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Screening of rapeseed and mustard entries against aphid under field condition

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ABSTRACT

Cultivation of resistant or tolerant varieties is the easiest way to protect mustard crop from insect pests. Varietal screening for aphid resistance and stability of seed yield under aphid-infested and protected environment would help in identifying the tolerant varieties for aphid attack. The present study was conducted in the field of the Oilseed Research Centre, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur, during *Rabi* season of 2014-2015. Twenty six entries of rapeseed and mustard were evaluated against mustard aphid (*Lipaphis erysimi* Kalt.). In three entries of *Brassica rapa*, namely BC-05115, BC-9921, BC-05117 (25.7-30.4 aphids/plant) and of *Brassica juncea* BJDH-01, BJDH-12 (6.6 -7.0 aphids/plant) comparatively less aphid infestation were found than the check and other entries. From the result of this experiment, it was observed that *Brassica rapa* entries were attacked by the highest number of aphid while *Brassica juncea* had the lowest aphid infestation.

Introduction

Rapeseed and mustard are the important source of edible oils and vegetable for human as well as its cakes used for animals feed in Bangladesh. In Asia, it is primarily cultivated in China, India, Bangladesh and Pakistan (Amer et al., 2010). Asian continent alone contributes 59.1% of the acreage and 48.6% of the world's production. The rapeseed-mustard crops are highly vulnerable to attack of insect pests. More than three dozens of insect pests, associated with various phenological stages of these crops (Bakhetia & Sekhon, 1989). Among them, mustard aphid (*Lipaphis erysimi* Kalt.) is widely distributed throughout the world (Razaq et al., 2011). It causes damage directly by sucking phloem from different parts of plant and indirectly as a vector of plant viruses (Ali & Rizvi, 2007). On heavy infestation, aphids are largely congregated underside of leaves, they make curling and yellowing leaves and twigs and plants fail to develop pods. If young pods develop do not produce healthy seeds and also resulting plant to loss their growth (Mamun et al., 2010).

Mustard aphid is considered as the most destructive pest of mustard and a major limiting factor for successful cultivation of the crop in this country (Biswas & Das, 2000). Both the nymphs and adults suck sap from leaves, inflorescence and pods; results the plant shows stunted growth, flowers and pod formation is hindered. The losses of mustard due to aphids varied from 35-90% depending upon the season (Rohilla et al., 2004). The yield loss in rapeseed-mustard also varies with their germplasms and agro-ecological practices (Ansari et al., 2007) and over use of insecticides causes resistance of the pest, destruction of beneficial organisms and environmental pollution. So it is necessary to find ecologically sound and environmentally safe methods for pest control measures. The breeding of insect resistant varieties is an important non-chemical management technique which is ecologically sound and socially acceptable for the farmers (Prasad, 1995). Therefore, the experiment was carried out to evaluate the performance of some mustard varieties/ entries against aphids.

Material and Methods

Study area

The experiment was conducted in the field of the Oilseed Research Centre, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, during Rabi season of 2014-15.

Plant materials

Twenty six entries of rapeseed and mustard were used in this experiment. Twelve entries of *Brassica rapa* and 14 entries of *Brassica juncea* were evaluated against mustard aphid. Two cultivars mustard variety namely BARI Sarisha -14 and Tori -7 were used as a check for *Brassica rapa* while BARI Sarisha -11 and BARI Sarisha-16 were used as a check variety for *Brasssica juncea* group. All the check variety used here is popular among the farmers. The planting materials were collected from Genetics and Breeding section of Oilseed Research Centre of BARI.

Experimental field and implementation of crop

The mustard entries were sown in November 20, 2014. To ensure good germination, ploughing of the experimental field was done with the help of soil turning plough followed by two cross ploughing with

harrow. Plot size was in 2 m × 80 cm and Randomized Complete Block design with three replications. The seeds were sown in lines. Fertilizers were applied as per recommended by Oilseed Research Centre, BARI. Other intercultural operations like thinning, weeding, irrigation and top dressing were done as per recommendation of Oilseed Research Centre. No insecticides were applied in the cropping period. Aphid populations were counted (*in situ*) from 10 randomly pre-selected plants in each replicated plots on 10 cm twigs of the inflorescence at 7 days intervals. The meteorological parameters viz. temperature, relative humidity and rainfall were also recorded. The mean values of previous 7 days data of the above mentioned parameters were computed for 7th days of observations.

Results

The aphid infestation on *Brassica rapa and Brassica juncea* was observed in the last week of December 2014, at 34 Days After Sowing (DAS) at average maximum temperature 22.60 ^{0}C and average minimum temperature 11.87 ^{0}C. Where average maximum relative humidity was 83.92% and average minimum humidity was 69.12%. The increasing trend observed up to 2nd week of January (55 DAS). The highest mean aphid population (35.12 aphids / plant) observed in the 2nd week of January in 2015. (Fig. 1) Twenty six entries of rapeseed and mustard (12 entries of *Brassica rapa,* 14 entries of *Brassica juncea*) were evaluated against mustard aphid (*Lipaphis erysimi*) during rabi season of 2014-15 at Oilseed Research Centre, Joydebpur, Gazipur. Among the entries, Three entries of *Brassica rapa*, namely BC-05115, BC-9921, BC-05117 (25.7-30.4 aphids/plant) two entries of *Brassica juncea*, BJDH-01, BJDH-12 (6.6 –7 aphids/plant) were found comparatively less aphid infestation than the check and other entries when other entries suffered the highest number of aphid.

Table 1. Evaluation of mustard entries Brassica *rapa* and *Brassica juncea* against aphid (*L. erysimi* Kalt.) During 2014-15 at Gazipur.

Germplasm	Aphids/plant
BC-100614	72.1
Tori-7	75.6
BARI sarisha-14	76.7
BC-11074(7)-2	72.5
BC-11074(3)-1	70.3
BC-110614(4)-2	69.5
BC-110614(8)-4	71.1
BC-110614(4)-9	71.3
BC-110614(4)-7	76.5
BC-9921	25.7
BC-05115	28.5
BC05117	30.4
BJDH-101575(17)	6.0
BJ111536(12)-5	18.0
BJ111536(7)-1	29.1
BJ111536(7)-7	19.2
BJDH-05	10.2
BARI sarisha-16 (Ch)	11.2
BJDH-20	18.2
BARI sarisha-11 (Ch)	11.2
BJDH-05	18.0
BJDH1111536	11.4
BJDH-17	17.2
BJDH12	7.0
BJDH-1111536(12)-1	16.5
BJDH01	6.6

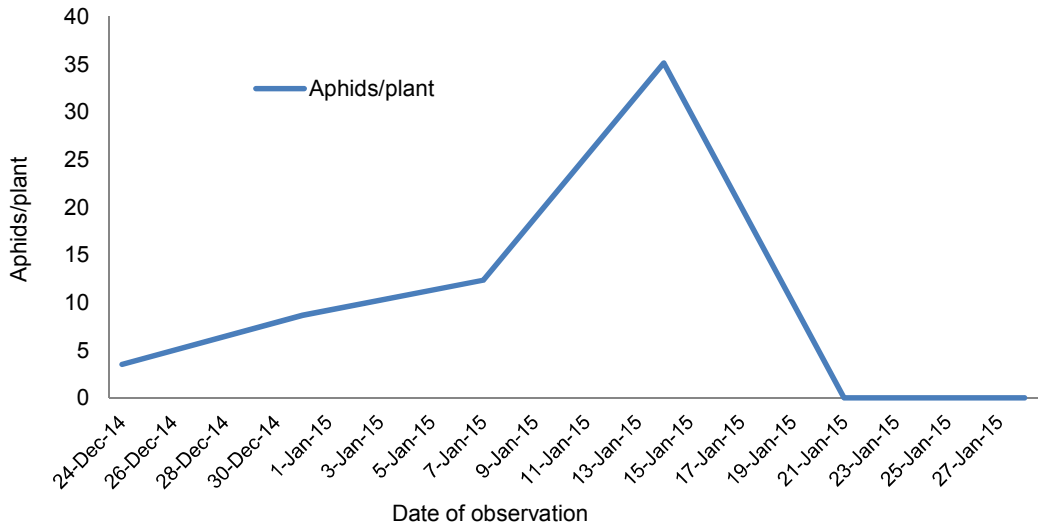

Fig. 1. Incidence of aphid in mustard at Oilseeds Research Centre experimental farm during 2014-2015.

Table 2. Aphid population fluctuation of mustard crop in prevailing weather parameter during 2014-2015.

Observation date	Crop age Days	Aphids/ plant	Aver. Tem (^{0}C)		RH (%)		Rain fall (mm)
			Max	Min	Max.	Min.	
24/12/2014	34	3.50	22.6	11.87	83.92	69.12	00
31/12/2014	41	8.66	20.72	12.15	82.81	70.43	00
7/1/2015	48	12.32	26.69	16.27	83.18	63.12	00
14/1/2015	55	35.12	24.01	15.03	87.57	70.14	00
21/1/2015	62	00	23.66	12.57	86.14	73.86	05
28 /1/2015	69	00	26.58	11.58	86.14	73.85	00

Discussion

Temperature played an important role in the population build up of aphid. The aphid population was higher during the 2nd week of January 2015 at 55 DAS of crop age when the average maximum temperature was 24.01 ^{0}C and the average minimum temperature was 15.03 ^{0}C. Research results reported that the highest rate of increase of aphid was observed when the ambient temperature was 15 ^{0}C to 25 ^{0}C and it decreased when the ambient temperature reached below 15 ^{0}C or over 25 ^{0}C (Nayer et al., 1986; Biswas & Das, 2000). Similar result was also observed in this experiment.

Singh and Goel (1994) reported that RH% ranging between 54-88% was favorable for increasing aphid population. In the 2nd week of January 2015 the average minimum humidity was 87.57% and the maximum relative humidity was 70.14% which was favorable for aphid multiplication. There was a little rainfall occurred during 3 rd week of January (05 mm) the crop period of 2015 at pod formation stage when no aphid population was found at this and later stage also.

Conclusion

The findings of this studies indicated that the use of aphid resistant varieties have number of advantages, as the resistance is inherent in the plant itself with no extra cost involved in the control measures. Therefore, the uses of resistant varieties are the most effective and important weapon for controlling aphids without insecticides application and thereby play an important role in Integrated Pest Management (IPM) Programme. Hence, the farmer will be suggested to grow aforesaid resistant or less susceptible and high yielding varieties. This will help them to ensure higher yield of mustard and at the same, the risk of health hazard and environment pollution may be avoided. So, the selected entries of *Brassica rapa*, BC-05115, BC-9921, BC05117 and two entries of *Brassica juncea* BJDH-01, BJDH-12 can be used as breeding program for developing suitable aphid tolerant mustard variety(s).

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