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Genetic Variability, Correlation and Path Analysis of F5 Generation of Ridge Gourd (*Luffa acutangula* (L.) Roxb.) for Yield and Quality

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A B S T R A C T

The present investigation on genetic variability, correlation and path analysis of F_5 generations of ridge gourd was carried out at College Orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai, Tamil Nadu during 2018 – 2019 to develop medium size, high yielding and good quality variety suitable for Madurai condition was aimed at. The selected genotypes from the two crosses *viz.*, Virudhunagar local x Periyakottai local (L_3xT_1) and Virudhunagar local x Alathur local (L_3xT_2) of ridge gourd along with their parents were evaluated. This study was laid out in a randomized block design (RBD) with two replications. The results revealed that both the crosses showed low PCV, GCV coupled with high heritability and high genetic advance for the character node to first male flower. Whereas low PCV, GCV coupled with high heritability and low genetic advance for the characters vine length, days to first female flower and sex ratio. Regarding correlation studies revealed that cross L_3xT_1 the trait fruit yield was found to be significantly and positively correlated with node to first male flower, node to first female flower, days to first harvest, fruit weight, number of fruits per plant and flesh thickness. Whereas cross L_3xT_2, fruit yield was found to be significantly and positively correlated with node to first male flower, node to first female flower, fruit weight, fruit length and fruit diameter. Path coefficient analysis showed that fruit weight in L_3xT_1 cross has contributed the maximum positive direct effect whereas cross L_3xT_2 fruit diameter contributed the maximum positive direct effect in F5 generation.

Introduction

Ridge gourd (*Luffa acutangula* (L.) Roxb.) is one of the important cucurbitaceous vegetable and belongs o the family cucurbitaceae. Ridge gourd has been cultivated for centuries in tropical, sub-tropical and milder portions of temperate zones. It is popularly known as kalitori and also called as angled gourd, angled loofah, chinese okra, silky gourd and ribbed gourd. It is grown as mixed crop in the river bed areas and as monocrop in the garden land. The green immature fruits are cooked as vegetable and used in preparation of chutney and curries. Fruit is demulcent, diuretic and nutritive. The leaves are used is poultice in

hemorrhoids, leprosy and splantis. The juice of fresh leaves is useful in granular conjunctivitis for children. The seeds possess purgative and emetic properties (Rahman *et al.,* 2008). Every 100g of edible portion of ridge gourd contains 0.5g of fiber, 0.5 percent of protein, 0.34 percent of carbohydrate, 37mg of carotene, 5.0mg of vitamin C, 18mg of calcium and 0.5mg of iron. Besides used as vegetable, it is also used in industries for cleaning and scrubbing machines.

It is also compressed and made into soles for chappals is Japan. Ridge gourd being a monoecious and cross pollinated crop and it exhibits considerable heterozygosity in population and does not suffer much due to inbreeding depression resulting is natural variability in the population.

Thus provides ample scope for exploitation of existing variability on commercial scale to increase the production and productivity (Narasannavar *et al.,* 2014). Most of the ridge gourd hybrids released from India has large sized fruits which are not preferred by a consumer and it affects the marketability as vegetable. The role of genetic variability in crop is of paramount importance in selecting the best genotypes for making rapid improvement in yield and related characters as well as to select the most potential parents for making the hybridization programme successful. Therefore, the present investigation on genetic variability, correlation and path analysis in F_5 generation of ridge gourd for growth, yield and quality were undertaken during the year 2018 - 2019.

Materials and Methods

The present study was carried out at College Orchard, Department of Horticulture, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu during December 2018 to April 2019. The aim of the present investigation is to develop medium size, high yielding and good quality variety suitable for Madurai condition. The crosses *viz.*, L_3xT_1 (Virudhunagar Local x Periyakottai Local) and L_3xT_2 (Virudhunagar Local x Alathur Local) were evaluated along with their parents. The present study was laid out is a Randomized Block Design (RBD) with two replications for F_5 generation. The spacing adopted for the study is 2m x 2m. From each replication 95 pits were taken and two plants per pit were maintained in each crosses and their parents and accounted for a total population of 190 plants in F_5 generation.

The observations on vine length (cm), days to first male flowering, days to first female flowering, node to first male flower, node to first female flower, number of fruits per plant, sex ratio, days to first harvest, fruit weight (kg), fruit length (cm), fruit diameter (cm), rind thickness (mm), flesh thickness (mm), fruit yield per plant (kg), estimated fruit yield per hectare (t/ha), total soluble solids (TSS) (°Brix), total crude fibre content (mg) were recorded.

The data's recorded were statistically analysed of variance of phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability, genetic advance as percentage of mean, correlation studies (Al-Jibouri *et al.,* (1958) and path co- efficient analysis (Dewey and Lu, 1959) to partition the genotypic correlation coefficient into measures direct and indirect effects.

Results and Discussion

The extent of variability present in the selected genotype of ridge gourd in F_5 generation from two crosses viz., L_3xT_1 and L_3xT_2 were measured for variability, heritability, genetic advance as percentage of mean are presented in Table 1 and 2.

Genotypic and phenotypic variability

The analysis of variance revealed significant differences among the two crosses of ridge gourd in F5 generation. The results revealed selection for vine length in the crosses L_3xT_1 (4.39; 3.63) and L_3xT_2 (5.25; 4.65), days to first male flowering L_3xT_1 (8.04; 7.18) and L_3xT_2 (7.23; 6.51), days to first female flowering L_3xT_1 (6.04; 5.32) and L_3xT_2 (5.95; 5.02), node to first male flower L_3xT_1 (8.45; 5.12) and L_3xT_2 (8.50; 6.99), sex ratio L_3xT_1 (5.03; 4.09) and L_3xT_2 (4.84; 4.57), days to first harvest L_3xT_1 (7.39; 5.96) and L_3xT_2 (7.82; 6.49), fruit diameter in crosses L_3xT_1 (9.21; 5.48) and L_3xT_2 (6.05; 4.18), rind thickness L_3xT_1 (24.29; 22.01) and L_3xT_2 (9.13; 6.98), total soluble solids L_3xT_1 (4.31; 3.95) and L_3xT_2 (9.82; 7.80), total crude fibre content L_3xT_1 (9.34; 8.28) and L_3xT_2 (7.44; 5.53) would not be effective due to low PCV and GCV. This agrees with the finding Karthik *et al.*, (2017), Samadia (2011) in ridge gourd and Dey *et al.*, (2009), Puddan (2000) in bitter gourd. This indicates selection resulted in attaining homozygosity and further selection will not alter this trait.

The traits node to first female flower in the crosses L_3xT_1 (17.70; 16.13) and L_3xT_2 (17.02; 15.86), number of fruits per plant L_3xT_1 (15.24; 14.47) and L_3xT_2 (16.59; 15.90), fruit weight L_3xT_1 (13.78; 12.25) and L_3xT_2 (14.09; 10.11), fruit length L_3xT_1 (19.07; 16.60) and L_3xT_2 (11.05; 10.51), flesh thickness L_3xT_1 (14.39; 12.85) and L_3xT_2 (13.34; 11.56), fruit yield per plant L_3xT_1 (15.24; 12.42) and L_3xT_2 (18.79; 17.21), estimated fruit yield per hectare L_3xT_1 (16.21; 13.98) and L_3xT_2 (19.09; 17.31 were exhibited moderate PCV and GCV. This was agrees with the findings of Koppad *et al.*, (2015), Samadia (2011) in ridge gourd, Devi and Mariappan (2013) in snake gourd and Dey *et al.*, (2009) in bitter gourd. This indicates the presence of medium amount of variability and improvements of these traits is possible up to an extent in further generation and attain homozygosity.

In case of rind thickness, L_3xT_1 (24.29; 22.01) cross showed high magnitude of PCV and Koppad *et al.*, (2015) found that high variability was occurred among the genotypes of ridge gourd. This confirms the presence of diverse genotypes in F_5 in these cross and improvement through selection is possible in further selection.

Heritability and genetic advance

Heritability and genetic advance as percentage of mean are presented in Table 1 and 2. In the present study high heritability coupled with high genetic advance were recorded for the traits node to first male flower, node to first female flower, number of fruits per plant, fruit weight, fruit length, rind thickness, flesh thickness, fruit yield per plant and estimated fruit yield per hectare in both the crosses. This confirm the presence of additive gene action and the traits are less influenced by environment and selecting the genotypes based on such characters could be worthwhile which agrees with Samadia (2011) in ridge gourd, Sahitya (2001) in snake gourd and Dey *et al.*, (2009) in bitter gourd.

High heritability coupled with moderate genetic advance was recorded for the traits days to first male flowering, days to first harvest and total crude fibre content in both the crosses. This might be due to homozygous line could be developed through continuous selection process and these results are similar to the findings of Choudhary and Kumar (2011) in ridge gourd and Kanimozhi *et al.*, (2015) in wax gourd.

High heritability coupled with low genetic advance was recorded for the traits vine length, days to female flowering and sex ratio

in both the crosses. This indicated the presence of certain degree of non-additive gene effect and was supported by findings in ridge gourd (Choudhary and Kumar, 2011, Samadia, 2011) and (Kanimozhi *et al.*, 2015) in wax gourd.

Correlation coefficient analysis

It was necessary to determine the magnitude and direction of relationship between yield and its components for the improvement of yield in ridge gourd. The sixteen traits in F_5 generation of L_3xT_1 and L_3xT_2 were considered for correlation analysis. Crosses L_3xT_1 and L_3xT_2 had registered correlation coefficients between yield and its components estimated were given in Table 3 & 4. The cross L_3xT_1, fruit yield was found to be significantly and positively correlated with node to first male flower (0.910), node to first female flower (0.552), days to first harvest (0.458), fruit weight (0.772), flesh thickness (0.660) and number of fruits per plant (0.455).

Table.1 Estimates of mean, components of variance, heritability and genetic advance for growth, flowering, yield and quality parameters in Virudhunagar local x Periyakottai local (L_3xT_1)

S. No	Characters	Mean	PCV (%)	GCV (%)	h^2 (%)	GAM
A.	**Growth traits**					
1.	Vine length(m)	7.76	4.39	3.63	84.73	**7.42**
B.	**Flowering Traits**					
1.	Days to 1st male flowering	26.43	8.04	7.18	79.43	**13.16**
2.	Days to 1st female flowering	34.17	6.04	5.32	73.34	**8.72**
3.	Node to 1st male flower	5.87	8.45	5.12	78.48	**26.80**
4.	Node to 1st female flower	16.28	17.70	16.13	84.56	**31.68**
5.	Sex ratio	5.79	5.03	4.09	79.73	**7.29**
6.	Days to first harvest	65.17	7.39	5.96	86.63	**13.42**
C.	**Yield Traits**					
1.	Number of fruits per plant	12.19	15.24	14.47	93.47	**32.28**
2.	Fruit weight (kg)	0.265	13.78	12.25	78.65	**25.03**
3.	Fruit length(cm)	27.50	19.07	16.60	89.59	**34.92**
4.	Fruit diameter (cm)	4.38	9.21	5.48	54.45	**19.21**
5.	Rind thickness (cm)	0.41	24.29	22.01	94.59	**47.52**
6.	Flesh thickness (cm)	3.36	14.39	12.85	86.12	**27.53**
7.	Fruit yield per plant (kg)	4.42	15.24	12.42	84.84	**22.58**
8.	Estimated fruit yield per hectare (t/ha)	19.76	16.21	13.98	89.14	**35.18**
D.	**Quality Traits**					
1.	Total Soluble Solids (TSS)	3.89	4.31	3.95	94.65	**24.63**
2.	**Total Crude Fibre Content (mg)**	**0.48**	**9.34**	**8.28**	**78.62**	**15.40**

PCV=Phenotypic coefficient of variance GCV = Genotypic coefficient of variance

h^2 = Heritability (broad sense) GAM = Genetic advance (per cent mean)

Table.2 Estimates of mean, components of variance, heritability and genetic advance for growth, flowering, yield and quality parameters in Virudhunagar local x Alathur local (L_3xT_2)

S. No.	Characters	Mean	PCV (%)	GCV (%)	h^2 (%)	GAM
A.	**Growth traits**					
1.	Vine length(m)	7.12	5.25	4.65	77.21	**8.49**
B.	**Flowering Traits**					
1.	Days to 1st male flowering	29.42	7.23	6.51	75.21	**12.40**
2.	Days to 1st female flowering	37.28	5.95	5.02	61.12	**11.82**
3.	Node to 1st male flower	5.80	8.50	6.99	75.69	**28.04**
4.	Node to 1st female flower	17.14	17.02	15.86	78.4	**26.48**
5.	Sex ratio	5.16	4.84	4.57	72.17	**5.45**
6.	Days to first harvest	68.35	7.82	6.49	69.56	**16.21**
C.	**Yield Traits**					
1.	Number of fruits per plant	10.54	16.59	15.90	91.24	**24.39**
2.	Fruit weight (kg)	0.278	14.09	10.11	68.87	**28.26**
3.	Fruit length(cm)	28.52	11.05	10.51	95.91	**34.40**
4.	Fruit diameter (cm)	4.46	6.05	4.18	51.93	**24.02**
5.	Rind thickness (cm)	0.46	9.13	6.98	77.89	**34.03**
6.	Flesh thickness (cm)	3.54	13.34	11.56	89.17	**26.13**
7.	Fruit yield per plant (kg)	3.95	18.79	17.21	87.55	**19.53**
8.	Estimated fruit yield per hectare (t/ha)	16.57	19.09	17.31	85.29	**33.04**
D.	**Quality Traits**					
1.	Total Soluble Solids (TSS)	3.32	9.82	7.80	84.28	**13.29**
2.	**Total crude fibre content (mg)**	**0.46**	**7.44**	**5.53**	**79.28**	**13.92**

PCV=Phenotypic coefficient of variance GCV = Genotypic coefficient of variance

h^2 = Heritability (broad sense) GAM = Genetic advance (per cent mean)

Table.3 Correlation coefficients of the cross Virudhunagar local x Periyakottai local (L_3xT_1) in F_5 generation

	Vine length	Days to first male flowering	Days to first female flowering	Node to first male flowering	Node to first female flowering	Days to first harvest	Fruit weight	Fruit length	Fruit diameter	Rind thickness	Flesh thickness	Number of fruits per plant	Sex ratio	Total soluble solids	Total crude fibre content	Fruit yield
Vine length	1.000	-0.893	-0.252	0.825**	0.559*	-0.762	0.350	-0.412	-0.927	0.108	-0.964	0.465	-0.683	-0.728	-0.104	**-0.335**
Days to first male flowering		1.000	0.842**	0.723**	0.247	0.208	0.365	0.414	0.567**	0.390	0.784**	0.402	0.330	0.275	-0.069	**0.455**
Days to first female flowering			1.000	0.947**	0.447*	0.379	0.213	0.440	0.306	0.440	0.192	0.701**	0.397	0.253	-0.087	**0.120**
Node to first male flowering				1.000	0.511*	-0.039	0.367	-0.745	-0.439	-0.226	-0.422	0.237	0.142	0.204	-0.054	**0.910****
Node to first female flowering					1.000	0.469*	-0.287	0.287	0.023	-0.420	0.262	-1.015	0.205	-0.321	-0.097	**0.552****
Days to first harvest						1.000	0.461*	0.337	0.055	-0.622	0.143	0.782**	0.731**	-1.103	0.069	**0.458***
Fruit weight							1.000	0.802**	0.255	0.510*	0.875**	-1.219	0.342	-0.985	0.017	**0.772****
Fruit length								1.000	0.739**	0.259	0.286	-0.085	0.971**	-0.896	0.078	**0.400**
Fruit diameter									1.000	0.270	0.987**	0.200	0.024	0.105	0.032	**0.164**
Rind thickness										1.000	0.421	0.770**	-0.443	-0.130	0.029	**0.427**
Flesh thickness											1.000	0.606**	0.069	0.374	0.106	**0.660****
Number of fruits per plant												1.000	0.593**	-0.467	0.086	**0.455****
Sex ratio													1.000	-0.721	-0.111	**0.188**
Total soluble solids														1.000	0.022	**-0.528**
Total crude fibre content															1.000	**0.074**
Fruit yield																**1.000**

**Correlation is significant at 1% level

*Correlation is significant at 5% level

Table.4 Correlation coefficients of the cross Virudhunagar local x Alathur local (L_3xT_2) in F_5 generation

	Vine length	Days to first male flowering	Days to first female flowering	Node to first male flowering	Node to first female flowering	Days to first harvest	Fruit weight	Fruit length	Fruit diameter	Rind thickness	Flesh thickness	Number of fruits per plant	Sex ratio	Total soluble solids	Total crude fibre content	Fruit yield
Vine length	1.000	-0.024	0.157	-0.391	-0.624	0.124	0.115	0.010	0.217	-0.193	0.200	0.120	-0.179	0.058	-0.135	**0.395**
Days to first male flowering		1.000	0.270	-0.183	0.110	0.056	0.102	0.124	-0.154	-0.081	-0.114	0.196	0.083	-0.198	-0.010	**0.156**
Days to first female flowering			1.000	0.015	0.127	-0.136	0.261	0.165	0.280	-0.050	0.019	0.110	0.683*	-0.176	0.028	**-0.141**
Node to first male flowering				1.000	0.640*	0.736**	0.218	-0.230	-0.258	0.224	0.054	0.091	-0.019	0.158	0.170	**0.721****
Node to first female flowering					1.000	0.176	0.139	-0.084	0.177	0.106	0.117	0.124	-0.128	0.025	-0.082	**0.778****
Days to first harvest						1.000	0.878**	-0.100	0.852**	-0.058	-0.233	-0.188	0.056	0.016	-0.036	**0.121**
Fruit weight							1.000	0.750**	0.756**	-0.046	0.687*	0.360	0.624*	0.146	0.146	**0.598***
Fruit length								1.000	0.149	-0.067	-0.172	0.543	0.131	-0.220	-0.043	**0.623***
Fruit diameter									1.000	0.167	0.716**	0.387	0.240	-0.106	-0.022	**0.760****
Rind thickness										1.000	0.102	0.724**	-0.052	-0.028	0.112	**0.246**
Flesh thickness											1.000	0.186	0.294	0.080	0.019	**0.470**
Number of fruits per plant												1.000	-0.572	-0.214	0.047	**0.512**
Sex ratio													1.000	0.025	-0.082	**0.153**
Total soluble solids														1.000	0.095	**-0.121**
Total crude fibre content															1.000	**0.162**
Fruit yield																**1.000**

**Correlation is significant at 1% level

*Correlation is significant at 5% level

Table.5 Path coefficient analysis of cross Virudhunagar local x Periyakottai local (L_3xT_1) in F_5 generation

	Vine length	Days to first male flowering	Days to first female flowering	Node to first male flowering	Node to first female flowering	Days to first harvest	Fruit weight	Fruit length	Fruit diameter	Rind thickness	Flesh thickness	Number of fruits per plant	Sex ratio	Total soluble solids	Total crude fibre content	Fruit yield
Vine length	**0.938**	0.470	-0.650	-0.207	-0.557	0.050	0.012	-0.176	0.739	0.344	-0.043	0.037	-0.035	0.007	-0.012	**-0.335**
Days to first male flowering	-0.773	**0.307**	0.034	0.943	-0.157	-0.030	0.001	0.019	0.316	-0.232	0.036	0.054	-0.012	0.015	-0.003	**0.455**
Days to first female flowering	0.003	-0.003	**0.041**	0.027	-0.038	0.058	-0.052	0.014	0.011	-0.013	-0.014	0.129	0.034	-0.120	-0.007	**0.120**
Node to first male flowering	-0.036	-0.019	0.027	**0.845**	-0.066	-0.017	-0.256	-0.011	-0.113	-0.017	0.335	-0.041	-0.058	0.056	-0.003	**-0.910**
Node to first female flowering	0.031	0.020	-0.049	-0.077	**-0.073**	0.067	-0.029	-0.016	-0.106	0.040	-0.072	-0.153	-0.076	0.033	0.006	**0.552**
Days to first harvest	0.004	-0.030	0.098	0.036	0.120	**-0.024**	0.065	0.034	-0.020	-0.021	-0.016	0.034	0.186	0.065	0.015	**0.458**
Fruit weight	0.021	-0.054	0.029	-0.015	0.018	0.021	**1.131**	0.091	0.022	-0.011	0.037	0.073	0.019	0.079	0.007	**0.772**
Fruit length	0.014	-0.062	0.015	-0.155	0.195	0.626	0.536	**1.126**	0.102	-0.058	0.045	0.096	0.059	-0.213	-0.010	**0.400**
Fruit diameter	0.004	0.011	-0.009	0.012	0.046	-0.010	0.303	0.051	**1.014**	-0.021	0.058	0.049	0.026	0.090	0.015	**0.164**
Rind thickness	-0.021	-0.011	0.021	0.052	0.038	-0.026	0.021	0.032	-0.013	**-0.124**	0.036	0.025	0.045	0.075	0.025	**0.427**
Flesh thickness	-0.052	-0.032	0.048	-0.017	-0.012	-0.042	0.396	0.060	-0.010	-0.013	**0.093**	0.099	-0.014	-0.142	0.020	**0.660**
Number of fruits per plant	-0.033	0.035	0.012	-0.042	0.082	-0.019	0.118	0.026	-0.016	-0.072	0.091	**1.003**	-0.038	0.055	-0.007	**0.455**
Sex ratio	0.009	-0.013	-0.018	0.022	0.032	-0.003	0.038	0.014	-0.009	-0.003	-0.008	-0.103	**0.167**	0.031	0.010	**0.188**
Total soluble solids	0.022	-0.056	0.041	-0.072	0.056	0.021	0.065	0.090	0.057	0.057	0.034	-0.010	-0.020	**-0.663**	0.020	**-0.528**
Total crude fibre content	**0.006**	**-0.005**	**0.005**	**0.001**	**-0.005**	**-0.006**	**0.008**	**0.072**	**-0.116**	**-0.014**	**-0.017**	**0.009**	**-0.017**	**0.016**	**-0.102**	**0.074**

RESIDUAL EFFECT= **0.050**

Table.6 Path coefficient analysis of cross Virudhunagar local x Alathur local (L_3xT_2) in F_5 generation

	Vine length	Days to first male flowering	Days to first female flowering	Node to first male flowering	Node to first female flowering	Days to first harvest	Fruit weight	Fruit length	Fruit diameter	Rind thickness	Flesh thickness	Number of fruits per plant	Sex ratio	Total soluble solids	Total crude fibre content	Fruit yield
Vine length	**0.005**	-0.002	0.011	0.007	0.003	0.002	0.261	-0.004	-0.021	-0.018	0.036	0.213	-0.002	-0.015	-0.003	**0.395**
Days to first male flowering	0.006	**-0.015**	0.086	-0.005	-0.007	0.012	0.543	0.027	0.054	0.038	-0.021	-0.027	-0.004	-0.027	0.002	**0.156**
Days to first female flowering	0.009	-0.024	**-0.088**	-0.008	0.017	-0.026	0.227	-0.024	0.014	0.032	-0.029	-0.642	-0.008	0.009	0.001	**-0.141**
Node to first male flowering	-0.039	0.038	0.028	**-0.015**	-0.021	0.068	1.216	0.116	0.217	0.040	-0.096	-0.299	0.012	-0.019	0.001	**0.721**
Node to first female flowering	0.011	-0.013	-0.029	-0.005	**0.213**	-0.047	0.286	0.043	0.038	-0.019	-0.058	0.625	0.019	0.027	0.002	**0.778**
Days to first harvest	-0.002	-0.025	0.024	-0.019	0.021	**0.675**	0.606	0.098	-0.105	-0.067	0.013	0.082	-0.016	-0.015	0.005	**0.121**
Fruit weight	-0.095	0.031	0.065	-0.022	0.014	0.046	**1.212**	-0.089	-0.372	-0.049	0.183	0.219	-0.029	-0.045	0.002	**0.598**
Fruit length	0.059	-0.012	0.044	0.018	0.021	0.034	0.652	**1.321**	0.589	0.051	0.088	0.304	-0.021	0.036	-0.003	**0.623**
Fruit diameter	0.007	0.019	-0.021	0.011	-0.015	0.063	0.431	0.051	**1.384**	-0.027	0.143	0.131	-0.008	-0.021	0.003	**0.760**
Rind thickness	-0.005	-0.016	-0.013	-0.010	0.006	-0.027	-0.324	0.128	0.313	**0.122**	-0.290	0.146	0.005	0.057	0.004	**0.246**
Flesh thickness	0.011	0.024	-0.082	0.003	0.024	0.065	1.146	0.222	0.251	-0.116	**0.319**	-0.542	-0.014	-0.045	0.002	**0.470**
Number of fruits per plant	0.025	-0.013	0.054	-0.014	0.019	-0.172	0.352	0.073	-0.028	0.039	0.037	**1.070**	0.021	0.017	-0.002	**0.512**
Sex ratio	-0.001	0.001	0.063	0.005	0.011	0.009	-0.127	-0.015	-0.421	0.032	0.056	0.132	**-0.097**	-0.029	-0.003	**0.153**
Total soluble solids	0.016	-0.021	0.014	-0.013	0.042	0.051	0.090	0.082	-0.011	-0.014	0.154	-0.052	-0.012	**-0.048**	0.004	**-0.121**
Total crude fibre content	**-0.006**	**0.005**	**-0.005**	**-0.002**	**-0.002**	**0.009**	**0.008**	**-0.071**	**0.003**	**0.017**	**-0.008**	**-0.017**	**0.008**	**0.016**	**-0.010**	**0.028**

RESIDUAL EFFECT= **0.071**

Whereas the cross L_3xT_2, fruit yield was found to be significantly and positively correlated with node to first male flower (0.721), node to first female flower (0.778), fruit weight (0.598), fruit length (0.623) and fruit diameter (0.760). This indicated that fruit yield can be improved by making selections on the bases of these yield attributing characters. Similar results were reported by Kumar *et al.,* 2007 in bottle gourd; Ananthan and Krishnamoorthy 2017 in ridge gourd, Sampath and Krishnamoorthy 2017 in pumpkin and Rajawat and Collis 2017 in cucumber.

Inter correlations among yield attributing components

The present study revealed that vine length was exhibited significant and positive correlation with node to first male flower (0.825), node to first female flower (0.559). The trait days to first male flower was exhibited significant and positive correlation with days to first female flower (0.842), node to first male flower (0.723), fruit diameter (0.567) and flesh thickness (0.784) whereas the trait days to first female flower was exhibited significant and positive correlation with node to first male flower (0.947), node to first female flower (0.447) and number of fruits per plant (0.701).

Days to first harvest was found to significant and positive correlation with fruit weight (0.461), number of fruits per plant (0.782) and sex ratio (0.731). Fruit weight was showed significant and positive correlation with fruit length (0.802), rind thickness (0.510) and flesh thickness (0.875).

Fruit length was exhibited significant and positive correlation with fruit diameter (0.739) and sex ratio (0.971) in L_3xT_1 cross. These results corroborate the findings of Lakshmi *et al.,* (2000) and Tamilselvi (2010) in pumpkin.

Days to first female flower exhibited significant and positive correlation with sex ratio (0.683). Node to first male flower also showed significant and positive correlation with node to first female flower (0.640) and days to first harvest (0.736). The trait days to first harvest exhibited significant and positive correlation with fruit weight (0.878) and fruit diameter (0.852).

Fruit weight showed significant and positive correlation with fruit length (0.750), fruit diameter (0.756), flesh thickness (0.687) and sex ratio (0.624). Fruit diameter showed significant and positive correlation with flesh thickness (0.716). Rind thickness also exhibited significant and positive correlation with number of fruits per plant (0.724) in L_3xT_2 cross and similar results were reported Lakshmi *et al.,* (2000) in pumpkin and Rahman *et al.,* (2002) in snake gourd.

Path coefficient analysis

Path analysis (Table 5) results revealed that vine length (0.938), days to first male flower (0.307), days to first female flower (0.041), node to first male flower (0.845), fruit weight (1.131), fruit length (1.126), fruit diameter (1.014), flesh thickness (0.093), number of fruits per plant (1.003) and sex ratio (0.167) exhibited significant and positive association with fruit yield L_3xT_1, cross. Among sixteen traits, fruit weight showed a highly significant and positive association (1.131) followed by fruit length (1.126), fruit diameter (1.014) and number of fruits per plant (1.003). Regarding path coefficient analysis (Table 6) of the cross L_3xT_2 results revealed that vine length (0.005), node to first female flower (0.213), days to first harvest (0.675), fruit weight (1.212), fruit length (1.321), fruit diameter (1.384), rind thickness (0.112), flesh thickness (0.319) and number of fruits per plant (1.070) exhibited significant and positive association with fruit yield.

Among sixteen traits, fruit diameter (1.384) showed highly significant and positive association followed by fruit length (1.321), fruit weight (1.212) and number of fruits per plant (1.070). From the F5 generation of L_3xT_1 and L_3xT_2 crosses, fruit length, fruit diameter, fruit weight and number of fruits per plant exhibited the maximum positive direct effect on the fruit yield. For selecting high yielding genotypes, special importance should be given on fruit weight, fruit length, fruit diameter and number of fruits per plant. This is in agreements with the findings of Kumar *et al.,* (2007) in bottle gourd, Rao *et al.,* (2000); Ananthan and Krishnamoorthy 2017 in ridge gourd. In the present study the traits fruit weight, fruit length, fruit diameter and number of fruits were more contributions to increase the yield. The residual effects of path coefficient were found to be low in two crosses indicated that most of the traits have respectable correlation with yield. These results are in conformity with Dey *et al.,* (2009) in bitter gourd and Husna *et al.,* (2011) in bottle gourd.

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