Study on the path coefficient analysis of certain matric traits in Brinjal (*solanum melongena*)

Abstract

The present investigation, entitled "Investigation on the genetic basis of certain metric traits in the brinjal (Solanum melongena L.) summer crop under Alwar (Rajasthan) conditions," was under way. In the present study, 74 genotypes (14 lines, 4 tests, and 56 F1's) with two checks were evaluated in RBD with three replications at the Vegetable Research Farm, Department of Vegetable Science, Sunrise University, Alwar, Rajasthan, India, under two summer seasons during 2021 and 2022. The observations were recorded for days to 50% flowering, days to first fruit harvest, plant height, number of primary branches per plant, length of pedicle (cm), number of fruits per cluster, average fruit weight (gm), number of fruits per plant, total phenol content (mg/100 gm), dry matter content (%), reducing sugar (%), non-reducing sugar (%), total sugars (%), TSS (Brix), ascorbic acid (mg/100 gm), total fruit yield per plant (kg), and yield Q/Ha. The observations were also recorded for some ancillary traits as well. The result revealed that, both year and pooled Phenotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.3723) followed by number of fruits per plant (0.2300), average fruit weight (0.2204), plant height (0.1734), number of fruits per cluster (0.0568), length of pedicle (0.0446), days to first fruit harvesting (0.0281), Total Phenol content (0.0159) and dry matter content (0.0081). Regarding indirect effects number of primary branches (0.2892 followed by reducing sugar (0.2536), days to 50 % flowering (0.1952), non-reducing sugar (0.0693) and TSS (0.0022). contributed number of fruits per cluster maximum positive and indirect effect. Although number of primary branches per plant gave maximum negative direct effect on plant height but high positive and indirect effect via total fruit yield per plant (0.591) and ultimately resulted in positive correlation with yield. In pooled Genotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.7791) followed by total sugar (0.3543), plant height (0.2132), average fruit weight (0.1956), Ascorbic acid (0.1216), number of fruit per cluster (0.0367), dry matter content (0.0260), Total Phenol content (0.0256) and TSS (0.0134). Regarding indirect effects reducing sugar (0.4582) followed by number of primary branches per plant (0.3155), non-reducing sugar (0.1718), days to first fruit harvesting (0.1336), number of fruits per plant (0.0428), days to 50 % flowering (0.0343) and number of fruits per cluster (0.0174). contributed plant height maximum negative and indirect effect.

Keyword- Path coefficient,

1. INTRODUCTION

"Brinjal or eggplant (Solanum melongena L.) is an important Solanaceous vegetable crops with diploid chromosome no 2n=2x=24". (Gupta RA et. Al. 2017). As per Vavilov [1] the crop is being of Indian origin. One of the critical aspects of crop improvement is understanding the genetic and phenotypic relationships among various traits that contribute to yield and quality. Path coefficient analysis, a statistical technique that quantifies the direct and indirect effects of multiple variables on a dependent variable, is particularly useful in this context. By dissecting

the complex interrelationships among traits, path coefficient analysis helps breeders identify key determinants of yield and quality, thereby guiding the selection process in breeding programs. In brinjal, certain metric traits such as plant height, number of branches, fruit size, and fruit weight significantly influence overall yield. However, the interdependencies among these traits are complex and not fully understood. This study aims to elucidate the direct and indirect effects of various metric traits on brinjal yield through path coefficient analysis. By doing so, we seek to identify the most influential traits that could serve as reliable selection criteria in breeding programs aimed at improving brinjal productivity. The insights gained from this investigation are expected to contribute to more effective breeding strategies, ultimately enhancing brinjal production and meeting the growing demands of both local and global markets.

Method and Martial

This study The Vegetable Research Farm, Department of Vegetable Science, Sunrise University Alwar, Rajasthan, India, examined 74 genotypes (14 lines, 4 testers, and 56 F1s) with two checks in RBD with three replications throughout the summer seasons of 2021 and 2022. Seed beds were prepared in a sandy loam soil, pH 7.3, and were 20 cm high and 1.0 m wide. Weathered cow dung manure at 4 kg·m-2 was mixed into the beds. The soil was drenched with 0.2% chlorothalonil and 0.1% carbendazim to avoid damping off disease. Seed, after treatment with Thiram® (3.0g kg-1 of seed), were sown on 16 January both the year 2021-2022, at a depth 1.0 cm, at a 5.0 cm spacing, and covered with finely sieved well-rotted leaf Mold (leaves left to decompose for 2 years) to add organic matter and prevent the soil from drying. After sowing, beds were covered with straw until germination which normally takes 5 to 7 days and were hand watered daily up to the 4th week of January. The beds were covered with 200 µm ultraviolet (UV)- stabilized clear polyethylene film supported by bamboo poles with open sides to protect seedlings from rain and direct sunlight. Seedlings were hardened by withholding water 4 days before transplanting. Thirty- five-day old seedlings were transplanted to the field on 2 march 2021,2022 both the year. The following additional qualities were also noted in the observations. Day count to 50% flowering, Day count to first fruit harvest, plant height, Number of primary branches per plant, Length of pedicle (cm), Fruit count per cluster, Average Fruit Weight (gm), Fruit count per plant, Total Phenol Content (mg/100 gm), Dry matter content (%), Reducing Sugar (%), Non-Reducing Sugar (%), Total Sugars (%), TSS (Brix), Ascorbic acid (mg/100 gm), Total Fruit Yield per plant (kg), Total Fruit Yield (Ha) were all noted.

Result and Discussion

Phenotypic path with yield Q/Ha

In Y1 Phenotypic Path coefficient analysis revealed high positive and direct effect of Average fruit weight (0.420) followed by total sugar (0.279), number of fruits per plant (0.249), TSS (0.192), Ascorbic acid (0.144), plant height (0.069), Dry matter content (0.055), Total Phenol content (0.045), total fruit yield per plant (0.043), length of pedicle (0.029) and Days to first fruits harvesting (0.028). Regarding indirect effects, Days to 50 % flowering followed

by reducing sugar (0.237), number of primary branches (0.115), non-reducing sugar (0.081), number of fruit per cluster (0.058) and length of pedicle (0.029). contributed maximum positive and indirect effect on length of pedicle and average fruit weight. Although, days to 50 % flowering gave maximum negative direct effect on plant height but high positive and indirect effect via average fruit weight (0.390) and ultimately resulted in positive correlation with yield. In Y2 Phenotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.4977) followed by number of fruits per plant (0.2897), days to first fruits harvesting (0.2417), number of fruits per plant (0.1298), plant height (0.1199), length of pedicle (0.0957), Ascorbic acid (0.0587), Total Phenol content (0.0552), average fruit weight (0.0236) and non-reducing sugar (0.0231). Regarding indirect effects, Days to 50 % flowering followed by reducing sugar (0.1435), TSS (0.0968), dry matter content (0.0943), number of primary branches (0.0895) and total sugar (0.0068). contributed no maximum positive and indirect effect. Although number of primary branches per plant gave maximum negative direct effect on plant height but high positive and indirect effect via total fruit yield per plant (0.752) and ultimately resulted in positive correlation with yield. In pooled Phenotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.3723) followed by number of fruits per plant (0.2300), average fruit weight (0.2204), plant height (0.1734), number of fruits per cluster (0.0568), length of pedicle (0.0446), days to first fruit harvesting (0.0281), Total Phenol content (0.0159) and dry matter content (0.0081). Regarding indirect effects number of primary branches (0.2892 followed by reducing sugar (0.2536), days to 50 % flowering (0.1952), non-reducing sugar (0.0693) and TSS (0.0022). contributed number of fruits per cluster maximum positive and indirect effect. Although number of primary branches per plant gave maximum negative direct effect on plant height but high positive and indirect effect via total fruit yield per plant (0.591) and ultimately resulted in positive correlation with yield. Similar results had also been reported by Singh et al. (2011)[11], Singh et al. (2013a)[12], Sonkiya et al. (2012)[13], Shinde et al (2017)[14], Tsega et al (2010)[15], Thangamani C et al (2012)[16], Tripathy B (2018)[17] and. Yadav et al. (2007)[18].

Genotypic path with yield Q/Ha

In Y1 Genotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.989) followed by days to 50 % flowering (0.777), plant height (0.496), total sugar (0.397), number of fruits per cluster (0.223), Ascorbic acid (0.222), TSS (0.118) and Total Phenol content (0.130). Regarding indirect effects average fruit weight (0.783) followed by reducing sugar (0.699), days to first fruit harvesting (0.583), number of fruits per plant (0.442), dry matter content (0.149), length of pedicle (0.136) and non-reducing sugar (0.019). contributed plant height maximum negative and indirect effect.

Table 1. Genotypic and phenotypic Path analysis between different characters of brinjal in Y1 (first year)

Characters		Days to 50% Flowering	Days to first fruit harvest	plant hight	Number of primary branches per plant	Length of pedicle (cm)	Number of fruit per cluster	Average fruit weight (gm)	Number of fruit per plant	Total Phenol Content (mg/100 gm)	Dry matter content (%)	Reducing Sugar (%)	Non-Reducing Sugar (%)	Total Sugars (%)	TSS (Brix)	Ascorbic acid (mg/100 gm)	Total fruit yield per plant (kg)	Yield Q/Ha
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	G	**0.777**	-0.268	0.030	-0.007	-0.020	-0.050	-0.084	0.083	-0.010	-0.011	-0.323	-0.032	0.075	0.019	0.020	-0.415	-0.214**
	P	**-0.341**	0.009	0.004	0.022	-0.001	0.008	0.018	-0.008	-0.001	0.000	-0.044	-0.006	0.019	0.053	0.009	0.000	-0.258**
2	G	0.357	**-0.583**	-0.101	-0.004	-0.035	-0.030	-0.078	-0.285	-0.003	-0.007	-0.139	-0.044	0.026	0.012	0.016	0.762	-0.137*
	P	-0.115	**0.028**	-0.015	0.015	-0.007	0.012	0.063	0.018	-0.003	0.005	-0.017	-0.005	0.014	-0.001	0.023	0.007	0.022
3	G	0.048	0.119	**0.496**	-0.003	0.017	0.003	0.185	0.019	-0.028	-0.049	-0.402	0.060	0.147	-0.017	0.049	-0.498	-0.152*
	P	-0.022	-0.006	**0.069**	0.013	0.003	-0.002	-0.122	-0.055	-0.006	0.012	-0.062	0.010	0.045	-0.003	0.022	-0.016	-0.120
4	G	-0.184	0.088	-0.045	**0.028**	-0.041	0.102	-0.380	-0.065	0.001	0.026	0.170	-0.076	0.002	0.009	-0.023	0.338	0.251**
	P	0.067	-0.004	-0.008	**-0.115**	-0.007	-0.024	0.188	0.057	0.001	-0.005	0.028	-0.012	-0.006	0.004	-0.009	0.015	0.170*
5	G	0.111	-0.149	-0.062	0.008	**-0.136**	0.002	-0.211	-0.010	0.000	0.004	0.106	-0.087	-0.110	0.046	-0.040	0.239	0.010
	P	-0.011	0.007	-0.008	-0.027	**-0.029**	0.002	0.100	0.071	-0.001	-0.001	0.012	-0.012	-0.031	0.031	-0.025	0.008	0.087
6	G	-0.175	0.079	0.006	0.013	-0.001	**0.223**	-0.289	-0.025	0.023	-0.007	-0.091	-0.120	0.162	-0.003	0.008	0.256	0.358**
	P	0.048	-0.006	0.002	-0.048	0.001	**-0.058**	0.117	0.066	0.009	0.001	-0.014	-0.019	0.047	0.007	-0.005	0.014	0.161*
7	G	0.083	-0.058	-0.117	0.013	-0.037	0.082	**-0.783**	-0.049	0.024	0.009	0.168	-0.190	-0.025	0.013	-0.036	0.156	0.454**
	P	-0.015	0.004	-0.020	-0.052	-0.007	-0.016	**0.420**	0.067	0.004	0.001	0.026	-0.027	-0.001	-0.002	-0.013	0.020	0.390**
8	G	-0.026	-0.068	-0.146	0.009	-0.040	0.066	-0.272	**-0.442**	0.026	-0.015	0.103	-0.623	-0.062	0.009	0.007	0.928	0.453**
	P	0.011	0.002	-0.015	-0.026	-0.008	-0.015	0.112	**0.249**	0.009	0.000	0.012	-0.018	-0.017	0.021	-0.001	0.032	0.348**
9	G	-0.057	0.014	-0.106	0.000	0.000	0.039	-0.144	-0.094	**0.130**	-0.038	-0.096	-0.039	0.304	-0.010	0.008	0.362	0.273**
	P	0.011	-0.002	-0.009	-0.001	0.001	-0.012	0.038	0.048	**0.045**	0.010	-0.044	-0.036	0.092	0.006	0.000	0.011	0.157*
10	G	0.056	-0.029	0.164	-0.005	0.003	0.010	0.049	-0.246	0.033	**-0.149**	-0.524	-0.081	0.348	0.013	0.013	0.529	0.185**
	P	-0.003	0.003	0.015	0.011	0.001	-0.001	0.010	0.002	0.008	**0.055**	-0.072	-0.012	0.109	-0.015	0.017	0.005	0.134*
11	G	0.167	-0.054	0.133	-0.003	0.010	0.014	0.088	0.167	0.026	-0.152	**-0.699**	0.073	0.039	-0.029	0.041	0.079	-0.101
	P	-0.063	0.002	0.018	0.014	0.001	-0.003	-0.047	-0.012	0.008	0.017	**-0.237**	0.012	0.220	-0.035	0.022	0.001	-0.083
12	G	0.048	-0.050	-0.057	0.004	-0.023	0.052	-0.287	-0.579	0.060	-0.023	0.212	**-0.019**	0.111	0.009	0.015	0.792	0.263**
	P	-0.024	0.002	-0.008	-0.017	-0.004	-0.014	0.142	0.054	0.020	0.008	0.034	**-0.081**	0.037	0.011	0.008	0.014	0.180**
13	G	0.073	-0.019	0.092	0.000	0.019	0.045	0.024	0.189	0.049	-0.065	-0.802	-0.073	**0.397**	-0.033	0.016	0.095	0.008

	P	-0.023	0.001	0.011	0.002	0.003	-0.010	-0.002	-0.015	0.015	0.021	-0.187	-0.011	**0.279**	-0.044	0.010	0.000	0.054
14	G	0.122	-0.058	-0.071	0.002	-0.053	-0.006	-0.084	-0.179	-0.011	-0.016	0.366	-0.040	-0.219	**0.118**	-0.061	0.430	0.240**
	P	-0.093	0.000	-0.001	-0.002	-0.005	-0.002	-0.004	0.028	0.001	-0.004	0.043	-0.005	-0.064	**0.192**	-0.037	0.006	0.051
15	G	0.070	-0.043	0.110	-0.003	0.025	0.008	0.126	-0.073	0.005	-0.009	-0.277	-0.034	0.058	-0.033	**0.222**	-0.168	-0.015
	P	-0.022	0.004	0.011	0.008	0.005	0.002	-0.038	-0.001	0.000	0.006	-0.036	-0.005	0.020	-0.050	**0.144**	0.000	0.047
16	G	-0.085	-0.117	-0.196	0.010	-0.045	0.074	-0.046	-0.009	0.040	-0.021	-0.071	-0.077	0.020	0.113	-0.010	**0.989**	0.570**
	P	-0.001	0.005	-0.025	-0.041	-0.005	-0.018	0.196	0.184	0.012	0.007	-0.004	-0.026	0.001	0.025	0.000	**0.043**	0.351**

Table 2. Genotypic and phenotypic Path analysis between different characters of brinjal in Y2 (Second year)

Characters		Days to 50% Flowering	Days to first fruit harvest	Plant hight	Number of primary branches per plant	Length of pedicle (cm)	Number of fruit per cluster	Average fruit weight (gm)	Number of fruits per plant	Total Phenol Content (mg/100 gm)	Dry matter content (%)	Reducing Sugar (%)	Non-Reducing Sugar (%)	Total Sugars (%)	TSS (Brix)	Ascorbic acid (mg/100 gm)	Total fruit yield per plant (kg)	Yield Q/Ha
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	G	**0.0163**	0.0729	0.0175	0.0274	0.0007	0.0108	-0.0011	0.0200	0.0000	-0.0002	-0.2152	-0.0270	0.1713	-0.0014	0.0052	0.0804	0.177**
	P	**-0.1435**	0.1329	0.0109	0.0246	0.0007	-0.0186	0.0012	0.0285	0.0003	0.0032	-0.0036	0.0022	-0.0014	-0.0066	0.0064	0.0644	0.102
2	G	0.0113	**0.1049**	-0.0634	0.0423	0.0064	0.0245	0.0156	0.0043	0.0003	0.0006	-0.0998	-0.0171	0.0493	-0.0006	0.0050	0.0043	0.088
	P	-0.0789	**0.2417**	-0.0390	0.0331	0.0017	-0.0425	0.0032	0.0162	-0.0030	-0.0082	-0.0016	0.0009	-0.0006	0.0008	0.0104	-0.0212	0.113
3	G	0.0015	-0.0339	**0.1959**	-0.0197	-0.0216	-0.0079	-0.0149	0.0078	0.0034	-0.0010	-0.0600	0.0505	-0.0340	0.0014	0.0018	-0.0023	0.067
	P	-0.0130	-0.0787	**0.1199**	-0.0145	-0.0167	0.0122	-0.0031	0.0177	-0.0172	0.0172	-0.0010	-0.0034	0.0003	-0.0025	0.0029	0.0036	0.024
4	G	-0.0044	-0.0438	0.0380	**-0.1015**	0.0097	-0.0110	-0.0073	-0.0055	0.0012	0.0002	0.0547	0.0336	-0.1105	-0.0029	-0.0031	-0.0605	-0.213**
	P	0.0394	-0.0895	0.0194	**-0.0895**	0.0045	0.0200	-0.0026	-0.0124	-0.0055	-0.0054	0.0010	-0.0023	0.0010	-0.0110	-0.0031	-0.0455	-0.181**
5	G	0.0001	0.0062	-0.0389	-0.0091	**0.1090**	-0.0125	0.0346	0.0607	0.0015	0.0002	0.1497	0.0485	-0.1727	-0.0050	0.0029	0.2381	0.413**
	P	-0.0011	0.0043	-0.0210	-0.0042	**0.0957**	0.0175	0.0068	0.0989	-0.0084	-0.0055	0.0025	-0.0031	0.0015	-0.0182	0.0038	0.1815	0.351**
6	G	-0.0026	-0.0374	0.0225	-0.0162	0.0198	**-0.0686**	0.0345	0.0153	0.0002	0.0019	0.0032	0.0372	-0.0048	-0.0019	0.0015	0.1483	0.153*
	P	0.0205	-0.0791	0.0113	-0.0138	0.0129	**0.1298**	0.0048	0.0309	-0.0026	-0.0273	0.0000	-0.0021	0.0001	-0.0063	0.0027	0.0943	0.176**
7	G	-0.0002	0.0161	-0.0286	0.0073	0.0370	-0.0232	**0.1017**	0.0652	-0.0007	0.0009	-0.1004	-0.0044	0.1318	-0.0031	0.0041	0.2747	0.478**
	P	-0.0076	0.0328	-0.0160	0.0098	0.0277	0.0263	**0.0236**	0.0824	0.0033	-0.0044	-0.0014	0.0004	-0.0013	-0.0033	0.0033	0.1479	0.324**
8	G	0.0022	0.0031	0.0105	0.0038	0.0451	-0.0071	0.0453	**0.1466**	0.0028	-0.0005	-0.0645	0.0375	0.0217	0.0017	0.0058	0.5326	0.787**
	P	-0.0141	0.0135	0.0073	0.0038	0.0327	0.0139	0.0067	**0.2897**	-0.0164	0.0080	-0.0010	-0.0025	-0.0002	-0.0008	0.0105	0.3488	0.700**

9	G	0.0000	-0.0033	-0.0705	0.0127	-0.0167	0.0017	0.0073	-0.0437	**-0.0095**	-0.0001	-0.0419	-0.1886	0.2978	-0.0011	-0.0042	-0.0765	-0.137*
	P	-0.0008	-0.0131	-0.0373	0.0089	-0.0146	-0.0061	0.0014	-0.0861	**0.0552**	0.0051	-0.0008	0.0116	-0.0025	-0.0072	-0.0047	-0.0543	-0.145*
10	G	-0.0005	0.0109	-0.0367	-0.0030	0.0047	-0.0234	0.0163	-0.0143	0.0002	**0.0055**	0.0041	0.0565	-0.0477	-0.0033	0.0063	-0.0696	-0.094
	P	0.0049	0.0209	-0.0219	-0.0051	0.0055	0.0375	0.0011	-0.0247	-0.0030	**-0.0943**	0.0002	-0.0034	0.0006	-0.0109	0.0115	-0.0162	-0.097
11	G	0.0048	0.0144	0.0162	0.0077	-0.0225	0.0003	0.0141	0.0130	-0.0006	0.0000	**-0.7248**	0.0588	0.6032	0.0028	0.0023	0.0335	0.023
	P	-0.0384	0.0294	0.0092	0.0068	-0.0176	0.0001	0.0025	0.0215	0.0032	0.0013	**-0.0135**	-0.0040	-0.0055	0.0153	0.0045	0.0238	0.038
12	G	0.0013	0.0052	-0.0286	0.0099	-0.0153	0.0074	0.0013	-0.0159	-0.0052	-0.0009	0.1233	**-0.3457**	0.2692	0.0005	0.0018	-0.0230	-0.015
	P	-0.0138	0.0090	-0.0174	0.0089	-0.0127	-0.0120	0.0004	-0.0314	0.0276	0.0139	0.0023	**0.0231**	-0.0024	0.0027	0.0025	-0.0149	-0.014
13	G	0.0038	0.0070	-0.0091	0.0153	-0.0256	0.0005	0.0183	0.0043	-0.0039	-0.0004	-0.5953	-0.1268	**0.7343**	0.0035	0.0025	0.0335	0.062
	P	-0.0290	0.0211	-0.0060	0.0134	-0.0210	-0.0023	0.0044	0.0098	0.0205	0.0076	-0.0109	0.0081	**-0.0068**	0.0173	0.0047	0.0162	0.047
14	G	0.0014	0.0037	-0.0168	-0.0185	0.0343	-0.0084	0.0198	-0.0158	-0.0007	0.0011	0.1296	0.0117	-0.1623	**-0.0159**	-0.0037	0.0232	-0.017
	P	-0.0097	-0.0019	0.0031	-0.0101	0.0180	0.0084	0.0008	0.0023	0.0041	-0.0106	0.0021	-0.0007	0.0012	**-0.0968**	-0.0091	0.0087	-0.090
15	G	0.0031	0.0190	0.0129	0.0115	0.0116	-0.0038	0.0152	0.0307	0.0015	0.0013	-0.0616	-0.0221	0.0675	0.0021	**0.0276**	0.1635	0.280**
	P	-0.0156	0.0430	0.0059	0.0048	0.0063	0.0059	0.0013	0.0519	-0.0044	-0.0184	-0.0010	0.0010	-0.0006	0.0150	**0.0587**	0.0905	0.244**
16	G	0.0020	0.0007	-0.0007	0.0092	0.0386	-0.0152	0.0416	0.1163	0.0011	-0.0006	-0.0361	0.0118	0.0367	-0.0006	0.0067	**0.6715**	0.883**
	P	-0.0186	-0.0103	0.0009	0.0082	0.0349	0.0246	0.0070	0.2030	-0.0060	0.0031	-0.0007	-0.0007	-0.0002	-0.0017	0.0107	**0.4977**	0.752**

Table 3. Genotypic and phenotypic Path analysis between different characters of brinjal in pooled (Both first year and Second year)

Characters		Days to 50% Flowering	Days to first fruit harvest	plant hight	Number of primary branches per plant	Length of pedicle (cm)	Number of fruit per cluster	Average fruit weight (gm)	Number of fruit per plant	Total Phenol Content (mg/100 gm)	Dry matter content (%)	Reducing Sugar (%)	Non-Reducing Sugar (%)	Total Sugars (%)	TSS (Brix)	Ascorbic acid (mg/100 gm)	Total fruit yield per plant (kg)	Yield Q/Ha
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	G	**-0.0343**	-0.0781	0.0218	0.0993	0.0031	0.0034	0.0163	-0.0022	-0.0013	0.0025	-0.1252	-0.0099	0.0546	0.0019	0.0165	0.0263	-0.005
	P	**-0.1952**	0.0145	0.0177	0.0866	0.0023	-0.0091	0.0124	0.0090	-0.0005	0.0005	-0.0656	-0.0046	0.0287	-0.0003	0.0142	0.0275	-0.062
2	G	-0.0200	**-0.1336**	-0.0552	0.1168	0.0061	0.0072	0.0249	-0.0057	-0.0008	0.0027	-0.0521	-0.0081	0.0065	0.0001	0.0168	0.1031	0.009
	P	-0.1003	**0.0281**	-0.0459	0.1008	0.0067	-0.0237	0.0324	0.0293	-0.0009	0.0008	-0.0264	-0.0027	0.0058	0.0000	0.0201	0.0428	0.067
3	G	-0.0035	0.0346	**0.2132**	-0.0140	-0.0094	-0.0027	-0.0564	0.0113	-0.0078	0.0018	-0.0648	0.0262	0.0322	-0.0006	0.0194	-0.2577	-0.078
	P	-0.0196	-0.0073	**0.1764**	-0.0085	-0.0107	0.0081	-0.0633	-0.0537	-0.0043	0.0004	-0.0347	0.0107	0.0171	0.0000	0.0195	-0.1164	-0.086
4	G	0.0108	0.0495	0.0095	**-0.3155**	0.0068	-0.0047	0.0358	-0.0002	-0.0013	-0.0014	0.0586	-0.0137	-0.0126	0.0012	-0.0150	-0.0120	-0.204**

	P	0.0584	-0.0098	0.0052	**-0.2892**	0.0066	0.0146	0.0341	-0.0051	-0.0007	-0.0002	0.0320	-0.0053	-0.0087	-0.0001	-0.0130	0.0030	-0.178**
5	G	-0.0029	-0.0222	-0.0547	-0.0583	**0.0367**	-0.0005	0.0404	-0.0118	-0.0024	-0.0016	0.0766	-0.0015	-0.0863	0.0046	-0.0096	0.2038	0.110
	P	-0.0102	0.0042	-0.0425	-0.0429	**0.0446**	-0.0003	0.0439	0.0591	-0.0015	-0.0003	0.0387	-0.0004	-0.0463	-0.0005	-0.0103	0.0769	0.112
6	G	0.0068	0.0557	0.0330	-0.0846	0.0010	**-0.0174**	0.0641	-0.0017	0.0036	0.0039	-0.0186	-0.0122	0.0303	0.0015	0.0008	0.1234	0.190**
	P	0.0314	-0.0118	0.0252	-0.0742	-0.0002	**0.0568**	0.0544	0.0075	0.0022	0.0010	-0.0102	-0.0055	0.0149	-0.0002	-0.0020	0.0554	0.145*
7	G	-0.0029	-0.0170	-0.0615	-0.0577	0.0076	-0.0057	**0.1956**	-0.0142	0.0051	0.0033	0.0057	-0.0632	0.0229	0.0020	-0.0015	0.4167	0.435**
	P	-0.0110	0.0041	-0.0507	-0.0448	0.0089	0.0140	**0.2204**	0.0591	0.0024	0.0009	0.0031	-0.0234	0.0155	-0.0002	-0.0030	0.1647	0.360**
8	G	-0.0018	-0.0177	-0.0564	-0.0018	0.0101	-0.0007	0.0650	**-0.0428**	-0.0020	-0.0022	-0.0065	-0.0041	-0.0136	0.0005	0.0222	0.6695	0.618**
	P	-0.0076	0.0036	-0.0412	0.0064	0.0115	0.0018	0.0566	**0.2300**	-0.0014	-0.0008	-0.0026	-0.0013	-0.0056	-0.0002	0.0213	0.2692	0.540**
9	G	0.0017	0.0042	-0.0650	0.0164	-0.0034	-0.0025	0.0391	0.0033	**0.0256**	0.0033	-0.0608	-0.0924	0.1456	-0.0004	-0.0076	0.0717	0.079
	P	0.0064	-0.0016	-0.0474	0.0133	-0.0043	0.0079	0.0329	-0.0204	**0.0159**	0.0007	-0.0329	-0.0356	0.0785	0.0000	-0.0074	0.0305	0.036
10	G	-0.0032	-0.0137	0.0148	0.0174	-0.0023	-0.0026	0.0251	0.0036	0.0032	**0.0260**	-0.1075	-0.0089	0.0817	0.0020	0.0209	-0.0459	0.010
	P	-0.0111	0.0028	0.0083	0.0060	-0.0018	0.0067	0.0246	-0.0235	0.0014	**0.0081**	-0.0536	-0.0032	0.0399	-0.0002	0.0218	-0.0084	0.018
11	G	-0.0094	-0.0152	0.0302	0.0404	-0.0061	-0.0007	-0.0024	-0.0006	0.0034	0.0061	**-0.4582**	0.0304	0.2958	-0.0032	0.0169	0.0326	-0.040
	P	-0.0505	0.0029	0.0241	0.0365	-0.0068	0.0023	-0.0027	0.0024	0.0021	0.0017	**-0.2536**	0.0122	0.1679	0.0005	0.0169	0.0114	-0.033
12	G	-0.0020	-0.0063	-0.0326	-0.0252	0.0003	-0.0012	0.0719	-0.0010	0.0137	0.0013	0.0810	**-0.1718**	0.0965	0.0006	0.0076	0.1138	0.147*
	P	-0.0129	0.0011	-0.0273	-0.0219	0.0003	0.0045	0.0743	0.0043	0.0082	0.0004	0.0448	**-0.0693**	0.0543	-0.0001	0.0067	0.0525	0.120
13	G	-0.0053	-0.0025	0.0194	0.0112	-0.0090	-0.0015	0.0126	0.0017	0.0105	0.0060	-0.3826	-0.0468	**0.3543**	-0.0037	0.0089	0.0310	0.004
	P	-0.0277	0.0008	0.0149	0.0124	-0.0102	0.0042	0.0169	-0.0063	0.0061	0.0016	-0.2099	-0.0186	**0.2028**	0.0005	0.0088	0.0114	0.008
14	G	-0.0048	-0.0005	-0.0089	-0.0286	0.0127	-0.0020	0.0288	-0.0015	-0.0008	0.0038	0.1098	-0.0079	-0.0968	**0.0134**	-0.0319	0.0845	0.069
	P	-0.0300	0.0001	0.0023	-0.0180	0.0107	0.0052	0.0151	0.0167	0.0000	0.0006	0.0559	-0.0022	-0.0483	**-0.0022**	-0.0298	0.0384	0.014
15	G	-0.0047	-0.0184	0.0340	0.0389	-0.0029	-0.0001	-0.0025	-0.0078	-0.0016	0.0045	-0.0637	-0.0107	0.0260	-0.0035	**0.1216**	0.1128	0.222**
	P	-0.0215	0.0044	0.0267	0.0291	-0.0036	-0.0009	-0.0051	0.0381	-0.0009	0.0014	-0.0334	-0.0036	0.0138	0.0005	**0.1287**	0.0465	0.220**
16	G	-0.0012	-0.0177	-0.0705	0.0049	0.0096	-0.0028	0.1046	-0.0368	0.0024	-0.0015	-0.0192	-0.0251	0.0141	0.0015	0.0176	**0.7791**	0.759**
	P	-0.0144	0.0032	-0.0551	-0.0024	0.0092	0.0085	0.0975	0.1663	0.0013	-0.0002	-0.0078	-0.0098	0.0062	-0.0002	0.0161	**0.3723**	0.591**

Although number of primary branches per plant gave maximum negative direct effect on total fruit yield per plant but high positive and indirect effect via total fruit yield per plant (0.591) and ultimately resulted in positive correlation with yield. In Y2 Genotypic Path coefficient analysis revealed high positive and direct effect of Total sugar (0.7343) followed by total fruits yield per plant (0.6715), plant height (0.1959), number of fruits per plant (0.1466), length of pedicle (0.1090), days to first fruit harvesting (0.1049), average fruit weight (0.1017), ascorbic acid (0.0276), days to 50 % flowering (0.0163) and dry matter content (0.0055). Regarding indirect effects reducing sugar (0.7248) followed by non-reducing sugar (0.3457), number of primary branches (0.1015), number of fruits per cluster (0.0686), TSS (0.159) and total phenol content (0.0095). contributed number of fruits per cluster maximum positive and indirect effect. Although number of primary branches per plant gave maximum negative direct effect on total fruit yield per plant but high positive and indirect effect via total fruit yield per plant (0.883) and ultimately resulted in positive correlation with yield. In pooled Genotypic Path coefficient analysis revealed high positive and direct effect of Total fruits yield per plant (0.7791) followed by total sugar (0.3543), plant height (0.2132), average fruit weight (0.1956), Ascorbic acid (0.1216), number of fruit per cluster (0.0367), dry matter content (0.0260), Total Phenol content (0.0256) and TSS (0.0134). Regarding indirect effects reducing sugar (0.4582) followed by number of primary branches per plant (0.3155), non-reducing sugar (0.1718), days to first fruit harvesting (0.1336), number of fruits per plant (0.0428), days to 50 % flowering (0.0343) and number of fruits per cluster (0.0174). contributed plant height maximum negative and indirect effect. Although non-reducing sugar gave maximum negative direct effect on number of primary branches per plant but high positive and indirect effect via total fruit yield per plant (0.759) and ultimately resulted in positive correlation with yield. Similar results had also been reported by Aliyu et al. (2007)[1], Awale et al (2011)[2], Bhatt et al. (2017)[3], Chotaliya and Kulkarni (2017)[4], Gebremichael et al (2019)[6], Kassahun et al. (2010)[7], Lu et al. (2012)[8], Prajapati et al. (2016)[9], Sharma et al (2016 b)[10] and Yadav et al. (2007)[18].

Conclusion

It can be concluded that Number of Fruit per plant, Number of fruits per cluster, Average Fruit Weight, and Total fruit per plant were the major contributing characters towards marketable yield and selection based on these characters can be effective for developing high yielding brinjal varieties.

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