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GENETIC ANALYSIS OF BIPARENTAL PROGENIES IN BHENDI [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH]

Anbu Selvam, Y

Department of Genetics and Plant Breeding,Faculty of Agriculture,
Annamalai University, Annamalainagar-608002

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ABSTRACT

Three populations of the bhendi viz, BIP, F2S and F3S developed in 2010 and these populations were evaluated in 2011 to study the extent of genetic variability, heritability and genetic advance for twelve characters in bhendi. Considerable variation was observed in BIP compared to F2 and F3 populations for most of the characters, which was confirmed by high mean and wider range of variation as evidenced by high to moderate PCV and GCV values for fruit length, number of fruits per plant and fruit yield per plant. High heritability of BIPS was revealed by Arka Anamika / MDU 1 for the traits *viz.*, days to 50 per cent flowering, number of fruits per plant, fruit length, fruit girth and fruit yield per plant which revealed the importance of additive gene action for these traits. Thus it is understood that intermating in early segregating generations of different individuals lead to release of additional variability, since biparental mating among the segregates in the F2 of a cross may provide more opportunity for the recombination to occur, break the linkage blocks and mop up desirable genes.

INTRODUCTION

Bhendi (*Abelmoschus esculentus* (L.) Monech.) commonly known as okra or ladies finger is an important crop of the family Malvaceae. Bhendi is especially valued for its tender delicious fruit and is a good source of iodine. Generally, the tender fruits are consumed as vegetable. As, this crop has been used in all factors of human life starting from food to industry the demand for this crop is increasing substantially. This growing demand could be met up only through genetic manipulations which could favourably be done by increasing the productivity as there is only little scope for increasing the area under production. Selection of suitable breeding methodologies which involves suitable mating design for breaking down of undesirable linkages in the early segregating generations is a must. Many breeding methodologies suited the need and production of biparental progenies in the early segregating generation is one such approach which is most effective in breaking the undesirable linkages and in obtaining desirable recombinants. Hence, in the present study, Biparental mating following North Carolina design 1 Model 1 had been followed.

MATERIALS AND METHODS

The present investigation was carried out at the Plant Breeding Farm, Department of Agricultural Botany, Annamalai University from January 2010-December-2011. The experimental material consisted of F_2 seeds of three cross combinations and their parents which were obtained from the germplasm collection of Department of Agricultural Botany, Annamalai University. The three cross combinations are Arka Anamika / S-51, Virudhunagar local / S-51 and Arka Anamika / MDU 1. From each of the four cross combinations, 200 F_2 plants were raised in non-replicated trail during January 2010 to April 2011 with a spacing of 60 cm between rows and 45 cm between plants. The F_2 population was raised and the seeds were harvested to build up F_3 generation. At the same time, enough F_2 seeds were also retained for raising the F_2 population during the next season for comparing F_2, F_3 and BIP_S progenies. BIPs were obtained by intermating the randomly selected F_2's as females and males. Recommended agronomic practices and need based plant protection measures were carried out. Four F_2 plants selected randomly were designated as males. BIPs were developed by crossing each of these males to four plants selected as females. The plants used as males and females were chosen at random for the development of

* Corresponding author: +91
E-mail address: anbusevam5p@gmail.com

Table 1 Range and mean performance of Parents, F_2's,F_3's and BIPs for fruit yield per plant (g)

Parents / Generation		Cross 1	Cross 2	Cross 3	General mean
P_1	Range	220-296	297-442	220-296	296.12
	Mean	240.00	383.20**	265.80	
P_2	Range	210-280	190-320	220-320	256.83
	Mean	245.50	255.00	270.00*	
F_2	Range	208-635	104-589	302-510	425.47
	Mean	424.20	437.22*	415.00	
F_3	Range	210-589	196-615	302-520	413.07
	Mean	412.04	405.06	422.05*	
BIP_S	Range	208-630	104-630	210-650	432.18
	Mean	436.18*	422.31	438.05**	

*Significant at 5 per cent level ** Significant at 1 per cent level

Table 2 Range and mean performance of Parents, F2's,F3's and BIPs for number of fruits per plant (g)

Parents / Generation		Cross 1	Cross 2	Cross 3	General mean
P1	Range	18-25	12-18	18-25	15.20
	Mean	15.30*	14.60	15.70*	
P2	Range	13-18	13-20	12-18	18.10
	Mean	20.00**	16.10	18.20*	
F2	Range	6-30	6-28	6-39	20.55
	Mean	19.27	22.20**	20.10	
F3	Range	10-31	51-23	9-30	22.56
	Mean	23.10*	21.20	23.00*	
BIPS	Range	6-25	5-28	9-30	23.44
	Mean	22.85	24.00	23.75	

*Significant at 5 per cent level ** Significant at 1 per cent level

Table 3 Variability parameters in F_2's,F_3's and BIPs for fruit yield per plant in Bhendi

Crosses	Population	PCV (per cent)	GCV (per cent)	Heritability (per cent)	Genetic Advance	Genetic Advance as per cent of Mean
	F_2	21.80	15.91	66.84	128.18	30.17
Cross 1	F_3	19.91	14.97	56.52	95.55	23.18
	BIPs	21.95	16.81	77.05	132.61	30.40
	F_2	18.87	14.33	57.71	98.11	22.44
Cross 2	F_3	22.98	18.88	67.52	129.52	31.97
	BIPs	17.59	15.02	72.96	114.83	29.44
	F_2	16.83	15.07	80.23	131.56	27.81
Cross 3	F_3	15.37	12.87	70.19	96.97	22.22
	BIPs	21.16	17.97	89.39	148.82	32.61

PCV andGCV	Heritability	Genetic Advance as per cent of mean
Below 10 per cent – low	Below 10 per cent – Low	Below 10 per cent – low
10 – 20 per cent – moderate	30 – 60 per cent – Moderate	10 – 20 per cent – Moderate
Above 20 per cent – High	Above 60 per cent – High	Above 20 per cent – High

Table 4 Variability parameters in F_2's,F_3's and BIPs for number of fruits per plant in Bhendi

Crosses	Population	PCV (per cent)	GCV (per cent)	Heritability (per cent)	Genetic Advance	Genetic Advance as per cent of Mean
Cross 1	F_2	37.53	26.73	67.04	6.88	48.84
	F_3	30.87	25.61	68.82	6.56	43.77
	BIPs	31.88	28.30	78.85	6.53	51.78
Cross 2	F_2	33.38	26.70	63.96	5.68	43.99
	F_3	24.52	19.81	65.22	5.59	32.98
	BIPs	30.93	22.36	78.23	6.61	49.85
Cross 3	F_2	31.45	22.69	52.08	5.31	33.74
	F_3	26.09	17.61	45.59	3.57	24.50
	BIPs	27.94	24.58	78.39	6.90	52.55

PCV andGCV	Heritability	Genetic Advance as per cent of mean
Below 10 per cent – low	Below 10 per cent – Low	Below 10 per cent – low
10 – 20 per cent – moderate	30 – 60 per cent – Moderate	10 – 20 per cent – Moderate
Above 20 per cent – High	Above 60 per cent – High	Above 20 per cent – High

BIPs and no seed parent was used in more than one mating. The rest of the F_2 plants after used in making BIPs were selfed by covering the flower with butter paper cover a day previous to anthesis. Selfed F_2 plants (F_3 seeds) were also harvested separately.

The F_2(200 plants) population was raised in non-replicated trail. The parents (20 plants), F_3(90 plants) seeds and intermated F_2(288 plants) were raised during June 2011 – September 2011 in Randomized Block Design with three replications. The spacing adopted was 60 cm between rows and 45 cm between plants. Observations like Days to 50 per cent flowering, Plant height, Internode length, Number of fruits per plant, Fruit girth, Fruit length and Fruit yield per plant were taken up. The phenotypic and genotypic coefficient of variation was computed according to Burton and Devane (1953). The heritability and genetic advance as per cent of mean was worked out as per the method of Hanson *et al.* (1956) and Robinson *et al.* (1949), respectively.

RESULTS AND DISCUSSION

The Analysis of variance of BIP_S indicated that there was significant difference among the ovule and pollen parent for almost all the traits in all the crosses studied.

The BIPs of Arka Anamika /MDU 1 recorded high mean performance for the traits *viz.*, internode length, number of fruits per plant, fruit length, fruit girth and fruit yield per plant. The superiority of BIPs over F_3's was also noticed in all the crosses. General shift in the value of ranges for characters by following biparental approaches was also reported by Nematullah and Jha (1993) in wheat. Hence, BIPs developed in all the three crosses could be used as base population for developing high yielding early maturity cultivars as they had combined superior performance for fruit yield per plant and earliness. These finding were similar to the reported mean and range values by Dhankar and Dhankar (2002) for these traits in bhendi. The analysis of components of variance of BIPs in all the crosses revealed that the additive genetic variance was predominant, which indicated that selection in the early intermating generations could result in the development of potential progenies. The variability studies indicated high PCV and moderate GCV in BIPs of Arka Anamika / MDU 1 for fruit yield per plant. All the other traits recorded low to moderate PCV and GCV. Similar results were obtained by Bindu *et al.* (1997) for days to first flowering in 70 genotypes of bhendi. However in general, BIPs recorded higher values of PCV and GCV when compared to F_3's for almost all the characters studied. This variability in BIPs might be attributed due to breakeage of linkage group obtained through intermating of the early segregating generations.

High heritability coupled with high genetic advance as per cent of mean was observed in BIPs of Arka Anamika / MDU 1 for the traits *viz.*, days to 50 per cent flowering, number of fruits per plant, fruit length, fruit girth and fruit yield per plant which revealed the importance of additive gene action for these traits. High heritability estimates in case of BIPs compared to selfed series were also reported by Yunus and Paroda (1983) in wheat and Parameshwarappa *et al.* (2009) in safflower. Presence of low to moderate PCV and GCV coupled with high heritability and genetic advance as per cent of mean for these traits indicated the presence of both additive and non-additive gene action (dominance and epitasis).

Thus, it is concluded that intermating in F_2 segregants increased the mean performance in BIPs than F_3's. Analysis of variance also indicated the predominance of additive variance. But however even though the heritability and genetic advance is high, the PCV and GCV is low to moderate for most of the traits in Arka Anamika / MDU 1. This indicated the presence of both additive and non-additive gene action. Hence, one or two generations of intermating in the subsequent generation followed by selection would result in obtaining potential genotypes.

References

Bindu, K.K., Manju, P. and Sreekumar, S.G., 1997, Genetic variability in bhendi (*Abelmoschus esculentus* (L.) Moench). South Indian Hort., 45(6): 286-288

Burton, G.W. and Devane, E.M., 1953, Estimating heritability in tall Fescue (*Festuca arunidinacea*) from replicated clonal material. Agron. J., 45: 478-481.

Dhankar, B.S. and Dhankar, S.K., 2002, Genetic variability, correlation and path analysis in Bhendi (*Abelmoschus esculentus* (L.) Moench). Veg. Sci., 29(1): 63-68.

Hanson, C.H., Robinson, H.R. and Comstock, R.S., 1956, Biometrical studies of yield in segregating population of Korea Lespedeza. Agron. J., 48: 268-272.

.Nematullah and Jha, P.B., 1993, Effect of biparnetal mating in wheat. Crop Improv. 20(2): 173-178.

Parameshwarappa, K.G., Rudra Naik. V., Bentur M.G., 2009, Impact of biparental mating on genetic variability and path analysis in safflower. Karnataka J. Agric. Sci., 22(1):44-46.

Robinson, H.F., Comstock, R.E. and Harvery, V.H., 1949, Estimates of heritability and degree of dominance in corn. Agron. J., 41: 353-359.

Yunus, M. and Paroda, R.S., 1982, Impact of biparental mating on correlation coefficients in bread wheat. Theor. App. Genet. , 57: 337-343.

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