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Genetics of yield and its contributing traits of brinjal (*Solanum melongena* L.)

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Abstract
The study on genetic components of variation revealed that the importance of non-additive systems operating in inheritance of yield and its important components. Degree of dominance was in range of over dominance range for all the characters and close to complete dominance for plant height. The traits *viz.* days to 50% flowering, days to first fruit harvest, average fruit weight, harvest duration and fruit yield per plant, exhibited non significant environmental effect. For days to 50% flowering, days to first fruit harvest, average fruit weight, harvest duration and fruit yield per plant dominant genes were more frequently distributed in the parents. The result suggested preponderance of dominance gene in the expression of traits studied. Therefore, heterosis breeding approach might be advantageous rather than selection to develop superior hybrids for high fruit yield in brinjal.

Keywords: Binjal, genetics, gene action, brinjal, additive

Introduction
Among Solanaceous vegetables, brinjal (*Solanum melongena* L.) is one of the important crops. It is commercially grown in both temperate and tropical regions of the world mainly for its immature fruits as culinary vegetables. Indian collections havemarked diversity in brinjal, as India is the primary centre of origin. (Vavilov, 1931 and Bhaduri, 1951) [6, 8]. Less attention has been paid by the researchers for the development of brinjal cultivars with better fruit quality and as per market preference. The local landraces were have not been fully utilized in anygenetic improvement programme such as selection and hybridization. In brinjal improvement programme, it is very imperative to know the nature and magnitude of gene action and also to know the combining ability of parental lines. In brinjal, the information generated in the breeding process can be used to understand the magnitude of heterosis. However, gene action of different yield and flowering traits has been reported by Chadha *et al.,* (1990) [9]. Due to gene and environment interactions, direct selection in brinjal is not successful. Knowledge of the gene action for targeted traits under selection is most important component of breeding strategy. Hence, a present study on gene action in brinjal is performed to estimate the genetic component, which will be helpful to formulate the future breeding strategies of brinjal.

Methods & Materials
Field experiment was conducted at (MES) Department of Vegetable Science, N.D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) India. The materials for the present investigation comprised of 8 divers genotype of brinjal viz.; Siliguri (P_1), Mukta Kesi (P_2), Pant Rituraj (P_3), NDW-White-1 (P_4), Panjab Sadabahar (P_5), NDB-S-1-1 (P_6), KS-224 (P_7) and NDB-3 (P_8). Eight inbred differing in growth habit, fruit and yield characters were selected as parents and were crossed in a diallel fashion excluding reciprocals. The experimental materials comprising 36 treatment *viz.*; 8 parents and 28 F_1s were sown in Randomized Block Design with three replications. Observations were recorded on eight competitive plants in each of parents and F_1's for 5 characters viz.; days to 50% flowering, days to first fruit harvest, average fruit weight (g), harvest duration (days) and yield per plant (kg). The data were subjected to analysis of variance (Panse and Sukhatme, 1967) [10], diallel cross analysis (Hayman, 1957, Jinks and Hayman, 1953) [11, 3] for analytical approach.

Results and Discussion

The analysis of variance showed highly significant difference due to treatment for all the characters. The t^2 value was non-significant in the population for all the characters in both year Y_1 and Y_2. Thus the non-significance value of t^2 indicates the validity of assumption pertaining to diallel analysis, while significant value of t^2 showed failure of hypothesis or null hypothesis for diallel cross analysis. Highly significant value for additive ($\hat{D}$) and dominance $\hat{H}_1$ and $\hat{H}_2$ effect of component were observed for all traits in both year (Y_1 and Y_2) except the value of $\hat{D}$ for days to 50% flowering and harvest duration in both the year, while total fruit yield in Y_2, The significant value of $\hat{D}$, $\hat{H}_1$ and $\hat{H}_2$ indicate the importance of both additive and dominance gene action in expression of these traits, which is in consonance with findings of Indiresh *et al*. (2005) [4]; Kumar *et al*. (2011) [5] and Deshmukh *et. al*. (2014) [2]. The two measures of dominant component $\hat{H}_1$ and $\hat{H}_2$ were also significant for all these traits. Similar result was reported by Kumar *et al.* (2014).

The estimates of $\hat{F}$ values was found significant and positive for average fruit weight and in both years and days to first harvesting in Y_1, suggested more frequency of dominant alleles than recessive, irrespective of whether or not the dominant alleles have increasing or decreasing effects (Deshmukh *et al.* 2014) [2]. The average degree of dominance $(\hat{H}_1/D)^{0.5}$ revealed the presence of over dominance for all the characters in both year (Y_1 & Y_2). This suggested that heterosis breeding might be advantageous for improvement of yield and its attributing traits in brinjal. This result is in agreement with the finding of Deshmukh *et al.* (2014) [2]. The maximum value of 0.25 was not revealed for the studied characters and obviously this might have been one of the reason for an over estimation of degree of dominance. However, all characters are close to the ratio of $\hat{H}2/4\hat{H}_1$ value of 0.25 in both the year, suggesting the asymmetrical distribution of positive and negative alleles among the parents. Therefore, the conclusion drawn for these characters regarding degree of dominance are valid and the prediction about the hybrids derived from such parents are expected to be with in the limit of standard error.

The proportion of dominant and recessive genes among the parents determines the extent of genetic advance that can be made in a particular direction because if the gene present in the population are predominantly of recessive nature. While expressions of the character to be improved through selection are controlled by dominant genes, the extent of genetic advance will be limited and vice versa. The ratio of recessive and dominant alleles were distributed more frequently than the recessive once for all the characters in both seasons. The ratio $\hat{h}^2/\hat{H}_2$ was less than unity for these characters in both the seasons, indicating the superiority of recessive genes for the control of these characters. This ratio is frequently reduced by complementary gene action and gives somewhat suspensive results (Chaudhary and Pathania 2001, Yadav *et al*. 2017) [1, 7]. The result suggested preponderance of dominance gene in the expression of traits studied. Therefore, heterosis breeding approach might be advantageous rather than selection to develop superior hybrids for high fruit yield in brinjal.

Table 1: Estimates of components of variation and their related statistics in 8 x 8 diallel crosses of brinjal over two year (Y_1, &Y_2)

Component of variation and related statistic	Year	Days to 50% flowering	Days to first fruit harvest	Average fruit weight (g)	Harvest Duration (days)	Total fruit yield per plant (kg)
		1	4	8	9	12
$\hat{D}$ Additive effect	Y_1	2.31	2.19*	1040.43*	83.27	1.78*
		±6.51	±41.13	±162.72	±59.03	±0.69
	Y_2	7.353	10.54	1724.94*	69.50	1.89
		±7.64	±29.13	±264.17	±37.82	±0.99
$\hat{F}$ Mean Fr over arrays	Y_1	6.54	4.00*	856.38*	12.69	0.99
		±15.39	±97.20	±384.50	±139.48	±1.63
	Y_2	18.893	7.57	1583.13*	43.83	1.69
		±18.05	±68.83	±624.21	±89.37	±2.33
$\hat{H}_1$ Dominance effect	Y_1	49.63*	334.06*	2507.61*	572.38*	12.78*
		±14.97	±94.57	±374.08	±135.70	±1.59
	Y_2	62.66*	186.94*	3037.30*	375.86*	11.62*
		±17.56	±66.97	±607.29	±86.95	±2.27
$\hat{H}_2$ Dominance indicating asymmetry of +/- effect of genes	Y_1	21.15*	258.63	2289.20*	552.07*	10.97*
		±8.73	±82.27	±325.45	±118.06	±1.38
	Y_2	46.18*	159.66*	2534.13*	353.75*	10.04*
		±15.28	±58.26	±528.34	±75.64	±14.21
$\hat{H}^2$	Y_1	41.43*	138.49	1955.11*	66.74*	11.12*
		±13.03	±55.17	±218.26	±79.17	±0.92
	Y_2	11.54	55.49	1030.60*	104.71*	14.21*
		±10.25	±39.07	±354.33	±50.73	±1.32
$\hat{E}$ Environmental component	Y_1	0.54	1.24	61.18	1.52	0.33
		±2.17	±13.71	±54.24	±19.67	±0.23
	Y_2	0.50	1.48	6.10	2.018	0.18
		±2.54	±9.71	±88.05	±12.60	±0.33
$H_1/D^{0.05}=F_1$ Proportion of dominant and recessive genes in parent	Y_1	4.63	12.34	1.55	2.62	2.67
	Y_2	2.91	4.21	1.33	2.32	2.47
$\hat{H}_2/4\hat{H}_1$ Proportion of gene with +/- effect of parents	Y_1	.20	0.19	0.23	0.24	0.21
	Y_2	0.18	0.21	0.21	0.23	0.21
KD/KR Proportion of dominant and recessive	Y_1	1.87	1.16	1.72	1.06	1.23
	Y_2	2.57	1.19	2.06	1.31	1.44

gene in parents						
h 2/H2	Y_1	0.51	0.54	0.85	0.12	1.01
Number of gene group	Y_2	0.25	0.35	0.41	0.29	1.41
t^2	Y_1	48.08	311.90	0.01	7.05	3.71
	Y_2	36.56	11.30	2.81	1.80	0.17
r	Y_1	-0.46	0.56	0.67	0.46	0.85
Correlation coefficient	Y_2	-0.37	0.28	0.17	0.05	0.02

*, **, Significant at 5 and 1 percent level of probability, respectively (Y_1= 2016-17, Y_2= 2017-18)

Table 2: Analysis of variance for combining ability of five characters over two Year (Y_1, Y_2).

Source of variation	Year	Df	Days to 50% flowering	Days to first fruit harvest	Average fruit weight	Harvest duration	Total fruit yield per plant (kg)
GCA	Y_1	7	6.21**	119.03**	1280.58**	216.345**	5.60**
	Y_2	7	7.32**	55.91**	1955.45**	122.88**	4.01**
SCA	Y_1	28	12.17**	77.32**	692.240**	143.06**	3.47**
	Y_2	28	13.86**	45.27**	720.16**	95.16**	3.23**
Error	Y_1	70	0.54	1.05	57.27	1.32	0.34
	Y_2	70	0.22	1.39	6.05	1.98	0.17

*, **, Significant at 5 and 1 percent level of probability, respectively. (Y_1=2016-17, Y_2= 2017-18)

References

1. Chaudhary DR, Pathania NK. Inheritance of agronomical and physiological growth parameters in brinjal (*Solanum melongena* L.). Himan. J Agric. Res. 2001; 26(1, 2):62-66.
2. Deshmukh SB, Sawant SN, Narkhede GW, Dod VN. Gene Action Studies in Brinjal (*Solanum melongena* L.) Middle-East J Scient. Res. 2014; 21(11):2177-2181.
3. Jinks JL, Hayman BI. The analysis of diallel crosses in maize. Gene. Crop News lette. 1953; 27:48-54.
4. Indiresh KM, Shivashankar KT, Kulkarni RS. Gene action for yield and its components in brinjal (*Solanum melongena* L.). Mysore J of Agric. Sci. 2005; 39(1):50-56.
5. Kumar A, Kumar S, Yadav YC. Gene action studies in brinjal (*Solanum melongena* L.). Envi. and Eco. 2011; 29(4):1717-1719.
6. Vavilov NI. The role of central Asia in the in the origin of cultivated plants, Bulletin of Applied Botany Genetics and Pl ant Breeding. 1931; 26(3):3-44.
7. Yadav PK, Warade SD, Kumar M, Singh S, Pandey AK. Gene Action for Determining Yield and Quality Attributing Traits in Brinjal (*Solanum melongena* L.) Int. J Curr. Microbiol. App. Sci. 2017; 6(6):1475-1480.
8. Bhaduri PN. Inter-relationship of non- tuberiferous species of Solanum with some consideration on the origin of brinjal (*S. melongena* L.). The Indian J Hort. 1951.
9. Chadha NML, Joshi AK, Ghai TR. Heterosis breeding in brinjal, The Indian J of Hort. 1990; 47:417-423.
10. Panse VG, Shukhatme PV. Statistical Methods for Agricultural Workers 2nd eds. Indian Council of Agriculture Research, New Delhi, 1967.
11. Hayman BI. Interaction, heterosis and diallel crosses. Genet. 1957; 42:336-355.