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STUDIES ON GENE ACTION IN BHENDI (*Abelmoschus esculentus L.Moench)*

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ABSTRACT

The variance due to SCA was higher than that of the variance due to GCA for all the six characters of interest. The variance due to dominance was much pronounced than that of additive genetic variance for all the characters studied. The study revealed the importance of both dominance and epistasis for evolving genotypes with higher fruit yield. It may be achieved by resorting to population improvement programme.

INTRODUCTION

Being native of tropical Africa, it is a prized vegetable of India. The young, immature, non-fibrous, edible and tender delicious fruits of bhendi used as vegetables in salads, soups and sauces, are also good sources of iodine, calcium, iron and vitamin A, B and C (Woodroof, 1927; Ephenhuijsen, 1974, Purseglove, 1974; Cobley and Steele, 1976; Martin and Ruberte, 1978). Bhendi leaves are most frequently cooked as spinach or added to soups and stews. It provides vitamins A and C, protein, calcium and iron (Irvine, 1952). It as been reported that bhendi has an Average Nutritive Value (ANV) of 3.21, which is higher than tomato, egg plant and most of the cucurbits except bittergourd (Grubben, 1977). Matured and dried seeds of bhendi are roasted and ground as a coffee substitute, or are added to coffee as an adulterant (Burkill, 1935). Bhendi dry seeds contain 13 to 22 per cent oil. The percentage of oleic acid and linoleic acid is 60 to 65 per cent. Residue of the whole seed contains 18 to 27 per cent protein and relatively high appeared to be a suitable ingredient in diet for rats and chicks (Edwards and Miller, 1947). The dried bhendi is a processed product for preservation and export. Bhendi seed is rich in tryptophan (94 mg/g N) and has an adequate content of sulphur containing amino acid (189 mg/g N). The protein of bhendi could thus complement that of legumes or cereal grain in some dietary combinations (Savello *et al.,* 1980). The genetic control of characters related to fruit yield and *per se* is important in any systematic crop improvement programme. A plant breeder must possess adequate knowledge on gene action of fruit yield and its component characters. The present study was formulated to find out the gene action governing fruit yield and its component characters in bhendi.

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MATERIALS AND METHODS

Eight lines *viz.,* TCR 852(L_1), IC 1543(L_2), TCR 2086(L_3),EC 306722 A3 (L_4), EC 306741 A6(L_5), IC 7952(L_6), IC 3340(L_7) and EC 305651(L_8) were crossed with five testers *viz*., Arka Anamika(T_1), Punjab Padmini(T_2), Hissar Unnat(T_3), Parbhani Kranti(T_4) and Varsha Uphar (T_5). The resulting 40 hybrids along with 13 parents were evaluated in a randomized Block Design with three replications at Paambanvillai, Asaripallam, Vembanoor village, Agatheeswaran Taluk, Kanyakumari district during 2008. The crop was planted at a spacing of 45 x 30cm in two plots of 4.5 m length. Recommended agronomic practices and need based plant protection measures were undertaken. Data were recorded on ten randomly selected plants for the characters *viz*., Days to first flowering, Plants

height at maturity, Number of branches per plant, Number of fruits per plant, Single fruit weight and Fruit yield per plant. The data were subjected to statistical analysis given by Kempthorne (1957).

RESULTS AND DISCUSSION

The variance due to lines was significant for days to first flowering and number of fruits per plant. The variance due to testers was significant for all the characters except plant height at maturity. The variance due to lines x testers was significant for all the six traits studied. The variance due to hybrids was also significant for all the characters (Table l). This indicated that there exist significant differences among lines, testers, and hybrids. Therefore, further analysis is appropriate. The variance due to SCA was higher than that of the variance due to GCA for all the characters studied (Table 2). It indicated that the characters *viz*., days to first flowering, plant height at maturity, number of branches per plant, number of fruits per plant, single fruit weight and fruit yield per plant were predominantly controlled by dominance and non-additive gene action. The result is in agreement with the findings of Senthilkumar (2007). These characters could well be improved by delaying the selection to later segregating generation, until the dominance and epistasis disappear and resorting to intermating of segregants followed by recurrent selection. Delogu *et al.* (1988) suggested recurrent selection as a basic breeding approach in self pollinated crops. Diallel selective mating design as suggested by Jensen (1970) can also be adopted. The contribution of lines x testers interaction to the total variance was higher for plant height at maturity and number of branches per plant (Table 3). The contribution of testers to the total variance was higher for days to first flowering, number of fruits per plant, single fruit weight, and fruit yield per plant, indicating the importance of both testers and lines x testers interaction to the total variance. The result is in agreement with the findings of Thirugnanakumar *et al.* (2005). The magnitude of dominance variance was much pronounced for all the six characters studied, both when F= 0 and F= 1 (Table 4). The result confirmed the presence of excess of dominance variance for these characters as inferred from the combining ability variance studied. The result is in agreement with the findings of Senthilkumar (2007) and Srivastava *et al.* (2008).

Table 1. Analysis of variance

S. No.	Characters	Hybrids	Lines	Testers	Line x tester	Error
		Df=39	DF=7	Df=4	Df=28	Df=104
1.	Days to first Flowering	36.303**	51.884**	170.11**	13.300**	0.2981
2.	Plant height at maturity	1984.44**	3038.26	6739.04	1041.76	8.647
3.	Number of branches per plant	1.4295**	1.4871	4.6753**	0.9515**	0.0272
4.	Number of fruits per plant	46.026**	22.718**	224.435**	26.366**	0.2937
5.	Single fruit Weight	6.1171**	4.3057	26.9071**	3.5999**	0.059
6.	Fruit yield per Plant	22789.68**	9282.20	122669.20**	11898.04**	78.644

Table 2. Estimate of combining ability variance

S. No.	Characters	GCA	SCA	GCA/SCA
1.	Days to first flowering	0.4057	4.3342	0.093
2.	Plant height at maturity	16.6281	344.3712	0.048
3.	Number of branches per plant	0.0084	0.3081	0.0271
4.	Number of fruits per plant	0.3468	8.6910	0.039
5.	Single fruit weight	0.0444	1.1801	0.037
6.	Fruit yield per plant	192.1184	3939..79	0.048

* Significant at 5% level
** Significant at 5 % level

Table 3. Proportional contribution of lines, tester and lines x tester

S. No.	Characters	Lines	Testers	Lines x tester
1.	Days to first flowering	25.63	48.06	26.30
2.	Plant height at maturity	27.48	34.83	37.69
3.	Number of branches per plant	18.67	33.54	47.79
4.	Number of fruits per plant	8.86	50.01	41.13
5.	Single fruit weight	12.63	45.13	42.25
6.	Fruit yield per plant	7.31	55.21	34.48

Table 4. Estimate of additive and dominance variance for six characters in bhendi

S. No.	Characters	Additive variance		Dominance variance	
		F=0	F=1	F=0	F=1
1.	Days to first flowering	1.6230	0.8115	17.336	4.334
2.	Plant height at maturity	66.512	33.256	1377.48	344.37
3.	Number of branches per plant	0.0337	0.0169	1.2324	0.3081
4.	Number of fruits per plant	1.3871	0.6936	34.764	8.691
5.	Single fruit weight	0.1776	0.0888	4.7204	1.1801
6.	Fruit yield per plant	768.473	384.236	15759.19	3939.79

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