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# SCREENING OF DIFFERENT GERMPLASMS OF BRASSICA AGAINST APHIDS IN TANDOJAM, PAKISTAN

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**ABSTRACT**

Edible oil is important need of Pakistan, its demand in Pakistan is high while domestic production meets only twenty percent, now time has come to increased its production. Brassica oil seed crop have short growth cycle, high produce and russet seed color. It is a potentially useful crop and can be replenish the cleft between supply and demand in Pakistan. This experiment was designed to screen the twenty six genotypes of Brassica (*Brassica campestris* and *Brassica juncea*) to ascertain aphids population and produce. In order to examine the vogue of aphid population and yield, the collected data was analyzed statistically, results depicted that variations present within the checked germplasms for both study variables. Aphid population was minimum on NM-2 (NIFA) (30.33 aphids/plant) and maximum (149.8 aphids/plant) on Chahiate-NIFA. For grain yield, NM-2 (NIFA) gave the highest yield (588.33 g/3.6 $m^2$), and Chahiate-NIFA yielded the lowest (300.0 g/3.6 $m^2$). Our results for the tested genotypes concluded that due to the infestation of aphids, the growth and yield of plants get negatively affected. This study will be equally beneficial for breeders & grower's and will also help out in growing the selected tolerant varities of Brassica against insect pests.

**Key-words :** *Brassica*, aphids, infestation, yield, growth.

## INTRODUCTION

Brassica crops are grown worldwide for food, oil and animal feed and have been cultivated for thousand of years. Brassica is a genus of Mustard plants (Family: Brassicaceae) and it have less intensity of erucic acid and glucosinolates (Love *et al*., 1990). Oil seed crops is a plant grown primarily for the production of vegetable oil, which is used in food, biofuels, and industrial applications. These crops are typically grown for their oil rich seeds which are extracted and processed for various uses. Rape and mustard are vital source of vegetable oil, these crops grown in the Rabi season (winter). During the Fiscal Year-2023, estimated local production of edible oil was 3.177 million tones (Anonymous, 2022-23).

The consumption of vegetable oil is increasing day by day due to rising population pressure. In Pakistan oil seed crop Brassica (Rapeseed and Mustard) are considered second largest origin of vegetable oil after cotton seed. Researcher's use different methods to control aphids in order to avoid from the pest damage in Brassica crop. Scientist use marker assisted biotechnological tools to alter the genetic makeup of plants, in this way internal defense mechanism get stronger against the attacking pests and resistance is created in host plants (Chhaya Atri *et al.,* 2012). Now a days, biological control techniques are also very useful in agro-ecosystem. Unfortunately in our country local available varieties of brassica have not much immunity against aphid attack (Amer *et al.,* 2009 and Aslam *et al.,* 2009).

Different insect pests like aphid, white fly, painted bug, pea leaf miner and saw fly random way attack on the *Brassica* spp., but aphids are very serious pests (Agarwal and Datta, 1999). Aphids enhance their population with fast way when environment is favourable, they attack on leaves, stems and inflorescence, suck the sap from these parts. When aphid attack on the pods of Brassica crop, as a result seeds become weaker and their growth almost retarded (Devi *et al.,* 2002). The produce losses span normally 30-35% has been observed due to the infestation of aphids on *Brassica* spp. Phadke (1985), but yield losses may rise up to 70% in case of severe attack of aphids on *Brassica* (Bhatti *et al.,* 1976). Aphid infestation causes significant losses in Brassica crops in Pakistan, maximum percentage loss of 70.77% in yield per hectare was reported by Umair Faheem *et al.* (2022).

Aphids are considered serious sucking pests of Brassica crop and profusely dispersed at the big scale in the world. Nymphs and adults both use their mouth parts to pierce the plant cells and suck out the sap, which contains nutrients like sugars, amino acids and other organic compounds. This feeding behaviour can weaken the plant and make it more susceptible to disease and other stressors (Khan and Ahmed, 1967). Insect pests are big hurdle for

farmers in getting high yield of crop. Almost thirty species of insects have been identified that attack on Brassica plants, but among all the aphids are very severe pests (Stanley and Marcroft, 1999 and Micic, 2005). Aphids after sucking the cell sap from the tender leaves and branches of brassica plants produce honey dew, this honey dew secretion of aphids further invite another pathogenic fungi and disease. As a vector, aphids have critical role in spreading the disease and in reducing crop yield (Irshad, 2001 and Emden and Harrington, 2007). The most prevailing specie of mustard aphid (Homoptera: Aphididae) that has been reported is *Lipaphis erysimi* (Farooq, 2007). A good field related knowledge of Brassica, its pests and plant related diseases is essential requirement before going to cultivate Brassicasae family. It can be suggested that for growers practiceable (IPM) integrated pest management programme like host plant resistance is the most cheap and useful method for the farmer's.

## MATERIALS AND METHODS

### Location:

This screening experiment was executed at NIA Farm Tandojam, during 2022-2023. Twenty six type of Brassica germplasms were screened against aphids infestation; the crop was sown at the end of October. Three replications of each line/germplasms were sown in 3.6 $m^2$ plots, each plot have three rows at a distance of 30 cm.

### Agronomic practices:

Agronomic practices were used with uniform way in the whole study and there was no chemical practice in overall replications. Nitrogen and phosphorous fertilizers were given at the time of sowing and flowering stage. Experimental plots were left for natural infestation of insect pests.

### Data collection:

Aphid data was recorded on weekly basis as the infestation start and continued till the maturity of crop. Randomly five plants were selected from each replicate for recording the data about aphids on per plant basis. Aphids were counted from leaves, stem and from inflorescence. After the harvesting & threshing yield data was also recorded from each plot of 3.6 $m^2$.

### Statistical analysis:

Overall compiled data was then converted to mean values to have the surveys on per plant basis. Mean values of aphids and yield characteristics were analyzed by analysis of variance (ANOVA) through computer software Statistix 8.1.

## RESULTS

Present study was conducted during 2022-23 (Table 1) divulged significant variation among selected genotypes of *Brassica.* Host plant resistance (HPR) is vital component of integrated pest management (IPM) strategies. After compiling the results, it was found that complete genetic resistance against aphids (*Myzus persicae*) attack is not present in any of the tested germplasm. However, on variety NM-2 (NIFA) the least aphids population (30.33 aphids/plant) was observed, that depicting genetic line is very resistant. Maximum infestation of aphids (149.8 aphid/plant) was noted on variety Chahiate-NIFA, showing its susceptibility (Table I).

As we know, aphids population directly linked with plant health and yield during the rising season. The maximum produce of 588.33 g/3.6 $m^2$/plot, was recorded by genotype NM-2 (NIFA), followed by NM-3 (NIFA), JS-13 and Taramira (Punjab), where recorded yield was 558.33, 533.33 and 366.67 g per plot, correspondingly. The minimum produce was achieved by variety Chahiate-NIFA (300.0 g/plot), followed S-9 4006 (NIA) and TSA-5005 (5) showing 351.67 and 375.00 g/plot in that order (Table I). Results disclosed that very clear resistance responses were noticed in the group of rape seed & mustard genotypes for aphids infestation and grain produce, as postulated in the consequent discussion.

In general, these results agreed with the findings of other workers such as Yadav *et al*. (1991), Bhadauria *et al*. (1992), Kher and Ratual (1992), Lipadhia *et al*. (1992), Upadhyay *et al*. (1992), Alipieva and Nankova (1996) and (Umair Faheem *et al.,* 2022) who have revealed significant connections between number of aphids and crop yield.

**Table 1. Mean aphids population on different brassica genotypes during 2022-23.**

| Sr. No. | Genotypes | Aphids/Plant | Yield in grams/3.6m$^2$ |
|---|---|---|---|
| 1. | NM-2 (NIFA) | 30.33 J | 588.33 A |
| 2. | NM-3 (NIFA) | 31.16 J | 558.33 AB |
| 3. | MM-1/17 (NIFA) | 48.41 HI | 523.33 BC |
| 4. | MM-2/17 (NIFA) | 80.83 DEF | 445.00 EFGH |
| 5. | MM-3/17 (NIFA) | 73.25 EFG | 425.00 GHIJK |
| 6. | NIFA Raya | 95.0 BC | 386.67 IJKLM |
| 7. | Chahiate - NIFA | 149.8 A | 300.00 N |
| 8. | S-9 4001 (NIA) | 85.83 CDE | 403.33 HIJKLM |
| 9. | S-9 4002 (NIA) | 91.66 CD | 380.00 IJKLM |
| 10. | S-9 4003 (NIA) | 49.66 H | 490.00 CDE |
| 11. | S-9 4004 (NIA) | 66.91 FG | 425.00 GHIJK |
| 12. | S-9 4005 (NIA) | 66.16 G | 458.33 DEFG |
| 13. | S-9 4006 (NIA) | 146.17 A | 351.67 MN |
| 14. | S-9 4007 (NIA) | 65.50 G | 430.00 FGHIJ |
| 15. | Agati-S-4008 (NIA) | 69.66 FG | 423.33 GHIJK |
| 16. | Agati-S-4009 (NIA) | 87.08 CDE | 400.00 HIJKLM |
| 17. | Agati-S-4010 (NIA) | 45.83 HI | 500.00 CD |
| 18. | Agati-S-4011 (NIA) | 67.91 FG | 416.67 GHIJKL |
| 19. | Agati-S-4012 (NIA) | 92.16 BCD | 383.33 IJKLM |
| 20. | S9-4013 (Parent) | 69.91 FG | 433.33 FGHI |
| 21. | TSA-5002 | 105.75 B | 376.67 JKLM |
| 22. | TSA-5005 (5) | 105.92 B | 375.00 KLM |
| 23. | Sindh Raya (ARI) | 50.50 H | 483.33 CDEF |
| 24. | JS-13 | 34.75 IJ | 533.33 BC |
| 25. | Taramira (Punjab) | 41.66 HIJ | 366.67 LM |
| 26. | Brown Raya (NIA) | 77.0 EFG | 410.00 GHIJKL |
| | $LSD_{0.05}$ | 14.00 | 54.15 |

*Means that do not share a letter in columns are significantly different.

## DISCUSSION

The *Myzus persicae*, also known as the green peach aphid, belongs the family: Aphididae and order: Hemiptera. Its population start to increase and usually obtained his maximum level when crop reached at pods stage. When crop of Brassica starts to get mature, at that time plant leaves and branches become less succulent and insect population naturally reduced (Mamun *et al*., 2010 and Ahmad *et al*., 2013). It can be concluded that grain production of few germplasms was observed maximum due to less aphid population and secondly it also shows that genetic material of screened line for getting production is very good. But minimum yield of the varieties was due to maximum aphids population attack.

Genetic potential of genotype & its resistance ability against aphids or pests is a prime factor that contribute in overall efficiency of genetic line. Result showed that aphid is a notorious pest of Brassica crop, when severe attack of aphids take place then development as well as yield of plants negatively affected (Razaq *et al*., 2011). It can be concluded that from the results of above studies, genotype NM-2 (NIFA), was very resistant for clutching minimum aphid population and also perform best yield wise. Variety Chahiate-NIFA was too much susceptible against aphids and poorer in yield traits. Field selection of above discussed genetic lines against aphids expressed that aphid infestation number and yield performance varied with variety to variety. Researcher's use various tools to detect the resistance or susceptibility of oilseed (brassica) genotypes against aphids.

The present research was executed at NIA farm as an effort to collect valuable knowledge on genotypes of various qualitative and seed yield related traits of brassica in order to support our Brassica breeding programme. Our results will definitely help in elimination of misunderstandings and also support the researchers to improve brassica traits like oil quality and yield potential. We also hope that knowledge delivered here about insect pests and yielding

potential of examined varieties will help and influence farmers to perk up agricultural practices and consequently oilseed production.

## CONCLUSIONS

The genotypes NM-2 (NIFA) and NM-3 (NIFA) sustained lowest aphid infestation at the time of experiments and were found most tolerant with high yield. These germplasms can be integrated in future breeding programs for resistance enrichment and also in IPM programs for the control of pest to evade yield losses.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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