Screening of different varieties/genotypes for their susceptibility against mustard aphid, Lipaphis erysimi (Kaltenbach)

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Mustard [Brassica juncea (Linneaus) Czern and Coss] is an important oilseed crop extensively grown in India. It is usually rich in oil content (40%) and provides good source of edible oil. Near about 38 insect pests are known to be associated with rapeseed-mustard crop in India (Bakhetia and Sekhon, 1989). Among them, aphid, Lipaphis erysimi (Kaltenbach) is known to be a key pest and caused 69.61 per cent loss in yield (Singh and Sachan, 1994). For the management of this key pest, growers generally reliance on the use of insecticides which creates undesirable problems such as residues, development of resistance in pest to insecticides, resurgence, environmental pollution, toxic effects on natural enemies etc. To such as adverse effects, the identification and use of resistance/tolerant varieties is considered as best alternative for the management of the pest.

A field experiment was conducted to see the relative susceptibility of different mustard genotypes/varieties against aphid under field condition during Rabi, 2009-10 at B. A. College of Agriculture, Anand Agricultural University Anand. Seventeen genotypes/varieties (Table 1) were grown in a plot 1.8 x 3.0 m with 45 x 15 cm spacing and replicated thrice in randomized block design. All the recommended agronomical practices were followed except use of any of the insecticides. The aphid, L. erysimi population was recorded regularly from its appearance at weekly interval on 5 randomly selected plants by following 0-5 index method as per the methodology described by Patel et al., (1995). The weight of 1000 seeds was recorded to see the impact of aphid infestation on quality and boldness of seeds. Seed yield of mustard was also from the plot.

**Aphid index:**

0: Plant free from aphid infestation
1: Only few aphids with very little injury
2: Small colonies on few twigs, no curling or yellowing of leaves
3: Aphid colonies on almost all the twigs, stunted growth, curling and yellowing of leaves
4: Very heavy population of aphids on inflorescence, leaves, stem and siliqua.
5: Very heavy population of aphids on inflorescence, leaves, stem and siliqua.

The average aphid index was worked out by using following equation:

\[
\text{Average aphid index} = \frac{0N + 1N + 2N + 3N + 4N + 5N}{\text{Total number of plants observed}}
\]

Where, 0, 1, 2, 3, 4, 5 were the aphid index

N= Number of plants showing respective aphid index.
Infestation of aphid:

The susceptibility of different varieties/genotypes of mustard has been adjudged based on pooled data over periods (Table-1, Column-2). None of the varieties/genotypes of mustard found free from the aphid attack. Significantly the lowest (1.18) aphid index was recorded in variety GM-2 and was at par with GM-1 and GM-3 (1.26 and 1.34 aphid index). Vardan, Pusa Jaylaxmi, Pusa Jagnath, RH-30, Vaibhav, Pusa Jaykisan and Pusa Agrani were more or less equally susceptible to aphid. Variety Pusa Bahar found significantly differed from these varieties/genotypes but was at par with Pusa Agrani. The highest (2.61) aphid index was recorded from genotype BIO-902 and was at par with varieties Pusa bold (2.52) and Krishna (2.46) followed by PM-67 (2.32), Varuna & PCR-7 (2.25).

Test weight:

The data presented in Table-1 (Column-3) on test weight (weight of 1000 seeds) revealed significant differences among the varieties/genotypes under investigation. Variety GM-2 recorded significantly the highest (6.08 g) test weight but was at par with PCR-7 (5.90 g) followed by Vaibhav. Variety GM-3, Pusa bold, Pusa Jagnath and Pusa Jaykisan also recorded higher test weight (5.03 to 4.96 g) and at par with each other followed by Varuna, Pusa Bahar, Pusa Jaylaxmi, RH-30 and Krishna (4.72 to 4.32 g). Significantly the lowest test weight recorded from the variety Vardan which was at par with PM-67 followed by BIO-902, Pusa Agrani and GM-1.

Yield:

The data (Table-1, Column-4) on seed yield revealed significant differences among the varieties/genotypes under study. Among the different varieties/genotypes, significantly the highest (10.54 q/ha) seed yield was recorded from the variety GM-2 which was at par with GM-1, GM-3, Vardan, Pusa Jaylaxmi, RH-30, Pusa Jagnath, Vaibhav, Pusa Jaykisan and Pusa Bahar (10.50 to 8.95 q/ha). Genotype BIO-902 recorded the lowest (7.12 q/ha) seed yield and was at par with Pusa bold, Krishna, PM-67, Varuna, PCR-7 and Pusa Bahar (7.12 to 8.95 q/ha).

Categorization of varieties/genotypes for susceptibility:

The different varieties/genotypes of mustard were also grouped in to four category of resistance viz., highly resistant (HR), resistant (R), susceptible (S) and highly susceptible (HS) based on aphid index by comparing the mean incidence of individual variety ($\bar{X}$) with mean incidence of all varieties ($\bar{X}$) and standard deviation (sd) (Table-2). The varieties GM-2, GM-1 and GM-3 found highly resistant (HR) whereas Vardan and Pusa Jaylaxmi were resistant (R). Pusa Jagnath and RH-30 were found susceptible (S) to mustard aphid *L. erysimi*. Vaibhav Pusa, Jaykisan, Pusa Agrani, Pusa Bahar, Varuna, PCR-7, PM-67, Krishna, Pusa Bold and Genotype BIO-902 proved to highly susceptible (HS).

Takar *et al.* (2003) reported the varieties/entries DLM-75, M-21, AG-5, DLRA-343 and Pusa Lord were highly resistant whereas Kranti, Pusa Bold, Rohini, VSL-5, BIO-772, DLM-58, Brani, RH-8113, Pusa Basant, DLM-80 and DLM-68 as moderately. T-59 (Varuna), BIO-902, PCR-7 (Rajat) and DLM-29 found least resistant. Significantly the lower aphid infestation and higher seed yield was recorded from the variety Varuna as against the Pusa bold, the
highest aphid infestation (Dhande et al., 2005). In the present investigation, Pusa Bold also recorded the higher aphid index and proved to be highly susceptible. As per the report of Jat et al. (2007), minimum aphid, *L. erysimi* population observed in variety Varuna (T-59) while it was maximum on RZM followed by JM-1, GM-2, RH-30, PCR-7 and BIO-902. Thus, results emerged out from the present study were more or less in conformity with the earlier reports.

**CONCLUSION**

Seventeen genotypes/varieties of mustard were screened against aphid, *Lipaphis erysimi* (Kaltenbach) at B. A. College of Agriculture, Anand Agricultural University, Anand during 2009-10. Varieties/genotypes for their susceptibility against aphid, *L. erysimi*, varieties GM-2, GM-1 and GM-3 found highly resistant (HR) whereas; Vardan and Pusa Jaylaxmi were resistant (R). Pusa Jagnath and RH-30 found susceptible (S). Among the varieties/genotypes, Vaibhav, Pusa Jaykisan, Pusa Agrani, Pusa Bahar, Varuna, PCR-7, PM-67, Krishna, Pusa bold and BIO-902 recorded higher aphid index (1.68 to 1.82) and proved to be highly susceptible (HS). Variety GM-2 recorded the highest (6.08 g) test weight followed by PCR-7, Vaibhav, GM-3, Pusa bold, and Pusa Jagnath. Maximum yield was harvested from variety GM-2 followed by GM-1, GM-3 and Vardan.

**REFERENCES**


Table 1: Population of aphid and yield as well as yield attributing characters in different varieties/genotypes of mustard.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Varieties/genotypes</th>
<th>Aphid index (0-5 scale)</th>
<th>Test weight (g)</th>
<th>Yield (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>GM 1</td>
<td>1.26 (1.33) \textsuperscript{ab}</td>
<td>3.59\textsuperscript{b}</td>
<td>10.50\textsuperscript{a}</td>
</tr>
<tr>
<td>2</td>
<td>GM 2</td>
<td>1.18 (1.30)\textsuperscript{a}</td>
<td>6.08\textsuperscript{a}</td>
<td>10.54\textsuperscript{a}</td>
</tr>
<tr>
<td>3</td>
<td>GM 3</td>
<td>1.34 (1.36)\textsuperscript{bc}</td>
<td>5.36\textsuperscript{f}</td>
<td>9.97\textsuperscript{ab}</td>
</tr>
<tr>
<td>4</td>
<td>PM 67</td>
<td>2.32 (1.68)\textsuperscript{e}</td>
<td>3.19\textsuperscript{ab}</td>
<td>8.57\textsuperscript{bcd}</td>
</tr>
<tr>
<td>5</td>
<td>Pusa Agrani</td>
<td>2.01 (1.58)\textsuperscript{vl}</td>
<td>3.57\textsuperscript{b}</td>
<td>9.32\textsuperscript{abc}</td>
</tr>
<tr>
<td>6</td>
<td>BIO 902</td>
<td>2.61 (1.77)\textsuperscript{l}</td>
<td>3.56\textsuperscript{g}</td>
<td>7.12\textsuperscript{d}</td>
</tr>
<tr>
<td>7</td>
<td>Varuna</td>
<td>2.29 (1.67)\textsuperscript{c}</td>
<td>4.72\textsuperscript{cde}</td>
<td>8.60\textsuperscript{bcd}</td>
</tr>
<tr>
<td>8</td>
<td>RH 30</td>
<td>1.67 (1.47)\textsuperscript{et}</td>
<td>4.37\textsuperscript{c}</td>
<td>9.74\textsuperscript{ab}</td>
</tr>
<tr>
<td>9</td>
<td>Pusa Bahar</td>
<td>2.10 (1.61)\textsuperscript{l}</td>
<td>4.63\textsuperscript{cde}</td>
<td>8.95\textsuperscript{abcd}</td>
</tr>
<tr>
<td>10</td>
<td>Pusa bold</td>
<td>2.52 (1.74)\textsuperscript{l}</td>
<td>5.01\textsuperscript{et}</td>
<td>7.93\textsuperscript{cd}</td>
</tr>
<tr>
<td>11</td>
<td>Vaibhav</td>
<td>1.80 (1.52)\textsuperscript{g}</td>
<td>5.48\textsuperscript{g}</td>
<td>9.57\textsuperscript{abc}</td>
</tr>
<tr>
<td>12</td>
<td>Vardan</td>
<td>1.42 (1.39)\textsuperscript{cd}</td>
<td>2.96\textsuperscript{a}</td>
<td>9.96\textsuperscript{ab}</td>
</tr>
<tr>
<td>13</td>
<td>PCR 7</td>
<td>2.25 (1.67)\textsuperscript{e}</td>
<td>5.90\textsuperscript{b}</td>
<td>8.62\textsuperscript{bcd}</td>
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<tr>
<td>14</td>
<td>Pusa Jagnath</td>
<td>1.58 (1.44)\textsuperscript{de}</td>
<td>5.01\textsuperscript{et}</td>
<td>9.65\textsuperscript{abc}</td>
</tr>
<tr>
<td>15</td>
<td>Krishna</td>
<td>2.46 (1.72)\textsuperscript{et}</td>
<td>4.32\textsuperscript{c}</td>
<td>8.55\textsuperscript{bcd}</td>
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<tr>
<td>16</td>
<td>Pusa Jaykisan</td>
<td>1.89 (1.55)\textsuperscript{df}</td>
<td>4.96\textsuperscript{def}</td>
<td>9.33\textsuperscript{abcd}</td>
</tr>
<tr>
<td>17</td>
<td>Pusa Jaylaxmi</td>
<td>1.48 (1.41)\textsuperscript{cd}</td>
<td>4.50\textsuperscript{cd}</td>
<td>9.93\textsuperscript{ab}</td>
</tr>
</tbody>
</table>

ANOVA

<table>
<thead>
<tr>
<th>S. Em. ±: Treatment (T)</th>
<th>0.02</th>
<th>0.17</th>
<th>0.65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period (P)</td>
<td>0.02</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T x P</td>
<td>0.06</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

C. D. at 5%  
T  
0.05  
P  
0.06  
T x P  
NS  
C. V.%  
7.03  
6.55  
12.11

Notes:
1. Figures in parentheses are transformed (square root (x) + 0.5 values); those outside are re-transformed values.
2. NS: Non significant
3. Treatment mean with letter(s) in common are not significant at 5 % level of significance within a column
   Test weight: wt. of 1000 seeds
Table 2: Categorization of mustard varieties/genotypes for their susceptibility against aphid, *L. erysimi*

<table>
<thead>
<tr>
<th>Category of resistant</th>
<th>Scale</th>
<th>Varieties</th>
<th>( \bar{X}_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Based on aphid index:</strong> ( \bar{X} = 1.54 ) and ( sd = 0.14 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highly resistant (HR)</td>
<td>( \bar{X}_i &lt; 1.40 )</td>
<td>GM-2</td>
<td>(1.18)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GM-1</td>
<td>(1.26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GM-3</td>
<td>(1.34)</td>
</tr>
<tr>
<td>Resistant (R)</td>
<td>( \bar{X}_i &gt; 1.40 &lt; 1.5 )</td>
<td>Vardan</td>
<td>(1.42)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusa Jaylaxmi</td>
<td>(1.48)</td>
</tr>
<tr>
<td>Susceptible (S)</td>
<td>( \bar{X}_i &gt; 1.54 &lt; 1.68 )</td>
<td>Pusa Jagnath</td>
<td>(1.58)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RH-30</td>
<td>(1.67)</td>
</tr>
<tr>
<td>Highly Susceptible (HS)</td>
<td>( \bar{X}_i &gt; 1.68 &lt; 1.82 )</td>
<td>Vaibhav</td>
<td>(1.80)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusa Jaykisan</td>
<td>(1.89)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusa Agrani</td>
<td>(2.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusa Bahar</td>
<td>(2.10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Varuna</td>
<td>(2.29)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCR-7</td>
<td>(2.25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PM-67</td>
<td>(2.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Krishna</td>
<td>(2.46)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pusa Bold</td>
<td>(2.52)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIO-902</td>
<td>(2.61)</td>
</tr>
</tbody>
</table>

**Note:** Figures in parenthesis are aphid index (0-5 scale).

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