STUDIES OF HETEROSIS AND IDENTIFICATION OF SUPERIOR CROSSES IN OKRA [ABELMOSCHUS ESCULENTUS (L.) MOENCH]*

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ABSTRACT

Eighteen genotypes consisting of 15 lines and three testers were crossed in line x tester design. 45 hybrids and their parents were used to estimate heterosis for 10 characters including pod yield per plant over three different environments. The crosses L9 x T1, L8 x T4, L11 x T4, L12 x T4 and L17 x T1 were identified as potential combinations as they showed high per se performance and heterobeltiosis across the environments.

Key words : Heterosis, Heterobeltiosis, Hybrid, Okra.

INTRODUCTION

Okra [Abelmoschus esculentus (L.) Moench] is one of the important, ancient and traditional vegetable crops. It has been reported that okra has an average nutritive value of 3.21, which is higher than tomato, egg plant and most of the cucurbits. A further increase in okra productivity needs intensive research and breeders need to examine whether productivity is enhanced mainly by genes favouring heterozygosity or homozygosity in okra. Hence, knowledge of genetic causes of heterosis of experimental population is important to decide the breeding strategies for yield improvement in okra.

Accordingly the present investigation was undertaken to have an idea of the nature of the gene action for green fruit yield and other important attributes in okra.

MATERIALS AND METHODS

Fifteen lines i.e. Heritage Green, GO-2, BO-2, Punjab Padmini, Harbhajan, Nirmal-303, Co-3, Pusa Sawani, Swati-10, Swati-25, Ankur-40, VRO-5, VRO-6, Ratnaraj and Varsha Uphar as female parents and three testers i.e. Parbhani Kranti, Arka Abhay and Arka Anamika as male parents were mated in line x tester fashion. 45 hybrids were raised in randomized block design with three replications

<table>
<thead>
<tr>
<th>Crosses</th>
<th>E1 Yield per pant</th>
<th>E1 Number of fruits per pant</th>
<th>Crosses</th>
<th>E2 Yield per pant</th>
<th>E2 Number of fruits per pant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritage Green x Arka Anamika</td>
<td>29.06</td>
<td>22.44</td>
<td>Heritage Green x Arka Abhay</td>
<td>31.52</td>
<td>15.75</td>
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<tr>
<td>VRO-6 x Arka Abhay</td>
<td>28.02</td>
<td>4.32</td>
<td>Ankur-40 x Parbhani Kranti</td>
<td>25.17</td>
<td>0.33</td>
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<tr>
<td>BO-2 x Arka Anamika</td>
<td>17.50</td>
<td>1.40</td>
<td>Swati-25 x Parbhani Kranti</td>
<td>22.83</td>
<td>11.09</td>
</tr>
<tr>
<td>Punjab Padmini x Arka Anamika</td>
<td>14.86</td>
<td>22.39</td>
<td>Ankur-40 x Arka Abhay</td>
<td>17.47</td>
<td>11.56</td>
</tr>
<tr>
<td>Ankur-40 x Arka Abhay</td>
<td>14.58</td>
<td>4.88</td>
<td>Swati-10 x Parbhani Kranti</td>
<td>15.82</td>
<td>3.17</td>
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<td>Ankur-40 x parbhani Kranti</td>
<td>14.39</td>
<td>6.40</td>
<td>Punjab Padmini x Arka Abhay</td>
<td>15.27</td>
<td>3.17</td>
</tr>
<tr>
<td>Ankur-40 x Arka Anamika</td>
<td>13.32</td>
<td>33.65</td>
<td>VRO-6 x Parbhani Kranti</td>
<td>13.86</td>
<td>1.75</td>
</tr>
<tr>
<td>VRO-6 x Arka Anamika</td>
<td>11.42</td>
<td>18.64</td>
<td>Ratnaraj x Parbhani Kranti</td>
<td>12.76</td>
<td>-</td>
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<tr>
<td>VRO-5 x Arka Abhay</td>
<td>8.40</td>
<td>-</td>
<td>VRO-5 x Arka Abhay</td>
<td>11.74</td>
<td>17.96</td>
</tr>
<tr>
<td>Ratnaraj x Arka Anamika</td>
<td>6.42</td>
<td>14.03</td>
<td>Pusa Sawani x Parbhani Kranti</td>
<td>11.09</td>
<td>12.22</td>
</tr>
</tbody>
</table>

* A part of Ph.D (Hort.) thesis of first Author.
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in three environments (crop seasons) namely, summer 2006, rainy 2006 and summer 2007. Plot size was single row of 12 plants for each entry with a spacing of 45 cm between row and 30 cm between plants in a row in all the environments. The character mean was used to estimate relative heterosis, heterobeltiosis.

RESULTS AND DISCUSSION

Higher yield is the basic objective of all crop improvement programmes and unless a new hybrid has a potential equal to or exceeding that of current cultivar or hybrid, it will fetch no success even if it has excellent quality. Appreciable amount of heterosis observed over the mid parent (38.25% in E₁) and better parent (31.52% in E₂) for yield per plant showed good scope of heterosis breeding in improvement of okra.

For yield per plant, 10 hybrids in E₁ and 9 hybrids in E₂ exhibited significant and positive relative heterosis, out of which, L₁ x T₃ (38.25 %) in E₁ and L₁₁ x T₁ (35.97%) in E₂ manifested highest heterosis whereas three crosses showed significant heterobeltiosis in each E₁ and E₂ environment. The maximum heterobeltiosis for this trait was observed for cross L₁ x T₃ (29.06%) in E₁ and for L₁ x T₂ (31.52%) in E₂. These findings were in agreement to the heterosis reported by Sood and Sharma (2001), Chauhan and Singh (2002), Yadav et al. (2002), Rewale et al. (2003) and Bhalekar et al. (2004).

Cross L₁ x T₃ also showed high estimates of heterobeltiosis for other component traits viz. number of fruits per plant (E₁ and E₂), fruit length (E₁ and E₂), days to harvesting (E₁ and E₂) and fruit weight (E₁, E₂ and E₃). Cross L₁ x T₂ also revealed high heterobeltiosis for traits viz. number of branches per plant (E₂), days to 50 % flowering (E₂), days to harvesting (E₂) and fruit weight (E₁ and E₂). Besides, cross combinations L₁₃ x T₂ in E₁ and L₁₀ x T₁ and L₁₁ x T₁ in E₂ also manifested good amount of heterobeltiosis for fruit yield.

With respect to earliness, 2 hybrids in E₁ and 11 in E₂ for 50 per cent flowering and 3 hybrids in E₂, 13 hybrids in E₃ and 2 hybrids in E₃ for days to harvesting showed negative and significant heterosis over mid parent. Whereas on better parent, only one cross L₁ x T₂ in E₁ for 50 per cent flowering and four crosses in E₂ for days to harvesting showed
significant heterobeltiosis. Earliness for these two traits has also been reported by Yadav et al. (2002) and Bhalekar et al. (2004). In general, it might be inferred that magnitude of heterotic effects was good for the entire yield contributing traits in one or more environment. The possible reason for no hybrid vigour in $E_1$ environments over better parent may be the use of early parents in calculating heterosis.

A perusal of yield contributing traits exhibited that crosses, L$_{11}$ x T$_3$ and L$_6$ x T$_3$ for plant height in $E_1$ and $E_2$ environments; cross L$_2$ x T$_1$ ($E_1$) for height of first effective fruiting node; L$_{11}$ x T$_3$ ($E_1$) and L$_{12}$ x T$_2$ ($E_2$) for number of fruits per plant; L$_{10}$ x T$_1$ ($E_1$) and L$_{14}$ x T$_1$ ($E_2$) for fruit length; L$_{13}$ x T$_2$ ($E_1$) and L$_{11}$ x T$_2$ ($E_2$) showed high heterobeltiosis. Pawar et al. (1999), Sood and Sharma (2001), Rewale et al. (2003).

For most of the traits only few hybrids exhibited significant relative heterosis in desirable direction, thereby indicating that the genes with negative effects were dominating, except fruit length and fruit weight where about 50 percent of the hybrids revealed desirable relative heterosis, thereby indicating that genes with negative and positive effects were almost equally distributed. The crosses Heritage Green x Arka Anamika and VRO-6 x Arka Abhay showed highest heterobeltiosis in $E_1$ and Heritage Green x Arka Abhay and Ankur-40 x Parbhani Kranti in showed highest heterobeltiosis in $E_2$ but only three crosses namely Ankur-40 x Arka Abhay, Ankur-40 x Parbhani Kranti, VRO-5 x Arka Abhay showed high level of heterobeltiosis in both the environments. Similarly, L$_1$ x T$_3$ for plant height, L$_6$ x T$_2$ for no. of Branches per plant, L$_{10}$ x T$_1$, L$_{14}$ x T$_1$ for fruit length and L$_{14}$ x T$_1$ for fruit girth showed high heterosis over better parent in both the environments. Therefore, these crosses can be used further for trait specific improvement based on respective traits or can be used for high yield potential based on the heterobeltiosis for yield.

REFERENCES


