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STUDIES ON GENETIC DIVERGENCE ANALYSIS OF EGGPLANT (*SOLANUM MELONGENA* L.) GENOTYPES UNDER COASTAL SALINE CONDITIONS

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Abstract

The present investigation was carried under soil have EC of 4.0 dS m^{-1} which is a saline stress condition. Fifty eggplant genotypes comprising of released varieties, local cultivars and breeding lines were utilized to identify genetically divergent genotype for fruit yield per plant and its component traits by using morphological traits. The information on the nature of association between the traits, existence of genetic diversity and contribution of individual to the total divergence were assessed. Analysis of variance revealed significant differences among the accessions for each of the twelve characters measured, indicating the presence of considerable amount of variability under stress condition. Based on the *per se* performance, the genotype VR-2, JBH-3, Utkalkeshari showed superior performance for fruit yield per plant. Genetic divergence analysis grouped the fifty genotypes into seven clusters which indicates the presence of considerable genetic diversity among the genotypes studied for fruit yield per plant and its component traits. The crosses among genotypes from broadly parted clusters are possibly to give desirable recombinants or hybrids in the upcoming breeding programmes. To study the range of association between different traits the genotypic and phenotypic simple correlation coefficient were worked out from the respective variance and covariances. Among the 12 morphological traits studied Path analysis showed that average fruit weight had higher positive direct effect towards fruit yield per plant followed by the component traits number of fruits per plant, fruit length and number of flowers per cluster. Based on Path analysis the average fruit weight might be considered as most important trait in determination of yield improvement.

Key words: D^2 analysis, Brinjal, Path analysis, salinity stress tolerance

Introduction

Eggplant (*Solanum melongena* L., 2n = 24), a member of the Solanaceae family, is the most common and popular vegetable crop of India. According to De Candolle (1883), eggplant was known in India in ancient times and probably a native of India. It is believed that eggplant may have originated in Indo- Burma and China may be the secondary centre of origin. It can be grown in almost all parts of India and is a major source of income for the small and marginal farmers. India is a major producer of eggplant in the world. It is the fourth most important vegetable after potato, onion and tomato in India. The area under eggplant cultivation in India is 648 thousand hectares with estimated annual production of 12303 thousand metric tonnes with a productivity of 18.98 metric tonnes per hectare. Eggplant fruits are fairly good source of calcium, phosphorus, iron and vitamins. Eggplant is usually self-pollinated but the extent of cross pollination has been reported to be as high as 48% hence, it is classified as often cross-pollinated crop (Gobu *et al*., 2017). Though eggplant is self-pollinated crop but there is high degree of cross-pollination due to heteromorphic flower structure. Estimation of variation on truly diverge germplasm offers knowledge about the scope of genetic variation. Better chances of improvement of crop depends on greater the genetic variability. Knowledge of interrelationship between yield and its components is obvious for efficient selection of desirable plant type. Unlike the correlation coefficient values which measure the extent of relationship, path coefficient (Wright, 1921; Dewey and Lu, 1959) measure the magnitude of direct and indirect effects of characters on complex dependent characters like yield and thus enable the breeders to judge

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best about the important component characters during selection.

Salt stress affects each phase of vegetable crop development including morphology, physiological function, yield, and nutritional value. Among crops, vegetables play vital role in the human diet because of their nutritional importance in providing vitamins, carbohydrates, proteins, and mineral nutrients. Unlukara *et al.,* 2010). Shalhevet *et al*., (1983) observed the fifty per cent of yield loss instigate in eggplant at irrigation water salinity, having EC of 8.5 dS m-1. Salinity stress harshly reduce the germination rate and seedling stages its affects the growth and development of eggplant (Akinci *et al*., 2004). Eggplant distinctly diminishes in both fruit weight and reduced number of fruits per plant under salinity stress condition. (Abbas *et al.,* 2010). Improving the salinity stress tolerance of eggplant has become the prime objective of eggplant growing zones. Even though ample improvement has been made in eggplant by Selection of saline tolerance genotypes for further crop improvement, achievement in development of salinity resistance eggplants with high salt tolerance has been limited. So far, only some studies have been reported to enhance the salinity tolerance of eggplant by to date (Yarra and Kirti, 2019) .

In the current study, the expression of eggplant which is significantly express the plant growth under salinity stress, as an important regulator of salinity tolerance in plants and can be used as a genetic resource for classical breeding of salinity tolerant crop varieties.

Materials and Methods

Experimental materials and location

The experiment was conducted with 50 genotypes of eggplant, laid out in a Randomized Block Design (RBD) with two replications in the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University during the *kharif* season, 2017-2019. The experimental genotypes were collected from NBPGR, New Delhi and Vegetable Research Station, Tamil Nadu Agriculture University, Palur. All the recommended agronomic practices were given to raise typical growth and development of the crop. Random sampling was adopted and five plants were selected from each treatment in all replication for detailed studies on twelve different quantitative traits *viz*.,. days to first flowering, plant height (cm), number of branches per plant, number of flowers per cluster, number of fruits per cluster, days to first harvest, days to last harvest, number of fruits per plant, fruit length (cm), fruit breadth (cm), average fruit yield (gm), fruit yield per plant (gm).

Statistical analysis

The mean values of all the traits under consideration were used for statistical analysis. The data were subjected to following statistical analysis.

Analysis of variance

Analysis of variance was performed to test the significance of difference between the lines for all the characters as per the method described by Panse and Sukhatme (1985).

Estimation of mean

The mean values of all the treatments for the traits under study were worked out by dividing the total by corresponding number of observations.

$$Mean(X) \quad \frac{1}{n} \sum_{i=1}^{n} xi$$

Where,

X = Mean of traits, xi = i^{th} observation of population,

n = Numberofobservationper replication

Genetic divergence analysis

The genetic divergence between genotypes was estimated using Mahalanobis's D^2 statistics (1936). The distance D from the sample was computed using the formula.

$$D2p = d1\ S - 1d$$

Correlation

In order to study the extent of association between different traits the genotypic and phenotypic simple correlation coefficient were worked out from the respective variance and covariances. The formula as

Table 1: Analysis of variance for twelve characters in fifty genotypes of eggplant.

Source of variation	Df	Mean Sum of Square										
		Days to First Flowering	Plant Height	Number of Branches per Plant	Number of Flowers per Clusters	Number of Fruits per Cluster	Days to First Harvest	Days to Last Harvest	Number of Fruits per Plant	Fruit Length	Fruit Breadth	Average Fruit Weight	Fruit yield per plant
Replication	2	523.931	1393.160	4.0278	2.144	0.819	789.531	3668.045	135.852	13.122	488.742	488.7425	503356.2
Genotype	49	22.653**	101.76**	6.534**	3.82**	1.61**	31.56**	296.04**	224.70**	24.08**	1940.74**	1940.74**	2995901**
Error	98	8.998	24.511	0.0836	0.043	0.017	14.523	69.198	2.944	0.278	12.996	12.996	15967.92

Table 2: Mean performance for twelve traits of eggplant genotypes.

Genotypes/ characters	Days to first flowering	Plant height	Number of branches per plant	Number of flowers per clusters	Number of fruits per cluster	Days to first harvest	Days to last harvest	Number of fruits per plant	Fruit length	Fruit breadth	Average fruit weight	Fruit yield per plant
ICO 216264	57.00	99.02	4.00	3.01	2.00	72.00	147.00	31.01	7.83	3.53	67.02**	2077.04
ICO 216794	59.02	102.04	4.00	3.00	2.00	76.02	163.03	43.00**	6.43	5.10	38.58	1655.58
ICO 241678	58.01	97.01	5.00	2.01	3.00	73.00	170.01	29.04	7.38	4.82	26.30	762.76
ICO 316294	61.02	109.02	4.01	3.00	3.00	80.00	80.00**	18.00	6.50	5.89*	88.10**	1585.85
ICO 329327	62.01	107.03	5.02	2.00	2.00	75.02	153.02	31.01	5.19	4.15	56.36	1745.32
ICO 334660	58.02	98.02	5.01	3.01	2.00	70.00*	168.03	20.02	4.58	4.63	71.82**	1436.03
ICO 334729	63.04	93.00	8.02	4.00	2.00	71.00	170.01	28.01	8.29	5.36	108.20**	3029.66**
ICO 336474	59.03	95.00	4.00	2.00	4.00**	74.01	149.02	36.00**	8.27	5.89*	80.76**	2905.25**
ICO 344674	62.01	111.00	3.02	4.00	2.00	76.02	162.03	35.00*	7.62	2.50	89.32**	3125.59**
ICO 354727	63.04	99.01	5.01	4.01	2.00	70.00*	173.00*	25.01	5.33	5.54	36.05	900.09
ICO 354749	60.02	108.04	3.00	4.00	2.00	72.00	180.00**	38.00**	8.41	4.10	21.02	798.02
ICO 355370	57.00	96.04	5.02	1.99	4.00**	73.00	167.01	23.01	7.95	4.89	21.08	483.03
ICO 361838	59.03	105.01	3.00	5.00	1.99	79.01	159.03	38.00**	8.73	4.71	61.67	2318.05**
ICO 373485	62.01	99.02	3.02	3.01	2.99	76.04	148.01	42.00**	15.29**	5.16	90.463**	3796.82**
ICO 374777	60.03	98.03	5.00	5.00	2.00	78.03	153.02	26.01	6.45	5.33	110.33**	2867.85**
ICO 382587	57.00	92.00	6.01	3.00	2.00	77.02	170.03	21.04	7.40	5.04	43.28	907.25
ICO 383119	59.02	105.02	5.00	5.00	5.01**	72.00	146.00	30.02	10.49*	5.34	46.76	1401.02
ICO 394902	62.01	115.00	4.02	2.01	2.00	71.00	167.01	38.00**	10.09*	4.90	71.39**	2709.40**
ICO 398820	61.03	89.00*	5.00	1.99	2.00	76.04	156.02	20.01	11.69**	7.49**	68.24**	1364.04
ICO 411485	59.02	108.01	3.99	2.01	2.02	75.01	149.03	40.00**	16.59**	6.88**	63.05*	2520.08**
ICO 422586	55*.00	96.04	3.02	3.00	3.02	74.03	174.00**	25.01	5.72	5.19	65.12*	1625.07
ICO 427008	57.00	109.02	3.02	4.01	2.00	78.03	162.01	18.00	6.48	5.67**	32.06	576.03
ICO 427029	63.01	93.00	4.01	2.00	3.07	79.02	177.00**	40.00**	7.42	4.65	40.19	1604.08
ICO 545862	61.00	104.01	4.99	3.00	2.00	72.00	169.01	32.01	6.25	5.13	26.54	848.03
ICO 545871	59.01	96.03	5.99	4.99	2.08	81.01	167.03	43.00**	7.13	4.15	50.31	2162.98*
ICO 545916	62.03	89.00*	3.99	5.01	2.99	76.04	174.00*	26.03	7.45	5.99**	53.09	1378.03
Whitish blue and ripped brinjal	61.02	93.00	4.00	3.01	4.05	74.02	179.00**	19.02	6.19	6.88**	41.64	790.47
Venyutha round brinjal	57.01	98.04	8.02**	2.00	2.01	72.00	166.02	24.04	6.42	5.87**	29.81	715.22
Namakkal brinjal	63.00	93.00	6.02	1.99	3.03	71.00	147.00	40.00**	12.19**	5.59	28.39	1132.05
Utha brinjal	56.00*	108.01	4.01	2.01	2.00	77.04	161.02	16.00	10.18**	4.50	21.06	336.09
Udumalai brinjal	58.03	97.04	4.00	4.01	2.00	75.03	169.01	30.02	13.08**	6.59**	81.35**	2439.04**

Genotypes/ characters	Days to first flowering	Plant height	Number of branches per plant	Number of flowers per clusters	Number of fruits per cluster	Days to first harvest	Days to last harvest	Number of fruits per plant	Fruit length	Fruit breadth	Average fruit weight	Fruit yield per plant
Udumalai samba kathari	61.02	96.02	5.04	5.01	2.1	78.01	155.02	35.00*	11.89**	4.45	77.92**	2595.14**
Vellore mullukathari	63.03	99.03	4.01	3.01	3.00	73.00	172.00*	39.00**	7.53	6.39**	61.20	2386.88**
Dindugalkathari	65.00	101.01	5.00	3.01	2.00	78.02	163.03	36.00**	12.88**	4.53	51.42	1850.47
Brinjal thorn	64.03	93.00	6.00	3.01	2.00	72.00	165.01	26.03	10.40*	5.98**	60.87	1580.83
Arkakusumakar	54.00**	98.04	4.04	5.01	2.00	80.00	167.02	18.00	7.00	3.30	34.06	612.07
CVK Sirukkaraisivappu	59.01	104.02	6.00	4.01	2.09	71.00	149.03	33.04	8.54	6.18**	61.54	2029.54
Udavai green brinjal	60.03	102.01	4.01	4.01	2.04	81.00	157.01	28.01	6.51	4.87	26.81	750.43
Pusaupkar	61.02	95.00	7.00**	5.01	3.00	73.00	160.03	41.00**	9.35	5.34	49.92	2045.90
Aussay	56.00*	98.04	4.00	3.01	2.00	72.00	176.00**	44.00**	8.82	4.16	71.31**	3137.22**
Utkalkeshari	64.02	99.03	5.04	5.01	2.00	76.01	163.02	41.00**	10.88*	5.79*	118.57**	4858.56**
Utkaljiyoti	60.02	97.01	7.01**	4.01	2.00	78.03	148.03	30.03	6.96	6.28**	96.73**	2901.07**
JBH-3	62.03	98.04	8.03**	5.01	2.99	71.00	164.01	46.00**	11.88**	4.82	71.86**	3302.84**
VR-2	64.01	103.03	3.04	5.01	2.00	75.03	179**	45.00**	11.49**	7.09**	62.09	2790.06**
DMU-1	59.03	95.00	7.01**	4.01	3.00	76.02	165.03	29.02	9.04	5.68	41.22	1194.89
KKM-1	55.00*	98.03	4.00	4.99	2.00	74.01	146.00	36.00**	7.01	4.46	33.43	1202.47
Punjab sadabahar	59.02	104.01	7.04**	4.01	2.00	79.04	170.01	28.03	13.98**	3.84	43.05	1204.03*
PBNB-1	62.03	93.00	3.01	2.01	3.00	80.00	165.00	18.00	11.99**	3.63	99.42**	1789.26*
PBNB-5	65.01	97.02	5.00	5.01	2.00	81.00	168.02	38.02	10.47**	4.64	88.36**	3355.46**
PBNB-6	57.00	102.01	8.00**	4.01	4.00**	78.01	171.01	18.00	15.09**	4.71	47.68	856.83

suggested by Johnson *et al.,* (1955) was used for calculating simple correlation coefficient as given below.

Genotypic correlation coefficient

$$(rg_{xy}) \quad \frac{Cov\ g_x \quad g_y}{\sqrt{\sigma g_x \quad \sigma^2 g_y}}$$

Phenotypic correlation coefficient

$$(rp_{xy}) \quad \frac{Cov\ p_x \quad p_y}{\sqrt{\sigma p_x \quad \sigma^2 p_y}}$$

Significance of correlation coefficient was determined from the Fisher and Yates Table at 5 and 1 per cent level of significance. The 'r' values were compared against (n-2) degrees of freedom.

Path analysis

The genotypic correlation coefficient between yield and its components were further partitioned into direct and indirect effects with the help of path coefficient analysis originally suggested by Wright (1921) and further outlined by Dewey and Lu (1959).

D^2 Analysis

The genetic diversity of all the 50 genotypes were worked out using Mahanolobis (1928) D^2 statistics.

Results and Discussion

Analysis of variation

Analysis of variance due to genotypes were highly significant for all the traits *viz.,* days to first flowering, plant height, number of branches per plant, number of flowers per cluster, number of fruits per cluster, days to first harvest, days to last harvest, number of fruits per plant, fruit length, fruit breadth, average fruit yield, fruit yield per plant (Table 1). This indicated that the genotypes selected for the present study were genetically dissimilar.The characters showing high degree of variations

have more scope for their further improvement (Mohanty 2002).

Mean performance

Per se performance of the parents in yield and yield attributing traits is one of the simplest selectionmethod for identifying superior genotypes to identify successful parents. Here, among the fifty genotypes studied twenty one genotypes recorded higher mean value with positive significance ranged from 336.09 to 4858.56 for the fruit yield per plant. High fruit yield per plant with positive significant mean values recorded in UTKALKESHARI (4858.56), followed by ICO373485 (3796.82) followed by PBNB-5 (3355.46) respectively. The mean performances of the fifty genotypes for twelve traits are presented in Table 2.

In the present study the genotypes VR-2, JBH-3 and Utkalkeshari recorded significant mean for six agronomic traits out of twelve traits studied and the genotypes Aussay, Udumalai Samba Kathiri and ICO 411485 recorded significant mean for five agronomic traits out of twelve traits studied followed by the genotypes ICO373485, ICO3402 and Udumalai Brinjal recorded significant mean for four agronomic traits out of twelve traits studied. By considering the overall performance of the best ranked genotypes, the genotypes VR-2, JBH-3, Utkalkeshari can be selected as a best parent and can be used as a donor for hybridization programmes for developing high yielding genotypes followed by Aussay, Udumalai Samba Kathiri, and ICO 411405.

Character contribution

The relative contribution of individual traits towards the expression of genetic diversity is estimated over character wise d^2 value. The influence of characters toward genetic divergence is an important criterion for selection of characters in hybridization programmes. The traits viz., Fruit yield per plant (36.16%), average fruit weight (16.65%) and number of fruits per plant (10.04%) were the topmost contributors towards total genetic divergence (Table 3). Comparable findings were observed by Bansal and Mehta (2007); Dutta *et al*., (2009) for genetic divergence in eggplant. The potential output of any crop is fundamentally esteemed in relations of yield per unit area.

Correlation

The information about the magnitude and the direction of correlation is used for judging improvement in one character which may cause simultaneous changes in other traits. Genotypic correlation coefficients among yield attributing traits, the average fruit weight (0.842), number of fruits per plant (0.621), days to first flowering (0.528), fruit length (0.310) and number of flowers per clusters (0.279) had significant positive correlation with yield per plant at genotypic level (Table 4). At phenotypic level, positive correlation was observed in traits like average fruit weight (0.844), number of fruits per plant (0.626), days to first flowering (0.385), fruit length (0.319), number of flowers per cluster (0.290) (Table 5). From the results recorded we can conclude that these traits were influencing the yield of the crop. This interpretation were earlier supported by Kalda *et al*., (1996).

Path analysis

The direct and indirect contribution of various independent characters on a dependent character with the inclusion of more characters in correlation study are measured by path co-efficient analysis. In this study, fruit yield was taken as dependent variable and the remaining characters were considered as independent variables. Path analysis (Table 6) showed that average fruit weight (0.769) had higher positive direct effect towards fruit yield (0.478) per plant followed by the component traits fruit length and number of flowers per cluster. As far as the indirect effects are considered, days to first flowering with average fruit weight (0.323), plant height with days to first flowering (0.030), number of branches per plant with days to first harvest (0.017), number of flowers per cluster with average fruit weight (0.145), number of fruits per cluster with days to first harvest (0.013), days to first harvest with average fruit weight (0.083), days to last harvest with days to first harvest (0.023) ,number of fruits per plant with average fruit weight (0.116), fruit length with average fruit weight (0.152), fruit breadth with average fruit weight (0.056) and average fruit weight with number of fruits per plant (0.072). The findings of previous work of Prabhu *et al*. (2008) are in line with the results obtained.

From the study ,it is concluded that average fruit weight is an important trait which could be used as a

Table 3: Relative contribution of different traits to genetic divergence.

S. No.	Character	Percentage of contribution
1.	Days to First Flowering	01.01
2.	Plant Height	04.89
3.	Number of Branches per Plant	01.79
4.	Number of Flowers per Clusters	02.53
5.	Number of Fruits per Cluster	07.26
6.	Days to First Harvest	01.14
7.	Days to Last Harvest	06.28
8.	Number of Fruits per Plant	10.04
9.	Fruit Length	02.83
10.	Fruit Breadth	09.33
11.	Average Fruit Weight	16.65
12.	Fruit yield per plant	36.16
	TOTAL	100.00

Table 4: Genotypic correlation coefficients among yield attributing characters in eggplant genotypes

	Days to First Flowering	Plant Height	Number of Branches per Plant	Number of Flowers per Clusters	Number of Fruits per Cluster	Days to First Harvest	Days to Last Harvest	Number of Fruits per Plant	Fruit Length	Fruit Breadth	Average Fruit Weight	Fruit yield per plant
Days to First Flowering	1.000	-0.562**	-0.032	-0.012	-0.130	-0.742**	-0.288*	0.399	0.210	0.170	0.421**	0.528**
Plant Height		1.000	-0.364**	-0.066	-0.300*	-0.500**	-0.373**	0.061	-0.007	-0.342**	-0.145	-0.019
Number of Branches per Plant			1.000	0.091	0.040	-0.345**	-0.151	-0.060	0.115*	0.079	-0.018	-0.035
Number of Flowers per Clusters				1.000	-0.131*	0.235**	-0.055	0.208*	-0.009	-0.105	0.189*	0.279**
Number of Fruits per Cluster					1.000	-0.257**	-0.043	-0.139	0.098	0.134	-0.125	-0.163*
Days to First Harvest						1.000	-0.455**	-0.307**	0.083	-0.428**	0.109*	-0.023
Days to Last Harvest							1.000	-0.245*	-0.290**	-0.074	-0.208*	-0.264**
Number of Fruits per Plant								1.000	0.247**	-0.041	0.151	0.621**
Fruit Length									1.000	0.109*	0.198*	0.310**
Fruit Breadth										1.000	0.074	0.047
Average Fruit Weight											1.000	0.842**
Fruit yield per plant												1.000

Table 5: Phenotypic correlation coefficients among yield attributing characters in eggplant genotypes.

	Days to First Flowering	Plant Height	Number of Branches per Plant	Number of Flowers per Clusters	Number of Fruits per Cluster	Days to First Harvest	Days to Last Harvest	Number of Fruits per Plant	Fruit Length	Fruit Breadth	Average Fruit Weight	Fruit yield per plant
Days to First Flowering	1.000	0.333	0.125	0.131	0.059	0.448	0.428	0.372	0.255	0.288	0.341	0.385
Plant Height		1.000	-0.133	0.071	-0.097	0.391	0.278	0.166	0.122	-0.074	-0.020	0.054
Number of Branchesper Plant			1.000	0.118	0.070	-0.034	0.011	-0.027	0.142	0.117	0.003	-0.017
Number of Flowers per Clusters				1.000	-0.100	0.262	0.073	0.232	0.019	-0.060	0.205	0.290
Number of Fruits per Cluster					1.000	0.006	0.084	-0.105	0.124	0.168	-0.102	-0.144
Days to First Harvest						1.000	0.409	-0.009	0.188	-0.022	0.159	0.071
Days to Last Harvest							1.000	-0.050	-0.088	0.111	-0.066	-0.121
Number of Fruits per Plant								1.000	0.268	0.005	0.170	0.626
Fruit Length									1.000	0.144	0.214	0.319
Fruit Breadth										1.000	0.100	0.070
Average Fruit Weight											1.000	0.844
Fruit yield per plant												1.000

Table 6: Path coefficient analysis for yield contributing trait.

	Days to First Flowering	Plant Height	Number of Branches per Plant	Number of Flowers per Clusters	Number of Fruits per Cluster	Days to First Harvest	Days to Last Harvest	Number of Fruits per Plant	Fruit Length	Fruit Breadth	Average Fruit Weight	Fruit yield per plant
Days to First Flowering	-0.054	0.009	0.001	-0.001	0.003	0.038	0.005	0.190	0.011	-0.001	0.323	0.528*
Plant Height	0.030	-0.016	0.010	-0.002	0.007	0.025	0.007	0.029	-0.001	0.001	-0.111	-0.019
Number of Branches per Plant	0.001	0.006	-0.029	0.003	-0.001	0.017	0.002	-0.028	0.006	-0.001	-0.013	-0.035
Number of Flowers per Clusters	0.001	0.001	-0.002	0.042	0.003	-0.012	0.001	0.099	-0.001	0.001	0.145	0.279
Number of Fruits per Cluster	0.007	0.005	-0.001	-0.005	-0.024	0.013	0.001	-0.066	0.005	-0.001	-0.096	-0.163
Days to First Harvest	0.040	0.008	0.010	0.009	0.006	-0.051	0.008	-0.146	0.004	0.002	0.083	-0.023
Days to Last Harvest	0.015	0.006	0.004	-0.002	0.001	0.023	-0.019	-0.117	-0.016	0.001	-0.160	-0.264
Number of Fruits per Plant	-0.021	-0.001	0.001	0.008	0.003	0.015	0.004	0.478	0.013	0.0002	0.116	0.621*
Fruit Length	-0.011	0.001	-0.003	-0.001	-0.002	-0.004	0.005	0.117	0.055	-0.001	0.152	0.310
Fruit Breadth	-0.009	0.005	-0.002	-0.004	-0.003	0.021	0.001	-0.019	0.006	-0.005	0.056	0.047
Average Fruit Weight	-0.022	0.002	0.001	0.008	0.003	-0.005	0.004	0.072	0.011	-0.001	0.769	0.842**

Residual Effect = 0.2076 *significance at 5% level, ** significance at 1% level

selection criteria for the direct improvement of fruit yield per plant followed by the other traits number of fruits per plant, fruit length and number of flowers per cluster for the yield improvement.

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