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Studies on heterosis in okra (*Abelmoschus esculentus* (L.) Moench)

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ABSTRACT

In the present investigation a study was undertaken in the Department of Agricultural Botany, Annamalai University during the year 2006-2008 to identify potential parents and superior cross combinations for yield improvement of okra. Six bhendi genotypes *viz* Girija Vikas, MDU 1, Hissar Unnath, Arka Abhay and EC 305623 were crossed in full diallel fashion (including the reciprocals). The eight characters observed included days to 50 per cent flowering, plant height, number of branches per plant, number of fruits per plant, fruit length, fruit girth, individual fruit weight, fruit yield per plant. The results revealed that the standard heterosis for fruit yield per plant was maximum with the hybrid MDU 1 x Hissar Unnath. Standard heterosis upto a value of 65.23 per cent recorded by MDU 1 x Hissar Unnath. This hybrid recorded high standard heterosis for all the characters except number of branches per plant and individual fruit weight.

Key Words: *Different type of heterosis, Heterosis, Oka*

INTRODUCTION

Okra is a powerhouse of variable nutrients. It is a good source of vitamin C, providing 20 per cent of daily value for a 2000 calorie diet in 100 g. It is low in calories and is fat free. Okra is a surprising versatile vegetable. It also holds a high place in the nutritional charts for its fibrous content and other medicinal benefits. The attempt on bhendi breeding was not exhaustive and has reviewed by Joshi and Hardas (1956). The yield potential of bhendi is low. The productivity of this crop should be increased by improving the genetic architecture through hybridization and recombination. Indeed knowledge of combining ability, heterosis of yield and its component characters should be placed greater emphasis for the improvement of this crop.

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MATERIALS AND METHODS

The experimental material consisted of five bhendi genotypes *viz*., Girija Vikas, MDU 1, Hissar Unnath, Arka Abhay and EC 305623 received from the Department of Agricultural Botany. The genotypes represented wide genetic diversity. The selected five genotypes were crossed in all possible combinations and produced 20 hybrids. The seeds obtained from the crossing block were sown during August 2007 to raise the hybrids. Cultural and agronomic practices were followed as per the standard recommendation and need based plant protection measures were taken up to maintain healthy crop stand. The observations like days to 50 per cent flowering, plant height, number of branches per plant, number of fruits per plant, fruit length, fruit girth, individual fruit weight and fruit yield per plant were taken. The magnitude of heterosis was calculated as follows:

i. Increase of mean F1 performance over that of the mean performance of the mid parent.

$$\text{Relative heterosis (di)} = \frac{\overline{F_1} - \overline{MP}}{\overline{MP}} \times 100$$

ii. Increase of mean F1 performance over that of the mean performance of the better parent

$$\text{Heterobeltiosis (dii)} = \frac{\overline{F_1} - \overline{BP}}{\overline{BP}} \times 100$$

iii. Increase of mean F1 performance over that of mean performance of the standard variety

$$\text{Standard heterosis (diii)} = \frac{\overline{F_1} - \overline{SV}}{\overline{SV}} \times 100$$

The significance of heterosis was tested using the formula suggested by Wynne *et al* (1970).

RESULTS AND DISCUSSION

The hybrids with high amount of heterosis can be exploited. The hybrids are normally assessed in terms of percent increase over mid parent, better parent and standard variety. In the present investigation five hybrids recorded significant and positive standard heterosis for days to 50 per cent flowering. Two hybrids recorded significant negative standard heterosis for this trait. The hybrid EC 305623 x MDU 1 recorded maximum positive significant standard heterosis for this trait. The hybrid MDU 1 x Hissar Unnath recorded maximum negative significant standard heterosis for this trait. Ten hybrids recorded significant positive standard heterosis for plant height. Maximum positive significant standard heterosis was recorded by MDU 1 x Hissar Unnath (27.14 per cent). For number of branches per plant none of the hybrids recorded positive and significant standard heterosis. The hybrids Arka Abhay x EC 305623 and EC 305623 x Arka Abhay recorded maximum positive significant relative heterosis and heterobeltiosis for this trait. Similar results was given by Singh and Singh (1979) and Rewale *et al* (2003). All the twenty hybrids recorded positive significant relative heterosis, heterobeltiosis and standard heterosis for number of fruits per plant. The hybrid Girija Vikas x EC 305623 recorded maximum positive significant relative heterosis and heterobeltiosis for this trait. The hybrid Hissar Unnath x Arka Abhay recorded maximum positive significant standard heterosis. For the fruit length all the twenty hybrids recorded positive significant relative heterosis, heterobeltiosis and standard heterosis. The hybrid MDU 1 x Hissar Unnath recorded maximum positive significant standard heterosis for this trait. For the fruit girth none of the hybrids recorded positive significant standard heterosis and heterobeltiosis. All the twenty hybrids recorded positive and significant relative heterosis, heterobeltiosis and standard heterosis for the individual fruit weight. The hybrid Hissar Unnath x MDU 1 recorded maximum positive significant standard heterosis for this trait. Similar reports were presented by Singh and Singh (1979), Poshiya and Shukla (1986), Metwally and Etsamy (1990), Saha and Kabir (2001), Shobha (2002) and Murugan (2004). All the twenty hybrids recorded positive and significant relative heterosis, heterobeltiosis and standard heterosis for the fruit yield per plant. The hybrid MDU 1 x Hissar Unnath recorded maximum positive significant standard heterosis for this trait. From the above discussion it may be concluded that the among the twenty hybrids the hybrid MDU 1 x Hissar Unnath was identified as superior hybrid as it recorded significant and positive standard heterosis for fruit yield per plant and significant and negative standard heterosis for days to 50 per cent flowering.

Table 1 Percentage of standard heterosis of diallel Hybrids.

Hybrids	Days to 50 Percent Flowering		Plant Height		Number of Branches Per Plant		Number of Fruits Per Plant	
	Direct	Reciprocal	Direct	Reciprocal	Direct	Reciprocal	Direct	Reciprocal
GIRIJA VIKAS X MDU–1	2.70**	2.70**	9.26**	17.70**	-1.69	1.69	15.72**	27.67**
GIRIJA VIKAS X HISSAR UNNATH	1.35	-2.70	2.50**	21.57**	0.01	5.08	19.81**	19.81**
GIRIJA VIKAS X ARKA ABHAY	2.70**	-2.70	11.50**	16.90**	5.08	1.69	22.33**	22.33**
GIRIJA VIKAS X EC 305623	0.01	0.01	13.65**	18.08**	1.69	1.69	22.96**	22.96**
MDU – 1 X HISSAR UNNATH	-4.05**	-4.05**	27.14**	25.08**	6.78	10.17	35.85**	28.93**
MDU – 1 X ARKA ABHAY	2.70	-2.70	1.69	5.08	1.69	5.08	27.99**	27.67**
MDU – 1 X EC 305623	2.70**	9.46**	1.69	1.69	1.69	1.69	26.10**	26.42**
HISSAR UNNATH X ARKA ABHAY	0.01	-2.70	0.01	1.69	0.01	1.69	27.99**	29.56**
HISSAR UNNATH X EC 305623	2.70	0.01	1.69	1.69	1.69	1.69	26.42**	25.79**
ARKA ABHAY X EC 305623	-2.70	0.01	1.69	1.69	1.69	1.69	27.99**	25.79**

** Significant at 1 per cent level

Table 2 Percentage of standard heterosis of diallel hybrids (contd.).

Hybrids	Fruit Length		Fruit Girth		Fruit Weight		Fruit Yield Per Plant	
	Direct	Reciprocal	Direct	Reciprocal	Direct	Reciprocal	Direct	Reciprocal
GIRIJA VIKAS X MDU–1	17.34**	21.23**	-2.39	-2.39	11.51**	12.92**	29.63**	29.63**
GIRIJA VIKAS X HISSAR UNNATH	20.82**	21.56**	-1.44	-2.20	12.95**	15.47**	35.89**	35.89**
GIRIJA VIKAS X ARKA ABHAY	16.19**	23.20**	-1.63	-2.39	11.99**	19.02**	37.68**	37.68**
GIRIJA VIKAS X EC 305623	17.42**	18.98**	-2.01	-1.63	11.47**	14.99**	37.97**	37.97**
MDU–1 X HISSAR UNNATH	28.61**	26.48**	0.57	-1.72	20.65**	20.84**	65.23**	58.42**
MDU–1 X ARKA ABHAY	18.69**	18.44**	-2.39	-2.01	13.25**	15.03**	44.55**	48.13**
MDU–1 X EC 305623	15.70**	16.31**	-1.91	-1.44	12.18**	11.81**	42.30**	42.12**
HISSAR UNNATH X ARKA ABHAY	21.19**	18.65**	-2.11	-2.11	16.43**	14.62**	49.92**	49.47**
HISSAR UNNATH X EC 305623	23.73**	15.78**	-2.58	-2.20	18.80**	11.88**	51.08**	41.73**
ARKA ABHAY X EC 305623	17.30**	20.61**	-1.05	-2.01	16.03**	16.03**	46.00**	46.80**

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