International Journal of Research Publication and Reviews

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

Evaluation of Susceptibility in *Brassica Napus* against Mustard Aphid (*Lipaphis Erysimi* Kalt.)

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DOI: https://doi.org/10.55248/gengpi.4.1223.123539

ABSTRACT

Brassica is one of the major oilseed crops. Its seeds can be utilized to extract refined oil, which is utilized for both industrial chemical manufacture and cooking. It is a great food source that may be utilized as oil for industrial and commercial uses because it contains 25–30% protein. Due to its unique fatty acid composition, mustard oil is indigestible to both humans and animals. Pakistan is among the nations that import edible oil. 0.680 million tons of edible oil are produced locally, making up nearly 25% of the world's edible oil consumption. Insect pests are one of the factors that limit the amount of crops that can be produced profitably, among insect pests brassica aphid (*Lipaphis erysimi*) is one of the major insect pest that contribute significantly to crop yield reduction. Keeping in view all these problems of insect problem present study was planned to evaluate those genotypes which are less susceptible to brassica aphid. Twelve genotypes were sown and on aphid appearance the data was recorded at fortnightly basis. The same experiment was repeated for two consecutive years. Data was statistically analyzed and results showed that all genotypes are less susceptible to brassica aphid. Minimum population was observed on KN-336 and Sandal Canola which was 8.200d and 9.600cd respectively. It concluded that entire evaluated germplasm of *Brassica napus* was less susceptible to mustard aphid (*Lipaphis erysimi*) and temperature exhibited positive correlation with population of insect pests and relative humidity showed negative correlation with the population of mustard aphid.

Introduction

The mustard plant's widespread cultivation and agricultural significance have led to its use as a condiment around the world. Its seeds can be utilized to make refined oil, which is utilized for both industrial chemical manufacture and cooking (Słowik-Borowiec, et al., 2015. Because of its high demand and the compounds derived from it because of its high vitamin C content, which strengthens the immune system, it is very important to the agricultural sciences. In order to combat bacteria and parasite infections, it also stimulates natural killer cells (Siraj et al., 2018).

It is a great food source that may be utilized as oil for industrial and commercial uses because it contains 25–30% protein (Siraj et al., 2018 & Ahmed et. al., 2013). Due to its unique fatty acid composition, mustard oil is indigestible to both humans and animals. It contains roughly 20–28% oleic acid, 10–12% linoleic acid, 9.0–9.5% linolenic acid, and 30–40% erucic acid. It is extensively utilized in the large-scale manufacture of condiments (Dorsainvil, et al., 2005).

Despite being an agricultural nation, Pakistan continues to spend millions of dollars importing edible oil, significantly depleting the nation's foreign exchange reserves. The nation's domestic oil production was unable to keep up with the population's increasing demands. Out of all the oilseed crops, mustard and rapeseed make up 21% of the country's oil production; nonetheless, the oil's quality is poor because they contain glucosinolates and erucic acid. Erucic acid lessens flavor and taste, but glucosinolates, when consumed in large amounts, not only induce goiters, a nutritional disorder, but also negatively impact an animal's ability to grow and reproduce (Tahir, et al., 2007).

Pakistan is among the nations that import edible oil. 0.680 million tons of edible oil are produced locally, making up nearly 25% of the world's edible oil consumption. The remaining amount must be imported, which will cost Rs. 77.78 billion a year (Anon., 2010). Canola oil is widely used as an edible oil among members of the mustard family (Cruciferae) due to its lower concentration of glucosinolates and erucic acid (Hasan et al., 2014). Canola has only 4.2% share in total edible oil production of Pakistan. Canola cultivation involves high input investment and low out puts in comparison to other winter crops.

Table 2.6: Area and Production of Major Oilseed Crops (000 Tonnes)

Crops	2021-22			2022-23 (P)		
	Area (000 Acres)	Production		Area (000 Acres)	Production	
		Seed	Oil		Seed	Oil
Cottonseed	4,740	2,126	255	5,103	1,244	149
Rapeseed & Mustard	798	478	153	1,260	785	251
Sunflower	133	83	32	179	124	47
Canola	122	81	31	200	130	49
Total	**5,793**	**2,768**	**471**	**6,742**	**2,283**	**496**

P: Provisional
Source: Pakistan Oilseed Department (POD), Pakistan Bureau of Statistics

Insect pests are one of the factors that limit the number of crops that can be produced profitably, among other factors. By sucking the sap from the plant, attracting fungal spores that cause plant diseases, and acting as a carrier of plant viruses, aphids are significant insect pests of canola plants that ultimately contribute significantly to crop yield reduction (Irshad, 2001; Emden & Harrington, 2007). Lipaphis erysimi Kalt. (Homoptera: Aphididae) has been identified as the dominant insect pest on Brassica species (Farooq, 2007). Aphids multiply very rapidly under favorable conditions on leaves, stems and inflorescence from where these pests suck the sap. They cause direct feeding damage to plant and transmit different viruses to a particular crop. Due to the attack of aphids on *Brassica,* infested pods and seeds remain stunted (Aslam, et al., 2011). Aphid infestation caused a yield loss that ranged from 35.4 to 91.3%, but it could be as high as 97% (Yadava & Singh, 1999).

Materials and Methods

Collection and Sowing of genotypes

Twelve genotypes were obtained from Oilseeds Research Institute (ORI), Ayub Agricultural Research Institute (AARI), Faisalabad, Pakistan. The tested genotypes comprised of Eleven promising strains viz; RBN-14017, RBN-16014, RBN-17014, RBN-18006, RBN-18007, 18 CBN 001, 18 CBN 008, KN-312, KN-327, KN-330, KN-336 and one approved variety; Sandal Canola.

These genotypes were evaluated in two consecutive crop growing seasons; 2020-21 and 2021-22 at farm area of Oilseeds Research Institute, Faisalabad. Crop was sown in the first fortnight of November with RCBD design. Row spacing and plant spacing was maintained at 45 cm and 15 cm respectively while 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 and continued up to mid-March. Data was analyzed, analysis of variance (ANOVA) was constructed and the Tuckey's HSD was performed for the differentiation of means among genotypes regarding susceptibility of genotypes against mustard aphid.

Results and Discussion

Mean population comparison of mustard aphid for the cultivars represented significant difference among them (Table 1). 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 1, maximum mustard aphid population (14.556) was found on RBN-14017 which was significantly different from the other cultivars while minimum mustard aphid population was recorded on KN-336 (8.200). RBN-17014, RBN-18006, KN-312 and KN-327 exhibited the same response as there was no significant difference among them (Table 1). Similarly, RBN-18007, 18 CBN 001, 18 CBN 008 and KN-330 showed similar response to each other and 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 (13.422) was recorded in case of RBN-17014 and minimum population count (10.511) was recorded in case of RBN-16014. It is also evident from Table 2 that all cultivars showed no significant difference among them. The overall population was low due to harshness of weather 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. However, it is inferred that all the tested germplasm was less susceptible to the mustard aphid infestation.

Table Mean Population of aphid for the years 2020-21 and 2021-22.

Sr. No.	Varieties	Mean 2020-21	Mean 2021-22
1	RBN-14017	14.556 a	11.667 a
2	RBN-16014	10.978 bcd	10.511 a
3	RBN-17014	11.978 abc	13.422 a

4	RBN-18006	12.222 abc	11.511 a
5	RBN-18007	13.533 ab	12.689 a
6	18 CBN 001	13.467 ab	10.556 a
7	18 CBN 008	13.711 ab	13.889 a
8	KN-312	11.889 abc	11.556 a
9	KN-327	11.578 abc	11.267 a
10	KN-330	12.822 ab	11.956 a
11	KN-336	8.200 d	12.422 a
12	Sandal Canola	9.600 cd	11.756 a

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 napus* cultivars (Ali et. al., 2002). Positive correlation was found between insect population and temperature for the population buildup. However, rainfall had negative correlation with the mustard aphid population as it decreased the insect population.

Conclusion

This experiment concluded that entire evaluated germplasm of *Brassica napus* was less susceptible to mustard aphid (*Lipaphis erysimi*). Data recorded were also statistically evaluated and there was no significant difference among cultivars. The cultivars interaction was developed and cultivars represented significant difference among themselves when evaluated on different data recording dates. It was also concluded that temperature exhibited positive correlation with population of insect pests and relative humidity showed negative correlation with the population of mustard aphid.

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