WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Resistance Potential in Mustard against Mustard Aphid (*Lipaphis Erysimi* Kalt.)

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ABSTRACT

Mustard crop seeds are utilized to extract oil, which is utilized in industries well as in domestic purposes. Pakistan is unable to meet its domestic needs from domestic production of mustard crop alongside other crops. Thus, the prime focus is to increase the availability of edible oil through enhanced crop production. On the other hand, insect pests limit profitably and mustard aphid (*Lipaphis erysimi*) is one of the major insect pests that contribute significantly to crop yield reduction. The present study was conducted to evaluate promising genotypes which possess resistance potential to mustard aphid. Twelve genotypes were sown and on aphid appearance during peak activity period, the data was recorded at fortnightly basis for two consecutive years. Data was statistically analyzed, and results showed that all genotypes are less susceptible to brassica aphid as in both years mustard aphid population did not reach the Economic Threshold Level (ETL). Minimum population was observed on KJ-284 (10.156). Besides this, it was also concluded that the temperature has positive correlation with mustard aphid while the relative humidity had negative correlation with the population of mustard aphid.

INTRODUCTION

Mustard (*Brassica juncea*) belongs to family Brassicaceae and it is economically important crop because of seed oil contents and some other plant parts like leaves which are edible. After oil extraction from seeds, very nutritious meal is left and used to feed animals (Shakeel et al., 2019). In Pakistan, it is considered as the second most important source of edible oil. However, Rapeseed and Mustard crops contribute up to 20% in domestic edible oil production. But, the consumption of domestic edible oil is higher than its production i.e. 2.821 million tons in the country out of which about 0.684 million tons are met through local resources and rest of it (2.1 million tons) is met by import (Lashari & Korai et al., 2022)

The mustard crop is more vulnerable to a wide variety of insect pests as compared to other oilseed crops (Shah et al., 2020). Insect-pests are one of the most important factors in reducing the crop yield. About 50 insect species have been reported on mustard crop throughout Asia. Out of many insect pests, mustard sawfly (*Athalia lugens*), leaf miner (*Chromatomyia horticola* Gorreau), painted bug (*Bagrada hilaris*), flea beetle (*Phyllotreta cruciferae* Goeze), diamond back moth (*Plutella xylostella* L.), cabbage butterfly (*Pieris brassicae* L.), mustard aphid (*Lipaphis erysimi* Kalt.), cabbage aphid (*Brevicoryne brassicae* L.), green peach aphid (*Myzus persicae* Sulzer) are considered as major economic insect pests (Patel et al., 2019; Rakha et al., 2017; Sun et al., 2017; Thongjua et al., 2015). Particularly, mustard aphid (*Lipaphis erysimi*) is a key pest that inflicts losses of around 96% in yield, 31% in seed weight and 5-6% in oil contents of canola crops. Yield losses that occur only due to the mustard aphid (*L. erysimi)* in Brassica crops account for approximately 50-75%. Apart from sucking cell sap, it also acts as a vector of many viral diseases (Rana, 2005).

Plants that are resistant to herbivore insect pests have unique physico-morphic and biochemical characters that enable them to resist insect pest infestation. Many factors are involved in plant resistance to insect pests including antixenosis, antibiosis and tolerance (Acquaah, 2012). Due to consumer acceptance, low crop protection costs, higher profitability the varietal resistance has received priority in IPM programs. Cultivation of resistant or tolerant cultivars or plant cultivars is the very effective and cheapest method of cultural control to save the mustard crop from insect pest infestation. Utilization of resistant varieties or germplasm against mustard aphids results in increased production and helps to reduce pesticides residues in the environment (Muhammad, N., & Khan, S. A., 2022). The objective of the present study was to evaluate the resistance ability to the infestation of mustard aphid on promising strains of mustard crop.

Material & Methods

Collection and Sowing of germplasm

The present study was conducted at the farm area of Oilseeds Research Institute (ORI), Ayub Agricultural Research Institute (AARI), Faisalabad, Pakistan in two consecutive Rabi crop growing seasons; 2020-21 and 2021-22. Eleven promising strains; RBJ-15013, RBJ-15017, RBJ-16007, RBJ-17003, RBJ-17005, BRJ-1775, BRJ-1778, 18CBJ-001, 18CBJ-005, KH-284, KJ-294 and Super Raya (An approved cultivar regarded as check), obtained from the Oilseeds Research Institute, Faisalabad were sown at the farm area of the same institute. Crop was sown in the first week of November each year with RCBD design. Row spacing was maintained at 45 cm and fertilizer input ratio was 90:85:60 NPK (kg/ha).

Data Recording and Statistical Analysis

Data for mustard aphid were recorded on five randomly selected plants at their top 10 cm of central shoot. Data recording were started in the first week of February each year and continued up to mid-March of respective year. Data was analyzed, analysis of variance (ANOVA) was constructed and the least significant difference was performed for the differentiation of means among genotypes.

Results and Discussion

Mustard aphid infestation on tested strains represented significant difference among them as expressed in the table. The data recording was started in the first week of February until the mid-March near the maturity stage of the crop as the population was declining. Temperature was being increased gradually so the mustard aphid population started to decline. So, the population of mustard aphid had positive correlation with the temperature. As per table, maximum mustard aphid population (14.022) was found on RBJ-17005 which was significantly different from the other cultivars while minimum mustard aphid population was recorded on KJ-284 (12.156). However, all other strains expressed the same response as there was no significant difference among them and are regarded as same group.

During the second year of experiment (2021-22), the overall mustard aphid population count remained low, but it is evident that no cultivar showed statistically different response to each other. However, maximum population count (14.556) was recorded in case of KJ-294 and minimum population count (11.311) was recorded on BRJ-1778 and 18CBJ-001. It is also evident from the table that all cultivars showed no significant difference among them. The overall population was low due to weather severity and rainfall during the peak active period of mustard aphid population.

Thus, in the both consecutive years, the mustard aphid population remained below Economic Threshold Level (ETL) which is widely considered in the range of 50-60 aphids/upper 10 cm portion of central twig of the plant. Thus, it is inferred that all the tested germplasm was less susceptible to the mustard aphid infestation.

Table. Mustard aphid infestation on mustard genotypes

Sr. No.	Mustard Promising Strains	2020-21	2021-22
1	RBJ-15013	11.444 ab	11.911 a
2	RBJ-15017	12.400 ab	11.822 a
3	RBJ-16007	13.000 ab	13.067 a
4	RBJ-17003	11.378 ab	12.111 a
5	RBJ-17005	14.022 a	12.867 a
6	BRJ-1775	10.778 ab	12.733 a
7	BRJ-1778	12.267 ab	11.311 a
8	18CBJ-001	11.756 ab	11.311 a
9	18CBJ-005	12.467 ab	13.489 a
10	KJ-284	10.156 b	12.156 a
11	KJ-294	11.467 ab	14.556 a
12	Super Raya (C)*	12.067 ab	12.156 a
LSD @ 5%		3.471	3.297

* = Approved cultivar as check.

Abiotic factors considerably affect the incidence of insect pests on crops and the situation was same in case of the mustard aphid infestation on *Brassica* cultivars (Ali et. al., 2002). There was a positive correlation among the insect population and temperature. However, rainfall had negative correlation with the mustard aphid population as it decreased the insect population.

Conclusion

Main purpose of the present study was to detect resistance behavior in promising strains of *Brassica juncea* against mustard aphid (*Lipaphis erysimi*). Data recorded were also statistically evaluated and there was no significant difference among cultivars. It was also concluded that temperature exhibited positive correlation with population of insect pests, but rainfall and relative humidity showed negative correlation with the population of mustard aphid.

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