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EVALUATION OF PARENTS AND HYBRIDS FOR FRUIT YIELD AND ITS COMPONENT TRAITS IN BHENDI (*ABELMOSHCHUS ESCULENTUS* L. MONECH)

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Abstract

The present investigation was undertaken to evaluate six parents and fifteen hybrids through half-diallel mating system to study fruit yield and its attributing characters in bhendi. Six parents *viz.,* Arka Anamika (P_1), Thanvi 66 (P_2), Villupuram Local (P_3), Dhaanya (P_4), Ankur 41 (P_5) and Varsha Uphar (P_6) were crossed in half-diallel fashion at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University. Observations were recorded on single plant basis. The observations were made on characters namely, days to first flowering, plant height at maturity, number of primary branches per plant, number of nodes per plant, number of fruits per plant, number of seeds per fruit, fruit length, fruit girth, single fruit weight and fruit yield per plant. Considering the mean performance of all the parents P_1, P_6 and P_4 were considered as the best parents for fruit yield per plant and its component traits. Among the hybrids, $P_1 \times P_6$ and $P_2 \times P_4$ were rated as best hybrids followed by $P_3 \times P_4$ and $P_2 \times P_5$ were better hybrids for exploitation of heterosis based on mean performance.

Key words: Bhendi, half diallel, hybrids, mean performance.

Introduction

In recent years, we are just experiencing a marginal surplus production in cereals leading to self-sufficiency. However, shortage in the production of vegetables has drawn the attention for increased cultivation of vegetables to provide food and nutritional security. Among the vegetables, India is one of the largest producers and consumers of bhendi in the world. In India bhendi is cultivated in area of 528 lakh ha with a production of 61 mt and productivity is 11.60 mt/ha (FAO, 2017). In Tamil Nadu it is cultivated in area of 12.78 lakh ha with a production of 88.07 mt and productivity is 6.89 mt/ha (NHB, 2017).

It is popularly known as ladies finger or okra is one of the most important vegetable crop grown in tropical and subtropical regions of the world and it is native of tropical Africa. It is commercially grown in Indian states of Gujarat, Maharashtra andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Bhendi (*Abelmoschus esculentus* (L.) Moench) is an important member of the family Malvaceae with chromosome number 2n=130. Keeping these considerations in view, the present study was carried out to evaluate the fruit yield and its component traits of bhendi hybrids.

Materials and Methods

The present investigation was carried out at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar. The experimental material consist of six genotypes *viz*., Arka Anamika (P1), Thanvi 66 (P_2), Villupuram Local (P_3), Dhaanya (P_4), Ankur 41 (P_5) and Varsha Uphar (P_6) which were received from the Indian Institute of Horticultural Research, Bangalore, National Bureau of Plant Genetic Resources, Thrissur and from Villupuram local area. Crosses were made in all possible combination through half diallel method.

During August 2017, F_1 hybrid seeds of 15 cross combinations obtained through half diallel mating design were sown in the field along with their parents. The seeds obtained from the crossing block were sown during August, 2017 to raise the hybrids. Six parents and fifteen hybrids were raised in a randomized block design with three replications. The seeds of each entry were sown in a single row of 3m long ridges with a spacing of 45cm × 30 cm and uniform population of 10 plants were maintained. A total of 21 ridges were formed in a plot size of 9.5m × 9m. 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 biometrical observations like days to first flowering, plant height at maturity, number of primary branches per plant, number of nodes per plant, number of fruits per plant, number of seeds per fruit, fruit length, fruit girth, single fruit weight and fruit yield per plant were taken.

Results and Discussion

The mean performance of ten characters of ten parents and their twenty one hybrids are presented as trait wise here under.

For the parents, mean values of number of days to first flowering varied from 35.88 (P_1) to 42.54 (P_5). Among the hybrids, it varied between 35.45 ($P_4 \times P_5$) and 45.55 ($P_5 \times P_6$). Among the six parents, P_1 was found to be early in flowering (35.88) followed by P_4 (38.65). The hybrid $P_4 \times P_5$ was found to be earlier in flowering (35.45) followed by $P_2 \times P_6$ (36.01). Two parents and nine hybrids were found to flower significantly earlier than the mean of parents (39.73) and hybrids (39.86).

For the parents, mean values of plant height at maturity varied from 124.36 (P_3) to 139.41 (P_6). Among the hybrids, it varied between 134.41 ($P_1 \times P_3$) and 148.26 ($P_1 \times P_6$). The parent P_3 showed the lowest plant height (124.36) followed by P_2 (132.65). Among the crosses, the hybrid $P_1 \times P_5$ exhibited the lowest plant height (133.58) followed by $P_1 \times P_3$ (134.41). Three parents and seven hybrids recorded significantly lower than the mean of parents (133.82) and hybrids (137.85).

For the parents, mean values of number of number of primary branches per plant varied from 2.11 (P_4) to 2.96 (P_5). Among the hybrids, it varied between 2.44 ($P_1 \times P_2$) and 3.44 ($P_1 \times P_5$). Among the six parents, the parents P_5 (2.96) and P_1 (2.77) registered the maximum number of branches per plant. Among the 15 hybrids, $P_1 \times P_5$, $P_4 \times P_6$ and $P_5 \times P_6$ (3.44) showed the maximum number of branches per plant (3.44). Three parents and nine hybrids were significantly higher mean than the mean of parents and hybrids.

For the parents, mean values of number of nodes per plant varied from 21.46 (P_3) to 25.71 (P_2). Among the hybrids, it varied between 21.83 ($P_4 \times P_5$) and 29.23 ($P_1 \times P_6$). Among the six parents, the parent P_2 (25.71) followed by P_6 (25.57) registered the maximum number of nodes per plant, five hybrids exceeded the mean of hybrids (25.87). Among these hybrids, $P_1 \times P_6$ (29.23) showed the maximum number of nodes per plant followed by $P_2 \times P_3$ (28.45) and $P_2 \times P_4$ (28.19).

For the parents, mean values of number of fruits per plant varied from 13.65 (P_3) to 17.66 (P_1). Among the hybrids, it varied between 15.89 ($P_3 \times P_6$) and 22.81 ($P_1 \times P_6$). Three parents and seven hybrids recorded mean values lesser than the mean of parents (15.50) and hybrids (18.86).

For the parents, mean values of number of seeds per fruit varied from 51.48 (P_3) to 62.43 (P_5). Among the hybrids, it varied between 45.03 ($P_3 \times P_6$) and 66.73 ($P_2 \times P_4$). Among the six parents, the parents P_5 (62.43) followed by P_6 (60.07) registered the maximum number of seeds per fruit. Among the fifteen hybrids, $P_2 \times P_4$ (66.73) showed the maximum number of seeds per fruit followed by $P_1 \times P_2$ (64.40) and $P_2 \times P_5$ (60.31). The mean values of three parents and seven hybrids exhibited higher mean than the mean of parents (55.51) and hybrids (57.82).

For the parents, mean values of fruit length varied from 12.54 (P_3) to 14.89 (P_2). For hybrids it ranged from 12.78 ($P_3 \times P_4$) to 18.90 ($P_1 \times P_6$). Three parents and seven hybrids recorded mean values higher than the mean of parents (13.83) and hybrids (16.42).

For the parents, mean values of fruit length varied from 5.79 (P_1) to 6.71 (P_5). For hybrids it ranged from 4.87 ($P_2 \times P_4$) to 6.23 ($P_4 \times P_5$). Among the six parents, two parents namely, P5 (6.71) and P6 (6.41) recorded the maximum fruit girth. The best performing hybrids in the meritorious order were $P_4 \times P_5$ (6.23), $P_3 \times P_5$ (6.05) and $P_1 \times P_4$ (5.98). Two parents and five hybrids showed mean values higher than the mean of parents (6.18) and hybrids (5.57).

For the parents, mean values of fruit length varied from 13.88 (P_3) to 17.07 (P_6). For hybrids it ranged from 13.11 ($P_5 \times P_6$) to 21.65 ($P_1 \times P_6$). Among the parents P_1 (17.52) followed by P_6 (17.07) and P_4 (16.85) registered the maximum fruit weight. For the hybrids, the maximum mean performance was recorded by $P_1 \times P_6$ (21.65) followed by $P_2 \times P_4$ (21.10) and $P_4 \times P_6$ (20.47). Three parents and seven crosses recorded the maximum mean performance above the mean of parents (16.90) and hybrids (17.30).

For the parents, mean values of fruit yield per plant varied from 189.46 (P_3) to 309.40 (P_1). For hybrids it

Table 1: Mean Performance of parents and hybrids for fruit yield and its contributing characters in bhendi.

S. No.	Characters / Genotypes /hybrids	Days to first flowering (days)	Plant height at maturity (cm) per plant (Nos.)	No. of primary branches plant (Nos.)	No. of nodes per plant (cm)	No. of fruits per fruit (Nos.)	No. of seeds per	Fruit length (cm)	Fruit girth (cm)	Single fruit weight (g.)	Fruit yield per plant (g)
1	P_1	35.88*	133.44**	2.77**	25.51	17.66**	53.27	14.77**	5.79	17.52**	309.40**
2	P_2	39.88	132.65**	2.33	25.71**	15.11	48.35	14.89**	5.90	15.59	235.56
3	P_3	41.11	124.36**	2.65**	21.46	13.65	51.48	12.54	6.22	13.88	189.46
4	P_4	38.65*	135.03	2.11	25.37	15.65**	57.47**	13.23	6.08	16.85**	263.70**
5	P_5	42.54	138.06	2.96**	24.88	14.48	62.43**	13.38	6.71**	14.65	212.13
6	P_6	40.31	139.41	2.41	25.57	16.48**	60.07**	14.21**	6.41**	17.07**	281.31**
7	$P_1 \times P_2$	36.77*	140.35	2.44	28.18**	19.81**	64.40**	16.44	5.71*	18.33**	363.12**
8	$P_1 \times P_3$	38.42*	134.41**	3.25**	25.72	19.14**	54.01	15.84	5.94**	17.89**	342.41**
9	$P_1 \times P_4$	39.54*	138.77	3.33**	26.25	18.24	57.27	16.72*	5.98**	17.11	312.09
10	$P_1 \times P_5$	40.01	133.58**	3.44**	22.25	18.48	56.40	17.43**	5.38	16.65	307.70
11	$P_1 \times P_6$	36.84*	148.26	3.11**	29.23**	22.81**	58.38**	18.90**	5.72*	21.65**	493.84**
12	$P_2 \times P_3$	43.25	135.15**	2.88	28.45**	16.58	57.60	16.75**	4.95	15.89	263.46
13	$P_2 \times P_4$	38.11*	138.45	2.88	28.19**	21.62**	66.73**	18.48**	4.87	21.10**	456.18**
14	$P_2 \times P_5$	40.54	140.97	2.44	26.59	20.14**	60.31**	17.77**	5.41	18.77**	378.03**
15	$P_2 \times P_6$	36.01*	135.43**	2.88	25.37	16.65	56.89	14.84	5.26	16.33	271.89
16	$P_3 \times P_4$	39.72*	140.46	2.55	27.61**	20.59**	55.41	12.78	5.36	19.89**	409.54**
17	$P_3 \times P_5$	44.25	135.20**	2.99	23.07	17.59	58.12**	14.22	5.89**	14.58	256.46
18	$P_3 \times P_6$	44.78	138.37	2.99	23.07	15.89	45.03	17.35**	6.05**	14.05	223.25
19	$P_4 \times P_5$	35.45*	134.80**	3.33**	21.83	17.07	59.82**	14.78	6.23**	13.65	233.00
20	$P_4 \times P_6$	38.80*	134.92**	3.44**	26.24	21.07**	61.00	18.30**	5.09	20.47**	431.30**
21	$P_5 \times P_6$	45.55	138.63	3.44**	26.09	17.24	55.95	15.82	5.65	13.11	226.01

*significant at 5% level; **significant at 1% level

ranged from 223.25 ($P_3 \times P_6$) to 493.84 ($P_1 \times P_6$). The mean values of three parents and seven hybrids exhibited mean values higher than the mean of parents (248.59) and hybrids (331.22) respectively.

Among the parents, Arka Anamika had superior *per se* performance for the characters *viz*., days to first flowering, fruit length, number of branches per plant, number of fruits per plant, fruit weight, fruit yield per plant. Varsha Uphar showed better performance for the characters, namely plant height at maturity, number of nodes per plant, number of fruits per plant, number of seeds per fruit, fruit girth, single fruit weight, fruit yield per plant, Ankur 41 for the plant height at maturity, number of branches per plant, number of fruits per plant, number of seeds per fruit, fruit girth. High mean performance of parents was observed by Rajendra Kumar *et al*., (2005); Weerasekara *et al.,* (2008); Pal and Sabesan, (2009) and Solankey and Singh, (2010). It is obvious that parents Arka Anamika, Varsha Uphar and Ankur 41 were found to be good for the most of the traits. Hence, it would be desirable to have multiple crosses involving the parents viz., Arka Anamika, Varha Uphar, Ankur 41 and make selection in the segregating generations to isolate superior genotypes. Considering the performance of all the parents for different characters, the parents Arka Anamika, Varsha Uphar and Ankur 41 were adjudged as best parents. This showed that the above mentioned parents might be useful for the incorporation of the respective characters in hybridization programme.

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