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POPULATION TREND OF APHID (*Lipaphis erysimi* Kalt) ON CANOLA (*Brassica spp.*) CULTIVAR IN PESHAWAR

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ABSTRACT

Four canola cultivars viz, (Durre-NIFA, Abasin, Raya-NIFA and Bulbul) were tested for their resistance/tolerance against aphid (*Lipaphis erysimi*) attack in randomized complete block design (RCBD) at the new developmental farm of Khyber Pakhtunkhwa agricultural university Peshawar, during the rabi season of 2011. The results of overall mean revealed that minimum aphid infestation (25.48) leaf^{-1} was recorded on canola cultivar Bulbul and maximum aphid infestation (58.67) leaf^{-1} was recorded on Raya-NIFA. Similarly the highest aphid (30.19) infestation per 2.8 cm of inflorescence was recorded on the Raya-NIFA and the lowest number (12.19) of aphids/2.8 cm of inflorescence was recorded on Bulbul. The cultivar Raya-NIFA could not tolerate aphid attack and resulted in stunted growth. Bulbul resulted in maximum yield (3085.56), oil content (49.1), siliqua plant^{-1}(117.96), 1000-seed weight (14.17), seed siliqua^{-1} (22) and low aphid infestation. Raya-NIFA presented better result to plant height (127.215), protein content (23.5) and moisture content (4.0). It was concluded from the study that aphid population on all the tested cultivars fluctuated and non of the cultivar showed complete resistance to aphid during most of the season probably due to lack of antixenosis or antibiosis. However, the data on yield and other agronomical characteristics indicated that the cultivar Bulbul possess some levels of resistance.

Keywords: Aphid infestation, canola cultivars, correlation of aphid infestation, plant characteristics

INTRODUCTION

Brassica napus L. belong to the family Cruciferae. Commonly this crop is known as "Sarsoon". The most important types grown in Pakistan are *Eruca sativa, B. campestris, B. juncea* and *B. napus*. Rape seed refers to *B. campestris* and *B. napus*. Local type (Desi) belongs to the *B. compestris* group. This group also contains yellow sarsoon, brown sarsoon and toria. Due to low concentration of erucic acid and glucosinolate content *B. campestris* and *B. napus* have been preferred over other species of *Brassica*. Human use its oil for food and oil seed cake (Khal) can be used for cattle. The edible oil production in Pakistan is low. In Pakistan after cotton seed, the rape seed and mustard seeds are vital source of edible oil due to their 17% contribution in oil production (PARC, 1998).

The name canola refers to the cultivars of those species that produce seed with lower level of glucosinolate and erucic acid than rape seed cultivars. In Pakistan, "canola" (*B. napus* and *B. campestris* .) is attaining the status of leading oil seed crop. Pakistan oil seed development board (PODB) has developed synthetic and hybrid varieties of canola with indigenous resources. Indigenous varieties performed better than the exotic varieties under different agro-ecological conditions of the country. Local canola seed production has resulted in self-sufficiency in the seed requirements of the country and now Pakistan is not importing any canola seed (Mohammad, 2008). The oil production can further be increased by improving the normal agronomic practices and overall by protecting the crop from the attack of insect pests. The production of edible oil in Pakistan is meeting only 25% of the total requirements. Presently, cotton is the most important crop of Pakistan, contributing more than 60% of the domestic production, while rape seed-mustard is the second important

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crop contributing more than 17% to domestic oil seed production (Mohammad, 2008).

Canola crop is attacked by several insect pests, but one of the most important insect is aphid which causes serious damage to this crop. Twenty-one insect pests feeding on canola crop in the world (Kelm and Gadomski, 1995). In Pakistan, oil seed *Brassica* crops are mainly damaged by *L. erysimi* and to a lesser extent by *B. brasicae* and *M. persicae* . Blackman and Aestop (2000) reported that canola aphid (*L. erysimi*) is the most destructive pest of *Brassica* crops. Louse-like, pale-greenish nymphs and adults cause damage. They suck cell sap from leaves, flowers and pods. They can be seen feeding in large numbers, often covering the entire surface of leaf, flower buds, shoots and pods. In severe infestation, the growth and development of the crop is ceased completely, resulting into seed yield losses up to 77 % and reduction in oil seed contents about 11 % (Kelm and Gadomski, 1995).

Many characters are responsible for plant resistance which include negative and positive effect on natural enemies and herbivores (Afzal and Bashir, 2007). Different authors observed different times of initiation of aphid infestation on *Brassica*. Infestation was reported to start in the first week of January (Biswas and Das, 2000), second week of January (Mar *et al.,* 2000) or second week of February (Aslam *et al.,*2002) depending on the location and season. Similarly, population peaks were also reported to occur at different times during the *Brassica* growing seasons. Peak aphid population has been reported during the second week of February (Singh and Lal, 1999; Biswas and Das, 2000), last week of February (Rohilla *et al.,* 1996) and second week of March (Aslam *et al.,* 2002).

The predominant species of aphids infesting this crop is *L. erysimi*. However, *M. persicae* also often associated with the damage. Aphids colonies feed on growing shoots, inflorescence and underside of the leaves. Poor pods formation and stunted growth is due to the high aphid on whole plant crom. (Maiti *et al.,* 1988). Canola aphid can be controlled conventionally in a number of ways, like cultural, biological, chemical and mechanical. Use of resistant varieties is one of the effective control tactics in the pest management. The resistance varieties escape the damage from insect pests by antixenosis, antibiosis or tolerance. The method is not only effective, but economical, environmentally safe and compatible with other control tactics of pest management (Mohammad, 2008). Keeping in view the above facts, the present study was conducted to screen out the resistant cultivars of canola to aphid. To evaluate the chemical composition of canola cultivars and co-related with the aphid infestation. To determine the peak and fall down of aphid infestation on canola cultivars.

MATERIALS AND METHODS

To determine the comparatively resistant canola cultivar to the attack of aphid (*L. erysimi.* Kalt.), an experiment was conducted at new developmental farm of Khyber Pakhtunkhwa Agricultural University Peshawar during the rabi season 2010-11. The experiment was laid out in randomized complete block design (RCBD). Four canola cultivar viz, Bulbul, Abasin, Raya-NIFA and Durre-NIFA were selected to evaluate their resistant/tolerance against aphid. Each cultivar was replicated four times.

The plot size for each cultivar per replication was 5 × 2 meters having five rows. Each row was 5 meters long. Row to row and plant to plant distances were kept 35 cm and 15 cm, respectively. Weekly data were recorded on the basis of number of aphids' on upper, middle and lower leaves of three plants respectively. First data was recorded at 3 to 4 leaves stage of plants. When the inflorescence was appear then data was taken by counting aphids on silique upper potion (2.8 cm) of inflorescence. The following components were also studied at the time of harvesting of crop

1. Height of plant
2. Number of silique/ plant
3. Number of seeds/ silique
4. Thousand seed weight
5. Seed yield / plant

The data were analyzed statistically using two way ANOVA test. The above mentioned components were correlated with the aphid infestation. Means were separated using LSD test at 5% level of significance using MSTAT-C package (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The present experiment was conducted in newly developmental farm of Khyber Pakhtunkhwa Agricultural University Peshawar during 2011. The experiment was laid out in randomized complete block design (RCBD) with treatments *i.e.* four canola cultivars viz; Durre-NIFA, Abasin, Raya-NIFA and Bulbul. The population of aphid on all canola cultivars was recorded from January to March 2011 and are given in Table-1 and their complete statistical analysis in Appendices from I-XIV.

The data from the Table1 showed that no aphid attacked was recorded on Durre-NIFA and Raya-NIFA during January 2011. However on cultivar Abasin the population of aphids/leaf was 1.5, 3.5, and 3.5 during 14th, 21st and 28th January 2011 respectively. Similarly on cultivar Bulbul 0.5, 2.25 and 2.25 aphids/leaf were recorded on the above mentioned dates of January 2011 respectively. Statistical Analysis of the data indicates that Durre-NIFA and Raya-NIFA has no aphid infestation in January 2011 (Table 1) and are significantly different from Abasin and Bulbul. Overall average infestation of aphids/leaf during the month of February showed on average of 5.31, 5.5, 6.56 and 6.43 aphids/leaf were recorded on Durre-NIFA, Abasin, Raya-NIFA and Bulbul respectively. However the statistical analysis of the data showed no significant differences among the cultivars during the month of February. The average infestation of aphids/ leaf during the month of March showed that on average of 169.58, 154.33, 146.16 and 67.66 were recorded on Raya-NIFA, Abasin, Durre-NIFA and Bulbul respectively in descending order. However the statistical analysis of the data shows that the Raya-NIFA, Abasin, Durre-NIFA was significantly different from Bulbul. The overall seasonal average infestation of aphids/leaf during three months (January, February and March) showed that average of 50.46, 54.06, 58.67 and 25.48 aphids/leaf were recorded on Durre-NIFA, Abasin, Raya-NIFA and Bulbul respectively (Table 1). The highest aphid infestation leaf^{-1} was recorded on Raya-NIFA (58.67) followed by Abasin (54.06)

Table 1
Seasonal aphid infestation/leaf on different canola cultivars during 2011.

Cultivars	January				February					March				Overall Mean
	14th Jan	21st -Jan	28th Jan	Mean	4th Feb	11th Feb	18th Feb	25th Feb	Mean	3rd Mar	10th Mar	17th Mar	Mean	
Durre-NIFA	0b	0b	0b	0b	1.25b	7.00a	4.75c	8.00ab	5.31a	3.75a	261.5 a	173.25ab	146.16a	50.46
Abasin	1.5a	3.5a	3.5a	2.83a	3.75ab	5.25a	9.25a	3.75c	5.5a	4.5 a	281.75a	169.25ab	154.33a	54.06
Raya-NIFA	0b	0b	0b	0b	1.25b	8.5a	7.5ab	9.00a	6.56a	7.75 a	246.75a	254.25a	169.58a	58.67
Bulbul	0.5ab	2.25a	2.25a	1.6a	6.75a	7.25a	6.5bc	5.25bc	6.43a	7.75 a	113.75b	81.5 b	67.66b	25.48
LSD	1.25	1.41	1.41		2.51	3.55	1.99	3.15			81.77	123.02		

*Means followed by the same letters within each column are not significantly different at 5% level of probability (LSD –Test)

while the lowest aphid infestation per leaf was recorded on Bulbul (25.48) followed by Durre-NIFA (50.46). The statistical analysis of the data showed no significant difference among the Durre-NIFA, Abasin and Raya-NIFA cultivars while these three cultivars were significantly different from Bulbul.

No aphid infestation was recorded on Durre-NIFA and Raya-NIFA during January as compared to Abasin and Bulbul where the aphid infestation was recorded lowest. Durre-NIFA and Raya-NIFA has no aphid infestation and were significantly different from Abasin and Bulbul. Our results are in accordance with Khan and Begum *(*2005) who recorded the same results on six different canola cultivars. The highest average aphid infestation leaf^{-1} was recorded on cultivar Bulbul followed by Abasin while the lowest aphid infestation leaf^{-1} was recorded on Durre-NIFA and Raya-NIFA. A non-significant difference was recorded among the cultivars. Our results were in agreement with the finding of Khan and Begum (2005) who recorded similar results; while differ with the findings of Prassad and Phadke (1984) who found significant differences among the varieties.

Overall variation was recorded among Durre-NIFA, Abasin, Raya-NIFA and Bulbul during the month of February. However the statistical analysis of the data shows non-significant differences among the cultivars during the month of February. The overall average infestation of aphids/ leaf during three months (January, February and March) was higher on Raya-NIFA followed by Abasin while it was lowest on Bulbul followed by Durre-NIFA. The statistical analysis of the data show non-significant difference among Durre-NIFA, Abasin, and Raya-NIFA cultivars while significantly different from Bulbul.

Overall mean of the data revealed that highest aphid infestation was recorded on the Raya-NIFA where the aphid infestation was 30.19 per 2.8 cm inflorescence. followed by Abasin 25.45 aphids/2.8 cm inflorescence (Table 2). While lowest aphid infestation was recorded on Bulbul 12.19 followed by Durre-NIFA 20.29 aphids/2.8cm inflorescence. Durre-NIFA, Abasin and Raya-NIFA showed non-significant difference among each other while significantly different from Bulbul. Our finding supported by Aslam *et al.,* (2007) who found the inflorescence data on different canola varieties.

Table 2
Mean aphid infestation/2.8 cm inflorescence on canola cultivars during 2011.

Cultivars	Months			
	February	March	April	Mean
Durre-NIFA	9.02 a	21.43 a	30.43 a	20.29
Abasin	10.95 a	26.81 a	38.61 a	25.45
Raya-NIFA	12.00 a	33.96 b	44.62 a	30.19
Bulbul	6.1 b	19.17 a	11.3 b	12.19
LSD value	2.33	3.24	1.22	3.45

It can be concluded that plant height and protein was recorded highest on Raya-NIFA. Bulbul resulted in maximum yield, silique plant^{-1}, seed pod^{-1}, 1000-seed weight and low aphid infestation (Table 3). Raya-NIFA presented better result to plant height. Munir and Neily (1986) found similar results for seeds per silique, 1000 seed weight, yield (kg/ha) while found same results for plant height and silique per plant.

Correlation of aphid infestation

The correlation of aphid infestation with different parameters during the cropping season is given in Table 4 and their complete statistical analyses are presented in appendix i-ix.

The Table 4 showed that infestation has significant positive correlation with oil (r = 0.554), while non-significant association of aphid infestation was recorded with protein content (r = 0.395), moisture content (r = 0.064) and plant height (r = 0.397). Moreover, negative non-significant correlation was recorded among aphid infestation and seed pod^{-1} (r = -0.409), silique plant^{-1} (r = -0.410), 1000-seed weight(r = -0.293) and yield (r = -0.395) respectively. A positive significant correlation of infestation was recorded with oil content. Whereas non-significant negative correlation was recorded with the seed pod^{-1}, silique plant^{-1}, 1000-seed weight and yield. These correlation results are in accordance with findings of Choudhury and Pal (2009) who also found significant and non-significant correlation results of infestation with agronomic traits including protein, oil and moisture contents of different varieties.

Table 3
Different parameters recorded on canola cultivars during 2011.

Parameters	Cultivars			
	Durre -NIFA	Abasin	Raya -NIFA	Bulbul
Plant height (cm)	127.25 a	137.10 a	150.87 b	124.93 a
Silique /plant	98.10 a	97.75 a	87.60 a	117.96 b
Silique /seed	17.75 a	18.75 a	12.5 b	22 a
1000-seed wt (g)	3.8 a	3.75 a	3.15 a	14.17 b
Yield (kg/ha)	2365.12 ab	1925.71 bc	1048.74 c	3085.56 a
LSD value	3.55	2.15	3.22	12.25

*Means followed by the same letters within in each rows are significantly different at 5% level of probability (LSD –test).

Table 4
Correlations of aphid infestation with different parameters during 2011.

Infestation (Aphids)	Plant Traits							
	Oil	Protein	Moisture	Seed/pod	Silique/plant	Seed-weight	Yield	Plant height
	0.554*	0.395	0.064	-0.409	-0.410	-0.293	-0.395	0.397

* Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

Based upon the observations under the prevailing agro-climatic conditions of Peshawar the Bulbul canola cultivar was ideal for low aphid infestation and yield and oil content. It was concluded from the study that aphid population on all the tested cultivars fluctuated during most of the season probably due to lack of antixenosis. However, the data on yield and other agronomical characteristics indicated that the cultivars Abasin and Bulbul possess some level of resistance .
It can also be concluded that plant height and protein was recorded highest on Raya-NIFA. Seed pod^{-1} was highest in Abasin where as silique plant^{-1}1000-seed weight, yield kg/ha and oil content was recorded highest in Bulbul.
Overall mean of the data revealed that highest aphid infestation was recorded on the Raya-NIFA where the aphid infestation was 30.19 aphids/2.8 cm inflorescence. followed by Abasin 25.45 aphids/2.8 cm inflorescence. While lowest aphid infestation was recorded on Bulbul 12.19 followed by Durre-NIFA 20.29 aphids/2.8 cm inflorescence. Durre-NIFA, Abasin and Raya-NIFA showed no significant difference among each other while significantly different from Bulbul.

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