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Correlation Studies in M_2 Generation in Brinjal Varieties

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A B S T R A C T

Field trials were conducted to study the effect of physical and chemical mutagens (Gamma rays, Ethyl Methane Sulphonate (EMS) and Diethyl sulphate (DES)) on biometric characters viz., days to 50% flowering, plant height, number of branches, fruits per plant, fruit length, fruit girth, fruit weight and fruit yield per plant and their correlations in five brinjal cultivars *viz*., Angoor, Annamalai, Hissar pragath, PLR 1 and Putheri. The results revealed that there had been strong association between number of fruits per plant and fruit weight with fruit yield per plant in M_2 generation.

Introduction

Brinjal or egg plant (*Solarium melongena*, 2n = 2x = 24) belonging to the family solanaceae is one of the important vegetable crops grown in India and other parts of the world. India is the primary center of origin (Bhaduri and Kallo, 1989) being confirmed through isozyme and morphological variations. It is also extensively grown in Bangladesh, Pakistan, Japan, Germany, U.S.A. and Italy besides South East Asian countries.

It is a very nutritive vegetable having high percentage of carbohydrates, proteins and other essential nutrients and also has some medicinal properties. Brinjal fruits are rich source of minerals like calcium, magnesium, potassium, iron, zinc and copper. The present investigation was attempted to study the association between various biometric characters in five brinjal varieties *viz*., Angoor, Annamalai, Hissar pragath, PLR 1 and Putheri in M_2 generation.

Materials and Methods

Five varieties of brinjal *viz*., Angoor, Annamalai, PLR 1, Putheri and Hissar Pragath were taken to study the effect of physical and chemical mutagens on the biometric characters and their association in M_2 and M_3 generations. Physical mutagen namely Gamma rays and chemical mutagens namely Ethyl Methane Sulphonate (EMS) and DiEthyl Sulphate (DES) were used for inducing mutation. Well filled 600 seeds per treatment were packed in polythene bags in respect of each genotype and treated in the gamma chamber (^{60}Co) at 10 krad dosage. Similarly, 600 seeds per treatment pre-soaked

for 12 hours in distilled water were treated with 0.04 per cent DES and 0.6 per cent EMS for four hours at room temperature (26±2°C) with intermittent shaking during this period. The treated seeds were washed thoroughly in running water and were used for germination test or for sowing immediately in seed bed. The same procedure was followed for the control, where 600 well filled seeds per genotype were soaked in distilled water for 12 hours at room temperature (26±2°C) with intermittent shaking during this period.

Genotype wise and treatment wise the seeds from M_1 were mixed, bulked and used for raising the M_2 generation. Genotype wise and treatment wise seeds from M_2 were mixed, bulked and used for raising M_3 generation with three replications in Randomized Block Design The number of plants per treatment was fifty and were transplanted to 3m x 4.5m treatment plot. Ten randomly selected plants were labelled for taking observations of quantitative characters except for days to 50% flowering. Number of days taken from sowing to 50 per cent flowering of treatment population was recorded for each treatment and expressed as number of days to 50% flowering. The height of the main stem of ten plants was measured from the ground level to the apical leaflet and the mean was expressed in cm and the number of branches borne on the main axis of 10 plants was counted at the time of harvest and the mean was expressed in numbers. The total number of fruits was counted for each of the randomly selected individual plants at the time of harvest and expressed in numbers. Fruit yield of ten random plants was recorded and the mean was expressed as fruit yield per plant in grams (g).

Statistical analysis

The data for each character in all the treatments were analysed separately by an appropriate analysis of variance. The statistics like mean, variance, standard error, co-efficient of variation, heritability and genetic advance as per cent of mean were computed for population in all traits studied adopting the standard statistical method. The estimates of inter component correlation were calculated for M_2 and M_3 generation as per the methods suggested by (Goulden, 1952).

$$r_{1.2} = \frac{\text{Sum of Products of 1 and 2}}{(\text{Sum of squares of 1} \times \text{Sum of squares of 2})^{1/2}}$$

Where, R = Correlation co-efficient and 1 and 2 are characters 1 and 2 respectively.

Results and Discussion

For designing an efficient plant breeding program, adequate knowledge about the magnitude and direction of association between yield and its component traits is essential. The genotypic and phenotypic correlation coefficients were estimated to measure the degree of association between yield and its contributing characters.

The correlation studies in Angoor between different characters indicated that number of fruits per plant was positive and highly significantly associated with fruit yield per plant and fruit weight in respect of all treatments. Similarly plant height was also found to be significant and positively associated with number of branches per plant in respect of all the treatments. The maximum positively significant association was noted between number of fruits per plant and fruit yield per plant for the mutagenic treatment 10 krad gamma rays (0.64) followed by 0.04 per cent DES (0.51) (Table 1). For the genotype Annamalai, the mutagenic treatment 10 krad gamma rays and 0.6 per cent EMS revealed positive and highly significant correlation values for most of the characters with fruit yield per plant.

Table.1 Phenotypic correlation for biometric traits of Angoor in M_2 generation

Parameters	Treatments	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Fruit yield per plant
Days to 50 *per cent* flowering	Control	0.19*	0.34**	-0.28*	-0.53	-0.31**	0.25**	0.19*
	10 krad Gamma rays	0.09	0.03	-0.12	0.16	-0.03	0.03	0.09
	0.04 per cent DES	0.12	0.12	-0.16	0.34**	0.36**	0.37**	0.12
	0.6 per cent EMS	0.31**	-0.22**	0.03	0.06	-0.09	-0.41**	0.31**
Plant height	Control		0.47**	-0.13	0.03	0.01	-0.11	0.05
	10 krad Gamma rays		0.43**	-0.08	-0.04	0.05	0.02	0.08
	0.04 per cent DES		0.52**	0.06	0.08	0.01	0.08	-0.07
	0.6 per cent EMS		0.55**	-0.04	-0.02	-0.03	0.12	0.05
Number of branches per plant	Control			-0.16	-0.03	0.02	-0.11	0.08
	10 krad Gamma rays			0.08	-0.02	-0.03	-0.03	0.02
	0.04 per cent DES			0.05	0.05	0.05	0.02	0.02
	0.6 per cent EMS			0.05	-0.03	-0.03	0.06	-0.05
Number of fruits per plant	Control				-0.08	0.02	0.29**	0.34**
	10 krad Gamma rays				0.03	-0.06	0.36**	0.64**
	0.04 per cent DES				-0.08	0.02	0.39**	0.51**
	0.6 per cent EMS				-0.02	0.06	0.41**	0.33**
Fruit length	Control					0.03	-0.09	0.08
	10 krad Gamma rays					-0.03	0.06	0.06
	0.04 per cent DES					-0.02	0.03	0.06
	0.6 per cent EMS					-0.02	-0.17*	0.17
Fruit girth	Control						0.12	-0.02
	10 krad Gamma rays						0.08	0.08
	0.04 per cent DES						0.03	0.05
	0.6 per cent EMS						0.12	0.05
Fruit weight	Control							0.03
	10 krad Gamma rays							-0.12
	0.04 per cent DES							-0.17*
	0.6 per cent EMS							-0.06

Table.2 Phenotypic correlation for biometric traits of Annamalai in M_2 generation

Parameters	Treatments	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Fruit yield per plant
Days to 50 *per cent* flowering	Control	0.02	0.16	-0.33	-0.16	0.01	0.19*	0.24**
	10 krad Gamma rays	0.11	0.04	-0.09	0.25	-0.06	-0.01	0.11
	0.04 per cent DES	0.15	0.00	-0.03	0.18*	0.56**	0.21**	0.06
	0.6 per cent EMS	0.20*	-0.17*	-0.16*	0.40**	0.23**	0.20	0.42**
Plant height	Control		0.17*	0.03	0.14*	0.02	0.77**	-0.11
	10 krad Gamma rays		0.38**	-0.19*	0.15*	0.00	0.24**	0.29**
	0.04 per cent DES		0.39**	0.12	0.32**	0.19*	0.22**	0.22**
	0.6 per cent EMS		0.11	0.01	0.07	0.05	0.20*	0.25**
Number of branches per plant	Control			-0.08	0.08	0.09	0.25**	0.09
	10 krad Gamma rays			0.17	0.33**	0.20*	0.35**	0.19*
	0.04 per cent DES			0.00	0.31**	0.16	0.27**	0.02
	0.6 per cent EMS			-0.13	0.22*	0.06	1.03**	0.36**
Number of fruits per plant	Control				0.24**	0.12	0.42**	0.41**
	10 krad Gamma rays				0.13	0.08	0.23**	0.59**
	0.04 per cent DES				0.27**	0.12	0.26**	0.40**
	0.6 per cent EMS				0.49**	0.20*	0.36**	0.34**
Fruit length	Control					0.14	0.14*	0.32**
	10 krad Gamma rays					0.16	0.38**	0.22**
	0.04 per cent DES					-0.01	0.27**	0.10
	0.6 per cent EMS					0.04	0.51**	0.37**
Fruit girth	Control						0.14	0.18*
	10 krad Gamma rays						0.22**	0.33**
	0.04 per cent DES						0.18	0.06
	0.6 per cent EMS						0.25**	0.54**
Fruit weight	Control							0.20*
	10 krad Gamma rays							0.09
	0.04 per cent DES							0.06
	0.6 per cent EMS							0.24**

Table.3 Phenotypic correlation for biometric traits of Hissar Pragath in M_2 generation

Parameters	Treatments	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Fruit yield per plant
Days to 50 *per cent* flowering	Control	0.10	0.07	-0.30	-0.18*	0.13	0.08	0.03
	10 krad Gamma rays	0.03	0.20*	-0.06	0.03	-0.13	-0.18	-0.07
	0.04 per cent DES	0.13	0.10	0.03	-0.16	-0.03	0.02	-0.11
	0.6 per cent EMS	0.16	-0.12	-0.21*	0.20*	0.36**	0.29**	0.55**
Plant height	Control		-0.18*	0.15	-0.10	0.07	0.03	-0.18
	10 krad Gamma rays		0.12	-0.18*	0.08	-0.10	0.07	0.03
	0.04 per cent DES		0.06	0.10	0.33**	0.26**	0.20*	0.20*
	0.6 per cent EMS		-0.33**	0.03	-0.03	0.03	0.10	0.10
Number of branches per plant	Control			0.13	-0.18*	0.13	0.42**	-0.10
	10 krad Gamma rays			0.16	0.36**	0.29**	0.55**	0.33**
	0.04 per cent DES			0.53**	0.03	0.13	0.16	-0.03
	0.6 per cent EMS			-0.18*	0.13	0.16	0.36**	0.03
Number of fruits per plant	Control				0.26**	0.20	0.20*	0.56**
	10 krad Gamma rays				0.03	0.10	0.10	0.03
	0.04 per cent DES				0.39**	0.13	0.13	0.13
	0.6 per cent EMS				0.42**	0.33**	0.33**	0.23**
Fruit length	Control					0.13	0.16	0.55**
	10 krad Gamma rays					0.16	0.36**	0.33**
	0.04 per cent DES					0.03	0.07	0.26**
	0.6 per cent EMS					0.06	0.23**	0.20*
Fruit girth	Control						0.12	0.20*
	10 krad Gamma rays						0.36**	0.66**
	0.04 per cent DES						0.20**	0.56**
	0.6 per cent EMS						0.26**	0.63**
Fruit weight	Control							0.24**
	10 krad Gamma rays							0.33**
	0.04 per cent DES							0.39**
	0.6 per cent EMS							0.42**

Table.4 Phenotypic correlation for biometric traits of PLR 1 in M_2 generation

Parameters	Treatments	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Fruit yield per plant
Days to 50 *per cent* flowering	Control	-0.33**	0.06	-0.30	0.06	0.18	0.14	0.41**
	10 krad Gamma rays	0.24*	-0.24*	-0.06	0.07	0.06	0.06	0.42**
	0.04 per cent DES	0.15	-0.33**	0.03	0.05	0.24*	0.13	0.36**
	0.6 per cent EMS	0.06	-0.12	-0.21*	0.03	0.30**	0.07	0.22*
Plant height	Control		-0.18*	0.15	0.11	-0.06	0.03	-0.18
	10 krad Gamma rays		0.12	-0.18	0.19*	0.06	0.23*	0.19
	0.04 per cent DES		0.06	0.12	0.16	0.18	0.24*	0.11
	0.6 per cent EMS		-0.33**	0.06	0.16	0.18	0.24*	0.21*
Number of branches per plant	Control			-0.33**	0.07	0.06	0.24*	0.42**
	10 krad Gamma rays			0.24**	0.05	0.24*	0.30**	0.06
	0.04 per cent DES			0.79**	0.03	0.30**	0.37**	0.12
	0.6 per cent EMS			-0.18*	0.01	-0.06	0.33**	-0.18
Number of fruits per plant	Control				0.29**	0.06	0.53**	0.79**
	10 krad Gamma rays				0.36**	0.18	0.24**	0.61**
	0.04 per cent DES				0.36**	0.18	0.24*	0.31**
	0.6 per cent EMS				0.24*	0.06	0.24*	0.42**
Fruit length	Control					0.24*	0.30**	0.06
	10 krad Gamma rays					0.30**	0.67**	0.12
	0.04 per cent DES					-0.06	0.63**	-0.18
	0.6 per cent EMS					0.06	0.73**	0.79**
Fruit girth	Control						0.12	0.30**
	10 krad Gamma rays						0.76**	0.06
	0.04 per cent DES						0.70**	0.06
	0.6 per cent EMS						0.76**	0.67**
Fruit weight	Control							0.24*
	10 krad Gamma rays							0.42**
	0.04 per cent DES							0.15
	0.6 per cent EMS							0.30**

Table.5 Phenotypic correlation for biometric traits of Putheri in M_2 generation

Parameters	Treatments	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Fruit yield per plant
Days to 50 *per cent* flowering	Control	0.20	0.36**	0.29**	0.55**	0.03	0.26**	0.20*
	10 krad Gamma rays	0.10	0.03	0.13	0.16	-0.03	0.03	0.10
	0.04 per cent DES	0.13	0.13	0.16	0.36	0.13	0.39**	0.13
	0.6 per cent EMS	0.33**	0.23**	0.03	0.07	-0.10	0.42**	0.33**
Plant height	Control		0.01	0.28**	0.07	0.02	0.23*	0.10
	10 krad Gamma rays		0.13	0.16	0.08	0.11	0.03	0.18*
	0.04 per cent DES		0.11	0.13	0.18	0.02	0.16	0.15
	0.6 per cent EMS		0.17	-0.08	-0.05	-0.07	0.26	0.11
Number of branches per plant	Control			-0.16	-0.03	0.02	-0.11	0.08
	10 krad Gamma rays			0.08	0.02	0.03	-0.03	0.02
	0.04 per cent DES			0.05	0.05	0.05	0.02	0.02
	0.6 per cent EMS			0.05	0.03	-0.03	0.07	-0.05
Number of fruits per plant	Control				0.16	0.02	0.41**	0.36**
	10 krad Gamma rays				0.03	-0.07	0.37**	0.67**
	0.04 per cent DES				0.08	0.02	0.41**	0.34**
	0.6 per cent EMS				0.02	0.07	0.42**	0.54**
Fruit length	Control					0.03	-0.10	0.08
	10 krad Gamma rays					-0.03	0.07	0.07
	0.04 per cent DES					-0.02	0.03	0.07
	0.6 per cent EMS					-0.02	-0.18*	0.18
Fruit girth	Control						0.13	-0.02
	10 krad Gamma rays						0.08	0.08
	0.04 per cent DES						0.03	0.05
	0.6 per cent EMS						0.13	0.05
Fruit weight	Control							0.03
	10 krad Gamma rays							-0.13
	0.04 per cent DES							-0.18
	0.6 per cent EMS							-0.07

Interestingly fruit yield has revealed positive and highly significant association with plant height, number of branches per plant, number of fruits per plant irrespective of treatments. Maximum positive and significant correlation value of 0.59 was noted between the fruit yield per plant and number of fruits per plant in the mutagenic treatment in 10 krad gamma rays (Table 2).

Correlation studies in Hissar Pragath showed that the fruit yield per plant was positive and highly significantly correlated with the traits fruit length, fruit girth and fruit weight. Fruit weight was positively and highly associated with fruit girth for all the mutagenic treatments. The maximum positive and highly significant association was observed between fruit yield per plant and fruit girth in the mutagenic treatment 10 krad gamma rays (0.66) followed by 0.6 per cent EMS (0.63)(Table 3). In case of PLR 1, it was observed that the fruit yield per plant was positive and highly significantly correlated with days to 50 percent flowering and number of fruits per plant. Interestingly fruit weight was positively and significantly associated with plant height, number of branches per plant, number of fruits per plant, fruit length and fruit girth in respect of all mutagenic treatments (Table 4).

The association analysis between different traits in Putheri showed that fruit yield per plant as well as fruit weight were associated positive and highly significantly with number of fruits per plant. Maximum positive correlation was observed between the traits fruit yield per plant and number of fruits per plant in 10 krad gamma rays (0.67) followed by 0.6 per cent EMS (0.54) (Table 5). Highly significant and positive correlation was observed between fruit yield per plant and fruit girth per plant (0.68) for the mutagenic treatment 0.6 per cent EMS followed by 10 krad gamma rays (0.66) in the M_2 generation in Hissar Pragath. The traits fruit length, fruit girth and fruit weight expressed higher significant positive correlations. Similar kind of results was reported by earlier workers (Mohanthy, 1999; Atul kumar *et al.,* 2002). This information suggests that yield could be improved through selections based on either of fruit diameter or number of fruits per plant and correlates with earlier observations (Mohanthy, 1999; Soorianatha *et al.,* 1994). These results are also in consonance with (Eldin *et al.,* 1968; Singh and Singh, 1990; Ingale, 1993; Patel and Sarnaik, 2004) in brinjal.

Number of fruits per plant (0.46), fruit diameter (0.38) and number of pickings (0.38) had significant positive correlation with yield per plant at genotypic level (Sunita Kushwah and Bandhyopadhya, 2005)**.** Positive association between number of fruits per plant and fruit yield per has been reported by many workers (Mohanthy, 1999; Atul kumar *et al.,* 2002) in brinjal; (Singh and Singh, 1990; Indunair and Thamburaj, 1995; Mohanty, 2003), in tomato and other crops. Similarly, in brinjal, (Nainar *et al.,* 1990; Kumar *et al.,* 1990; Nalini *et al.,* 2009) reported strong association between number of fruits per plant and fruit yield. The entries having maximum number of fruits per plant and heavier fruits were generally observed to yield higher.

To conclude, it has been observed that there was strong relationship between fruit yield with number of fruits and fruit weight per plant.

References

Atul Kumar, M.S., Dahiya, and Butani, R.D. 2002. Correlation and path analysis in brinjal, *Haryana J. Hort. Sci.,* 31(1&2): 71-73.

Bhutani, R.D., and Kallo, G. 1989. Correlation and path coefficient analysis of some quality traits in tomato. *Haryana J. Horti. Sci.*, 18: 130-135.

Eldin, S. A., Blackrust, H.T., and Perry, B.A. 1968. The interrelationship between six plant characters in eggplant (*Solanum melongena* L.). *Proc. Am. Soct. Hort. Sci.*, 93: 438-443.

Goulden, C.H. 1952. Methods of statistical analysis. John Weilly and Sons Inc., New York.

Indunair, P., and Thamburaj, S. 1995. Correlation studies in certain exotic collections of tomato. *South Indian Hort.*, 43: 35-37.

Ingale, B.V. 1993. Diversity, heterosis and genetics of yield and quality parameters in brinjal (*Solanum melongena* L.). Ph. D. Thesis, University of Agricultural. Sciences., Dharwad.

Kumar, B.N., Bisht, J.K., and Joshi, M.C. 1990. Inter-relationship of qualitative traits in eggplant. *Madras Agric. J.*, 77: 86-89.

Mohanty, B.K. 1999. Character associations and path analysis in brinjal. *Progressive Horticulture,* 31(1&2): 23-28.

Mohanty, B.K. 2003. Genetic variability, correlation path coefficient studies in tomato. *Indian J. Agrl. Res.*, 37: 68-71.

Nainar, P., Subbiah, R., and Irulappan, I. 1990. Path coefficient analysis in brinjal. *South Indian Horti.*, 38: 18-19.

Nalini, A., Dharwad, P., Salimath, M., and Patil, S. A. 2009. Association and path co-efficient analysis in elite germplasm lines of brinjal (*Solanum melongena* L.). *Karnataka J. Agric. Sci.*, 22(5): 965-966.

Patel, K.K., and Sarnaik, D.A. 2004. Correlation and path coefficient analysis in brinjal (*Solanum melongena* L.). *Haryana J. Horti. Sci.*, 33: 246-247.

Singh, S.N., and Singh, H.N. 1980. Association in segregating population of brinjal. *Indian J. Genet. and Plant breed*, 40: 322-326.

Soorianatha Sundarm, K., Irulappan, I.,. and Thamburaj, S. 1994. Correlation studies in certain double cross hybrids of tomato. *South Indian Horti.*, 42: 141-142.

Sunita Kushwah. and Bandhyopadhya, B.B. 2005. Variability and correlation studies in brinjal. *Indian J. Hort.*, 62(2): 210-212.

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