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Genetic study for earliness in sponge gourd [*Luffa cylindrica* (Roem.) L.]

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ABSTRACT

The component of gene effects for characters related to earliness in sponge gourd were studied using six basic generation means (P_1, P_2, F_1, F_2, BC_1 and BC_2) derived from eight diverse genotypes. Non-allelic interactions were present in all the characters for majority of the crosses as evident from individual scaling tests and joint scaling test. The results revealed that earliness in flowering and fruiting as well as number of picking was mainly governed by dominance (h) and dominance x dominance (l) gene effects with few exception and hence these characters can be improved through heterosis breeding. The preponderance of duplicate gene action is suggestive, most of the crosses revealed the possibility of improvement of earliness and number of picking through heterosis breeding. However, for exploration of all the types of gene effects (both additive and non-additive gene action), reciprocal recurrent selection may be suggested.

Key words : Gene effect, Generation mean analysis, Sponge gourd, Heterosis breeding.

Sponge gourd [*Luffa cylindrica* (Roem.) L.] is one of the most important cucurbitaceous vegetable crops grown extensively throughout the tropical and sub-tropical region of the world. Tender fruits of sponge gourd are very popular and well known culinary vegetable in India with good nutritive value and high yield potentials. It is good source of carbohydrates, vitamins A and C and minerals. The fibers are used for industrial purpose. Sponge gourd is highly cross-pollinated crop and has a broad spectrum of early maturity, high yielding, large fruit size and shape, colour and other compositions. The generation mean analysis provides valuable information on the nature of gene action and relative magnitude of additive, dominance and epistatic variances. Therefore, present experiment was planned to study generation mean analysis for earliness in sponge gourd.

MATERIALS AND METHODS

Eight promising genotypes/cultivars of diverse nature *viz.,* CHSG-2, JSGL-46, JSGL-71, JSGL-51, JSGL-39 JSGL-23, Pusa Chikni and NSG-28 were used as parental lines in the present investigation conducted at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif*, 2004. The experimental material consisted of six basic generations (P_1, P_2, F_1, F_2, BC_1 and BC_2) of six crosses namely CSHG-2 x JSGL-46 (cross-I), JSGL-71 x JSGL-46 (cross-II), JSGL-71 x JSGL-51 (cross-III), Pusa Chikni x JSGL-51 (cross-IV), NSG-28 x JSGL-39 (cross-V) and NSG-28 x JSGL-23 (cross-VI) involving eight genotypes. The experiment was carried out in RBD with three replications. In each replication, observations were recordered on five plants for each parental line and their F_1 crosses, 40 plants for each F_2 and 20 plants for each BC_1 and BC_2 generations. The family means values for P_1, P_2, F_1, F_2, BC_1 and BC_2 were calculated for each cross in each replication.

The observations were recorded on seven characters (Table 1) to study various statistical parameters used in this investigation. The plants were spaced at 2.0 m between rows and 1.0 m within a row. The vines were trained to horizontal trellises. All the recommended cultural practices and plant protection measures were adopted to raise a good crop. The estimate of six genetic parameters *viz*., m (mean), d (additive), h (dominance), i (additive x additive), j (additive x dominance) and l (dominance x dominance) were calculated based on the formula suggested by Hayman (1958).

RESULTS AND DISCUSSION

The analysis of variance for six basic generations revealed significant differences among the generation means for all the characters for all the crosses except for number of node at which first female flower appeared in cross V; for days to first picking in cross II, III, IV and V; for number of picking in cross IV and VI. The individual scaling tests of Mather (1949) and joint scaling test of Cavalli (1952) revealed the presence of non-allelic interaction in majority of the crosses for the characters studied.

Days to first male flower opening :

The significant additive (d) gene effect was observed in negative direction in all the three interacting crosses,

while significant dominance (h) gene effect was observed in cross II toward positive side and was greater in magnitude than additive effect (Table1). Among the epistatic components, additive x additive (i) and dominance x dominance (l) effect was significant in cross II and cross V, respectively. Duplicate epistasis was noticed in all the three interacting crosses.

Days to first female flower opening :

Non-allelic interaction was present in all the crosses (Table 1). The relative magnitude of additive (d) and dominance (h) effects suggested that significant dominance gene effect had contributed more to the total variation of this trait for cross II, III, IV and V while additive gene effect was significant in crosses I, III and IV. Among the epistatic components, additive x additive (i) and dominance x dominance (l) effect was significant in cross I, (i) and (j) effect in cross II, (j) in cross III, V and VI as well as (i) in cross IV only. Complement epistasis was noticed in cross II, while the remaining five crosses showed duplicate epistasis.

Number of node at which first male flower appearing:

Duplicate epistasis (Table1)was present in cross IV

Table 1: Estimation of gene effects for various characters in sponge gourd

Cross No.	m	(d)	(h)	(i)	(j)	(l)	Types of epistasis
Days to first male flower opening							
II	41.52±0.32**	-2.43±0.79**	4.56±2.21*	7.46±2.13**	-1.73±1.17	-3.44±3.94	D
III	50.25±0.41**	-3.23±0.85**	-3.23±2.29	-2.37±2.51	-2.27±1.13	1.96±3.67	D
V	45.13±0.39**	-2.47±0.88**	-2.83±2.83	-1.97±2.49	-1.46±1.28	21.60±6.03**	D
Days to first female flower opening							
I	52.63±0.76**	-3.97±0.88**	6.53±3.55	13.13±3.52**	0.63±0.92	-28.40±4.77**	D
II	48.72±0.82**	2.53±1.36	17.43±4.29**	17.53±4.25**	4.37±1.41**	3.07±6.46	C
III	49.37±0.69**	-3.17±0.95**	8.10±3.41*	5.0±3.36	-8.07±1.03**	-6.20±4.86	D
IV	52.97±0.91**	4.20±0.93**	-17.73±4.12**	-14.13±4.10**	-0.60±0.95	7.20±5.26	D
V	53.83±0.79**	-2.40±1.46	10.87±4.41*	7.60±4.28	-3.93±1.59*	-2.13±6.94	D
VI	52.10±0.76**	0.37±1.37	4.97±4.24	4.47±4.09	-4.27±1.48**	-9.27±6.64	D
Number of node at which first male flower appearing							
I	4.87±0.85**	-0.65±0.32*	2.32±2.54	--	--	--	--
IV	7.99±1.23**	2.93±0.28*	-6.08±1.78**	-5.17±1.2 1**	-0.67 ±0.86	1.13±2.11	D
Number of node at which first female flower appearing							
I	14.87±0.44**	-2.80±0.53**	3.73±2.09	2.80±2.04	6.67±0.56**	-7.47±2.88*	D
II	14.60±0.46**	2.87±0.70	1.30±2.34	2.40±2.31	3.90±0.73**	1.40±3.44	C
III	13.75±0.38**	2.13±0.54**	1.93±1.90	-	-	-	--
IV	14.05±0.61**	1.90±0.65**	-8.53±2.77**	-9.33±2.76**	-0.23±0.68	8.33±3.60*	D
VI	11.38±0.36**	-2.63±0.69**	12.27±2.08**	12.80±1.99**	-4.63±0.75**	-22.01±3.35**	D
Days to first picking							
I	57.72±0.66**	-0.50±1.09	27.50±3.51**	22.80±3.43**	4.47±1.18**	-21.60±5.31**	D
VI	50.52±0.81**	-2.29±1.11*	9.80±4.02*	7.60±3.92	-10.43±1.16**	-11.27±5.78	D
Days to last picking							
I	122.68±1.61**	6.80±2.31**	35.40±7.98**	16.99±4.94*	23.67±2.35*	11.27±11.41	C
II	126.48±1.32**	-1.17±1.76	16.03±6.43*	16.67±6.34*	10.20±1.85**	-31.87±9.06**	D
III	124.32±0.71**	2.93±1.92	12.53±4.89*	4.93±4.76	12.60±1.98**	6.53±8.47	C
IV	130.15±0.84**	-3.60±0.87**	-14.73±3.87**	-13.93±3.8**	4.00±0.93**	16.07±5.06**	D
V	125.65±0.67**	5.83±3.40	15.90±7.33**	11.73±7.31	-3.33±1.40*	8.53±13.89	C
VI	110.03±1.75**	2.67±2.17	22.40±8.60*	27.73±8.23**	-14.00±2.24**	-17.67±12.20	D
Number of picking							
I	10.30±0.31**	0.57±0.29*	-5.99±1.41**	-7.93±1.37**	1.50±0.36**	14.53±1.83**	D
II	9.58±0.28**	-0.40±0.53	3.73±1.59*	1.13±1.54	-1.27±0.56*	1.93±2.51	C
III	9.43±0.28**	1.83±0.41**	-2.23±1.41	-1.98±1.38	3.00±0.44**	10.47±2.07**	D
V	9.25±0.27**	0.70±0.34*	-2.40±1.29	-4.53±1.26**	-0.43±0.37	9.13±1.80**	D

* and ** indicate of significance of values at P = 0.05 and 0.01, respectively,

only and was due to significance of additive x additive (i) gene effect besides significance of additive (d) and dominance (h) gene effects. In case of non-interacting cross I, only the additive (d) gene effect was significant and negative.

Number of node at which first female flower appearing:

Additive-dominance model (Table1) was satisfactory for cross III due this trait in which only additive (d) gene effect was significant and positive. Additive (d) gene effects as well as two epistatis gene effects *viz*., (j) and (l) was significant in cross I, while only (j) was significant in cross II. All the six types of gene effects were significant in cross IV and VI except (j) effect in cross IV. Duplicate epistasis was observed in cross I, IV and VI, while complimentary epistasis was observed in cross II only.

Days to first picking :

All the three types of non-allelic interaction was noticed for days to first harvest in cross I besides dominance gene effect (Table1). Additive (d), dominance (h) and additive x dominance (j) gene effects were significant in cross VI. Both crosses showed duplicate epistasis for this trait.

Days to last picking :

Non-allelic interaction was noticed for days to last picking in all the six crosses (Table1). All the six gene effects *viz.,* m, (d), (h), (i), (j) and (l) were significant in cross I, III, IV, V and VI except (d) in cross II and (d) and (i) in cross III, (d), (i) and (j) in cross V and (d) and (l) in cross VI. The absolute magnitude of significant and positive gene effects revealed that dominance (h) except cross IV. Three interacting crosses had duplicate epistasis and three crossed showed complementary epistasis for this trait.

Number of picking :

Number of picking is most important character in sponge gourd and is directly related to fruit yield per vine (Table1). All the six gene effects *viz.,* m, (d), (h), (i), (j) and (l) were significant in all the four interacting crosses except (d), (i) and (l) in cross II, (h) and (i) in cross III and (h) and (j) in cross V. All the crosses showed duplicate epistasis except cross II.

A perusal of the results revealed that the characters related to earliness like days to first male and female flower opening and node number at which both appearing, days to first and last picking and number of harvest were, in general, largely controlled by dominance (h) and dominance x dominance (l) components. In majority of the cases, the total magnitude of dominance (h) and dominance x dominance (l) components were in favourable direction. Duplicate epistasis was also observed in most of the crosses for all the characters. This indicated that improvement in earliness of flowering and fruiting may be achieved by heterosis breeding. Srivastava and Premnath (1976) and Celine and Sirohi (1998) also reported dominance gene action and favourable direction for earliness in bitter gourd. Further more, Janakiram and Sirohi (1990) and Pichaimuthu (1991) in bottle gourd also reported major contribution of dominance (h) and dominance x dominance (l) gene effects coupled with duplicate epistasis for earliness in flowering and fruiting using generation mean analysis.

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REFERENCES

Cavalli, L.L. (1952). An analysis of linkage in quantitative inheritance. In: Reeve RCR and CH Waddington (Eds.). *Quantitative inheritance*. HMSO London. p. 135-144.

Celine, V.A. and Sirohi, P.S. (1998). Generation mean analysis for earliness and yield in bitter gourd *(Monordica charantia* L.). *Veg. Sci.,* **25** (1): 51-54.

Hayman, B.I. (1958). The separation of epistatic form additive and dominance variation in generation means. *Heredity*, **12**: 371-390.

Jankiram, T. and Sirohi, P.S. (1990). Genetics of fruit maturity in bottle gourd. *South Indian J. Hort.,* **38**: 3-7.

Mather, K. (1949). *Biometrical genetics* 1st Edn. Dover Publications Inc. New York.

Pichaimuthu, M. (1991). Heterosis in bottle gourd [*Lagenaria siceraria* (Mol) Standl]. Ph.D. Thesis, IARI, New Delhi.

Srivastava, V.K. and Premnath, (1976). Dialled analysis in *Momordica charantia* L. Proc. Third Int. Symp. Sub Trop. Hort. Bangalore, I. Improve. *Hort. Plant Med. Plants,* 157-68.

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