Eco. Env. & Cons. 30 (January Suppl. Issue) : 2024; pp. (S22-S25)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2024.v30i01s.004

Monitoring of Alate Mustard Aphid, *Lipaphis erysimi* Through Yellow Sticky Trap

Arun Kumar, Mukesh Kumar Mishra*, Rakesh Pandey and B. K. Singh

Department of Entomology, College of Agriculture, Banda University of Agriculture & Technology, Banda 210 001, Uttar Pradesh, India

(Received 7 June, 2023; Accepted 9 August, 2023)

ABSTRACT

A research experiment was conducted to monitor mustard aphid, *Lipaphis erysimi* (Aphididae: Hemiptera) through yellow sticky trap during two consecutive rabi seasons of 2019-21 at Banda University of Agriculture and Technology, Banda. The catches of alate population were first noticed in 45th Standard Meteorological Week (first week of November), then it gradually increased with a slight fluctuation with peak of 135.93/ trap (3rd SMW) and declined after 5th SMW over the experimentation period. The population was competitively higher in 2020-21 than 2019-20. Maximum trapped occurred in 3rd SMW (115.86 / trap) during 2019-20, whereas, it was three peaks were recorded in 52nd (156.07/trap), 3rd (156.00/trap) and 9th (122.82 / trap) SMW during 2020-21. Aphid population had highly significant negative correlation with minimum temperature (r=-0.784) and maximum temperature (r=-0.730), highly significant positive correlation with maximum relative humidity (RH) (r= 633) and significant positive correlation with minimum RH (r= 457). Stepwise regression analysis showed the combined influence of weather parameters had more influence on incidence of alate aphid (R^2 = 0.808) than the single weather parameter (R^2 =0.139).

Key words : *Alate mustard aphid, Correlation, Monitoring, Yellow sticky trap, Regression*

Introduction

Rapeseed (*Brasssica rapa* L) is one of the major oilseed crops grown in Rabi season in India and ranks third in total acreage (19.8%) and production (9.8%) of the world (Anonymous, 2019). However, its production and productivity is much influenced with the biotic and abiotic stresses. In case of biotic stresses, among 38 insects associated with *Brassica* at different stages of its growth, the mustard aphid, *Lipaphis erysimi* (Kaltenbach), continues to be the key pest damaging oilseed brass. It is the major limiting factor causing up to 96% yield losses from the seedling stage to maturity (Singh and Sharma, 2002 and Shylesha *et al*., 2006) and a decrease of about 15% in oil contents (Verma and Singh, 1987). Mustard aphid appears during the end of December and remains active up to the end of March. Adult aphid is found in two forms i.e., winged (alate) and other (delate). Both nymphs and adults suck the cell sap from different parts of the plant i.e., leaf, stem, twig, inflorescence and pods. Besides biotic parameters like natural enemies, abiotic parameters also play a vital role in the population build-up of mustard aphids. Their positive or negative association with the pest population gives a place to develop suitable management strategies against the pest. Repeatable and reliable management decisions can be made based on monitoring information. Therefore, considering the above fact, the present investigation was

Assistant Professor

envisaged to information on the monitoring of alate mustard aphid in relation to weather parameters in Bundelkhand region of Uttar Pradesh.

Materials and Methods

The present investigation was conducted during 2019-20 and 2020-21 in the PG Research Block of College of Agriculture, Banda University of Agriculture and Technology, Banda, Uttar Pradesh, India (24º 532 25º 552 N latitude, 80º 072 81º 342 E longitudes). For the monitoring of alate mustard aphid, yellow sticky traps were made by the empty round tin box of 1 kg capacity and painted with yellow colour were set on a 1.5-meter-long iron rod at four locations around the rapeseed-mustard field at uniform distance. The height of trap has been adjusted 1 foot above the crop canopy. Then a coating of lowcost petroleum grease was smeared around the yellow painted surface of the empty round tin so that it becomes sticky. The petroleum grease was changed twice in a week after recording the observation on alate mustard aphid for better stickiness. The observations on alate aphid population were taken by counting them daily trapped in following morning with the help of a needle and after taking observation these aphids were removed. Daily count of alate aphid were aggregated into weekly mean values for statistical analysis as per the procedure of Panse and Sukhatme (1967).

To study the impact of weather parameters on population buildup of alate aphid catches, the meteorological data (weekly mean) on temperature (maximum and minimum), relative humidity (maximum and minimum), rainfall (mm) and wind speed (kph) were obtained from meteorological observatory of the College of Agriculture, BUA&T, Banda for the experimentation period. Correlation coefficients were worked out for the alate aphid population (means of pooled data of both cropping seasons) and in relation to weather parameters. Further, step-wise linear regression model was developed for estimating alate aphid with the climatic parameters namely, temperature (maximum and minimum), relative humidity (maximum and minimum), rainfall (mm) and wind speed (kph).

Results and Discussion

The pooled mean data presented in Fig.1 revealed that the initial appearance of the alate aphid was noticed during 45th Standard Meteorological Week (first week of November), then it gradually increased with slight fluctuation with peaks of 135.93 alate aphid/ trap in 3rd SMW and finally declined after 5th SMW over the period of experimentation. During 2019-20, maximum alate aphid was trapped in the sticky trap at 3rd SMW (115.86 alate aphid sticky trap^{-1}). Whereas, during 2020-21, three peak catches were recorded in 52nd SMW (156.07 alate aphid /trap), 3rd SMW (156.00 alate aphid /trap) and 9th SMW (122.82 alate aphid/trap). This observation is in conformity with the findings of Sahoo, 2013 who recorded the first appearance of apterous aphids on the mustard crop in West Bengal during the last week of December. The activity and maximum trapping of alate mustard aphid during present study could be supported by the observation of Meena *et al.,* 2019; who were also recorded the alate mustard aphid was observed from 43rd standard week to 12th standard week with peak (145.7 aphids/trap). It is also closed to the observations by Ahuja (1990) the aphid population reaching a peak between 26th January and 1st February. The buildup of population trend indicates that the pest attained the peak by 3rd to 5th SMW are accordance of Pal *et al.* (2018). The variable peak activity in present study is in partial agreement with Singh and Nagar (2016), who reported the population of alate aphid reached to peak variably depending upon the weather parameters in different years of study. The population was competitively higher in 2020-21 than 2019-20, it follows the results of Singh and Sharma (2009) which evident that the abiotic factors had a key role in regulating the aphid population.

Based on pooled analysis (Table 1), it is evident that alate aphid population had highly significant negative correlation with minimum temperature (r=-0.784) and maximum temperature (r= -0.730) with minimum and maximum temperature ranged between 7.93 °C to 19. 64 °C and 19.07 °C to 19. 34.86 °C, respectively. Whereas the minimum RH (r= 457) had significant and maximum RH (r= 633) had highly significant positive correlation. Although the alate aphid population had shown non-significant positive correlation with wind speed and rainfall. The result is closed to the observations of Singh and Lal (2012); Sahoo and Saha (2018) they were recorded non-significant positive correlation with rainfall and significant correlation with relative humidity. The observations corroborate with the findings of Gour and Pareek, 2003 and Mishra and

Table 1. Correlation values (r) between incidence of alate mustard aphid and weather parameters during 2019-21 (pooled)

Trapped alate aphid	Meteorological parameters					
	Temperature (^{0}C)		Relative Humidity (%)		Wind speed (Km/h)	Rainfall (mm)
	Minimum	Maximum	Minimum	Maximum		
	-0.784**	-0.730**	0.457*	0.633**	0.188^{NS}	0.372^{NS}

* Significant at (p= 0.05) , ** Significant at p= 0.01% level of significance

Table 2. Stepwise regression equations for estimating the influence of weather parameters on the incidence of alate mustard aphid during 2019-21 (pooled)

Regression equation	R^2
$Y= 40.26 + 3.46X_1 -1.26X_2 -6.12X3 -0.49X_4 + 0.97X_5 + 20.08X_6$	0.808
$Y= 253.39 + 4.19X_1 -0.10 X_2 - 9.06 X_3 + 0.46 X_4 + -1.24X_5$	0.683
$Y= 153.11 + 3.87X_1 -0.17X_2 - 7.49 X_3 -0.06X_4$	0.672
$Y= 147.56 + 3.87X_1 -0.02X_2 -7.56X_3$	0.672
$Y= 202.72 + 3.55X^1 -5.97X_2$	0.578
$Y= 43.77 + 5.91X_1$	0.139

Note: X_1= Rainfall (mm); X_2= maximum temperature (R C); X_3= minimum Temperature (R C); X_4= Minimum RH (%); X_5= Maximum RH (%) and X_6= Wind speed (km hr^{-1})

Kanwat (2018) who reported that the aphid population had negative significant correlation with mean maximum and minimum temperatures and sunshine, and positively correlated with humidity. The positive correlation of alate aphid population with wind speed is in agreement with Bavisa *et al*. (2018) who had also recorded a positive correlation with wind speed.

The influences of temperature, relative humidity, wind speed and rainfall on incidence of alate aphid were evaluated through stepwise regression analysis. It was observed that the combined influence of these weather parameters had more influence on incidence of alate aphid (R^2 = 0.808) than the single weather parameter as the R^2 value was only 0.139 (Table 2). The combined effect of rainfall and maximum temperature with R^2 value of 0.578 and when maximum temperature was deleted the R^2 value comes down to 0.139. This shows that maximum temperature had 43.9 per cent influences. Similar observations were also reported by Choudhury and Pal (2009). It could be inferred from the above study that maximum trapping of alate mustard aphid and multiple peaks during the month of January and February and might be because of variable sowing dates and maturity of the mustard crop and increasing temperature at that period which influenced the formation of alate aphid for migration. This migration information may be utilized for forewarning so that farmers could take proper decision for execution of future pest management strategies.

Acknowledgement

The authors gratefully acknowledge Dr. S. K. Singh, Professor & Head, Department of Entomology and Dr. G.S. Panwar, Dean, College of Agriculture, Banda University of Agriculture and Technology, Banda for providing necessary facilities and financial support during research programme in the form of Post Graduate Research.

Conflict of Interest

There is no conflict of Interest.

References

Ahuja, D. B. 1990. Population dynamics of mustard aphid *Lipaphis erysimi* (Kalt.) on Indian mustard, *Brassica juncea* (subsp. *juncea*). *Indian J. Plant Prot*. 18(2): 233-235.

Anonymous, 2019. AMAFW Annual report 2018-19 by Ministry of Agriculture and Farmers Welfare, Government of India. Annual report 2018-19. Retrieved from http://agricoop.nic.in/sites/default/files/AR_2018-19_Final_for_Print.pdf

Bavisa, R., Parmar, G. M., Hirapara, M. M. and Acharya, M.F. 2018. Population dynamics of mustard aphid, *Lipaphis erysimi* (Kaltenbach) on mustard in relation to different weather parameters. *Journal of Pharmacogn. Phytochem.* 7(4): 394-396.

Choudhury, S. and Pal, S. 2009. Population dynamics of mustard aphid on different *Brassica* cultivars under terai agro-ecological condition of West Bengal. *J. Plant Prot. Sci.* 1: 83-86.

Gour, I.S. and Pareek, B.L. 2003. Seasonal incidence of major insect pests of mustard crop and their correlation with abiotic factors under the semi-arid region of Rajasthan. *J. Insect Sci.* 16(1/2): 37-40.

Meena, R.K., Meena, R. K., Gurjar, H. and Kumar, S. 2019. Recent trends of mustard aphid (*Lipaphis erysimi*) infestation in rapeseed mustard in eastern Rajasthan. *J. Oilseed Brassica*. 10: 134-139.

Mishra, S.K. and Kanwat, P. M. 2018. Seasonal incidence of mustard aphid, *Lipaphis erysimi* (Kalt) and its major predator on mustard and their correlation with abiotic factors. *J. Entomol. Zool. Stud.* 6(3): 831-836.

Pal, S., Singh, D.K. and Umrao, R.S. 2018. Population dynamics of insect pests in mustard and eco-friendly management of *Lipaphis erysimi* (Kaltenbach) in Uttrakhand. *Int. J. Curr. Microbiol. Appl. Sci.* 7(7): 324-331.

Panse, V.G. and Sukhatme, P.V. 1967. *Statistical Methods for Agricultural Workers*. 2nd Edn. ICAR, New Delhi, India.

Sahoo, S.K. 2013. Population dynamics of mustard aphid, *Lipaphis erysimi* Kaltenbach (Hemiptera; Aphididae) on *Brassica* germplasm. *Indian J. Ent.* 75(1): 09-14.

Sahoo, S.K. and Saha, A. 2018. Monitoring of alate mustard aphid (*Lipaphis erysimi* Kaltenbach) by using yellow sticky trap in West Bengal. *J. Crop Weed*. 14(3): 149-152.

Shylesha, A.N., Azad Thakur, N. S., Pathak, K.A., Rao, K.R., Saikia, K., Surose, S., Kodandaram, N.H. and Kalaishekar, A. 2006. Integrated management of insect pest of crops in north eastern hill region. *Technical Bulletin* No. 19. ICAR RC for NEH Region, Umiam, pp. 50.

Singh, A.K. and Lal, M.N. 2012. Population dynamics of mustard aphid, *Lipaphis erysimi* (Kalt.) on mustard in relation to weather parameters. *Asian J. Bio Sci.* 7(2): 216-218.

Singh, Y. P. and Sharma, K. C. 2002. Integrated approach to manage the mustard aphid, *Lipaphis erysimi* (Kalt.) (Homoptera: Aphididae) in oil seed *Brassica* crops-A review *J. Amphibiology.* 16: 77-88.

Singh, Y.P. and Sharma, K.C. 2009. Monitoring of alate mustard aphid, *Lipaphis erysimi* Kalt. on yellow sticky traps and its relation to abiotic factors. *Indian J. Appl. Ent.,* 23(1): 49-52.

Singh, Y.P. and Nagar, R. 2016. Monitoring of alate mustard aphid, *Lipaphis erysimi* Kalt. on yellow sticky traps. *Indian J. Ecol.* 43(1): 137-140.

Verma, S.N. and Singh, O.P. 1987. Estimation of avoidable losses to mustard by the aphid, *Lipaphis erysimi* in Madhya Pradesh. *Indian J. Plant Prot.* 15(1): 87-89.