Indian J. Pulses Res. 19(1): 36-38, 2006

Comparison of biparental mating and selfing series for yield improvement in mungbean

P.G. KATARAKI and S.T. KAJJIDONI

Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwad 580 005; Email: stkajjidoni@yahoo.co.in

ABSTRACT

The F_2 generation of a single cross, China mung x TM 98-50, of mungbean was advanced to F_3 generation following biparental mating (BIP), single pod descent (SPD), bulk and single plant selection (SPS) methods. The biparental progenies exhibited higher mean performance with higher upper limits of the range in the desired direction for all the characters except plant height. High degree of genetic variation was exhibited by BIP progenies as compared to other progenies for most of the characters except plant height and pod length. The biparental progenies proved superior to SPD, bulk and SPS progenies in producing higher frequency of transgressive segregants. The utility of biparental mating in early segregating generations is emphasized in mungbean.

Key words: Biparental mating, Genetic parameters, Mungbean, Selfing series, Single pod descent, *Vigna radiata*

Conventional selection methods, such as pedigree, bulk and single pod descent (SPD), are the most commonly used methods for improvement of self pollinated crops. These schemes have inherent limitations of not able to release the hidden variability presumably due to the conserved linkage blocks in self-pollinated crops. Biparental mating (BIP) in segregating population helps break such linkages resulting in the release of useful variability (4). This mating may appropriately be applied where lack of desired variation is the immediate bottleneck in the breeding programmes, though contrasting views have been expressed on the effectiveness of biparental approach in self-pollinated crops. BIP has been successfully employed in some crops like wheat and safflower. However, there are hardly any report (2, 3) on the effectiveness of BIP mating in mungbean (*Vigna radiata* L. Wilczek). The present investigation was, therefore, planned to compare the BIP with the SPD, bulk and single plant selection (SPS) progenies for genetic variability and to identify transgressive segregants for yield and its components.

MATERIAL AND METHODS

Two genotypes *viz.,* China mung and TM 98-50 were selected on the basis of their contrasting yield traits. China mung is a widely cultivated early maturing genotype with shinning large seeds, whereas TM 98-50 is a genotype with high pod number. The F_2 generation of the cross between these two parents used to effect biparental mating (BIP). At the same time, F_2 plants were also advanced to F_3 following single pod descent (SPD), bulk and single plant selection (SPS) methods. The field experiment was conducted at the Agricultural College, UAS, Dharwad during *kharif* 2002-03. The BIP, SPD, bulk and SPS progenies were sown in plots of 12 rows each of 5 m length. The data were recorded on 100 plants in BIP and bulk progenies 150 in SPD and 15 plants per SPS progeny for seven quantitative characters *viz.*, plant height, clusters per plant, pods per plant, pod length, seeds per pod, 100-seed weight and seed yield per plant. Mean and range of each character were worked out for all the progenies. Phenotypic and genotypic coefficients of variation (1), heritability in broad sense (6 and genetic advance (11) were computed following standard statistical methods. The data were used to identify transgressive segregants in positive direction for seed yield and 100-seed weight on the basis of mean plus one standard deviation.

RESULTS AND DISCUSSION

Mean, range and estimates of genetic parameters in different progenies are presented in Table 1. Comparison of mean and range of different genetic parameters indicated higher mean values in biparental progenies than the corresponding mean values in other progenies for most of the characters except plant height. The upper limit of the range was also high in BIP than the selfed progenies indicating presence of superior segregants in BIP progenies. At the same time, the lower limit was more or less equal to that of SPD, bulk and SPS progenies. These results are in agreement with the earlier reports in mungbean (2) and wheat (12). The shift in range values of different traits by biparental mating was also reported earlier in safflower (10) and wheat (9).

Among different methods, biparental progenies exhibited greater GCV, PCV, heritability and genetic advance with respect to all the traits under study. The characters which showed wide range of values were also characterized by higher magnitude of GCV and PCV values. Higher GCV and PCV in BIP progenies were also reported in wheat (8). Among different characters, clusters (47.12 and 50.34), pods (40.20 and 44.95) and seed yield (30.03 and 40.01) per plant had higher GCV and PCV, indicating scope of selection of better segregants in biparental progenies. Further, the heritability estimates for seed yield and its components were higher in biparental progenies than SPD, bulk and SPS progenies. This

Table 1. Mean, range and estimates of genetic parameters in respect of seven quantitative traits in four progenies of China mung x TM 98-50 cross in mungbean

Characters	Progenies	Mean	Range	PCV (%)	GCV (%)	h^2 (%)	GA (%)
Plant height (cm)	BIP	38.64	25-57	17.13	13.77	64.59	22.79
	SPD	38.98	25-64	16.01	12.42	60.16	19.84
	Bulk	40.65	28-57	16.07	12.82	63.66	21.09
	SPS	35.81	20-49	16.71	13.21	64.48	21.93
Clusters/ plant	BIP	6.10	2-22	50.34	47.12	87.59	90.85
	SPD	5.55	2-12	37.76	32.35	73.38	57.09
	Bulk	5.01	2-13	37.90	31.15	67.54	52.74
	SPS	3.99	2-09	33.49	19.67	34.50	23.80
Pods/plant	BIP	6.34	6-41	44.95	40.20	79.98	74.07
	SPD	15.19	4-38	39.35	34.62	77.40	62.75
	Bulk	13.68	6-38	40.30	33.54	69.26	57.57
	SPS	10.62	5-27	37.97	24.77	42.58	12.31
Pod length (cm)	BIP	7.98	5-10.2	10.99	9.71	77.92	17.65
	SPD	7.87	4.8-10	10.93	9.59	77.02	17.34
	Bulk	7.64	6-10	10.22	8.58	70.49	14.84
	SPS	7.56	4.4-9.8	9.54	7.82	67.30	13.22
Seeds per pod	BIP	9.47	6-14.6	20.10	19.56	94.73	39.23
	SPD	9.01	6.2-11.6	11.41	10.33	81.93	19.30
	Bulk	8.31	2.8-11.0	11.70	10.45	79.78	19.23
	SPS	8.39	5.8-10.8	9.77	8.27	71.65	14.41
100-seed weight (g)	BIP	3.42	2.4-4.8	15.55	14.05	81.91	26.02
	SPD	3.37	2.0-4.8	12.49	11.18	80.12	20.54
	Bulk	3.16	2.0-4.0	12.93	10.96	71.85	19.14
	SPS	2.96	2.0-3.6	11.99	10.07	70.63	16.34
Seed yield/plant (g)	BIP	4.97	2.0-19.1	40.01	30.03	56.36	46.44
	SPD	4.43	1.1-10.4	39.22	28.42	46.74	37.69
	Bulk	3.91	1.8-6.7	36.41	18.04	41.83	24.04
	SPS	3.39	1.3-6.3	23.06	16.67	39.43	21.56

suggested that the environment played a relatively limited role in influencing these characters in biparental progenies. High heritability estimates in case of BIP over F_3 were also reported in wheat (8) and safflower (10). Among different characters, clusters per plant, pods per plant, seeds per pod and seed yield per plant exhibited relatively higher genetic advance in BIP as compared to progenies of other selection methods.

Table 2. Per cent transgressive segregants for seed yield and pods per plant in progenies of China mung x TM 98-50 cross in mungbean

Progenies	Seed yield per plant		Pods per plant	
	#of plants	Per cent	#of plants	Per cent
BIP	18	18.00	23	23.00
SPD	20	13.33	27	18.00
Bulk	12	12.00	16	16.00
SPS	08	7.62	11	10.48

Biparental progenies produced more transgressive segregants than SPD, bulk and SPS progenies for pods and seed yield per plant (Table 2). Biparental mating produced nearly 5% more transgressive segregants for seed yield and pods per plant than the best selfing progenies (SPD). More transgressive segregants in biparental progenies were attributed to enhanced recombination between favourable genes due to intermating (4, 5). The mean performance of transgressive segregants obtained from biparental progenies was considerably higher than other progenies for pods (34.38) and seed yield (8.89) per plant (Table 3). The upper as well as lower limits of range values of transgressive segregants were higher in biparental progenies than the selfing series. This can again be explained on the basis of increased recombination frequency in intermated population with consequent release of variability (7). The results of the present study clearly support the advantage of biparental mating compared to selfing series for obtaining transgressive segregants for yield.

Table 3. Mean and range values of transgressive segregants for seed yield and pods per plant in four progenies of China mung x TM 98-50 cross in mungbean

Progenies	Pods per plant		Seed yield per plant (g)	
	Mean	Range	Mean	Range
BIP	8.89	7.1 – 19.1	34.38	21 - 41
SPD	7.71	6.3 – 10.4	29.72	18 - 38
Bulk	5.54	4.9 – 6.7	27.86	16 – 38
IPS	5.12	4.2 – 6.3	21.23	17 – 27

LITERATURE CITED

1. Burton, G.W. and Devane, E.M. 1953. Estimating heritability in tall fescue (*Festuca cirnelinaceae*) from replicated clonal material. *Agronomy Journal* 45: 479-481.
2. Dahiya, B.N. and Singh, V.P. 1986. Comparison of single seed descent, selective intermating and mass selection for seed size in greengram. *Theoretical Applied Genetics* 72: 678-681.
3. Dahiya, B.N. and Singh, V.P. 1991. Variability among progenies of greengram developed through five selection methods. *Indian Journal of Pulses Research* 4: 5-8.
4. Gill, K.S., Bains, S.S., Singh, G. and Bains, K.S. 1973. Partial diallel test crossing for yield and its components in *Triticum aestivum* L. *Proceedings of Fourth International Wheat Genetics Symposium*, Missouri, Columbia, pp. 29-33.
5. Singh, G., Bhullar, G.S. and Gill, K.S. 1986. Comparison of variability generated following biparental mating and selfing in wheat. *Crop Improvement* 13: 24-28.

6. Hanson, G.H., Robinson, H.F. and Comstock, R.E. 1956. Biometrical studies of yield in segregating populations of *Koren hespedeza*. *Agronomy Journal* 48: 267-282.

7. Nagaraj, K., Salimath, P.M. and Kajjidoni, S.T. 2002. Transgressive segregants in populations derived form different mating and selection schemes in chickpea. *Crop Research* 23: 95 – 98.

8. Nanda, G.S., Singh, G. and Gill, K.S. 1990. Efficiency of intermating in F_2 generation of an intervarietal cross in bread wheat. *Indian Journal of Genetics and Plant Breeding* 50: 364-368.

9. Nematullah and Jha, P.B. 1993. Effect of biparental mating in wheat. *Crop Improvement* 20: 173 – 178.

10. Parameshwarappa, K.G., Kulkarni, M.S., Gulaganji, G.G., Kubsad, V.S. and Mallapur, C.P. 1997. An assessment of genetic variability created through biparental mating in safflower. *Fifth International Safflower Conference*, Bari (Italy), 2-7 June, 1997, pp. 238-239.

11. Robinson, H.F., Comstock, R.E. and Harvey, P.H. 1949. Estimates of heritability and degree of dominance in corn. *Agronomy Journal* 41: 353-359.

12. Yunus, M. and Paroda, R.S. 1983. Extent of genetic variability created through biparental mating in wheat. *Indian Journal of Genetics and Plant Breeding* 43: 76–81.