obtained from the Metrological Department of the University. Simple correlation coefficients ($p=0.05$) were worked out.

RESULTS AND DISCUSSION

The data on the population dynamics presented in Figs. 1 and 2 indicate that the *L. erysimi* first appeared in the last week of December and continued till the second of March. These observations corroborate with Kumar and Kumar (2018). In the beginning incidence was very low i.e. 34-25 aphids/ 10 cm/ twig on Rohini and 30-25 aphid/ 10 cm/ twig on RH0749. However, it increased gradually and reached peak in the second week of February at full flowering stage i.e. 160-

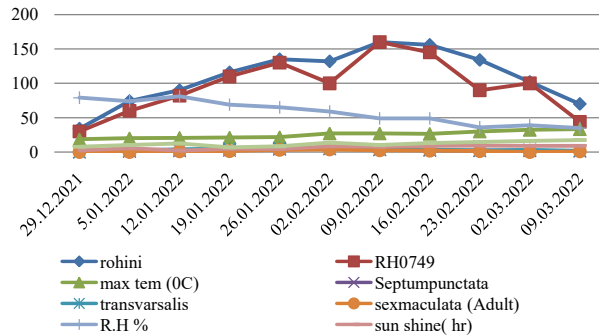


Fig. 1. Population dynamics of *L. erysimi* and coccinellid predators on mustard (2021-2022)

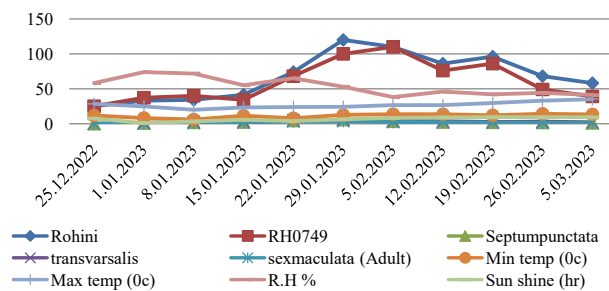


Fig. 2. Population dynamics of *L. erysimi* and coccinellid predators on mustard (2022-2023)

120/10 cm twig on Rohini and 160-100/ 10 cm twig on RH0749. Malik and Sachan (2013) also reported that the incidence of aphids started in the different weeks of December reaching its peak in the second week of February. Afterward, an abrupt decline in the population was noted with rising temperatures and a decline in relative humidity. The present results corroborate with those of Venkateswarlu et al. (2011), Sahoo (2013), Singh et al. (2018) and Mishra and Kanwat (2018).

Aphid incidence exhibited a positive correlation ($r=0.45, 0.46$) with bright sunshine hours and minimum temperature ($r=0.74, 0.78$). These results are in conformity with those of Bavisa et al. (2018). Maximum temperature and mean RH showed negative correlation (Figs. 1, 2). The present findings are in conformity with those of Gaur (2001) and Kumar (2016). The coccinellid predators *C. sexmaculata* (L), *C. septempunctata* (F) and *C. transversalis* (F) preying on *L. erysimi*, corresponding with the peak aphid incidence; a substantial positive association ($r=0.74, 0.82$) was found between aphids and coccinellid predators. These results agree with those of Singh and Lokeshwari's (2010), Singh et al. (2017) and Varshney et al. (2017).

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AUTHOR CONTRIBUTION STATEMENT

AS wrote the paper and translated the manuscript. AK created the experimental procedure.

CONFLICT OF INTEREST

No conflict of interest.

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