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Correlation and path analysis assessment for yield traits in brinjal (*Solanum melongena* L.)

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Abstract

Brinjal (*Solanum melongena* L.) is an important vegetable which belongs to the family *Solanaceae*. An experiment on “Correlation and path analysis assessment for yield traits in brinjal (*Solanum melongena* L.)” was conducted in the field of Department of Vegetable Science at Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district (Karnataka). The research results indicated that fruit yield per plant had positive and high significant (at $p=0.01$) association with number of fruits per plant ($r_g=0.802$ and $r_p=0.707$), average fruit weight ($r_g=0.473$ and $r_p=0.585$), fruits girth ($r_g=0.401$) and also it had positive and significant (at $p=0.05$) association with fruits girth ($r_p=0.214$), plant height at 120 DAT ($r_g=0.184$). But it had negative and high significant (at $p=0.01$) association with days to fifty per cent flowering ($r_g= -0.335$). Among the eighteen traits chosen for path analysis, plant height at 60, 90 DAT, number of primary branches per plant at 60, 90 DAT, stem girth at 120 DAT, days to first flowering, number of fruits per plant, average fruit weight and fruit length had significant positive direct effect on fruit yield per plant. Therefore, direct selection for these traits would be rewarding for improvement of fruit yield.

Keywords: Association, brinjal, correlation, path and yield

Introduction

Brinjal (*Solanum melongena* L.) is an important vegetable which belongs to the family *Solanaceae* and has chromosome number of $2n = 2x = 24$. It is one of the major and principle vegetable crop widely grown in both temperate (during warm season) and tropical regions of the world. It is a perennial but grown commercially as an annual crop. Being a native of India, it has got lot of variation from state to state and region to region. Variability studies provide insight knowledge on extent of improvement that could be achieved in different characters, but they do not throw light on the extent and nature of relationship existing between various characters. Therefore, an approach towards the improvement of yield by selection has to be made for the yield components (Grafius, 1959) [5]. Also, many of these yield contributing characters may interact in desirable and undesirable direction. Hence, the information regarding association of various characters among themselves and with economic characters is essential. In the present study, the genotypic and phenotypic correlation coefficients were worked for growth, yield and quality traits in brinjal, the observed difference between the genotypic and phenotypic correlation coefficients was narrow for various traits in the present findings and this indicates the lesser influence of environment on the expression of these traits and presence of strong inherent association among the traits. The technique of path coefficient analysis facilitates in partitioning the correlation coefficients into direct and indirect contribution to various characters on yield. It is a standardised partial regression coefficient analysis. As such, it measures the direct influence of one variable upon other. Such information would be of great value in enabling the breeder to specifically identify important component traits of yield and utilise the genetic stock for improvement in a planned way.

Materials and Methods

The experiment on “Correlation and path analysis studies in brinjal (*Solanum melongena* L.)” was conducted in the field of Department of Vegetable Science at Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district (Karnataka). Brinjal germplasm comprising of 60 genotypes collected from different parts of India. Experiment was laid out in

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RCBD design with 2 Replication with Spacing 75 cm × 60 cm. Seeds were sown in pro trays which were filled with the mixture of cocopeat and vermicompost during May 2017. These pro trays were covered with black polythene to build up humidity for better and early germination of seeds. After germination, polythene cover was removed and watering was done either in the morning or evening hours. The 19:19:19 nutrient spray was taken to seedlings @ 0.5g/litre of water at 25 days after sowing and again this was repeated after 10 days. Triazophos 40 EC spray @ 1.5 ml/litre of water was taken to protect from leaf miner incidence.

Results and Discussion

Association of different characters with yield per plant

Fruit yield per plant had positive and high significant (at $p=0.01$) association with number of fruits per plant ($r_g=0.802$ and $r_p=0.707$), average fruit weight ($r_g=0.473$ and $r_p=0.585$), fruits girth ($r_g=0.401$) and also it had positive and significant (at $p=0.05$) association with fruits girth ($r_p=0.214$), plant height at 120 DAT ($r_g=0.184$). But it had negative and high significant (at $p=0.01$) association with days to fifty per cent flowering ($r_g= -0.335$) (Table 1 and 2).

Genotypic and Phenotypic correlation

Average fruit weight had positive significant (at $p=0.05$) correlation with fruit girth ($r_g= 0.688$). Fruit length had negative significant (at $p=0.05$) correlation with fruit girth ($r_g=-0.651$) whereas, fruit girth showed positive significant (at $p=0.05$) correlation with fruit yield per plant ($r_g= 0.401$). A positive and significant (at $p=0.01$) correlation was noticed between average fruit weight and fruit girth ($r_p=0.316$), while fruit length had negative and significant (at $p=0.01$) correlation with fruit girth ($r_p=-0.450$). Fruit yield per plant had positive and high significant (at $p=0.01$) association with number of fruits per plant, average fruit weight, fruit girth and also it had positive and significant (at $p=0.05$) association with fruit girth and plant height at 120 DAT. As higher the number of fruits per plant and average fruit weight, higher will be the fruit yield per plant. It is logical to take attempt for selecting genotypes performing well for growth and yield

related traits which would simultaneously help in improvement of yield. The findings of Das *et al.* (2010) [2], Reshmika *et al.* (2015) [8], Sujin *et al.* (2017) [9], Banerjee *et al.* (2018) [1], Divya and Sharma (2018) [3] and Dutta *et al.* (2018) [4] were similar.

Genotypic path co-efficient analysis

Number of fruits per plant had high and direct positive effect (1.268) on yield per plant. Meanwhile, it had high to low positive and indirect effect through plant height at 120 DAT (0.616), plant height at 90 DAT (0.590), plant height at 60 DAT (0.571), stem girth at 120 DAT (0.526), stem girth at 60 DAT (0.478), stem girth at 90 DAT (0.472), number of primary branches at 60 DAT (0.334) number of primary branches at 90 DAT (0.195) and number of primary branches at 60 DAT (0.169). Average fruit weight had high positive and direct effect (0.565) on fruit yield per plant. But it had low and indirect negative effect through days to fifty per cent flowering (-0.319), plant height at 90 DAT (-0.261), stem girth at 60 DAT (-0.248), stem girth at 120 DAT (-0.238), plant height at 60 DAT (-0.233), leaf area (-0.191), plant height at 120 DAT (-0.187) and number of primary branches at 60 DAT (-0.179). Among the eighteen traits chosen for path analysis, plant height at 60, 90 DAT, number of primary branches per plant at 60, 90 DAT, stem girth at 120 DAT, days to first flowering, number of fruits per plant, average fruit weight and fruit length had significant positive direct effect on fruit yield per plant. Therefore, direct selection for these traits would be rewarding for improvement of fruit yield. Similar findings were observed by Nayak and Nagre (2013) [6], Reshmika *et al.* (2015) [8], Pujer *et al.* (2017) [7], Tripathy *et al.* (2017) [7] and Dutta *et al.* (2018) [4]. Whereas, plant height at 120 DAT, number of primary branches per plant at 120 DAT, stem girth at 60 and 120 DAT, leaf area, days to fifty per cent flowering, days to first fruit maturity, number of fruits per cluster and fruit girth had significant and negative direct effect with fruit yield. Therefore, direct selection for these traits would be rewarding for improvement of fruit yield in brinjal.

Table 1: Genotypic correlation coefficients among growth, yield and quality parameters in brinjal

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1	0.995**	0.873**	0.624**	0.370**	0.203*	0.473**	0.480**	0.481**	-0.165	-0.404**	0.396**	-0.251**	0.09	0.451**	-0.413**	0.683**	-0.575**	0.114
2		1	0.971**	0.792**	0.583**	0.487**	0.532**	0.426**	0.466**	-0.009	-0.305**	0.456**	-0.289**	0.114	0.465**	-0.463**	0.875**	-0.704**	0.094
3			1	0.846**	0.639**	0.652**	0.707**	0.649**	0.726**	-0.143	-0.065	0.370**	-0.187*	0.224*	0.486**	-0.331**	0.602**	-0.558**	0.184*
4				1	0.483**	0.574**	0.770**	0.784**	0.871**	-0.225*	0.148	0.634**	-0.072	0.482**	0.264**	-0.318**	0.108	-0.529**	0.054
5					1	0.970**	0.758**	0.672**	0.664**	-0.071	-0.464**	-0.221*	-0.213*	0.163	0.154	-0.203*	0.232**	-0.466**	0.010
6						1	0.749**	0.747**	0.735**	-0.110	-0.194*	-0.022	0.025	0.178	0.131	-0.156	0.142	-0.682**	0.004
7							1	0.945**	0.153	-0.715**	-0.500**	0.156	-0.062	0.212*	0.377**	-0.440**	0.131	-0.530**	0.064
8								1	0.993**	-0.737**	-0.489**	0.068	0.054	0.234**	0.372**	-0.308**	0.101	-0.519**	0.134
9									1	-0.729**	-0.548**	-0.025	-0.022	0.272**	0.415**	-0.422**	0.172	-0.684**	0.092
10										1	-0.509**	0.086	-0.819**	-0.444**	-0.027	-0.338**	-0.177	-0.478**	-0.172
11											1	0.475**	0.680**	-0.158	0.105	0.052	-0.448**	0.537**	0.121
12												1	0.321**	-0.082	0.027	-0.564**	0.034	-0.260**	-0.335**
13													1	-0.123	0.005	0.091	-0.231*	0.200*	0.063
14														1	0.063	0.01	-0.133	0.046	0.125
15															1	-0.136	-0.011	-0.056	0.802**
16																1	-0.163	0.688**	0.473**
17																	1	-0.652**	-0.120
18																		1	0.401**
19																			1

Critical r_g value at 5% = 0.179

Critical r_g value at 1% = 0.234

*significant at 5%

**Significant at 1%

1. Plant height (cm) at 60 DAT	6. No. of primary branches at 120 DAT	11. Days to first flowering	16. Average fruit weight (g)
2. Plant height (cm) at 90 DAT	7. Stem girth (cm) at 60 DAT	12. Days to fifty percent flowering	17. Fruit length (cm)
3. Plant height (cm) at 120 DAT	8. Stem girth (cm) at 90 DAT	13. Days to first fruit maturity	18. Fruit girth (cm)
4. No. of primary branches at 60 DAT	9. Stem girth (cm) at 120 DAT	14. No. fruits per cluster	19. Fruit yield per plant (kg)
5. No. of primary branches at 90 DAT	10. Leaf area (cm ²)	15. No. fruits per plant	

Table 2: Phenotypic correlation coefficients among growth, yield and quality parameters in brinjal

1	0.883**	0.807**	0.475**	0.172	0.115	0.226*	0.183*	0.194*	-0.011	-0.255**	-0.122	-0.184*	0.025	0.211*	-0.205*	0.343**	-0.322**	0.020
2	1	0.930**	0.539**	0.331**	0.300**	0.232*	0.182*	0.217*	0.003	-0.247**	-0.135	-0.171	0.045	0.196*	-0.251*	0.370**	-0.327**	0.036
3		1	0.528**	0.366**	0.347**	0.233*	0.171	0.196*	0.057	-0.232*	-0.145	-0.166	0.106	0.195*	-0.142*	0.258**	-0.299**	0.035
4			1	0.283**	0.305**	0.297**	0.314**	0.271**	-0.070	-0.142	-0.052	-0.020	0.231*	0.137	-0.310**	0.066	-0.211*	0.109
5				1	0.702**	0.336**	0.387**	0.344**	-0.044	-0.271**	-0.037	-0.102	0.119	0.142	-0.198*	0.139	-0.216*	0.014
6					1	0.305**	0.346**	0.375**	0.028	-0.076	0.066	0.051	0.120	0.105	-0.134	0.091	-0.148	0.018
7						1	0.727**	0.694**	-0.097	-0.103	-0.016	-0.015	0.138	0.264**	-0.190*	0.038	-0.350**	0.080
8							1	0.922**	-0.012	-0.119	0.013	0.020	0.133	0.248**	-0.108	0.012	-0.275**	0.120
9								1	-0.083	-0.084	0.033	0.013	0.129	0.255**	-0.140	0.040	-0.258**	0.105
10									1	0.677**	0.653**	0.450**	-0.060	0.109	0.058	0.052	0.016	0.059
11										1	0.469**	0.618**	-0.081	0.053	0.092	-0.209*	0.225*	0.118
12											1	0.316**	-0.013	0.048	-0.206*	0.011	-0.049	-0.097
13												1	-0.048	0.036	0.010	-0.169	0.177	0.046
14													1	0.082	0.001	-0.114	0.059	0.116
15														1	-0.142	-0.011	-0.044	0.707**
16															1	-0.132	0.341**	0.585**
17																1	-0.450**	-0.110
18																	1	0.214*
19																		1

Critical r_g value at 5% = 0.179

Critical r_g value at 1% = 0.234

*significant at 5%

**Significant at 1%

1. Plant height (cm) at 60 DAT	6. No. of primary branches at 120 DAT	11. Days to first flowering	16. Average fruit weight (g)
2. Plant height (cm) at 90 DAT	7. Stem girth (cm) at 60 DAT	12. Days to fifty percent flowering	17. Fruit length (cm)
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4. No. of primary branches at 60 DAT	9. Stem girth (cm) at 120 DAT	14. No. fruits per cluster	19. Fruit yield per plant (kg)
5. No. of primary branches at 90 DAT	10. Leaf area (cm ²)	15. No. fruits per plant	

Table 3: Genotypic path coefficient analysis for yield and its components in brinjal

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	rG	
1	0.239	0.238	0.208	0.149	0.088	0.048	0.113	0.114	0.115	-0.039	-0.096	0.094	-0.060	0.021	0.107	-0.098	0.163	-0.137	0.113
2	1.697	1.706	1.656	1.350	0.994	0.830	0.908	0.726	0.794	0.015	-0.520	0.777	-0.493	0.194	0.793	-0.789	1.492	-1.201	0.093
3	-3.647	-4.057	-4.179	-3.536	-2.671	-2.725	-2.953	-2.711	-3.036	0.599	0.273	-1.546	0.781	-0.937	-2.030	1.385	-2.514	2.330	0.184*
4	1.373	1.743	1.862	2.201	1.066	1.263	1.695	1.727	1.917	-0.495	0.325	1.395	-0.157	1.061	0.581	-0.699	0.238	-1.164	0.053
5	0.852	1.343	1.471	1.115	2.303	2.235	1.747	1.546	1.530	-0.164	-1.069	-0.509	-0.490	0.374	0.355	-0.467	0.535	-1.074	-0.009
6	-0.332	-0.793	-1.063	-0.935	-1.583	-1.630	-1.222	-1.218	-1.197	0.180	0.316	0.036	-0.040	-0.290	-0.213	0.254	-0.231	1.111	0.004
7	-0.678	-0.763	-1.013	-1.104	-1.088	-1.075	-1.434	-1.356	-1.456	1.026	0.717	-0.223	0.088	-0.303	-0.541	0.631	-0.187	0.760	0.064
8	-0.089	-0.079	-0.120	-0.145	-0.124	-0.138	-0.175	-0.185	-0.184	0.137	0.090	-0.012	-0.010	-0.043	-0.069	0.057	-0.018	0.096	0.133
9	0.630	0.611	0.953	1.142	0.871	0.964	1.332	1.303	1.312	-0.956	-0.719	-0.033	0.029	0.356	0.544	-0.553	0.225	-0.897	0.092
10	0.063	0.003	0.055	0.086	0.027	0.042	0.274	0.283	0.279	-0.383	0.579	0.417	0.314	0.170	0.010	0.129	0.068	0.183	-0.171
11	-0.401	-0.302	-0.064	0.146	-0.461	-0.192	-0.496	-0.486	-0.544	-1.499	0.993	0.471	0.675	-0.156	0.104	0.051	-0.444	0.533	0.120
12	-0.406	-0.468	-0.380	-0.652	0.227	0.022	-0.160	-0.069	0.026	1.117	-0.488	-1.028	-0.330	0.084	-0.027	0.579	-0.034	0.267	-0.335**
13	0.049	0.057	0.037	0.014	0.042	-0.004	0.012	-0.010	-0.004	0.162	0.134	-0.063	-0.197	0.024	-0.001	0.017	0.045	-0.039	0.062
14	-0.041	-0.052	-0.102	-0.221	-0.074	-0.081	-0.097	-0.107	-0.126	0.203	0.072	0.0375	0.056	-0.458	-0.028	-0.004	0.060	-0.021	0.125
15	0.571	0.590	0.616	0.334	0.195	0.165	0.478	0.472	0.526	-0.034	0.133	0.034	0.006	0.080	1.268	-0.172	-0.014	-0.071	0.801**
16	-0.233	-0.261	-0.187	-0.179	-0.114	-0.088	-0.248	-0.174	-0.238	-0.191	0.029	-0.319	0.051	0.005	-0.007	0.565	-0.092	0.389	0.473**
17	0.187	0.240	0.165	0.029	0.063	0.038	0.035	0.027	0.047	-0.048	-0.123	0.009	-0.063	-0.036	-0.003	-0.044	0.274	-0.179	-0.119
18	0.278	0.341	0.270	0.256	0.225	0.330	0.256	0.251	0.331	0.231	-0.260	0.126	-0.096	-0.022	0.027	-0.333	0.315	-0.483	0.401**

Diagonal indicates direct effect *Significant at 5% **Significant at 1% rG- Genotypic correlation with fruit yield per plant (kg) Residual effect = 0.54

1. Plant height (cm) at 60 DAT	6. No. primary branches at 120 DAT	11. Days to first flowering	16. Average fruit weight (g)
2. Plant height (cm) at 90 DAT	7. Stem girth (cm) at 60 DAT	12. Days to fifty percent flowering	17. Fruit length (cm)
3. Plant height (cm) at 120 DAT	8. Stem girth (cm) at 90	13. Days to first fruit maturity	18. Fruit girth (cm)
4. No. primary branches at 60 DAT	9. Stem girth (cm) at 120 DAT	14. No. fruits per cluster	19. Fruit yield per plant (kg)
5. No. primary branches at 90 DAT	10. Leaf area (cm ²)	15. No. fruits per plant	

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