Relationships between different growth and yield traits in bottle guord [*Lagenaria siceraria* (mol.) standl] with path coefficient analysis over seasons under salt affected soil

Abstract

This study used 23 genotypes of bottle gourd—27 F1 hybrids, 12 Parents (9 lines, and 3 testers)—during two seasons (Y1 and Y2) and pooled analyses to analyze the correlations between fruit production per plant (Kg), growth, and economic features. The observations were evaluated based on qualities that are related to growth and yield. It was discovered that the fruit yield per plant had exhibited a significant and positive phenotypic correlation with the length of the male and female flowers' pedicels, the number of primary branches per plant, the length of the vine, the number of nodes per vine, the internodal length, the duration of picking, the length of the peduncle, the length of the fruit, the average fruit's circumference, the average fruit's weight, the number of fruits per plant. The highest positive direct effect on fruit yield per plant was exerted by number of fruit per plant followed by average fruit weight at phenotypic level. Whereas, higher negative direct effects exerted by days to first fruit harvest. The soil type of experimental site was sandy loam with average fertility level and pH in the range of 7.5-8.5.

Keywords: Correlation, fruit yield per plant, path analysis, bottle gourd.

Inroduction

"Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the popular cucurbit vegetable crop with 2n = 2x = 22. It is an important cultivated annual cucurbitaceous crop grown throughout the country. Being warm season vegetable crop it thrives well in warm and humid climate but at present it's off season cultivation has progressively stretched throughout the year in northern Indian plains. It is mainly grown for its fruits for culinary purposes and seeds which are good source of oil and protein" (Panse and Sukhatme, 1967). "This delicious vegetable is also known by other names such as *bottle squash, calabash gourd, white flowered gourd, doodhi* and *lowki*. It is highly cross pollinated crop due to its monoecious and andromonoecious nature. Bottle gourd is the largest produced cucurbitaceous vegetables in the world preferred in both urban and rural population. In India, the total area covered under bottle gourd is 0.117 million ha with production of 2.18 million tonnes and its productivity is 18.6 tonnes per ha" (Anonymous, 2018,14).

Materials and methods

The research work was conducted during *Zaid* seasons of 2019-20 (Y_1) and 2020-21 (Y_2) to study heterosis over better-parent and standard variety using line × tester mating design at the Main Experiment Station (MES) of the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) India. The soil of this farm have more than 8 pH and alkaline in nature. The observations were recorded on twenty five characters.

The experimental materials for the present investigation comprised of nine promising and diverse inbred lines/varieties with three testers of bottle gourd selected on the basis of genetic variability from the germplasm stock maintained in the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) India. The selected parental lines *i.e.*; NDBG-28 (L_1), NDBG-13 (L_2), NDBG-15 (L_3), Narendra Pooja (L_4), NDBG-104 (L_5), NDBG-Sel-1 (L_6), Narendra Kamna (L_7), NDBG-21(L_8), NDBG-22 (L_9) were crossed with three testers *viz.* Pusa Naveen (T_1), Narendra Prabha (T_2), Narendra Rashmi (T_3) to get 27 F_1 seed. Parental lines (9 lines and 3 testers) were also selfed/sibbed to get the true to type seeds. The present experiments were conducted in RBD with three replications to appraise the performance of 27 F_1 hybrids and their 12 parents (9 lines and 3 testers) for the study of heterobeltiosis and standard heterosis for twenty three fruit yield and quality attributing traits. The crop was sown in rows spaced at 3 meters apart with a plant to plant spacing of 0.50 meter. Sowing was done on 20 March, 2019-20 and 19 March, 2020-21. All the recommended agronomic package of practices and protection measures were followed to raise good crops. Observations were recorded on days to first male flower anthesis, days to first female flower anthesis, node number to first

male flower appearance, node number to first female flower appearance, length of pedicel of male flower (cm), length of pedicel of female flower (cm), days to first harvest, primary branches per plant, vine length (m), number of node per vine, internodal length (cm), picking duration, peduncle length (cm), fruit length (cm), average fruit circumference (cm), average fruit weight (kg), number of fruit per plant, fruit yield per plant (kg), total soluble solids (%), reducing sugars (%), non- reducing sugar (%), total sugars (%) and dry matter (g/100g). The data were subjected to analysis of variance for randomized block design as suggested by Panse and Sukhatme (1967).

Statistical Analysis

As indicated by Al-Jibouri *et al*. (1958), phenotypic and genotypic correlation coefficients have been estimated to investigate the association of various combinations of characteristics. A standard incomplete regression coefficient is the path coefficient. It provides a division of correlation coefficients into direct and indirect effects. Following Dewey and Lu (1959), the path coefficient analysis of the traits that contribute to marketable green fruit yield per plant was done.

Results and Discussion

Correlation coefficients

Based on studies on correlation, using one character will improve all other correlated characters. Due to natural associations, many of the characters have positive or negative correlations with one another. Correlation tables' indirect correlation gets more complicated as more variables are taken into effect. The twenty-three characters under study's phenotypic and genotypic correlation coefficients are shown in Tables 1 and 2.

Fruit yield per plant had significant negative phenotypic correlation with days to first male flower anthesis, days to first female flower anthesis, days to first fruit harvest, and node number to first male flower appearance at phenotypic level during two seasons and also over seasons (pooled). Fruit yield per plant had positive and significant phenotypic correlation with number of fruits per plant, average fruit weight, vine length, number of primary branches per plant, and circumference of fruit. Many earlier researchers had also reported positive and significant correlation of most of the above traits with fruit yield per plant namely, (Ghuge *et al.* 2016, Gautam *et al.* 2017, Malviya *et al.* 2017, Niva *et al.* 2018, Quamruzzaman and Ahmad 2020, and Geeta *et al.* 2021) thereby, they also supported present findings.

Looked at these associations from findings of present research it appears that for improvement of bottle gourd, number of fruits per plant, average fruit weight, vine length, fruit circumferences, primary branches per plant, days to first male flower anthesis, days to first female flower anthesis, days to first fruit harvest, inter nodal length and node number to first male flower appearance need to be given more consideration. A positive association of days to first male flower anthesis, days to first female flower anthesis and node number to first male flower appearance with days to first fruit harvest suggests that early flowering and flower appearance at lower node would be appropriate selection criteria to get early yield. The presence of positive correlation of number of fruits per plant with vine length and primary branches per plant revealed that longer vine length can be selected for harvesting more marketable fruits.

Path coefficient analysis

Finding out the direct and indirect effects of yield attributes, which are essential to choosing the best genotypes, is helpful. The estimated correlation coefficients merely show how individuals are related to one another; they do not reveal any information about the causal connections. The analysis of path coefficient, developed by Wright (1921), offers a practical method for identifying both direct and indirect reasons of association. It enables a careful assessment of the precise forces at work to form a given correlation and quantifies the relative weight of each causal factor. The first study to show the value of route coefficient analysis in a breeding exertion employing relatives of crested wheat grass was Dewey and Lu in 1959. The degree of direct impacts exerted by independent variables and the impact exerted via other characters, which unavoidably arise as an inherent component of the growth pattern, govern the development of the dependent variable due to the reciprocal relationship. The complete correlation is insufficient in these complicated situations to explain the true association necessary for an efficient and

successful manipulation of the characteristics. To determine the direct and indirect effects of various features on fruit yield, the route coefficient analysis was carried out using the phenotypic and genotypic correlation coefficients. Tables 1, 2, and 3 show the direct and indirect effects of numerous characteristics on fruit yield at phenotypic level. The number of fruits per plant and average fruit weight at the phenotypic level had the most positive direct effects on fruit output per plant, according to analysis of the path coefficient. The days until the first fruit harvest, however, have a detrimental direct effect. Number of primary branches per plant as well as the number of fruits per plant showed a positive relationship with fruit yield per plant at the phenotypic level. However, negative indirect effects via average fruit weight had an influence on this relationship. The number of fruits per plant had a positive indirect effect on circumference of fruit, which was positively correlated with fruit output per plant. Fruit output per plant shown a favorable link with fruit circumference via fruit production per plant. The connection between fruit output per plant and fruit production per plant was positive. As determined by the quantity of fruits per plant, fruit production per plant showed a favorable connection. The number of fruits per plant and average fruit weight showed a favorable correlation between vine length and fruit yield per plant. Average fruit weight, which exhibited a strong positive direct effect on fruit yield per plant at the phenotypic level, was the primary contributor to the significant positive correlation. Plant fruit output significantly correlated negatively with the number of days before the first male flower anthesis. When this link was broken down, it became clear that the indirect impacts caused by the quantity of fruits produced by each plant were mostly to blame. Days to first female flower with fruit yield per plant revealed a significant inverse relationship with days to first female flower. It was mostly because of the indirect effect of the number of fruits per plant that the node number to the first male flower appearance showed a substantial negative association with fruit production per plant. The relationship between fruit yield per plant and days before the first fruit harvest was negatively significant. When this negative correlation was broken down, it became clear that the amount of fruits produced by each plant was mostly to blame for this association. Internodal length revealed a negative, statistically significant correlation with fruit output per plant at the phenotypic level via the indirect effect of the number of fruits per plant. Positive direct effect of various traits on fruit yield has also been reported by earlier workers viz., for average fruit weight (Ghuge *et al.* 2016, Gautam *et al.* 2017, Malviya *et al.* 2017, Padmakshi 2017) for number of fruits per plant (Niva *et al*. 2018, Quamruzzaman and Ahmad 2020, Quamruzzaman *et al*. 2020 and Geeta *et al*. 2021) which substantiate the present findings. The path coefficient analysis showed that the genotypic level direct and indirect effects were significantly different from those at the phenotypic level, which may be because the environment influences the various traits under study to various degrees. Component variance analysis and correlation tests conducted in all three seasons and habitats confirmed these findings. Last but not least, the path coefficient analysis showed that increasing the number of fruits per plant and average fruit weight would improve the bottle gourd plant's overall output per plant.

Table 1: Estimates of correlation coefficient at phenotypic level for growth, yield traits in bottle gourd during *Zaid*, 2020 (Y_1)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.00**	0.98**	-0.09	0.059	-0.098	0.333**	0.997**	0.053	0.052	0.127	0.065	-0.160	0.272**	-0.258**	0.246**	0.123	0.125	0.063	-0.027	0.082	-0.16	0.12	0.12
Days to first female flower		**1.00**	-0.06	0.092	-0.108	0.217*	0.995**	0.069	0.065	0.152	0.073	-0.101	0.294**	-0.233*	0.241**	0.080	0.173	0.083	-0.071	-0.002	-0.13	0.10	0.10
Node number to first male flower appearance			**1.00**	0.911**	0.272**	-0.030	0.055	-0.002	-0.029	-0.073	-0.014	-0.122	-0.030	-0.073	0.231*	0.279**	-0.035	-0.077	0.043	0.118	-0.23**	-0.35**	-0.42**
Node number to first female flower appearance				**1.000**	0.207*	0.115	0.166	0.150	0.135	-0.010	-0.111	-0.276**	0.093	-0.405**	0.399**	0.277**	0.163	-0.053	0.019	0.067	-0.29**	-0.21*	-0.27**
Length of pedicel of staminate flower					**1.000**	0.313**	-0.100	-0.181	-0.176	-0.270**	-0.041	-0.155	0.086	-0.168	-0.297**	0.357**	0.017	-0.200*	0.218*	0.278**	-0.160	-0.63**	-0.50**
Length of pedicel of pistillate flower (cm)						**1.000**	0.259**	0.104	0.018	0.037	0.016	-0.053	-0.017	-0.685**	0.178	0.328**	0.210*	0.037	-0.071	-0.096	-0.169	-0.30**	-0.13
Days to first harvest							**1.000**	0.023	-0.033	0.082	0.099	-0.073	0.211*	-0.296**	0.193*	0.165	0.133	0.025	-0.005	0.031	-0.112	0.02	0.04
Primary branches per plant								**1.000**	0.541**	0.444**	-0.053	0.062	0.301**	-0.749**	0.575**	-0.120	0.187*	0.297**	-0.216*	-0.229*	-0.383**	0.41**	0.26**
Vine length (m)									**1.000**	0.251**	-0.617**	-0.099	0.375**	-0.208*	0.521**	-0.293**	0.289**	0.515**	-0.357**	-0.305**	-0.110	0.54**	0.36**
Number of node per vine										**1.000**	0.597**	-0.245**	0.132	-0.075	0.255**	-0.112	0.648**	0.263**	-0.232*	-0.249**	-0.296**	0.38**	0.27**
Internodal length(cm)											**1.000**	-0.096	-0.172	0.142	-0.197*	0.159	0.245**	-0.252**	0.144	0.089	-0.196*	-0.14	-0.07
Harvest duration												**1.000**	-0.144	0.386**	-0.101	-0.161	-0.590**	0.067	0.003	0.087	-0.006	0.06	0.11
Peduncle length(cm)													**1.000**	-0.604**	0.320**	-0.162	0.342**	0.160	-0.134	-0.184*	-0.014	0.23*	0.21*
Fruits length (cm)														**1.000**	-0.560	-0.669	-0.768	-0.768	0.895**	0.835**	-0.133	0.10*	0.34**

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Average fruit circumference (cm)															**1.000**	-0.050	0.585**	0.429**	-0.409**	-0.455**	-0.445**	0.32**	0.20*
Average fruit weight (kg)																**1.000**	0.132	-0.116	-0.067	-0.162	-0.095	-0.56**	-0.54**
Total soluble solids (%)																	**1.000**	0.443**	-0.589**	-0.747**	-0.106	0.19*	-0.01
Reducing sugar (%)																		**1.000**	-0.940**	-0.994**	0.077	0.29**	0.11
Non-reducing sugar (%)																			**1.000**	1.211**	-0.163	-0.15	0.04
Total sugars (%)																				**1.000**	-0.192*	-0.08	0.12
Dry matter																					**1.000**	0.05	0.15
Number of fruits per plant																						**1.00**	0.85**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 2: Estimates of correlation coefficient at phenotypic level for growth, yield traits in bottle gourd during *Zaid*, 2021 (Y_2)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower (cm)	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.000**	0.863 **	-0.123	-0.150	-0.314 **	0.076	0.764 **	0.160	0.272 **	0.257 **	0.005	-0.125	0.245 **	-0.043	0.112	-0.159	0.098	0.041	-0.040	-0.057	-0.070	0.388 **	0.303 **
Days to first female flower		**1.000**	-0.233 *	-0.214 *	-0.301 **	0.037	0.891 **	0.237 **	0.318 **	0.255 **	-0.036	-0.140	0.234 *	-0.125	0.060	-0.272 **	0.112	0.069	-0.111	0.025	-0.092	0.365 **	0.187 *
Node number to first male flower appearance			**1.000**	0.256 **	0.280 **	0.066	-0.229 *	-0.079	-0.094	-0.075	0.024	-0.081	-0.136	0.005	-0.053	0.127	-0.064	-0.104	0.100	-0.197 *	-0.234 *	-0.312 **	-0.424 **
Node number to first female flower appearance				**1.000**	0.078	0.016	-0.163	0.144	-0.006	0.277 **	0.246 **	-0.251 **	0.042	0.022	-0.068	-0.111	-0.023	0.109	-0.202 *	0.059	0.034	-0.008	-0.119
Length of pedicel of staminate flower					**1.000**	0.163	-0.252 **	-0.062	-0.159	-0.220 *	-0.042	-0.062	0.059	-0.179	-0.020	0.408 **	-0.035	-0.122	0.245 **	-0.125	-0.134	-0.566 **	-0.376 **
Length of pedicel of pistillate flower (cm)						**1.000**	0.003	0.066	0.060	0.069	-0.005	-0.040	0.007	-0.261 **	0.144	0.346 **	0.171	0.038	-0.024	0.006	-0.049	-0.257 **	-0.082
Days to first harvest							**1.000**	0.211 *	0.323 **	0.259 **	-0.035	-0.196 *	0.150	-0.010	0.032	-0.282 **	0.140	0.090	-0.103	0.080	-0.085	0.366 **	0.200 *
Primary branches per plant								**1.000**	0.547 **	0.368 **	-0.075	0.071	0.281 **	-0.201 *	0.297 **	-0.422 **	0.098	0.260 **	-0.229 *	0.258 **	-0.368 **	0.476 **	0.179
Vine length (m)									**1.000**	0.235 *	-0.556 **	-0.120	0.237 *	0.054	0.140	-0.438 **	0.208 *	0.459 **	-0.374 **	0.448 **	-0.144	0.528 **	0.237 *
Number of node per vine										**1.000**	0.668 **	-0.232 *	0.087	-0.016	0.230 *	-0.261 **	0.225 *	0.209 *	-0.247 **	0.234 *	-0.215 *	0.316 **	0.165
Internodal length(cm)											**1.000**	-0.079	-0.065	-0.057	0.107	0.111	0.016	-0.182 *	0.085	-0.147	-0.102	-0.131	-0.046
Harvest duration												**1.000**	-0.083	-0.084	-0.031	0.039	-0.118	0.073	-0.002	0.060	-0.028	0.011	0.116
Peduncle length(cm)													**1.000**	-0.167	0.188 *	-0.133	0.108	0.133	-0.114	0.187 *	-0.028	0.166	0.103
Fruits length (cm)														**1.000**	-0.379	0.018	-0.073	-0.106	0.125	-0.105	0.013	0.060	0.127

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Average fruit circumference (cm)															**1.000**	-0.071	0.145	0.192*	-0.157	0.209*	-0.208*	0.206*	0.146
Average fruit weight (kg)																**1.000**	0.032	-0.265**	0.265**	-0.305**	0.180	-0.703**	0.019
Total soluble solids (%)																	**1.000**	0.288**	-0.264**	0.266**	0.109	0.054	0.079
Reducing sugar (%)																		**1.000**	-0.820**	0.849**	0.058	0.236*	0.046
Non-reducing sugar (%)																			**1.000**	-0.712**	-0.124	-0.214*	0.027
Total sugars (%)																				**1.000**	0.034	0.239**	0.064
Dry matter																					**1.000**	0.008	0.257**
Number of fruits per plant																						**1.000**	0.645**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 3: Estimates of correlation coefficient at phenotypic level for growth, yield traits in bottle gourd during *Zaid*, 2020-21 (pooled)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.000**	0.888 **	-0.075	-0.068	-0.174 **	0.163 *	0.810 **	0.122	0.227 **	0.202 **	-0.006	-0.082	0.230 **	-0.081	0.119	-0.062	0.076	0.036	-0.018	0.008	-0.095	0.282 **	0.207 **
Days to first female flower		**1.000**	-0.125	-0.099	-0.177 **	0.098	0.916 **	0.180 *	0.268 **	0.209 **	-0.032	-0.062	0.232 **	-0.106	0.071	-0.145 *	0.072	0.059	-0.072	0.044	-0.093	0.272 **	0.137 *
Node number to first male flower appearance			**1.000**	0.497 **	0.243 **	0.024	-0.091	-0.032	-0.018	-0.074	-0.034	-0.090	-0.072	0.009	0.056	0.130	-0.076	-0.047	0.066	0.004	-0.261 **	-0.285 **	-0.373 **
Node number to first female flower appearance				**1.000**	0.098	0.038	-0.043	0.148 *	0.074	0.147 *	0.049	-0.246 **	0.077	0.004	0.076	0.000	-0.014	0.058	-0.115	0.055	-0.107	-0.050	-0.151 *
Length of pedicel of staminate flower					**1.000**	0.166 *	-0.152 *	-0.087	-0.156 *	-0.214 **	-0.029	-0.102	0.061	-0.096	-0.077	0.353 **	-0.056	-0.153 *	0.214 **	0.018	-0.128	-0.516 **	-0.392 **
Length of pedicel of pistillate flower (cm)						**1.000**	0.093	0.090	0.080	0.069	-0.017	-0.028	-0.003	-0.229 **	0.125	0.243 **	0.179 **	0.089	-0.046	0.030	-0.091	-0.243 **	-0.074
Days to first harvest							**1.000**	0.152 *	0.240 **	0.181 **	-0.031	-0.078	0.149 *	-0.044	0.053	-0.124	0.076	0.041	-0.044	0.093	-0.081	0.246 **	0.121
Primary branches per plant								**1.000**	0.528 **	0.390 **	-0.069	0.083	0.279 **	-0.205 **	0.333 **	-0.251 **	0.091	0.252 **	-0.213 **	0.012	-0.357 **	0.437 **	0.210 **
Vine length (m)									**1.000**	0.231 **	-0.591 **	-0.043	0.273 **	0.014	0.220 **	-0.363 **	0.181 **	0.435 **	-0.339 **	0.072	-0.113	0.505 **	0.277 **
Number of node per vine										**1.000**	0.624 **	-0.208 **	0.102	-0.013	0.209 **	-0.173 **	0.276 **	0.200 **	-0.233 **	-0.046	-0.233 **	0.317 **	0.193 **
Internodal length(cm)											**1.000**	-0.117	-0.103	-0.016	-0.008	0.142 *	0.069	-0.208 **	0.099	-0.072	-0.138 *	-0.138 *	-0.074
Harvest duration												**1.000**	-0.100	0.025	-0.059	-0.076	-0.191 **	0.086	-0.001	0.094	-0.039	0.062	0.135 *
Peduncle length(cm)													**1.000**	-0.171 **	0.201 **	-0.116	0.112	0.134 *	-0.117	0.006	-0.024	0.191 **	0.145 **

Fruits length (cm)														**1.000**	-0.309**	-0.141*	-0.121	-0.180**	0.202**	0.161*	-0.020	0.054	0.184**
Average fruit circumference (cm)															**1.000**	-0.005	0.121	0.212**	-0.207**	-0.069	-0.233**	0.231**	0.137*
Average fruit weight (kg)																**1.000**	0.015	-0.181**	0.109	-0.187**	0.055	-0.529**	-0.243**
Total soluble solids (%)																	**1.000**	0.275**	-0.283**	-0.076	0.047	0.058	0.069
Reducing sugar (%)																		**1.000**	-0.822**	-0.089	0.083	0.224**	0.070
Non-reducing sugar (%)																			**1.000**	0.262**	-0.142*	-0.167**	0.043
Total sugars (%)																				**1.000**	-0.067	0.036	0.096
Dry matter																					**1.000**	0.027	0.184**
Number of fruits per plant																						**1.000**	0.697**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 4: Estimates of correlation coefficient at genotypic level for growth, yield traits in bottle gourd during *Zaid*, 2020 (Y_1)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.000**	0.981 **	-0.093	0.059	-0.098	0.333 **	0.997 **	0.053	0.052	0.127	0.065	-0.160	0.272 **	-0.258 **	0.246 **	0.123	0.125	0.063	-0.027	0.082	-0.167	0.126	0.127
Days to first female flower		**1.000**	-0.067	0.092	-0.108	0.217 *	0.995 **	0.069	0.065	0.152	0.073	-0.101	0.294 **	-0.233 *	0.241 **	0.080	0.173	0.083	-0.071	-0.002	-0.134	0.108	0.102
Node number to first male flower appearance			**1.000**	0.911 **	0.272 **	-0.030	0.055	-0.002	-0.029	-0.073	-0.014	-0.122	-0.030	-0.073	0.231 *	0.279 **	-0.035	-0.077	0.043	0.118	-0.299 **	-0.356 **	-0.419 **
Node number to first female flower appearance				**1.000**	0.207 *	0.115	0.166	0.150	0.135	-0.010	-0.111	-0.276 **	0.093	-0.405 **	0.399 **	0.277 **	0.163	-0.053	0.019	0.067	-0.297 **	-0.216 *	-0.277 **
Length of pedicel of staminate flower					**1.000**	0.313 **	-0.100	-0.181	-0.176	-0.270 **	-0.041	-0.155	0.086	-0.168	-0.297 **	0.357 **	0.017	-0.200 *	0.218 *	0.278 **	-0.160	-0.635 **	-0.508 **
Length of pedicel of pistillate flower (cm)						**1.000**	0.259 **	0.104	0.018	0.037	0.016	-0.053	-0.017	-0.685 **	0.178	0.328 **	0.210 *	0.037	-0.071	-0.096	-0.169	-0.306 **	-0.137
Days to first harvest							**1.000**	0.023	-0.033	0.082	0.099	-0.073	0.211 *	-0.296 **	0.193 *	0.165	0.133	0.025	-0.005	0.031	-0.112	0.028	0.048
Primary branches per plant								**1.000**	0.541 **	0.444 **	-0.053	0.062	0.301 **	-0.749 **	0.575 **	-0.120	0.187 *	0.297 **	-0.216 *	-0.229 *	-0.383 **	0.410 **	0.263 **
Vine length (m)									**1.000**	0.251 **	-0.617 **	-0.099	0.375 **	-0.208 *	0.521 **	-0.293 **	0.289 **	0.515 **	-0.357 **	-0.305 **	-0.110	0.544 **	0.359 **
Number of node per vine										**1.000**	0.597 **	-0.245 **	0.132	-0.075	0.255 **	-0.112	0.648 **	0.263 **	-0.232 *	-0.249 **	-0.296 **	0.387 **	0.276 **
Internodal length(cm)											**1.000**	-0.096	-0.172	0.142	-0.197 *	0.159	0.245 **	-0.252 **	0.144	0.089	-0.196 *	-0.147	-0.078
Harvest duration												**1.000**	-0.144	0.386 **	-0.101	-0.161	-0.590 **	0.067	0.003	0.087	-0.006	0.067	0.118
Peduncle length(cm)													**1.000**	-0.604 **	0.320 **	-0.162	0.342 **	0.160	-0.134	-0.184 *	-0.014	0.230 *	0.214 *
Fruits length (cm)														**1.000**	-	-	-	-	0.895	0.835	-	0.199	0.342

															0.560 **	0.669 **	0.768 **	0.768 **	**	**	0.133	*	**
Average fruit circumference (cm)															**1.000**	-0.050	0.585 **	0.429 **	-0.409 **	-0.455 **	-0.445 **	0.325 **	0.202 *
Average fruit weight (kg)																**1.000**	0.132	-0.116	-0.067	-0.162	-0.095	-0.565 **	-0.541 **
Total soluble solids (%)																	**1.000**	0.443 **	-0.589 **	-0.747 **	-0.106	0.193 *	-0.004
Reducing sugar (%)																		**1.000**	-0.940 **	-0.994 **	0.077	0.295 **	0.115
Non-reducing sugar (%)																			**1.000**	1.211 **	-0.163	-0.153	0.041
Total sugars (%)																				**1.000**	-0.192 *	-0.085	0.120
Dry matter																					**1.000**	0.058	0.149
Number of fruits per plant																						**1.000**	0.853 **
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 5: Estimates of correlation coefficient at genotypic level for growth, yield traits in bottle gourd during *Zaid*, 2021 (Y_2)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.000**	0.916 **	-0.130	-0.177	-0.374 **	0.102	0.870 **	0.168	0.275 **	0.251 **	-0.011	-0.140	0.266 **	-0.103	0.187 *	-0.158	0.409 **	0.053	-0.047	-0.065	-0.090	0.401 **	0.342 **
Days to first female flower		**1.000**	-0.263 **	-0.270 **	-0.356 **	0.054	0.999 **	0.274 **	0.358 **	0.275 **	-0.059	-0.154	0.283 **	-0.143	0.089	-0.274 **	0.487 **	0.086	-0.123	0.020	-0.111	0.388 **	0.245 **
Node number to first male flower appearance			**1.000**	0.345 **	0.343 **	0.064	-0.274 **	-0.074	-0.101	-0.070	0.042	-0.092	-0.153	0.039	-0.107	0.124	-0.086	-0.114	0.102	-0.200 *	-0.268 **	-0.325 **	-0.472 **
Node number to first female flower appearance				**1.000**	0.098	0.041	-0.199 *	0.142	-0.029	0.315 **	0.295 **	-0.290 **	0.057	0.060	-0.022	-0.142	-0.177	0.163	-0.233 *	0.072	0.014	0.004	-0.142
Length of pedicel of staminate flower					**1.000**	0.251 **	-0.417 **	-0.087	-0.184 *	-0.267 **	-0.052	-0.078	0.051	-0.350 **	-0.086	0.452 **	-0.345 **	-0.180	0.268 **	-0.132	-0.142	-0.630 **	-0.455 **
Length of pedicel of pistillate flower (cm)						**1.000**	0.049	0.096	0.100	0.061	-0.044	-0.053	0.034	-0.390 **	0.259 **	0.409 **	0.487 **	0.058	-0.027	0.010	-0.080	-0.292 **	-0.102
Days to first harvest							**1.000**	0.250 **	0.413 **	0.292 **	-0.093	-0.215 *	0.187 *	-0.064	0.030	-0.333 **	0.346 **	0.109	-0.123	0.088	-0.128	0.431 **	0.261 **
Primary branches per plant								**1.000**	0.561 **	0.396 **	-0.074	0.077	0.291 **	-0.351 **	0.633 **	-0.439 **	0.369 **	0.293 **	-0.237 **	0.271 **	-0.395 **	0.491 **	0.206 *
Vine length (m)									**1.000**	0.260 **	-0.562 **	-0.142	0.263 **	0.057	0.270 **	-0.483 **	0.676 **	0.531 **	-0.389 **	0.473 **	-0.142	0.559 **	0.256 **
Number of node per vine										**1.000**	0.644 **	-0.239 **	0.111	-0.058	0.427 **	-0.294 **	0.682 **	0.242 **	-0.260 **	0.259 **	-0.256 **	0.342 **	0.192 *
Internodal length(cm)											**1.000**	-0.059	-0.069	-0.104	0.187 *	0.130	0.000	-0.228 *	0.099	-0.161	-0.134	-0.149	-0.048
Harvest duration												**1.000**	-0.087	-0.099	-0.036	0.019	-0.360 **	0.090	-0.013	0.056	-0.019	0.015	0.110
Peduncle length(cm)													**1.000**	-0.247	0.406 **	-0.134	0.322 **	0.158	-0.118	0.203 *	-0.028	0.166	0.122

														**									
Fruits length (cm)														**1.000**	-0.556**	-0.015	-0.165	-0.191*	0.188*	-0.159	0.049	0.097	0.129
Average fruit circumference (cm)															**1.000**	-0.252**	1.040**	0.320**	-0.274**	0.324**	-0.349**	0.381**	0.180
Average fruit weight (kg)																**1.000**	0.018	-0.345**	0.281**	-0.328**	0.206*	-0.719**	-0.068
Total soluble solids (%)																	**1.000**	0.718**	-0.691**	0.706**	0.052	0.174	0.179
Reducing sugar (%)																		**1.000**	-0.929**	0.943**	0.076	0.281**	0.036
Non-reducing sugar (%)																			**1.000**	-0.737**	-0.131	-0.218*	0.031
Total sugars (%)																				**1.000**	0.030	0.244**	0.064
Dry matter																					**1.000**	0.007	0.288**
Number of fruits per plant																						**1.000**	0.693**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 6: Estimates of correlation coefficient at genotypic level for growth, yield traits in bottle gourd during *Zaid*, 2020-21 (pooled)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**1.000**	0.956 **	-0.181 **	-0.196 **	-0.234 **	0.183 **	0.951 **	0.300 **	0.313 **	0.413 **	0.146 *	-0.207 **	0.477 **	-0.131 *	0.287 **	-0.214 **	0.708 **	0.154 *	-0.137 *	0.029	-0.191 **	0.306 **	0.266 **
Days to first female flower		**1.000**	-0.186 **	-0.178 **	-0.228 **	0.153 **	1.008 **	0.441 **	0.413 **	0.487 **	0.135 *	-0.165 *	0.526 **	-0.114 *	0.223 **	-0.335 **	0.811 **	0.075	-0.070	0.170 *	-0.278 **	0.326 **	0.239 **
Node number to first male flower appearance			**1.000**	0.721 **	0.434 **	0.057	-0.164 *	-0.080	-0.187 **	-0.121	0.029	-0.212 **	-0.221 **	-0.089	0.134 *	0.291 **	-0.159 *	-0.081	0.018	-0.037	-0.305 **	-0.523 **	-0.586 **
Node number to first female flower appearance				**1.000**	0.197 **	0.031	-0.132 *	0.030	-0.256 **	0.218 **	0.382 **	-0.372 **	-0.014	-0.187 **	0.306 **	0.167 *	0.105	0.374 **	-0.589 **	-0.440 **	-0.198 **	-0.322 **	-0.341 **
Length of pedicel of staminate flower					**1.000**	0.504 **	-0.305 **	-0.283 **	-0.380 **	-0.329 **	0.018	-0.118	0.060	-0.332 **	-0.183 **	0.633 **	-0.192 **	-0.235 **	0.225 **	-0.155 *	-0.077	-0.821 **	-0.669 **
Length of pedicel of pistillate flower (cm)						**1.000**	0.153 *	0.111	-0.085	-0.026	0.087	0.131 *	0.041	-0.571 **	0.264 **	0.495 **	0.599 **	0.205 **	-0.179 **	-0.113	-0.101	-0.465 **	-0.290 **
Days to first harvest							**1.000**	0.429 **	0.416 **	0.503 **	0.138 *	-0.216 **	0.444 **	-0.082	0.181 **	-0.368 **	0.796 **	0.070	-0.075	0.201 **	-0.293 **	0.323 **	0.240 **
Primary branches per plant								**1.000**	0.670 **	0.779 **	0.210 **	0.187 **	0.460 **	-0.293 **	0.764 **	-0.417 **	0.507 **	0.489 **	-0.397 **	-0.200 **	-0.675 **	0.592 **	0.389 **
Vine length (m)									**1.000**	0.468 **	-0.395 **	-0.029	0.279 **	0.101	0.383 **	-0.489 **	0.355 **	0.385 **	-0.088	0.194 **	-0.111	0.667 **	0.597 **
Number of node per vine										**1.000**	0.612 **	-0.219 **	0.399 **	-0.147 *	0.523 **	-0.375 **	0.704 **	0.463 **	-0.489 **	-0.043	-0.352 **	0.535 **	0.333 **
Internodal length(cm)											**1.000**	-0.184 **	0.169 *	-0.200 **	0.184 **	0.057	0.364 **	0.066	-0.374 **	-0.127	-0.329 **	-0.044	-0.186 **
Harvest duration												**1.000**	-0.077	-0.009	0.177 **	-0.199	-0.439	0.231 **	-0.043	0.235 **	-0.270	0.188 **	0.142 **

																**	**				**		
Peduncle length(cm)													**1.000**	-0.557**	0.610**	-0.144*	0.396**	0.292**	-0.304**	-0.207**	-0.070	0.361**	0.329**
Fruits length (cm)														**1.000**	-0.471**	-0.359**	-0.508**	-0.331**	0.343**	0.253**	0.071	0.223**	0.216**
Average fruit circumference (cm)															**1.000**	-0.020	0.746**	0.704**	-0.726**	-0.228**	-0.348**	0.391**	0.403**
Average fruit weight (kg)																**1.000**	0.134*	-0.077	-0.003	-0.208**	0.155*	-0.755**	-0.491**
Total soluble solids (%)																	**1.000**	0.320**	-0.383**	-0.167*	0.094	0.185**	0.144**
Reducing sugar (%)																		**1.000**	-0.967**	-0.171**	-0.110	0.382**	0.308**
Non-reducing sugar (%)																			**1.000**	0.245**	0.086	-0.271**	-0.202**
Total sugars (%)																				**1.000**	-0.269**	-0.067	-0.208**
Dry matter																					**1.000**	-0.078	0.106
Number of fruits per plant																						**1.000**	0.903**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 7: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at genotypic level during *Zaid* (Y_1)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**-0.180**	0.019	0.016	-0.036	0.023	-0.021	0.146	-0.024	-0.235	0.288	0.015	-0.028	0.017	0.014	0.009	-0.160	0.003	-0.001	-0.014	-0.008	-0.003	0.502	0.127
Days to first female flower	-0.165	**0.021**	0.032	-0.055	0.022	-0.011	0.167	-0.038	-0.305	0.316	0.076	-0.031	0.018	0.019	0.004	-0.277	0.004	-0.002	-0.037	0.002	-0.003	0.487	0.102
Node number to first male flower appearance	0.023	-0.005	**-0.121**	0.070	-0.021	-0.013	-0.046	0.010	0.086	-0.080	-0.055	-0.019	-0.010	-0.005	-0.005	0.125	-0.001	0.002	0.031	-0.025	-0.008	-0.408	-0.419**
Node number to first female flower appearance	0.032	-0.006	-0.042	**0.202**	-0.006	-0.008	-0.033	-0.020	0.025	0.362	-0.381	-0.059	0.004	-0.008	-0.001	-0.143	-0.001	-0.003	-0.070	0.009	0.000	0.006	-0.277**
Length of pedicel of staminate flower	0.067	-0.007	-0.042	0.020	**-0.061**	-0.051	-0.070	0.012	0.157	-0.306	0.067	-0.016	0.003	0.047	-0.004	0.457	-0.003	0.003	0.080	-0.016	-0.004	-0.790	-0.508**
Length of pedicel of pistillate flower (cm)	-0.018	0.001	-0.008	0.008	-0.015	**-0.202**	0.008	-0.014	-0.085	0.070	0.056	-0.011	0.002	0.053	0.012	0.413	0.004	-0.001	-0.008	0.001	-0.002	-0.366	-0.137
Days to first harvest	-0.157	0.021	0.033	-0.040	0.025	-0.010	**0.168**	-0.035	-0.353	0.335	0.120	-0.044	0.012	0.009	0.001	-0.336	0.003	-0.002	-0.037	0.011	-0.004	0.540	0.048
Primary branches per plant	-0.030	0.006	0.009	0.029	0.005	-0.020	0.042	**-0.140**	-0.479	0.455	0.096	0.016	0.018	0.048	0.030	-0.443	0.003	-0.005	-0.071	0.033	-0.011	0.615	0.263**
Vine length (m)	-0.050	0.007	0.012	-0.006	0.011	-0.020	0.069	-0.079	**-0.853**	0.299	0.724	-0.029	0.017	-0.008	0.013	-0.488	0.005	-0.009	-0.116	0.058	-0.004	0.701	0.359**
Number of node per vine	-0.045	0.006	0.008	0.064	0.016	-0.012	0.049	-0.055	-0.222	**1.147**	-0.830	-0.048	0.007	0.008	0.020	-0.297	0.006	-0.004	-0.078	0.032	-0.007	0.429	0.276**
Internodal length(cm)	0.002	-0.001	-0.005	0.060	0.003	0.009	-0.016	0.010	0.479	0.739	**-1.289**	-0.012	-0.004	0.014	0.009	0.131	0.000	0.004	0.030	-0.020	-0.004	-0.187	-0.078
Harvest duration	0.025	-0.003	0.011	-0.059	0.005	0.011	-0.036	-0.011	0.121	-0.274	0.076	**0.202**	-0.006	0.013	-0.002	0.019	-0.003	-0.002	-0.004	0.007	-0.001	0.019	0.118
Peduncle length(cm)	-0.048	0.006	0.019	0.011	-0.003	-0.007	0.031	-0.041	-0.225	0.127	0.089	-0.018	**0.063**	0.033	0.019	-0.135	0.003	-0.003	-0.035	0.025	-0.001	0.209	0.214*
Fruits length (cm)	0.019	-0.003	-0.005	0.012	0.021	0.079	-0.011	0.049	-0.049	-0.067	0.135	-0.020	-0.016	**-0.135**	-0.026	-0.015	-0.001	0.003	0.056	-0.020	0.001	0.121	0.342**

Average fruit circumference (cm)	-0.034	0.002	0.013	-0.005	0.005	-0.053	0.005	-0.089	-0.230	0.490	-0.241	-0.007	0.026	0.075	**0.047**	-0.255	0.008	-0.006	-0.082	0.040	-0.010	0.478	0.202*
Average fruit weight (kg)	0.029	-0.006	-0.015	-0.029	-0.028	-0.083	-0.056	0.061	0.412	-0.337	-0.167	0.004	-0.009	0.002	-0.012	**1.010**	0.000	0.006	0.084	-0.040	0.006	-0.901	-0.541**
Total soluble solids (%)	-0.074	0.010	0.010	-0.036	0.021	-0.099	0.058	-0.052	-0.577	0.783	0.000	-0.073	0.021	0.022	0.049	0.019	**0.008**	-0.012	-0.206	0.087	0.002	0.218	-0.004
Reducing sugar (%)	-0.010	0.002	0.014	0.033	0.011	-0.012	0.018	-0.041	-0.453	0.277	0.294	0.018	0.010	0.026	0.015	-0.348	0.006	**-0.017**	-0.278	0.116	0.002	0.352	0.115
Non-reducing sugar (%)	0.009	-0.003	-0.012	-0.047	-0.016	0.006	-0.021	0.033	0.332	-0.299	-0.128	-0.003	-0.008	-0.025	-0.013	0.284	-0.006	0.016	**0.299**	-0.091	-0.004	-0.273	0.041
Total sugars (%)	0.012	0.000	0.024	0.015	0.008	-0.002	0.015	-0.038	-0.403	0.297	0.208	0.011	0.013	0.022	0.015	-0.331	0.006	-0.016	-0.220	**0.123**	0.001	0.305	0.120
Dry matter	0.016	-0.002	0.032	0.003	0.009	0.016	-0.021	0.055	0.121	-0.294	0.173	-0.004	-0.002	-0.007	-0.016	0.208	0.000	-0.001	-0.039	0.004	**0.028**	0.009	0.149
Number of fruits per plant	-0.072	0.008	0.039	0.001	0.038	0.059	0.072	-0.069	-0.477	0.393	0.192	0.003	0.011	-0.013	0.018	-0.726	0.001	-0.005	-0.065	0.030	0.000	**1.254**	0.853**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 8: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at genotypic level during *Zaid* , 2021 (Y_2)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Pedunce length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**-0.180**	0.019	0.016	-0.036	0.023	-0.021	0.146	-0.024	-0.235	0.288	0.015	-0.028	0.017	0.014	0.009	-0.160	0.003	-0.001	-0.014	-0.008	-0.003	0.502	0.342**
Days to first female flower	-0.165	**0.021**	0.032	-0.055	0.022	-0.011	0.167	-0.038	-0.305	0.316	0.076	-0.031	0.018	0.019	0.004	-0.277	0.004	-0.002	-0.037	0.002	-0.003	0.487	0.245**
Node number to first male flower appearance	0.023	-0.005	**-0.121**	0.070	-0.021	-0.013	-0.046	0.010	0.086	-0.080	-0.055	-0.019	-0.010	-0.005	-0.005	0.125	-0.001	0.002	0.031	-0.025	-0.008	-0.408	-0.472**
Node number to first female flower appearance	0.032	-0.006	-0.042	**0.202**	-0.006	-0.008	-0.033	-0.020	0.025	0.362	-0.381	-0.059	0.004	-0.008	-0.001	-0.143	-0.001	-0.003	-0.070	0.009	0.000	0.006	-0.142
Length of pedicel of staminate flower	0.067	-0.007	-0.042	0.020	**-0.061**	-0.051	-0.070	0.012	0.157	-0.306	0.067	-0.016	0.003	0.047	-0.004	0.457	-0.003	0.003	0.080	-0.016	-0.004	-0.790	-0.455**
Length of pedicel of pistillate flower (cm)	-0.018	0.001	-0.008	0.008	-0.015	**-0.202**	0.008	-0.014	-0.085	0.070	0.056	-0.011	0.002	0.053	0.012	0.413	0.004	-0.001	-0.008	0.001	-0.002	-0.366	-0.102
Days to first harvest	-0.157	0.021	0.033	-0.040	0.025	-0.010	**0.168**	-0.035	-0.353	0.335	0.120	-0.044	0.012	0.009	0.001	-0.336	0.003	-0.002	-0.037	0.011	-0.004	0.540	0.261**
Primary branches per plant	-0.030	0.006	0.009	0.029	0.005	-0.020	0.042	**-0.140**	-0.479	0.455	0.096	0.016	0.018	0.048	0.030	-0.443	0.003	-0.005	-0.071	0.033	-0.011	0.615	0.206*
Vine length (m)	-0.050	0.007	0.012	-0.006	0.011	-0.020	0.069	-0.079	**-0.853**	0.299	0.724	-0.029	0.017	-0.008	0.013	-0.488	0.005	-0.009	-0.116	0.058	-0.004	0.701	0.256**
Number of node per vine	-0.045	0.006	0.008	0.064	0.016	-0.012	0.049	-0.055	-0.222	**1.147**	-0.830	-0.048	0.007	0.008	0.020	-0.297	0.006	-0.004	-0.078	0.032	-0.007	0.429	0.192*
Internodal length(cm)	0.002	-0.001	-0.005	0.060	0.003	0.009	-0.016	0.010	0.479	0.739	**-1.289**	-0.012	-0.004	0.014	0.009	0.131	0.000	0.004	0.030	-0.020	-0.004	-0.187	-0.048
Harvest duration	0.025	-0.003	0.011	-0.059	0.005	0.011	-0.036	-0.011	0.121	-0.274	0.076	**0.202**	-0.006	0.013	-0.002	0.019	-0.003	-0.002	-0.004	0.007	-0.001	0.019	0.110
Peduncle length(cm)	-0.048	0.006	0.019	0.011	-0.003	-0.007	0.031	-0.041	-0.225	0.127	0.089	-0.018	**0.063**	0.033	0.019	-0.135	0.003	-0.003	-0.035	0.025	-0.001	0.209	0.122
Fruits length (cm)	0.019	-0.003	-0.005	0.012	0.021	0.079	-0.011	0.049	-0.049	-0.067	0.135	-0.020	-0.016	**-0.135**	-0.026	-0.015	-0.001	0.003	0.056	-0.020	0.001	0.121	0.129
Average fruit circumference (cm)	-0.034	0.002	0.013	-0.005	0.005	-0.053	0.005	-0.089	-0.230	0.490	-0.241	-0.007	0.026	0.075	**0.047**	-0.255	0.008	-0.006	-0.082	0.040	-0.010	0.478	0.180
Average fruit weight (kg)	0.029	-0.006	-0.015	-0.029	-0.028	-0.083	-0.056	0.061	0.412	-0.337	-0.167	0.004	-0.009	0.002	-0.012	**1.010**	0.000	0.006	0.084	-0.040	0.006	-0.901	-0.068
Total soluble solids (%)	-0.074	0.010	0.010	-0.036	0.021	-0.099	0.058	-0.052	-0.577	0.783	0.000	-0.073	0.021	0.022	0.049	0.019	**0.008**	-0.012	-0.206	0.087	0.002	0.218	0.179
Reducing sugar (%)	-0.010	0.002	0.014	0.033	0.011	-0.012	0.018	-0.041	-0.453	0.277	0.294	0.018	0.010	0.026	0.015	-0.348	0.006	**-0.017**	-0.278	0.116	0.002	0.352	0.036
Non-reducing sugar (%)	0.009	-	-	-	-	0.006	-	0.033	0.332	-	-	-	-	-	-	0.284	-	0.016	**0.299**	-	-	-	0.031

		0.003	0.012	0.047	0.016		0.021			0.299	0.128	0.003	0.008	0.025	0.013		0.006			0.091	0.004	0.273	
Total sugars (%)	0.012	0.000	0.024	0.015	0.008	-0.002	0.015	-0.038	-0.403	0.297	0.208	0.011	0.013	0.022	0.015	-0.331	0.006	-0.016	-0.220	**0.123**	0.001	0.305	0.064
Dry matter	0.016	-0.002	0.032	0.003	0.009	0.016	-0.021	0.055	0.121	-0.294	0.173	-0.004	-0.002	-0.007	-0.016	0.208	0.000	-0.001	-0.039	0.004	**0.028**	0.009	0.288**
Number of fruits per plant	-0.072	0.008	0.039	0.001	0.038	0.059	0.072	-0.069	-0.477	0.393	0.192	0.003	0.011	-0.013	0.018	-0.726	0.001	-0.005	-0.065	0.030	0.000	**1.254**	0.693**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 9: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at genotypic level during *Zaid*, 2020-21 (pooled)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**0.263**	2.192	-0.082	0.217	0.128	-0.187	-1.744	0.662	1.242	-2.162	0.639	0.005	-0.210	-0.002	-0.123	0.065	-0.111	-0.059	0.249	-0.016	-0.246	-0.452	0.266**
Days to first female flower	0.251	**2.293**	-0.085	0.196	0.125	-0.157	-1.848	0.972	1.635	-2.550	0.592	0.004	-0.232	-0.002	-0.096	0.102	-0.128	-0.029	0.127	-0.093	-0.358	-0.482	0.239**
Node number to first male flower appearance	-0.048	-0.426	**0.456**	-0.796	-0.238	-0.058	0.300	-0.176	-0.740	0.632	0.127	0.005	0.097	-0.002	-0.058	-0.089	0.025	0.031	-0.032	0.020	-0.393	0.774	-0.586**
Node number to first female flower appearance	-0.052	-0.407	0.329	**-1.104**	-0.108	-0.032	0.242	0.065	-1.013	-1.141	1.680	0.008	0.006	-0.003	-0.131	-0.051	-0.016	-0.144	1.068	0.241	-0.254	0.476	-0.341**
Length of pedicel of staminate flower	-0.061	-0.522	0.198	-0.217	**-0.548**	-0.516	0.558	-0.623	-1.508	1.721	0.080	0.003	-0.027	-0.006	0.079	-0.193	0.030	0.091	-0.407	0.085	-0.099	1.215	-0.669**
Length of pedicel of pistillate flower (cm)	0.048	0.352	0.026	-0.034	-0.276	**-1.024**	-0.280	0.244	-0.336	0.135	0.383	-0.003	-0.018	-0.011	-0.114	-0.151	-0.094	-0.079	0.324	0.062	-0.130	0.688	-0.290**
Days to first harvest	0.250	2.312	-0.075	0.146	0.167	-0.156	**-1.833**	0.946	1.650	-2.633	0.606	0.005	-0.196	-0.002	-0.078	0.112	-0.125	-0.027	0.135	-0.110	-0.376	-0.478	0.240**
Primary branches per plant	0.079	1.011	-0.036	-0.033	0.155	-0.113	-0.786	**2.206**	2.655	-4.078	0.925	-0.004	-0.203	-0.005	-0.329	0.127	-0.080	-0.189	0.721	0.110	-0.868	-0.875	0.389**
Vine length (m)	0.082	0.946	-0.085	0.282	0.208	0.087	-0.763	1.478	**3.963**	-2.450	-1.736	0.001	-0.123	0.002	-0.164	0.149	-0.056	-0.149	0.160	-0.106	-0.143	-0.987	0.597**
Number of node per vine	0.108	1.117	-0.055	-0.240	0.180	0.026	-0.922	1.719	1.855	**-5.235**	2.689	0.005	-0.176	-0.003	-0.225	0.115	-0.111	-0.179	0.886	0.023	-0.453	-0.792	0.333**
Internodal length(cm)	0.038	0.309	0.013	-0.422	-0.010	-0.089	-0.253	0.464	-1.565	-3.204	**4.395**	0.004	-0.074	-0.004	-0.079	-0.018	-0.057	-0.025	0.678	0.070	-0.423	0.066	-0.186**
Harvest duration	-0.054	-0.379	-0.097	0.410	0.064	-0.134	0.395	0.413	-0.116	1.146	-0.807	**-0.023**	0.034	0.000	-0.076	0.061	0.069	-0.089	0.078	-0.129	-0.347	-0.278	0.142**
Peduncle length(cm)	0.125	1.205	-0.101	0.016	-0.033	-0.042	-0.814	1.015	1.104	-2.086	0.741	0.002	**-0.441**	-0.010	-0.262	0.044	-0.062	-0.113	0.552	0.113	-0.090	-0.534	0.329**
Fruits length (cm)	-0.034	-0.260	-0.040	0.206	0.182	0.585	0.150	-0.647	0.399	0.770	-0.878	0.000	0.246	**0.019**	0.202	0.110	0.080	0.128	-0.622	-0.139	0.091	-0.330	0.216**
Average fruit	0.075	0.510	0.061	-	0.100	-	-	1.686	1.517	-	0.809	-	-	-	-	0.006	-	-	1.315	0.125	-	-	0.403

circumference (cm)				0.337		0.271	0.331			2.737		0.004	0.269	0.009	**0.430**		0.117	0.272			0.447	0.579	**
Average fruit weight (kg)	-0.056	-0.768	0.133	-0.185	-0.347	-0.507	0.674	-0.921	-1.936	1.963	0.252	0.005	0.063	-0.007	0.009	**-0.305**	-0.021	0.030	0.005	0.114	0.200	1.117	-0.491**
Total soluble solids (%)	0.186	1.861	-0.073	-0.115	0.105	-0.614	-1.460	1.117	1.406	-3.685	1.600	0.010	-0.174	-0.009	-0.321	-0.041	**-0.157**	-0.124	0.694	0.092	0.121	-0.274	0.144**
Reducing sugar (%)	0.040	0.172	-0.037	-0.413	0.129	-0.210	-0.129	1.079	1.526	-2.423	0.288	-0.005	-0.129	-0.006	-0.302	0.024	-0.050	**-0.386**	1.753	0.094	-0.142	-0.564	0.308**
Non-reducing sugar (%)	-0.036	-0.161	0.008	0.650	-0.123	0.183	0.137	-0.877	-0.349	2.559	-1.643	0.001	0.134	0.006	0.312	0.001	0.060	0.373	**-1.813**	-0.134	0.110	0.401	-0.202**
Total sugars (%)	0.008	0.390	-0.017	0.485	0.085	0.115	-0.368	-0.442	0.767	0.223	-0.559	-0.005	0.091	0.005	0.098	0.063	0.026	0.066	-0.445	**-0.548**	-0.346	0.099	-0.208**
Dry matter	-0.050	-0.637	-0.139	0.218	0.042	0.103	0.536	-1.489	-0.441	1.845	-1.444	0.006	0.031	0.001	0.149	-0.047	-0.015	0.043	-0.155	0.147	**1.287**	0.116	0.106
Number of fruits per plant	0.080	0.747	-0.239	0.355	0.450	0.476	-0.592	1.305	2.643	-2.802	-0.195	-0.004	-0.159	0.004	-0.168	0.231	-0.029	-0.147	0.491	0.037	-0.100	**-1.479**	0.903**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 10: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at phenotypic level during *Zaid* 2020 (Y_1)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**-0.056**	-0.044	0.014	-0.010	0.007	-0.006	0.066	-0.004	-0.145	0.174	-0.004	-0.013	0.015	0.000	-0.001	-0.150	-0.002	0.000	-0.007	-0.007	-0.004	0.479	0.086
Days to first female flower	-0.048	**-0.052**	0.027	-0.014	0.006	-0.003	0.077	-0.006	-0.169	0.173	0.026	-0.015	0.014	0.000	-0.001	-0.256	-0.002	0.000	-0.021	0.003	-0.005	0.451	0.063
Node number to first male flower appearance	0.007	0.012	**-0.116**	0.017	-0.006	-0.005	-0.020	0.002	0.050	-0.051	-0.018	-0.009	-0.008	0.000	0.001	0.119	0.001	0.000	0.019	-0.022	-0.012	-0.385	-0.344**
Node number to first female flower appearance	0.008	0.011	-0.030	**0.066**	-0.002	-0.001	-0.014	-0.004	0.003	0.188	-0.179	-0.027	0.003	0.000	0.001	-0.104	0.000	0.000	-0.038	0.007	0.002	-0.010	-0.215*
Length of pedicel of staminate flower	0.018	0.016	-0.033	0.005	**-0.021**	-0.012	-0.022	0.002	0.085	-0.149	0.030	-0.007	0.004	0.000	0.000	0.382	0.001	-0.001	0.046	-0.014	-0.007	-0.699	-0.393**
Length of pedicel of pistillate flower (cm)	-0.004	-0.002	-0.008	0.001	-0.003	**-0.075**	0.000	-0.002	-0.032	0.047	0.004	-0.004	0.000	0.000	-0.002	0.325	-0.003	0.000	-0.005	0.001	-0.002	-0.317	-0.088
Days to first harvest	-0.043	-0.046	0.027	-0.011	0.005	0.000	**0.086**	-0.006	-0.172	0.176	0.026	-0.021	0.009	0.000	0.000	-0.265	-0.003	0.000	-0.019	0.009	-0.004	0.451	0.016
Primary branches per plant	-0.009	-0.012	0.009	0.009	0.001	-0.005	0.018	**-0.027**	-0.291	0.249	0.055	0.008	0.017	0.000	-0.004	-0.396	-0.002	0.001	-0.043	0.029	-0.019	0.588	0.237**
Vine length (m)	-0.015	-0.016	0.011	0.000	0.003	-0.005	0.028	-0.015	**-0.533**	0.159	0.406	-0.013	0.014	0.000	-0.002	-0.411	-0.004	0.002	-0.070	0.051	-0.007	0.652	0.322**
Number of node per vine	-0.014	-0.013	0.009	0.018	0.005	-0.005	0.022	-0.010	-0.125	**0.677**	-0.488	-0.025	0.005	0.000	-0.003	-0.245	-0.004	0.001	-0.046	0.027	-0.011	0.390	0.222*
Internodal length(cm)	0.000	0.002	-0.003	0.016	0.001	0.000	-0.003	0.002	0.296	0.452	**-0.731**	-0.008	-0.004	0.000	-0.001	0.104	0.000	-0.001	0.016	-0.017	-0.005	-0.162	-0.086
Harvest duration	0.007	0.007	0.009	-0.016	0.001	0.003	-0.017	-0.002	0.064	-0.157	0.058	**0.107**	-0.005	0.000	0.000	0.037	0.002	0.000	0.000	0.007	-0.001	0.013	0.125
Peduncle length(cm)	-0.014	-0.012	0.016	0.003	-0.001	-0.001	0.013	-0.008	-0.126	0.059	0.048	-0.009	**0.060**	0.000	-0.002	-0.125	-0.002	0.001	-0.021	0.021	-0.001	0.205	0.186*
Fruits length (cm)	0.002	0.006	-0.001	0.001	0.004	0.020	-0.001	0.005	-0.029	-0.011	0.042	-0.009	-0.010	**-0.001**	0.005	0.017	0.001	0.000	0.023	-0.012	0.001	0.074	0.237*
Average fruit circumference (cm)	-0.006	-0.003	0.006	-0.004	0.000	-0.011	0.003	-0.008	-0.074	0.156	-0.078	-0.003	0.011	0.000	**-0.012**	-0.067	-0.003	0.001	-0.029	0.024	-0.010	0.254	0.138
Average fruit weight (kg)	0.009	0.014	-0.015	-0.007	-0.009	-0.026	-0.024	0.011	0.233	-0.177	-0.081	0.004	-0.008	0.000	0.001	**0.938**	-0.001	-0.001	0.049	-0.035	0.009	-0.868	-0.529**
Total soluble solids (%)	-0.006	-0.006	0.007	-0.002	0.001	-0.013	0.012	-0.003	-0.111	0.153	-0.012	-0.013	0.007	0.000	-0.002	0.030	**-0.019**	0.001	-0.049	0.030	0.006	0.066	0.059
Reducing sugar (%)	-	-	0.012	0.007	0.003	-	0.008	-	-	0.142	0.133	0.008	0.008	0.000	-	-	-	**0.004**	-	0.096	0.003	0.292	0.110

	0.002	0.004				0.003		0.007	0.245						0.002	0.249	0.006		0.152				
Non-reducing sugar (%)	0.002	0.006	-0.012	-0.013	-0.005	0.002	-0.009	0.006	0.199	-0.167	-0.062	0.000	-0.007	0.000	0.002	0.249	0.005	-0.003	**0.186**	-0.081	-0.006	-0.264	0.050
Total sugars (%)	0.003	-0.001	0.023	0.004	0.003	-0.001	0.007	-0.007	-0.238	0.159	0.107	0.006	0.011	0.000	-0.003	-0.286	-0.005	0.003	-0.132	**0.113**	0.002	0.295	0.118
Dry matter	0.004	0.005	0.027	0.002	0.003	0.004	-0.007	0.010	0.077	-0.146	0.075	-0.003	-0.002	0.000	0.002	0.169	-0.002	0.000	-0.023	0.004	**0.050**	0.010	0.103
Number of fruits per plant	-0.022	-0.019	0.036	-0.001	0.012	0.019	0.032	-0.013	-0.281	0.214	0.096	0.001	0.010	0.000	-0.002	-0.660	-0.001	0.001	-0.040	0.027	0.000	**1.234**	0.762**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 11: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at phenotypic level during *Zaid* 2021 (Y_2)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	-**0.056**	-0.044	0.014	-0.010	0.007	-0.006	0.066	-0.004	-0.145	0.174	-0.004	-0.013	0.015	0.000	-0.001	-0.150	-0.002	0.000	-0.007	-0.007	-0.004	0.479	0.303**
Days to first female flower	-0.048	-**0.052**	0.027	-0.014	0.006	-0.003	0.077	-0.006	-0.169	0.173	0.026	-0.015	0.014	0.000	-0.001	-0.256	-0.002	0.000	-0.021	0.003	-0.005	0.451	0.187*
Node number to first male flower appearance	0.007	0.012	-**0.116**	0.017	-0.006	-0.005	-0.020	0.002	0.050	-0.051	-0.018	-0.009	-0.008	0.000	0.001	0.119	0.001	0.000	0.019	-0.022	-0.012	-0.385	-0.424**
Node number to first female flower appearance	0.008	0.011	-0.030	**0.066**	-0.002	-0.001	-0.014	-0.004	0.003	0.188	-0.179	-0.027	0.003	0.000	0.001	-0.104	0.000	0.000	-0.038	0.007	0.002	-0.010	-0.119
Length of pedicel of staminate flower	0.018	0.016	-0.033	0.005	-**0.021**	-0.012	-0.022	0.002	0.085	-0.149	0.030	-0.007	0.004	0.000	0.000	0.382	0.001	-0.001	0.046	-0.014	-0.007	-0.699	-0.376**
Length of pedicel of pistillate flower (cm)	-0.004	-0.002	-0.008	0.001	-0.003	-**0.075**	0.000	-0.002	-0.032	0.047	0.004	-0.004	0.000	0.000	-0.002	0.325	-0.003	0.000	-0.005	0.001	-0.002	-0.317	-0.082
Days to first harvest	-0.043	-0.046	0.027	-0.011	0.005	0.000	**0.086**	-0.006	-0.172	0.176	0.026	-0.021	0.009	0.000	0.000	-0.265	-0.003	0.000	-0.019	0.009	-0.004	0.451	0.200*
Primary branches per plant	-0.009	-0.012	0.009	0.009	0.001	-0.005	0.018	-**0.027**	-0.291	0.249	0.055	0.008	0.017	0.000	-0.004	-0.396	-0.002	0.001	-0.043	0.029	-0.019	0.588	0.179
Vine length (m)	-0.015	-0.016	0.011	0.000	0.003	-0.005	0.028	-0.015	-**0.533**	0.159	0.406	-0.013	0.014	0.000	-0.002	-0.411	-0.004	0.002	-0.070	0.051	-0.007	0.652	0.237*
Number of node per vine	-0.014	-0.013	0.009	0.018	0.005	-0.005	0.022	-0.010	-0.125	**0.677**	-0.488	-0.025	0.005	0.000	-0.003	-0.245	-0.004	0.001	-0.046	0.027	-0.011	0.390	0.165
Internodal length(cm)	0.000	0.002	-0.003	0.016	0.001	0.000	-0.003	0.002	0.296	0.452	-**0.731**	-0.008	-0.004	0.000	-0.001	0.104	0.000	-0.001	0.016	-0.017	-0.005	-0.162	-0.046
Harvest duration	0.007	0.007	0.009	-0.016	0.001	0.003	-0.017	-0.002	0.064	-0.157	0.058	**0.107**	-0.005	0.000	0.000	0.037	0.002	0.000	0.000	0.007	-0.001	0.013	0.116
Peduncle length(cm)	-0.014	-0.012	0.016	0.003	-0.001	-0.001	0.013	-0.008	-0.126	0.059	0.048	-0.009	**0.060**	0.000	-0.002	-0.125	-0.002	0.001	-0.021	0.021	-0.001	0.205	0.103
Fruits length (cm)	0.002	0.006	-0.001	0.001	0.004	0.020	-0.001	0.005	-0.029	-0.011	0.042	-0.009	-0.010	-**0.001**	0.005	0.017	0.001	0.000	0.023	-0.012	0.001	0.074	0.127
Average fruit circumference (cm)	-0.006	-0.003	0.006	-0.004	0.000	-0.011	0.003	-0.008	-0.074	0.156	-0.078	-0.003	0.011	0.000	-**0.012**	-0.067	-0.003	0.001	-0.029	0.024	-0.010	0.254	0.146
Average fruit weight (kg)	0.009	0.014	-0.015	-0.007	-0.009	-0.026	-0.024	0.011	0.233	-0.177	-0.081	0.004	-0.008	0.000	0.001	**0.938**	-0.001	-0.001	0.049	-0.035	0.009	-0.868	0.019
Total soluble solids (%)	-0.006	-0.006	0.007	-0.002	0.001	-0.013	0.012	-0.003	-0.111	0.153	-0.012	-0.013	0.007	0.000	-0.002	0.030	-**0.019**	0.001	-0.049	0.030	0.006	0.066	0.079
Reducing sugar (%)	-0.002	-0.004	0.012	0.007	0.003	-0.003	0.008	-0.007	-0.245	0.142	0.133	0.008	0.008	0.000	-0.002	-0.249	-0.006	**0.004**	-0.152	0.096	0.003	0.292	0.046

Non-reducing sugar (%)	0.002	0.006	-0.012	-0.013	-0.005	0.002	-0.009	0.006	0.199	-0.167	-0.062	0.000	-0.007	0.000	0.002	0.249	0.005	-0.003	**0.186**	-0.081	-0.006	-0.264	0.027
Total sugars (%)	0.003	-0.001	0.023	0.004	0.003	-0.001	0.007	-0.007	-0.238	0.159	0.107	0.006	0.011	0.000	-0.003	-0.286	-0.005	0.003	-0.132	**0.113**	0.002	0.295	0.064
Dry matter	0.004	0.005	0.027	0.002	0.003	0.004	-0.007	0.010	0.077	-0.146	0.075	-0.003	-0.002	0.000	0.002	0.169	-0.002	0.000	-0.023	0.004	**0.050**	0.010	0.257**
Number of fruits per plant	-0.022	-0.019	0.036	-0.001	0.012	0.019	0.032	-0.013	-0.281	0.214	0.096	0.001	0.010	0.000	-0.002	-0.660	-0.001	0.001	-0.040	0.027	0.000	**1.234**	0.645**
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

Table 12: Estimates of direct and indirect effects of different growth and yield traits on fruit yield per plant of bottle gourd at phenotypic level during *Zaid* 2020-21 (pooled)

Traits	Days to first male flower anthesis	Days to first female flower	Node number to first male flower appearance	Node number to first female flower appearance	Length of pedicel of staminate flower	Length of pedicel of pistillate flower (cm)	Days to first harvest	Primary branches per plant	Vine length (m)	Number of node per vine	Internodal length(cm)	Harvest duration	Peduncle length(cm)	Fruits length (cm)	Average fruit circumference (cm)	Average fruit weight (kg)	Total soluble solids (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Dry matter	Number of fruits per plant	Fruit yield/plant (kg)
Days to first male flower anthesis	**0.131**	-0.090	0.010	0.000	0.008	0.017	-0.048	0.002	-0.051	0.052	0.001	-0.009	0.017	-0.016	0.009	-0.010	0.004	0.004	-0.005	0.000	-0.018	0.198	0.207**
Days to first female flower	0.116	**-0.101**	0.017	0.000	0.008	0.010	-0.055	0.002	-0.060	0.054	0.008	-0.007	0.017	-0.021	0.005	-0.023	0.004	0.007	-0.021	0.001	-0.017	0.190	0.137*
Node number to first male flower appearance	-0.010	0.013	**-0.139**	0.000	-0.011	0.003	0.005	0.000	0.004	-0.019	0.009	-0.010	-0.005	0.002	0.004	0.020	-0.004	-0.006	0.019	0.000	-0.048	-0.200	-0.373**
Node number to first female flower appearance	-0.009	0.010	-0.069	**0.000**	-0.004	0.004	0.003	0.002	-0.017	0.038	-0.013	-0.028	0.006	0.001	0.006	0.000	-0.001	0.007	-0.033	0.002	-0.020	-0.035	-0.151*
Length of pedicel of staminate flower	-0.023	0.018	-0.034	0.000	**-0.044**	0.018	0.009	-0.001	0.035	-0.055	0.007	-0.012	0.005	-0.019	-0.006	0.055	-0.003	-0.019	0.062	0.001	-0.024	-0.362	-0.392**
Length of pedicel of pistillate flower (cm)	0.021	-0.010	-0.003	0.000	-0.007	**0.106**	-0.006	0.001	-0.018	0.018	0.004	-0.003	0.000	-0.045	0.009	0.038	0.009	0.011	-0.013	0.001	-0.017	-0.171	-0.074
Days to first harvest	0.106	-0.093	0.013	0.000	0.007	0.010	**-0.060**	0.002	-0.054	0.047	0.008	-0.009	0.011	-0.009	0.004	-0.019	0.004	0.005	-0.013	0.003	-0.015	0.173	0.121
Primary branches per plant	0.016	-0.018	0.004	0.000	0.004	0.010	-0.009	**0.013**	-0.119	0.100	0.017	0.009	0.021	-0.040	0.025	-0.039	0.005	0.031	-0.062	0.000	-0.066	0.306	0.210**
Vine length (m)	0.030	-0.027	0.003	0.000	0.007	0.008	-0.014	0.007	**-0.225**	0.060	0.151	-0.005	0.020	0.003	0.017	-0.056	0.009	0.053	-0.098	0.002	-0.021	0.354	0.277**
Number of node per vine	0.026	-0.021	0.010	0.000	0.009	0.007	-0.011	0.005	-0.052	**0.258**	-0.159	-0.023	0.008	-0.002	0.016	-0.027	0.014	0.025	-0.068	-0.001	-0.043	0.222	0.193**
Internodal length(cm)	-0.001	0.003	0.005	0.000	0.001	-0.002	0.002	-0.001	0.133	0.161	**-0.255**	-0.013	-0.008	-0.003	-0.001	0.022	0.004	-0.026	0.029	-0.002	-0.026	-0.096	-0.074
Harvest duration	-0.011	0.006	0.012	0.000	0.005	-0.003	0.005	0.001	0.010	-0.054	0.030	**0.113**	-0.007	0.005	-0.004	-0.012	-0.010	0.011	0.000	0.003	-0.007	0.044	0.135*
Peduncle length(cm)	0.030	-0.023	0.010	0.000	-0.003	0.000	-0.009	0.004	-0.061	0.026	0.026	-0.011	**0.075**	-0.033	0.015	-0.018	0.006	0.017	-0.034	0.000	-0.004	0.134	0.145**
Fruits length (cm)	-0.011	0.011	-0.001	0.000	0.004	-0.024	0.003	-0.003	-0.003	-0.003	0.004	0.003	-0.013	**0.194**	-0.023	-0.022	-0.006	-0.022	0.058	0.005	-0.004	0.038	0.184**
Average fruit circumference (cm)	0.016	-0.007	-0.008	0.000	0.003	0.013	-0.003	0.004	-0.049	0.054	0.002	-0.007	0.015	-0.060	**0.075**	-0.001	0.006	0.026	-0.060	-0.002	-0.043	0.162	0.137*
Average fruit weight (kg)	-	0.015	-	0.000	-	0.026	0.007	-	0.082	-	-	-	-	-	0.000	**0.155**	0.001	-	0.032	-	0.010	-	-

	0.008		0.018		0.016			0.003		0.045	0.036	0.009	0.009	0.027				0.022		0.006		0.371	0.243 **
Total soluble solids (%)	0.010	-0.007	0.010	0.000	0.002	0.019	-0.005	0.001	-0.041	0.071	-0.018	-0.021	0.008	-0.024	0.009	0.002	**0.051**	0.034	-0.082	-0.002	0.009	0.041	0.069
Reducing sugar (%)	0.005	-0.006	0.007	0.000	0.007	0.009	-0.002	0.003	-0.098	0.052	0.053	0.010	0.010	-0.035	0.016	-0.028	0.014	**0.123**	-0.239	-0.003	0.015	0.157	0.070
Non-reducing sugar (%)	-0.002	0.007	-0.009	0.000	-0.009	-0.005	0.003	-0.003	0.076	-0.060	-0.025	0.000	-0.009	0.039	-0.016	0.017	-0.014	-0.101	**0.290**	0.008	-0.026	-0.117	0.043
Total sugars (%)	0.001	-0.004	0.000	0.000	-0.001	0.003	-0.006	0.000	-0.016	-0.012	0.018	0.011	0.000	0.031	-0.005	-0.029	-0.004	-0.011	0.076	**0.030**	-0.013	0.025	0.096
Dry matter	-0.012	0.009	0.036	0.000	0.006	-0.010	0.005	-0.005	0.025	-0.060	0.035	-0.004	-0.002	-0.004	-0.018	0.009	0.002	0.010	-0.041	-0.002	**0.186**	0.019	0.184 **
Number of fruits per plant	0.037	-0.027	0.039	0.000	0.023	-0.026	-0.015	0.006	-0.113	0.082	0.035	0.007	0.014	0.010	0.017	-0.082	0.003	0.028	-0.048	0.001	0.005	**0.701**	0.697 **
Fruit yield/plant (kg)																							

*, ** Significant at 5 percent and 1 percent probability levels, respectively.

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