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RELATIVE IMPORTANCE OF GENE EFFECTS IN BITTER GOURD (*MOMORDICA CHARANTIA* L.)

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Abstract

Full diallel set was made in bitter gourd (*Momordica charantia* L.) involving six genetically divergent parents, namely BGGB1, BGGB4, BGGB6, BGGB12, BGGB13 and BGGB14 and their inheritance pattern of yield and yield contributing traits were studied.

The six genotypes were derived from the cultigens, collected from different parts of Bangladesh. The field experiment was conducted at the Fruit Research Station, Rajshahi to evaluate the genotypes BGGB1, BGGB4, BGGB6, BGGB12, BGGB13 and BGGB14 for various yield and yield components. The experiment was arranged in a randomized block design with three replications. The rows were spaced at 0.5 m apart with area of 1.5 × 1.5 sq. m per plant. Recommended cultural practices were adopted to raise a good crop. Data were collected from 30 F_1 plants and six parents for days to anthesis of first male flowering (DAMF), days to anthesis of first female flowering (DAFF), ovary length (OL), ovary diameter (OD), fruit length (FL), fruit diameter (FD), fruit weight (FW), fruit flesh weight (FFW) and harvested fruit number per week (HFNW) at edible stage. Data were statistically analyzed for genetic components using diallel techniques of Hayman's (1954a,b). For combining ability studies, the techniques of Griffing (1956a,b) Method II and Model I were followed.

In Hayman's analysis of variance table, item 'a' and 'b' were significant for most of the traits, suggested the importance of additive and non-additive gene effects in their inheritance. Celine and Sirohi (1994) reported that earliness in flowering and fruiting is governed mainly by dominance effects and dominance × dominance effects and yield per plant is governed mainly by dominance and additive × additive gene effects in bitter gourd. Sirohi and Choudhury (1980) noted greater involvement of dominance and dominance × dominance gene action for fruit length and diameter in bitter gourd.

The component *D* which measures additive variation was highly significant for most of the characters except DAMF and DAFF. Srivastava and Premnath (1976) reported dominant gene action in favorable direction for earliness in bitter gourd.

The H_1 component which measures dominance variation was significant for the characters FL, FD and HFNW. The significant value of H_2 indicated the dominance asymmetry of positive and negative genes in the parents for the characters OD, FL, FD and HFNW. The *F* value was significant and positive in sign for the characters FL, FW and HFNW, suggested that the dominant alleles were more frequent than recessive in parents (Mather and Jinks 1971). The h^2 components were negative for DAMF, OD and FD. This showed that decreasing alleles were dominant in most loci than increasing alleles, i.e., $u > v$ (Mather and Jinks 1982).

The crosses showing the highest significant positive specific combining ability (SCA) effects for various characters were BGGB4 × BGGB1 for OL, BGGB14 × BGGB4 for OD, BGGB12 × BGGB1 for FL, BGGB6 × BGGB4 for FD, BGGB14 × BGGB13 for FW and FFW, and BGGB12 × BGGB6 for HFNW. Further, two best combinations as judged from SCA estimates for yield, are BGGB14 × BGGB13 and BGGB6 × BGGB1. Choudhari and Kale (1991), Munshi and Sirohi

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(1994), Khattra *et al.* (1994) and Mishra *et al*, (1994) also studied SCA in bitter gourd. From these studies, it is evident that SCA effects of certain crosses were related with General combing ability (GCA) of their parents as the best cross combination for most of the characters involved at least one parent with high or average GCA effects for particular traits. Similar results have been reported by Mishra *et al.* (1994). Further, the best combination as judged from SCA estimates for yield is BGGB13 × BGGB13.

Table 1. Analysis of variance of six-parental diallel for different traits of bitter gourd.

Item	Characters								
	DAMF	DAFF	OL	OD	FL	FD	FW	FFW	HFNW
a	39.20**	14.03**	2537.43**	217.86**	730.55**	253.11**	543.64**	332.60**	53.61**
b	14.02**	11.96**	118.58**	1.49^{NS}	3.29**	5.20**	4.30**	4.07**	2.88**
c	103.56**	48.91**	966.13**	34.17**	59.84**	24.15**	77.08**	43.42**	3.19**
d	15.64**	10.44**	133.27**	0.92^{NS}	7.40**	1.09^{NS}	2.10**	1.65^{NS}	1.21^{NS}

* and ** indicate significance at 5 and 1% level. NS - non-significant.

Table 2. Components of variation and their proportional values for the different traits of bitter gourd.

Item	Characters								
	DAMF	DAFF	OL	OD	FL	FD	FW	FFW	HFNW
D	38.05^{NS}	16.52^{NS}	22.97**	0.71**	5.65**	0.66**	384.0**	241.99**	19.59**
F	36.98^{NS}	22.51^{NS}	– 5.13^{NS}	– 0.03**	0.45**	–0.12**	36.19**	10.16^{NS}	8.58**
H_1	38.89^{NS}	39.24^{NS}	10.22^{NS}	– 0.0002^{NS}	0.07**	0.06**	21.82^{NS}	19.90^{NS}	3.71*
H_2	26.45^{NS}	27.70^{NS}	8.31^{NS}	– 0.0013**	0.07**	0.06**	10.77^{NS}	10.98^{NS}	2.07*
h^2	– 0.58^{NS}	1.47^{NS}	2.28^{NS}	– 0.007**	0.002*	– 0.007**	1.48^{NS}	14.19*	3.71**
$[H_1/D]^{1/2}$	0.51	1.19	0.22	– 0.0002	0.006	0.043	0.03	0.04	0.095
$H_2/4H_1$	0.17	0.18	0.20	1.40	0.26	0.28	0.12	0.14	0.14
$[(4DH_1)^{1/2}+F]/[(4DH_1)^{1/2}-F]$	1.03	1.04	0.98	– 1.03	3.66	– 0.24	1.0	1.002	1.13

* and ** indicate significance at 5 and 1% level. NS - non-significant.

Table 3. GCA and SCA effects of characters of the parents.

Characters	GCA			SCA		
	MS	Best general combiner	GCA effect (value)	MS	Best cross combiner	SCA effect (value)
DAMF	26.92**	BGGB4	– 2.26**	38.50**	BGGB14 × BGGB4	– 10.38**
DAFF	16.91**	BGGB1	– 2.22**	32.59**	BGGB6× BGGB1 and BGGB14 × BGGB4	– 9.14**
OL	76.12**	BGGB1	5.50**	2.52**	BGGB4 × BGGB1	2.67**
OD	1.05**	BGGB1	0.50**	0.02**	BGGB14 × BGGB4	0.22**
FL	18.06**	BGGB1	2.83**	1.54**	BGGB12 × BGGB1	1.82**
FD	1.36**	BGGB4	0.17**	0.26**	BGGB6 × BGGB4	0.79**
FW	695.37**	BGGB1	13.21**	78.70**	BGGB14 × BGGB13	18.16**
FFW	520.97**	BGGB1	12.94**	72.48**	BGGB14 × BGGB13	16.76**
HFNW	34.34**	BGGB14	3.07**	1.62**	BGGB142× BGGB6	1.35^{NS}

* and ** indicate significance at 5 and 1% level. NS - non-significant.

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