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Genetics of Quantitative Traits in Brinjal (*Solanum melongena* L.)

Gajanana Kustagi[1*], H.B. Lingaiah[2], N. Jagadeesha[3], B. Ravikumar[4], N. Ashok[5] and G.B. Srinivasulu[6]

[1]Division of Post-Harvest technology, [3]Division of Agronomy, [4]Division of Plant pathology, [5]Division of Agricultural Economics, [6]Division of floriculture and Land scape Architecture, [2]Division of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, India

**Corresponding author*

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A B S T R A C T

A Field experiment was conducted at University of Agricultural Sciences, Bangalore with an objective to study the Genetics of quantitative traits in Brinjal (*Solanum melongena* L.). The present investigation was carried out with six generations, *viz*., P_1, P_2, F_1, F_2 BC_1P_1 and BC_1 P_2 generated from the crosses Arka Keshav X Arka Sheel and Arka Sheel X Annamali. Six generations of both the crosses were grown in compact family block with three replications. Each plot had two row for non-segregating generations (P_1, P_2 and F_1), eight rows for back cross generations (BC_1P_1 and BC_1P_2) and sixteen rows for F_2 generation. The estimates of six parameters m (mean), d (additive), h (dominance), i (additive X additive), j (additive X Dominance) and l (Dominance X Dominance). The values of estimates varied among the two crosses for the characters under study. From the data, it was observed that individual scaling test was significant for all the characters in both the crosses.

Introduction

Brinjal is one of the most important vegetable crops. The knowledge of gene effects for different traits in brinjal is of prime importance before starting a breeding programme. The genetics of yield and other characteristics is essential for improving its yielding ability. Genetic studies involving high yielding and widely adopted plant type need more attention because such crosses are expected to offer desirable genetic variability. Genetic variation in quantitative traits could arise from additive, dominance and epistatic gene effects. Keeping this in view the present investigation was planned to assess the gene action for yield and its contributing traits in brinjal. So that inference could be drawn from this study and could be utilized in specific breeding programme for obtaining fruitful results.

Materials and Methods

A Field experiment was conducted at University of Agricultural Sciences, Bangalore with an objective to study the Genetics of quantitative traits in Brinjal

(*Solanum melongena* L.). The soil of the experimental site was red sandy loam in texture classified under the order *Alfisols*, Vijapura series, isohyperthermic family of *oxihaplustaf*. pH was slightly acidic (6.44) having low cation exchange capacity (7.50 C mol kg^{-1}) with an electrical conductivity of 0.23 dSm^{-1}. The average annual rainfall was 927 mm distributed in 62 rainy days (> 2.5 mm). The present investigation was carried out with six generations, *viz*., P_1, P_2, F_1, F_2 BC_1P_1 and BC_1P_2 generated from the crosses Arka Keshav X Arka Sheel and Arka Sheel X Annamali. Six generations of both the crosses were grown in compact family block with three replications. Each plot had two row for non-segregating generations (P_1, P_2 and F_1), eight rows for back cross generations (BC_1P_1 and BC_1P_2) and sixteen rows for F_2 generation. Each row consisted of 5 plants keeping inter and intra row spacing of 60 cm. the data were recorded on ten, forty and eighty plants from each plot of non-segregating generations, back crosses and F_2 s respectively. Observations were recorded on plant height, number of branches, number of flowers/ cluster, number of fruit per cluster, number of fruits per plant, fruit yield per plant, fruit length and fruit width. Analysis of variance was done by standard statistical procedure given by Panse and Sukhatme (1961). The joint scaling test (m, d, h) were performed for all the characters in both the crosses to know the adequacy of three parameter (non epistatic) model (Mather and Jinks, 1982). The estimates of gene effects were obtained using the digenic epistatic model (Hayman, 1958).

Results and Discussion

The estimates of six parameters m (mean), d (additive), h (dominance), i (additive X additive), j (additive X Dominance) and l (Dominance X Dominance) are presented in Table 2. Whereas significance of scaling test is presented in Table 1. The values of estimates varied among the two crosses for the characters under study. From the data, it was observed that individual scaling test was significant for all the characters in both the crosses.

Number of fruits per plant

Additive (d) and dominance x dominance (l) gene effects were found to be significant in cross Arka Keshav X Arka Sheel. Duplicate type of epistasis was noticed for this cross. In cross Arka Sheel XAnnamalai, additive (d), additive Xadditive (i) and additive x dominance (j) gene effects were found significant. This cross shown complimentary type of epistasis. It is therefore suggested that selection for this character has to be delayed till the dominance is reduced due to selfing in advanced generations. Similar findings were also noticed by Singh *et al.,* (1974) and Gopinath and Madalageri (1986).

Fruit yield per plant

Additive (d), additive x dominance (j) and dominance X dominance (l) gene effects werefound significant in both the crosses [(Arka Keshav X Arka Sheel, and Arka Sheel X Annamalai)]. Both the crosses shown duplicate type of epistasis. It is suggested to adopt recurrent selection to improve this trait. These results were in conformity with the findings of Dixit *et al.,* (1984) and Babruwahan (1993).

Fruit length

In cross Arka Keshav X Arka sheel additive(d), dominance(h), additive X additive(i) and additive X dominance (j) gene effects were found significant and duplicate type of epistasis was noticed. Whereas, for cross Arka Sheel X Annamalai additive X dominance (j) and dominanceX dominance (l)

gene effects were found significant and complimentary type of epistasis was noticed. It is suggested to adopt recurrent selection to improve this trait. Similar results were reported by Babruwahan (1993).

Fruit width

Additive9d), dominance (h), additive x additive (i) and dominance X dominance (l) gene effects were found significant for cross arka Keshav x Arka sheel. In cross Arka Sheel X annamalai additive (d), dominance (h) and additive X dominance (j) gene effects were found significant. Duplicate type of epistasis was noticed in both the crosses. It is therefore suggested to improve this trait by biparental mating or pedigree method of selection. Gopinath and Madalageri (1986) have also been obtained similar results.

Table.1 Estimates of additive, dominance and interaction effects of 8 traits in Two crosses of brinjal

Characters	Cross	M	d	h	i	j	l	Type of epistasis
Plant height (Cm)	C I	86.65**	0.88	6.42*	-7.3*	14.68**	15.40**	C
	C II	82.83**	1.50	6.20*	2.52	-11.75**	-6.99	D
No of branches	C I	10.04**	0.19	-3.18**	-4.05**	2.16**	8.18**	D
	C II	8.18**	-0.065	0.46	1.27*	-2.18**	1.07	C
No of flowers per cluster	C I	6.74**	0.36**	-1.77**	-1.45**	0.82**	4.80**	D
	C II	5.78**	0.032	0.32	0.83	-0.22	4.44**	C
No of fruits per cluster	C I	4.79**	0.37**	-0.95*	-0.84*	1.03**	2.97**	D
	C II	3.94**	-0.05	0.60	1.02	-0.27	3.77**	C
No of fruits	C I	26.93**	-2.14*	1.40	-1.73	0.045	-39.21**	D
	C II	33.23**	3.66*	-4.63	-15.70**	7.09**	-2.32	C
Fruit yield per plant	C I	1323.99**	-226.88**	380.35	186.32	-145.91*	-3133.34**	D
	C II	1750.67**	258.19**	88.43	-555.95	481.96**	-1215.83**	D
Fruit length (Cm)	C I	12.43**	1.12**	3.56**	2.82**	0.96**	-6.59**	D
	C II	13.00**	-0.004	0.22	-1.14	0.64**	2.24**	C
Fruit width (Cm)	C I	3.13**	-0.14*	0.59**	0.58**	-0.12	-2.94**	D
	C II	3.23**	0.15*	0.61**	0.08	0.36**	-0.45	D

-Significant at 5% level
** - Significant at 1 % level

Table.2 Estimates of genetic parameters for different traits in two crosses of brinjal

Characters	Cross	Heritability (broad sense)	Genetic advance as % mean	Inbreeding depresssion	Heterosis (%)	
					MP	BP
Plant height (Cm)	C I	88.46	14.74	8.15 **	17.18**	-0.053
	C II	70.58	8.58	1.62**	4.55**	-10.22**
No of branches	C I	18.41	7.38	4.58	8.97**	-9.56**
	C II	22.82	5.31	6.11*	-8.53	-25.23**
No of flowers per cluster	C I	21.91	5.45	4.59*	-4.34	-9.96**
	C II	38.02	9.18	22.14**	-6.73*	-9.83**
No of fruits per cluster	C I	44.28	15.70	5.42	-2.22	-13.37**
	C II	56.96	16.76	31.47**	-7.50**	-11.14**
No of fruits	C I	97.75	77.83	-35.01**	18.00**	2.94
	C II	95.85	76.50	-5.20	5.41**	31.96**
Fruit yield per plant	C I	99.44	86.75	-45.34**	33.55**	16.19**
	C II	97.17	77.08	-14.83**	7.61**	39.29**
Fruit length (Cm)	C I	85.02	19.29	1.04	6.18**	4.75**
	C II	72.94	14.83	5.23**	11.12**	5.55**
Fruit width (Cm)	C I	71.42	17.28	-14.05**	0.74	-0.37
	C II	64.70	17.14	6.19**	18.27**	10.64**

* - Significant at 5% level
** - Significant at 1% level

Plant height

Dominance (h), additive X dominanace(j) and dominance X dominance (l) gene effects were found significant and complimentary type of epistasis was noticed for cross, Arka Keshav X Arka sheel. Whereas, for cross Arka sheel X Annamalai, dominance(h) and Additive x dominance (j) effect was found significant and duplicate type of epistasis was noticed.

It is suggested to adopt reciprocal recurrent selection or biparental mating to improve this trait. Similar results were reported by Dixit (1973), Singh and Nandapuri (1974).

Number of branches

Dominance (h), additive x additive (i), additive x dominance (j) and dominance X dominance (l) gene effects were found significant and complimentary type of epistasis was noticed for cross Arka Keshav X Arka Sheel. Whereas, for cross Arka sheel X annamalai additive X dominance (j) gene effect found significant and duplicate type of epistasis was noticed. It is suggested to adopt reciprocal recurrent selection or biparental mating to improve this trait. Similar findings were reported by Peter and singh (1974) and Babruwahan (1993).

Number of flowers per cluster

In cross arka keshav X Arka Sheel additive(d), dominance(h), additive x additive(i), additive x dominance (j) and dominance x dominance (l) gene effects were found significant and duplicate type of epistasis was noticed. While for cross Arka sheel X Annamalai, dominance X dominance (l) gene effect was significant and complimentary type of epistasis was observed. Therefore it is suggested to adopt reciprocal recurrent selection or biparental mating to improve this trait. Similar results were obtained by Peter and Singh (1974) and Babruwahan (1993).

Number of fruits per cluster

In general, generation mean analysis suggested that gene effects for different traits varied from one cross to another cross. However, impact of additive and non-additive gene effects were found prominent for different characters. The situation thus suggested that these traits could possibly be improved by adopting reciprocal recurrent selection or biparental mating system of breeding.

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