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

Abstract

The objective of this study was to determine the relationships among fruit yield per plant (Kg), growth and economic traits using twenty three genotypes [27 F_1 hybrids and 12 Parents (9 lines and 3 testers)] of bottle gourd during two seasons (Y_1 and Y_2) and pooled analysis worked out. The observations were measured on growth and yield attributing traits. It revealed that the fruit yield per plant had exhibited significant and positive phenotypic correlation withlength of pedicel of male flower, length of pedicel of female flower, primary branches per plant, vine length, number of node per vine, internodal length, picking duration, peduncle length, fruit length, average fruit circumference, average fruit weight, number of fruit per plant, fruit yield per plant, total soluble solids, reducing sugars, non- reducing sugar, total sugars and dry matter and negative significant association with 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 and days to first harvest at phenotypic level during two seasons and over seasons (pooled). 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. 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).

Materials and methods

The research work was conducted during *Zaid*seasons of2019-20 (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), NarendraPooja (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), NarendraPrabha (T_2), NarendraRashmi (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

Phenotypic and genotypic correlation coefficients were worked out to study the relationship of various pairs of characters as suggested by Al-Jibouri*et al*. (1958). Path coefficient is a standardized partial regression coefficient. It permits the partitioning of coefficients of correlation into direct and indirect effects. The path coefficient analysis of component traits of marketable green fruit yield per plant was carried out by following Dewey and Lu (1959).

Results and Discussion

Correlation coefficients

Correlation studies provide information that selection for one character will result in progress for all positively correlated characters. Many of the characters are correlated, because of natural association, positive or negative with other characters. As more variables are considered in correlation tables, their indirect correlation becomes more complex. The phenotypic and genotypic correlation coefficient computed among the twenty three characters under study had been presented in Table 1 and 2.

Fruit yield per plant had exhibited significant and positive phenotypic correlation with number of fruits per plant, average fruit weight, vine length, number of primary branches per plant, circumference of fruit and negative significant association 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) which are desirable except node number to first male flower appearance during Y_1 and Y_2. 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

It helps to find out the direct and indirect effects of yield attributes that which is one of great importance to select the superior genotypes. The estimates of correlation coefficients indicate only the inter-relationship of the character but, do not furnish information on the cause and effect relationships. Wright (1921) has devised the analysis of path coefficient to provide effective means of finding out direct and indirect causes of association which permits the critical examination of specific forces acting to produce a given correlation and measures the relative importance of each causal factor. Dewey and Lu (1959) were the first to demonstrate the utility of path coefficient analysis in breeding programme using

crested wheat grass progenies. Due to the mutual association, the development of dependent variable is determined by the degree of direct effect of independent variables and direct effects exerted via other characters, arising inevitably as an integral part of the growth pattern. Under such complex situations, the total correlation is insufficient to explain the real association for an effective and fruitful manipulation of the characters. The path coefficient analysis was carried out from phenotypic and genotypic correlation coefficients to resolve direct and indirect effect of different characters on fruit yield. The direct and indirect effect of different characters on fruit yield at phenotypic level is presented in tables 1, 2 and 3. Analysis of path coefficient revealed that 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, negative direct effect by days to first fruit harvest. At phenotypic level, number of primary branches per plant via number of fruits per plant exhibited positive association with fruit yield per plant. However, this association was affected by negative indirect effects via average fruit weight. Equatorial circumference of fruit had positive association with fruit yield per plant which, was mainly due to indirect positive effect via number of fruits per plant. Polar circumference of fruit via number of fruits per plant exhibited positive association with fruit yield per plant. Flesh thickness via number of fruits per plant exhibited positive association with fruit yield per plant. Vine length via number of fruits per plant and average fruit weight exhibited positive association with fruit yield per plant. Average fruit weight had substantial positive direct effect on fruit yield per plant at phenotypic level which was major component of the significant positive association. Days to first male flower anthesis had significant negative association with fruit yield per plant. Break up this association revealed that the indirect effects via number of fruits per plant was mainly responsible for this association. Days to first female flower via number of fruits per plant had significant negative association with fruit yield per plant. Node number to first male flower appearance had significant negative association with fruit yield per plant, which was mainly due to indirect effect of number of fruits per plant. Days to first fruit harvest exhibited negative significant correlation with fruit yield per plant. Break up of this negative correlation revealed that the negative indirect effect via number of fruits per plant was mainly responsible for this association. Internodal length via indirect effect of number of fruits per plant had negative significant association with fruit yield per plant at phenotypic level. 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 revealed that direct and indirect effect obtained at genotypic level were markedly different from those at phenotypic level which might be due to varying degree influence of environment on various traits studied and theses were also observed in component variance analysis and correlation studies during all three seasons and over environments. Finally the path coefficient analysis revealed that focusing on number of fruits per plant and average fruit weight could improve total yield per plant in bottle gourd.

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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