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VARIETAL PREFERENCE OF APHIDS (*Lipaphis erysimi* Kalt) ON MUSTARD (*Brassica* spp.)

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Abstract

An experiment was conducted to observe the varietal preference of aphid*Lipaphis erysimi* Kalt and to show the response against aphid infestation among the eight varieties of mustard for yield and yield attributes. The experiment was carried out at experimental farm of Sher-e-Bangla Agricultural University, Dhaka during 2007-08. The seeds of eight mustard varieties, viz., SAU Sarisha -1, BARI Sarisha (Tori-7), BARI Sarisha-9 (Tori rape), BARI Sarisha-6 (Dhali), BARI Sarisha (SS-75), BINA Sarisha -6, BINA Sarisha (Safol) and BINA Sarisha (Agrani) were used. Aphids appeared on plants during 19th January and continued up to harvest. First observation was taken on 55 DAS when the minimum population of 214.50 was observed on variety Agrani, and the maximum population of 420.50 on the variety Tori-7. The peak population of aphid was observed after 62 DAS. Minimum pest population was 227.00 on Agrani and the maximum population was 545.00 on Tori-7. The result showed that among all the varieties observed the *Lipaphis erysimi* preferred the variety Tori-7.The influence of the aphid infestation on the yield and yield attributes, among eight mustard varieties, Agrani was the best in all aspects of yield attributes. Conversely, the variety Tori-7 is the least performer in all aspects of yield attributes. Considering the yield and yield loss caused by aphid infestation, the highly aphid infested mustard variety Tori-7 produced lowest yield (373.40 kg/ha) and caused maximum yield loss (71.50%). Conversely, the least aphid infested variety Agrani produced highest yield (615.50 kg/ha) and caused minimum yield loss (46.20%).The variety Agrani can be regarded moderately resistant to mustard aphid.The variety BARI Sarisha-9, BINA Sarisha-6, SS75, Safol and BARI Sarisha-6 can be regarded as moderately susceptible, Tori-7 and SAU Sarisha-1 can be graded as susceptible to aphid infestation.

Keywords: Preference, *Lipaphis erysimi,* mustard varieties, yield, yield attributes.

Introduction

Mustard (*Brassica* spp. L.) is one of the most oil crops in Bangladesh. Canada is the largest producer of mustard seeds in the world and accounts for about 97% of world exports (Man and Weir, 2009). The oilseed crop is very important in agricultural production of Bangladesh. This crop occupied 5,56,000 hectares of land that

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produce 8, 36,000 metric tons of oilseeds (BBS, 2008). Among these oilseed crops, mustard is the most important, dominant and popular oilseed crop in Bangladesh, which occupied 72,000 hectares of land and produce about 74,000 metric tons of mustard seeds (BBS, 2008), which is low compared to that of many other mustard growing countries of the world (Ahmed *et al.,* 1988). Global mustard seed output was forecasted at 50 million tons in 2008 to 2009 from 49 million in the previous year (SMDC, 2009). A large number of edible oil seed crops are growing in Bangladesh. But edible oil in the country is increasing every year with the increase of population growth.

A greater portion of population in Bangladesh is suffering from an acute shortage of protein and calories. The seed has as high as 46 to 48% of oil and the seed meal has 43.6% protein. Mustard is a cool season crop that can be grown in short growing season. As major oil producing crop, per hectare yield of mustard seed is considerably lower than those of other developing countries. The yield potentiality of our varieties is now at stagnant condition.

The *Brassica spp.* crops are attacked by a large number of insect pests. They are mustard aphid, *Lipaphis erysimi* Kalt. Cabbage aphid, *Brevicoryne brassicae* L., whiteflies, mustard leaf eater, thrips, etc. Among all the insects, aphids are serious pests of mustard. The adult and nymphare pale greenish in colour and look like louse; feed on leaves, flowers, buds, pod and shoots of cruciferous oilseed crops. Maximum damage is caused by aphid at pod formation stage (Brar and Sandhu, 1987). Aphids under gobreed parthenogenitically and they produce about 23-130 young ones, full grown by 7-10 days and complete 4 to 5 generations in a year (Lohar, 2001).

In Bangladesh, mustard crop is cultivated during the Rabi season. This crop is infested in the field by several species of insect pests. Among them, the mustard aphid, *Lipaphis erysimi* (Kalt.) is very devastating in Bangladesh (Alam *et al.*, 1964; Ahmed *et al.,* 1977; Kabir, 1987; Begum, 1988; Shahjahan, 1994; Husain and Shahjahan, 1997). Both nymphs and adults of mustard aphid, *Lipaphis erysimi* causes damage to mustard plants from vegetative to siliqua maturity stage (Brar and Sandhu, 1987). Siliqua is the most suitable part for development of this pest (Tripathi *et al.*, 1986); they suck sap from twigs, siliqua, flower buds, flower and leaves of the plants. Maximum damage is caused by aphid at pod formation stage (Brar and Sandhu, 1987). The affected leaves become curled and crinkled. As a result, plants loss their vigour and ultimately their growth is stopped. The infested flower fail to set pods, the affected pods get twisted and shriveled. In the case of severe infestation, the plant fail to develop pods, they do not mature and unable to produce healthy seeds (Husain and Begum, 1984; Kabir, 1987; Begum, 1988 and Shahjahan, 1994).

The losses caused by insect pests particularly aphids have compelled the entomologists to develop control strategies

for these insect pests. Feeling the gravity of the situation, the study was carried out to assess the varietal preference of *Lipaphis erysimi* Kalt to different mustard varieties under agro-ecological conditions of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh and to study the relationship between infestation level and different yield attributes of different mustard varieties.

Materials and Methods

Preference of *Lipaphis erysimi* (Kalt.) to different mustard varieties was evaluated in an experimental field of SAU, Dhaka, Bangladesh during 2007-08. The seeds of eight mustard varieties i.e., SAU Sarisha-1, BARI Sarisha (Tori-7), BARI Sarisha-9 (Tori rape), BARI Sarisha-6 (Dhali), BARI Sarisha (SS-75), BINA Sarisha-6, BINA Sarisha (Safol) and BINA Sarisha (Agrani) were sown on 24th November 2007 in Randomized Complete Block Design with three replications. The target land was divided into 24 equal plots (3m x 2m) with plot to plot distance 0.5 m; and block to block distance 1.0m. Seeds were then directly sown in the field in good tilth condition @ 8 kg/ha. After germination, all the cultural practices were performed throughout the growing season in all the plots. Insecticides were not sprayed in and around the experimental area.

Observation on aphid population

The observations on aphid population were recorded at 55 DAS (Days after sowing) starting with invasion of aphids. Six plants from each plot i.e., space plants of each variety were selected at random and tagged for aphid counts throughout the crop season. Whole plants from bottom to top were observed. When direct counting became difficult, the population was estimated by counting aphids on predetermined a measured part of plant and then population was multiplied with the total measurement of whole plant, and from this, the number of aphids present on the plant were calculated. The number aphid on six randomly selected plants from each plot was counted at 55 DAS and 62 DAS. The top 10cm apical twigs of three randomly selected inflorescences were cut and brought to the laboratory in bags separately for counting the number of aphids per plant. The aphids were removed from the infested excised plant parts with the help of a soft camel hair brush and placed on a piece of white paper. Then the number of aphids was counted with the help of a magnifying glass and tally counter. Finally, the average number of aphids per plant was determined. The daily weather data on maximum and minimum temperature, relative humidity, and rainfall were also collected from Regional Meteorological Center, Dhaka. The results obtained on aphid population were further analyzed statistically.

Data collection and calculation

For data collection, six plants per plot were randomly selected and tagged. Data collection was started at 65 days after sowing. All the data were collected once a week. The data were collected on different

parameters, such as number of height (cm/plant), branch (no./plant), pod (no./plant), pod length (cm/pod), and 1000-seed weight, total yield (g) per plot, and % yield loss of different mustard varieties.

Yield and yield contributing characters

The crops were harvested at full maturity stage from 19 February to 26 February 2008. For the purpose of the study, yield contributing characters, such as data on number of pods per plant and number of infested pods per plant, and yield of five healthy plants and five infested plants were recorded.

Calculation of yield loss

$$\% \text{ Yield loss} = \frac{\text{Yield of 5HP} - \text{5 IP}}{\text{Yield of 5 HP}} \text{x } 100$$

Here, HP= Healthy Plants, IP= Infested Plants

Statistical analysis

The data obtained from different parameters were statistically analyzed using MSTAT program. The means of statistically significant parameters were separated by using Duncan's Multiple's Range Test (DMRT) at 5% and 1% level.

Results and Discussion

Observation of aphid population

The preference of *Lipaphis erysimi* (Kalt.) on different mustard varieties under field conditions was determined from 19 January 2008 and 26 January 2008 in the field. The detailed results on various aspects of aphid, *Lipaphis erysimi* development are discussed and presented in Table 1. It was observed that aphid population attack varied significantly with the mustard varieties. The appearance of aphid population on different varieties was recorded during 19 January. The aphid infestation increased gradually with the progress of plant phenology of reproductive stages and reached peak during last week of January.

Statistically significant variations were observed in the incidence of aphid population by number among eight selected mustard varieties used in the present trial (Table 1). The mean number of aphids per plant ranged from 214.00 to 420.5 at 55 DAS and 227.00 to 545.00 at 62 DAS. At 55 DAS, significantly highest incidence of aphid population by number per plant was recorded in the variety Tori-7(420.5). This was statistically similar with the variety SAU Sarisha-1 (401.00) followed by that of SS 75 (340). This was followed by Safol (306.50) but statistically lower. On the other hand, significantly lowest incidence of aphid by number per plant was recorded in the variety Agrani (214.00) followed by that of BARI Sarisha-6 (247.00) and BARI Sarisha-9 (258.50) with no significant difference between the later two. BINA Sarisha-6 (290.00) and Sofol (306.50) had statistically identical aphid population.

More or less similar trend but higher incidence of aphid population by number per plant was also observed at 62 DAS and the highest incidence was recorded in

Tori-7 (Table 1), which was statistically similar to that of SAU Sarisha-1 (531.00) and SS 75 (527.00). On the other hand, significantly lowest incidence was recorded in the variety Agrani (227.00), which was statistically different from all other varieties. This was followed by that of BARI Sarisha-9 (377.00). As a result, the order of trends in the incidence of aphid population in terms of comparative host preference among eight mustard varieties was Tori-7 > SAU Sarisha-1 > SS 75 > Safol > BINA Sarisha-6 > BARI Sarisha-9 > BARI Sarisha-6 > Agrani.

From the above findings, it is revealed that Tori-7 was found to be the most preferred host followed by SAU Sarisha-1, whereas Agrani, BARI Sarisha-6, and BARI Sarisha-9 performed as least preferred host for mustard aphid in terms of incidence of aphid population by number. Almost similar results were also reported by several workers. Hussain and Begum (1984) found Tori-7 and YS-67 highly susceptible to aphid and BINA-M-46, BINA-M-59, M-248, and R-5 resistant or tolerant to the aphid. Similar results was found by Kabir (1987), he found out of 12 mustard germplasm BINA-M-46, BINA-M-59, M-128-17, M-258, and Sampad as tolerant; M-151, M-127 and M-110-7 as susceptible; M-4 as highly susceptible; Sampad, Kallyania, and YS-67 as moderately susceptible to mustard aphid. Therefore, on the basis of present results, it could be concluded that the aphid, *Lipaphis erysimi*

Table 1. Incidence of aphid population in the field of different mustard varietiesduring winter cropping season (2007-2008).

Variety	Incidence of aphid population (No./plant)	
	55 DAS*	62 DAS
SAU Sarisha-1	401.50 a	531.00 a
BINA Sarisha-6	290.00 c	465.50 b
Tori-7	420.50 a	545.00 a
BARI Sarisha-9	258.50 d	377.00 c
BARI Sarisha-6	247.00 d	302.00 d
Safol	306.50 c	472.00 b
Agrani	214.00 e	227.00 e
SS 75	340.00 b	527.00 a
LSD (0.01)	31.565	52.88
CV (%)	4.60%	5.23%

In a column means followed by same letter(s) do not differ significantly at 1% by DMRT

*DAS = Days after sowing

(Kalt.) preferred all the mustard under the trial. The variety Agrani was comparatively resistant to aphid and Tori-7 was the most susceptible. The results would be helpful to select the proper varieties of mustard crop in Bangladesh.

Influence of aphid infestation on yield attributes of different mustard varieties

Significant variation was recorded in terms of height for different mustard varieties evaluated against is represented in Table 2. In terms of height, maximum was recorded at 62 DAS in the variety Agrani. This was (148.0cm) which was significantly different from all other varieties followed by that of BARI Sarisha-6 (129.7cm), Safol (125.0cm), BINA Sarisha-6 (117.0 cm) and the minimum height was in Tori-7 (103.0cm), which was almost statistically similar with other varieties followed SAU Sarisha-1 (113.0cm), BARI Sarisha-9 (109.0cm), SS75 (109.3cm). As a result, the trend of results in terms of height per plant among eight mustard varieties is Agrani > BARI Sarisha-6 > Sofol > SS 75 > BINA Sarisha-6 > BARI Sarisha-9 > SAU Sarisha-1 > Tori-7.

Significant variation recorded in terms of number of branches per plant at 62 DAS for eight mustard varieties evaluated against aphid is presented in the Table 2. In terms of number of branches per plant, maximum number of branches per plant was recorded in the variety Agrani and this was 10.67, which was almost statistically similar with the variety BARI Sarisha-6 (10.37) followed by that of Safol (10.00) and the same number

Table 2. Yield attributes of different mustard varieties grown in winter season.

Variety	Yield attributes at 62 DAS				
	Height (cm/plant)	Branch (No./plant)	Pods (No./plant)	Pod length (cm/pod)	1000-seed wt (g)
SAU Sarisha-1	113.0 e	8.00 b	131.70 c	5.40 e	2.70 b
BINA Sarisha-6	117.0 cd	8.33 ab	127.70 cd	5.30 e	2.70 b
Tori-7	103.0 e	7.66 b	118.70 d	5.17 e	2.18 d
BARI Sarisha-9	109.0 de	9.00 ab	131.70 c	5.20 e	2.70 b
BARI Sarisha-6	129.7 b	10.37 a	174.00 a	7.33 b	2.86 ab
Safol	125.0 bc	10.00 ab	158.00 b	6.23 c	2.83 ab
Agrani	148.0 a	10.67 a	180.70 a	7.97 a	3.10 a
SS 75	109.3 de	9.00 ab	136.30 c	5.80 d	2.50 bcd
$LSD_{0.01}$	11.69	2.210	12.09	0.3437	0.3350
CV%	8.43	9.92	3.43	2.34	6.33

In a column means followed by same letter (s) do not differ significantly at 1% by DMRT

*DAS = Days after sowing.

of branches in BARI Sarisha-9 and SS 75 (9.00). The minimum number of branches per plant was found in the variety Tori-7 (7.67) and SAU Sarisha-1 (8.00).

In terms of number of pods per plant, maximum was recorded in the variety Agrani (180.7) followed by that of BARI Sarisha-6 (174.00). On the other hand, the lowest number of pods per plant (118.7) was recorded in Tori-7.

In terms of length per pod (cm), maximum length of pod (7.97cm) was recorded in Agrani followed by that in BARI Sarisha-6 (7.33 cm). On the other hand, the lowest length per pod (5.17 cm) was recorded in Tori-7.

In terms of 1000-seed weight (g), maximum weight of seed (3.10g) was recorded in Agrani followed by that in BARI Sarisha-6 (2.86g) and the minimum weight (2.18g) of 1000 seeds was recorded in Tori-7, which was statistically identical with 2.70g as recorded in SAU Sarisha-1 and BARI Sarisha-9.

Considering the above factors it is clearly observed that Agrani is the best in terms of yield attributes. Conversely, the variety Tori-7 is the least performer the trend of the varieties in the order is Agrani > BARI Sarisha-6 > Sofol > SS 75 > BINA Sarisha-6 > BARI Sarisha-9 > SAU Sarisha-1 > Tori-7. This result was in agreement with those of Brar and Sandhu (1987), Kabir (1987), Begum (1988) and Agarwal *et al.* (1996), who also found on yield contributing traits lesser influence of aphid infestation.

Influence of aphid infestation on yield and yield loss of different mustard varieties

Significant variations were recorded in terms of yield and yield loss among

Table 3. Yield and yield loss caused by aphid infestation among different mustard varieties.

Variety	Grain yield (kg/ha)	Yield loss (%)
SAU Sarisha-1	380.80 f	70.00 a
BINA Sarisha-6	482.30d	66.20 a
Tori-7	373.40 f	71.50 a
BARI Sarisha-9	429.80 e	69.70 a
BARI Sarisha-6	541.10 b	51.00 b
Safol	531.30 bc	53.70 b
Agrani	615.50 a	46.20 b
SS 75	493.80 cd	51.70 b
LSD (0.01)	38.26	10.80
CV (%)	3.47%	10.17%

Means followed by same letter (s) do not differ significantly at 1% level of significance by DMRT

*DAS = Days after sowing.

varieties the (Table 3). The highest yield was recorded in the variety Agrani (615.50 kg/ha), which was statistically different from other varieties and the lowest yield was found in the variety Tori-7 (373.40 kg/ha). As a result, the trend of the yield of eight selected mustard varieties were as follows: Agrani > BARI Sarisha-6 > Safol > SS 75 > BINA Sarisha-6 > BARI Sarisha-9 > SAU Sarisha-1 > Tori-7.

In the case of yield loss due to aphid infestation, maximum yield loss (71.50%) was found to occur in the variety Tori-7, which was statistically identical with SAU Sarisha-1 (70.00%), BARI Sarisha-9 (69.70%), and BINA Sarisha-6 (66.20%). Conversely, the minimum yield loss (46.20%) was observed in Agrani, which was statistically similar with BARI Sarisha-6 (51.00%), SS 75 (51.70%), and Safol (53.70%). So, the trend of the yield loss caused by aphid infestation among eight mustard varieties is reverse which was Tori-7 > SAU Sarisha-1 > BARI Sarisha-9 > BINA Sarisha-6> SS 75 > Safol > BARI Sarisha 6 > Agrani.

From the above findings, it is revealed that the highly aphid infested variety Tori-7 produced lowest yield and caused maximum yield loss. Conversely, the least aphid infested variety Agrani produced highest yield and caused minimum yield loss. This result was in agreement with those of Begum (1995) and Mondal *et al.* (1994).

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