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POPULATION DYNAMICS OF APHID [*Lipaphis erysimi* (Kaltenbach)] on *Brassica juncea* GENOTYPE RH 725

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ABSTRACT

Mustard aphid (*Lipaphis erysimi*) is a serious insect pest of mustard in Haryana, India. Severe incidence leads to damages to the various part of the mustard plant leading to loss in crop yield. Adequate knowledge about the population dynamics of this insect pest is essential for formulating pest management strategies. Therefore, a field experiment was carried out to scrutinise the population dynamics of aphid on *Brassica juncea* genotype RH 725 in relation to weather parameters at farmer's field, Kolana village, Aravalli Hills Region, Rewari, Haryana, India during *rabi* 2019-20 and 2020-21.The pooled results revealed that the initial occurrence of aphid population (1.36 aphids plant^{-1}) was recorded at 3rd standard meteorological week (SMW), subsequently; it was build up progressively, reaching a peak (45.59 aphids plant^{-1}) at 9th SMW and thereafter declined. Correlation coefficients between weather parameters and aphid population exhibited positive and non-significant relationships with maximum and minimum temperature, morning humidity, rainfall and evaporation, while evening humidity, sunshine and wind velocity had negative and non-significant influence.

(Key words: Aphid, *Brassica*, correlation coefficients, evaporation, population dynamics, weather parameters)

INTRODUCTION

Rapeseed and mustard (Brassica spp.) belonging to the genus Brassica and family Cruciferae (Brassicaceae) are the major *rabi* oilseed crops grown in different agro-climatic regions of India. In India, it is placed second (25%) after soybean (38%) in total oilseed production and first (23%) in edible oil production. The main oilseed *Brassica* species cultivated in India are *Brassica juncea*, *B. napus*, *B. carinata*, *B. oleracea* and *B. nigra*. Out of these species *Brassica juncea* (L.) Czern. is holding sizable contribution in case of area and oilseeds production (Jat *et al*., 2019). Insect pests are main biotic constraints that cause severe damages to *Brassica* from germination to harvest.

Out of more than 43 insect pests species infesting rapeseed and mustard crops, mustard aphid, *Lipaphis erysimi* (Kaltenbach) (Homoptera:Aphididae) is a key destructive pest that cause up to 35.4 - 96% losses in seed yield (Purwar *et al*., 2004; Sahoo, 2012; Shrestha *et al*., 2020) and 4.92 - 8.14 % reduction in oil content (Sharma *et al*., 2019). The earlier studies have been showed weather parameters *viz*., temperature, relative humidity, sunshine, rainfall and rainy days plays an significant role on the aphid appearance, multiplication and disappearance on various varieties of mustard (Bavisa *et al*., 2018; Mishra and Kanwat, 2018; Das *et al*., 2019; Sharma *et al*., 2019). Knowledge of the seasonal incidence and population build-up trend of aphid in relation to weather parameters is essential to time adjustment of ecological parameters like planting or harvesting as well as is also important in the forecast of the correct time of insecticide application. This study explores the population dynamics of mustard aphid in the agro-ecosystem of Rewari, Haryana.

MATERIALS AND METHODS

The field experiment was conducted to study the population dynamics of mustard aphid on *Brassica juncea* genotype RH 725 and their relation to weather parameters during the *rabi*season of the year 2019-20 and 2020-21 at farmer's field, Kolana village, Aravalli Hills Region, Rewari, Haryana. The surveyed area situated at 28°12'24.7"N latitude, 76°21'11.0"E longitude and altitude 296 m above sea level. The soil was sandy loam in texture.RH 725 variety was sown on 20th October in plot of 250 m^2 size and spacing between row to row and plant to plant was 30 and 10 cm, respectively and separated by a strip of one meter all around. All the recommended agronomic practices were followed to raise the good crop except plant protection measures. The population of mustard aphid was recorded at weekly intervalstarting from the initial appearance till harvest. Fifty plants were selected randomly from the select area of the variety RH 725. The number of aphids was recorded from the 10 cm main apical shoot (Sharma *et al*., 2019). Weather

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Table 1. Population dynamics of mustard aphid (Pooled of *rabi*, 2019-20 and 2020-21)

SMW	Weather parameters								
	Temperature (°C)		Humidity (%)		Sunshine (hrs)	Rainfall (mm)	Wind velocity (km h^{-1})	Evaporation (mm)	*No.of aphids $plant^{-1}$
	Maximum	Minimum	Morning	Evening					
3	17.15	5.30	96.0	64.5	3.45	2.80	3.50	1.10	1.36
4	19.90	5.70	89.5	44.0	6.10	0.70	3.80	2.20	2.85
5	21.90	4.05	92.5	39.5	7.35	5.00	2.35	3.00	6.04
6	22.30	5.00	93.5	38.5	7.50	-	2.45	2.70	11.28
7	26.70	8.30	87.0	33.5	7.85	-	2.85	3.90	20.01
8	26.75	9.25	91.5	39.5	6.65	0.70	2.95	3.90	31.42
9	28.85	12.10	86.5	37.5	4.10	13.90	3.70	3.64	45.59
10	27.90	12.05	87.5	41.0	6.40	25.65	4.05	3.40	7.24
11	28.70	12.20	73.0	33.0	6.30	6.70	3.35	3.25	1.17

*Average of 50 plants; SMW: Standard Meteorological week

Table 2. Correlation between weather parameters and mustardaphid population (Pooled of*rabi*, 2019-20 and 2020-21)

Weather Parameters	Temperature (°C)		Humidity (%)		Sunshine (hrs)	Rainfall (mm)	Wind velocity (km h^{-1})	Evaporation (mm)
	Maximum	Minimum	Morning	Evening				
Correlation	0.541	0.415	0.042	-0.338	-0.152	0.097	-0.000	0.617

**Significant at P =0.05

data were obtained from meteorological observatory, CCSHAU Regional Research Station, Bawal,Rewari, Haryana. The correlation coefficient between the weather parameters and aphid population was calculated using statistical software OPSTAT (Sheoran *et al*., 1998).

RESULTS AND DISCUSSION

The pooled data (*rabi*, 2019-20 and 2020-21) revealed that the first incidence of mustard aphid (1.36 aphids $plant^{-1}$) was observed during 3rd standard meteorological week (SMW), when weekly average temperature (maximum and minimum), humidity (morning and evening), sunshine hours, rainfall, wind velocity and evaporation were 17.15 and 5.3°C, 96 and 64.5 %, 3.45 hrs., 2.8 mm, 3.5 km h^{-1} and 1.1 mm, respectively. Successively, the aphid population increased gradually in the coming weeks till it reached to maximum number of 45.59 aphids $plant^{-1}$ in the 9th SMW. During this period the weekly average maximum and minimum temperature were 28.85 and 12.1°C, while morning and evening humidity, sunshine hours, rainfall, wind velocity and evaporation were 86.5 and 37.5 %, 4.1 hrs., 13.9 mm, 3.7 km h^{-1} and 3.64 mm, respectively. Thereafter, population of aphid declined abruptly and reached minimum levels of 7.24 and 1.17 aphids $plant^{-1}$ during 10th and 11th SMW, respectively (Table 1 and Fig. 1). These results agree with those of Sharma *et al*. (2019) according to which, the incidence of mustard aphid started (1.25 - 5.38 aphids 10^{-1} cm main apical shoot) during 3rd (BSH1) and 5th SMW (RH 0749 and HNS 0901) and reached its peak (23.33-31.98 aphids 10^{-1} cm main apical shoot) during 6th (BSH1) and 9th SMW (RH 0749 and HNS 0901) under timely sown crop. The present results are also in accordance with earlier results of Zia and Haseeb (2019), who reported the first appearance of the aphid population in the 3rd standard week (72.00 aphids $plant^{-1}$) and contradicts with those on first incidence of aphid population (1st standard week) with Rahul *et al*. (2020) and Bavisa *et al*. (2018). Present observations are also in conformity with Choudhury and Pal (2009), who reported peak level of aphid population from 7th to 9th standard week.

The data registered on the correlation coefficients

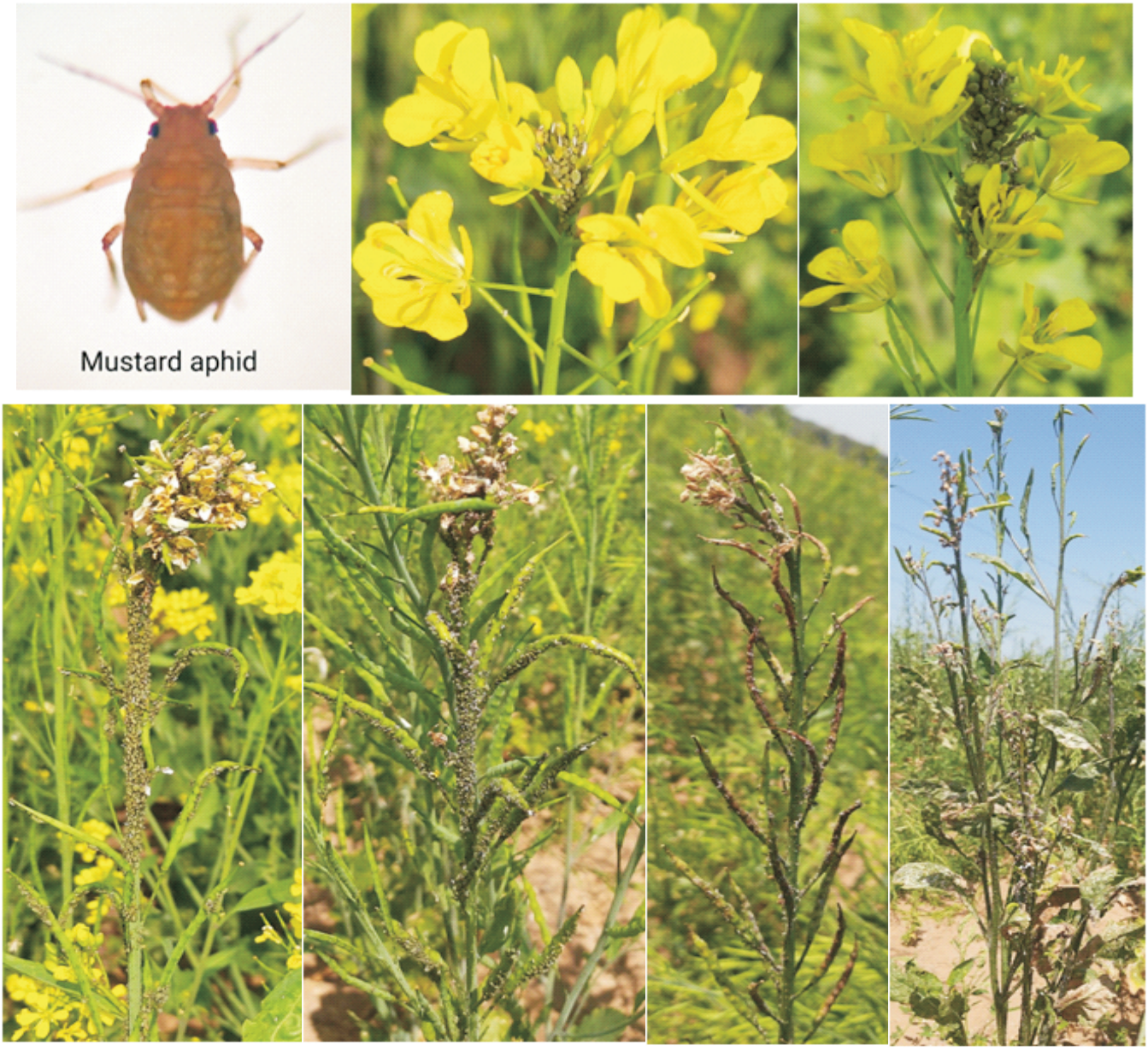

Plate 1. Infestation of mustard aphid, *Lipaphiserysimi* on *Brassica juncea* genotype RH 725

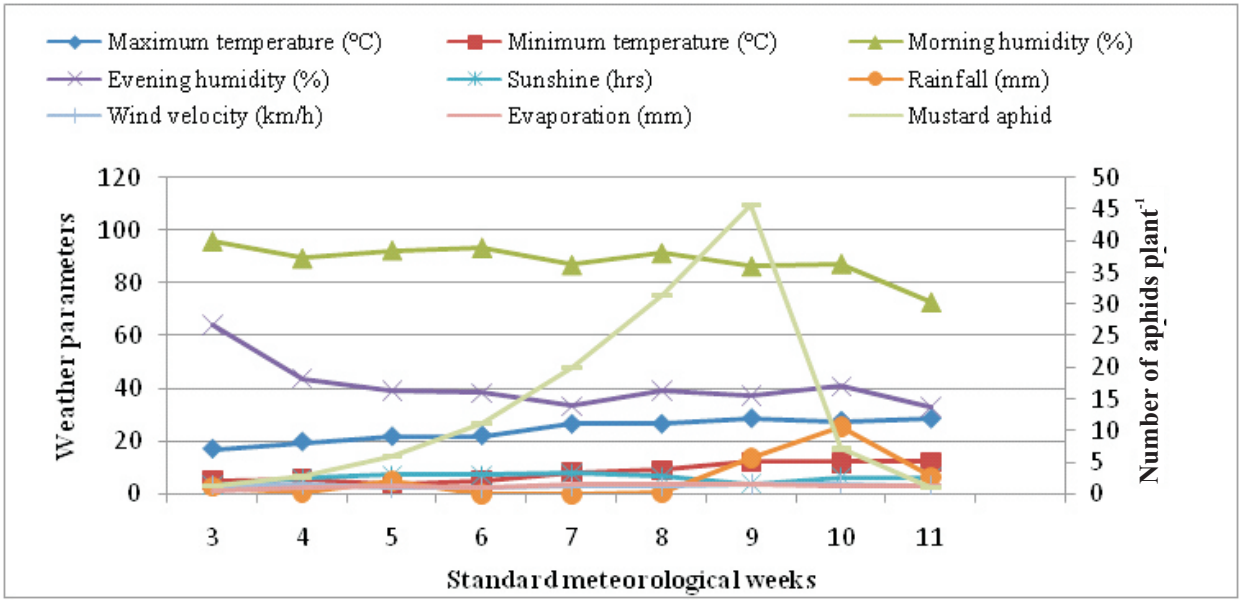

Fig. 1. Population dynamics of mustard aphid, *Lipaphiserysimi* (Pooled of *rabi*, 2019-20 and 2020-21)

(r) revealed a non-significant positive correlation of aphid population with maximum (r =0.541) and minimum (r =0.415) temperature, morning humidity (r =0.042), rainfall (r =0.097) and evaporation(r =0.617), and there existed a non-significant negative correlation with evening humidity (r = -0.338), sunshine(r = -0.152) and wind velocity(r = -0.000) (Table 2).The results given above conform to those of Bavisa *et al*. (2018), who reported a non-significant positive correlation of aphid with maximum temperature (r = 0.541) and non- significant negative one with evening relative humidity (r = -0.338). Sharma *et al*. (2019) also indicated that maximum and minimum temperature (RH 0749 and HNS 0901) exerted a non-significant positive association with aphid population, while the morning relative humidity (BSH1) exerted a non-significant negative correlation and contradicts with those on evening relative humidity and wind speed with Das *et al*. (2019). Similar results were also found by Singh and Lal (2012), who observed maximum temperature and rainfall had non-significant positive relationship and in contrast the non-significant negative correlation with minimum temperature and sunshine. Present results are also disparity with those on maximum and minimum temperature with Zia and Haseeb (2019).

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