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Correlation and path co-efficient analysis in bottle gourd (*Lagenaria siceraria* L.)

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ABSTRACT

The present study was conducted to examine the correlation and path- coefficient analysis in bottle gourd (*Lagenaria siceraria* L.). The experiment was carried out at Horticulture Research Center (HRC), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut during Kharif season 2020. The experiment containing twenty genotype which were sown in Randomized Block Design (RBD) with three replications. Correlation coefficient analysis showed that fruit yield quintal per hectare was significant and positively correlated with number of fruit per plant, vine length, number of primary branch, fruit girth, number of leaf, average fruit weight, fruit length at both phenotypic and genotypic levels respectively, whereas, it was negatively and significant correlated with day to first fruit harvest, day to 1st fruit set, day to 1st flower Initiation, day to 50% flowering and duration of crop at both phenotypic and genotypic levels. Path co-efficient analysis revealed the positive and direct effect of yield q/hac followed by fruit length, vine length, fruit girth, number of leaf, duration of crop, number of primary branch, day to 1st fruit set, number of fruit per plant hence, direct and indirect influences towards yield.

Key words : *Correlation, Coefficient, Phenotypic, Genotypic*

Introduction

Bottle gourd is a white flowered, monoecious, diploid self compatible, annual climbing or prostrate species in the Cucurbitaceae, It is commonly cultivated in tropics and subtropical region of India. Bottle gourd is grown for its tender fruits and commonly used as a cooked vegetable. The tender edible fruits are also prepared into sweets, raita, curries and pickles and other delicious preparations. Bottle gourd is one of the best vegetable and is rich in medicinal values. It cures the many disorders of our body like jaundice, inflammation of the kidney and even toothaches which occur because of our bad eating habits. Its fruits are traditionally used as a nutritive agent having cardio protective, cardio tonic, and general tonic, diuretic and aphrodisiac properties. It cures pain, ulcers and fever and is used for curing pectoral cough, asthma, stomach problems and other bronchial disorders (Gorasiya *et al*., 2012). Oil from the seeds is used to relieve headache and also diuretic and nutritive (Rahman *et al*., 2008).

Bottle gourd (*Lagenaria siceraria* L (Mol) Standl.) is widely grown in world as vegetable crop (Hidayatullah *et al*., 2012). Bottle gourd is found in wild form in India and Southern African. Among the cucurbits, it is one of the most important cucurbitaceous vegetable crops in India which is

grown in rainy and summer seasons. It belongs to the family Cucurbitaceae with having chromosome number 2n=22. It is highly cross pollinated crop and exhibited more variation in various growth and yield traits (Ilyas *et al*., 2017) Assessment on variability, heritability and genetic advance can helps in predicting inheritance pattern of various characters. However, correlation studies between yield and its contributing characters will be of great value in planning of breeding program for specific traits. Similarly, path analysis facilitates the partitioning of correlation coefficients into the direct and indirect effects on yield and other attributes Therefore, the present investigation had been carried out with a view to work out phenotypic and genotypic coefficients of variation and their direct and indirect effect on yield in bottle gourd, so as to make effective selection for improvement of this crop.

Materials and Method

A total of twenty accessions/genotypes of bottle gourd were used in the study. Seeds were grown in the experimental field of Horticulture Research Center (HRC), Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut. The experiment was laid out in Randomized Block Design (RBD) and replicated thrice. The genotypes have good marketable attributes were studied for different parameters affecting yield (quantitative character). The Statistical analysis was carried out on 13 quantitative characters by using ANOVA as per the standard procedure suggested by (Panse and Sukhatme, 1978). The correlation coefficients were estimated by employing the formula given by (Al-Jibouri *et al*., 1958). The path coefficient analysis was done according to the method by Dewey and Lu (1959).

Results and Discussion

Correlation coefficient

The estimates of genotypic and phenotypic correlation coefficients among the different characters are presented in Table 1. In general genotypic correlation coefficient was higher than phenotypic correlation coefficient for majority of characters. Fruit yield quintal per hectare was significantly and positive correlated with number of fruit per plant, vine length, number of primary branches, fruit girth, number of leaf, average fruit weight and fruit length at both phenotypic and genotypic levels respectively. Similar results were also reported by., 1993 Rahman *et al.,* 2002; Rana and Pandit, 2011) in different cucurbit crops whereas, it was negatively and significant correlated with day to first fruit harvest, day to 1st fruit set, day to 1st flower initiation, day to 50% flowering and duration of crop. Duration of crop showed highly significant and positive correlation with day to 1st fruit harvest, day to 50% flowering, day to 1st flower initiation, day to 1st fruit set, average fruit weight, fruit girth, number of leaf, and significantly negative correlated with number of primary branch, fruit length, number of fruits per plant, vine length at phenotypic and genotypic level, respectively. Number of fruit per plant showed highly significant and positive correlation with number of primary branch, vine length, fruit girth, average fruit weight, number of leaf, fruit length whereas it was negatively and significant correlated with day to 1st fruit harvest, day to 1st flower initiation, day to 1st fruit set, day to 50% flowering at phenotypic and genotypic level, respectively. These findings are in line with (Husan *et al*. 2011and Kumar *et al.* 2012) in bottle gourd; Blessing *et al*. (2012) in pumpkin; Islam *et al*. (2009) in bitter gourd and Khan *et al*. (2009) in pointed gourd. Day to 1st fruit harvest showed highly significant and positive correlation with day to 1st fruit set, day to 1st flower initiation, day to 50% flowering, average fruit weight but it was significant and negatively correlated with number of primary branch, fruit length, vine length, fruit girth, number of leaf and average fruit weight at phenotypic and genotypic level, respectively. Similar findings were also observed by Kumar *et al*. (2007) in bottle gourd and Lal and Singh (1997) in musk melon. Average fruit weight showed highly significant and positively correlation with fruit length, vine length, number of primary branches, number of leaf while average fruit weight exhibited significant and negatively correlation with fruit girth, day to 1st fruit set, day to 50% flowering and day to 1st flower initiation at both level. Fruit girth demonstrated significant and positively correlation with vine length, number of primary branches but negatively and significant correlation with fruit length, day to 1st flower initiation, day to 1st fruit set, number of leaf, and day to 50% flowering. Fruit length was positively and significant correlated with number of primary branches and vine length but negatively correlated with day to 1st flower initia-

Table 1. Genotypic and phenotypic correlation coefficient among yield and yield contributing traits in bottle gourd.

Characters		Day to 1st flower Initiation	Day to 50% flower	Day to 1st fruit set	Vine Length (cm)	Number of leaf	Number of primary branch	Fruit Length cm	Fruit girth cm	Average fruit weight	Day to 1st fruit harvest	Number of fruit per plant (g)	Duration of crop	Yield q/hac
Day to 1st flower Initiation	G	1.000	0.949**	0.959**	-0.165**	0.124*	-0.374**	-0.258**	-0.097	-0.013	0.673**	-0.573**	0.279**	-0.314**
	P	1.000	0.802**	0.918**	-0.183**	0.140*	-0.371**	-0.243**	-0.090	-0.016	0.627**	-0.539**	0.211**	-0.313**
Day to 50% flower	G			0.910**	-0.105	0.162*	-0.322**	-0.231**	-0.029	-0.029	0.521**	-0.390**	0.294**	-0.221**
	P			0.743**	-0.057	0.108	-0.276**	-0.226**	-0.022	-0.032	0.454**	-0.353**	0.187**	-0.201**
Day to 1st fruit set	G				-0.179**	0.083	-0.366**	-0.252**	-0.046	-0.033	0.702**	-0.570**	0.253**	-0.332**
	P				-0.219**	0.105	-0.359**	-0.230**	-0.054	-0.018	0.631**	-0.515**	0.172**	-0.314**
Vine Length (cm)	G					0.341**	0.070	0.018	0.156*	0.267**	-0.115	0.449**	-0.040	0.513**
	P					0.251**	0.089	0.006	0.158*	0.218**	-0.089	0.407**	0.002	0.479**
Number of leaf	G						-0.155*	-0.249**	-0.041	0.069	-0.037	0.119	0.000	0.229**
	P						-0.183**	-0.221**	-0.053	0.083	-0.062	0.117	-0.022	0.222**
Number of primary branch	G							0.146*	0.078	0.081	-0.344**	0.462**	-0.143*	0.384**
	P							0.129*	0.084	0.061	-0.307**	0.432**	-0.089	0.365**
Fruit Length cm	G								-0.482**	0.294**	-0.127*	0.080	-0.099	0.011
	P								-0.483**	0.291**	-0.130*	0.082	-0.087	0.013
Fruit girth cm	G									-0.084	-0.051	0.311**	0.149*	0.284**
	P									-0.107	-0.028	0.288**	0.132*	0.270**
Average fruit weight (gm)	G										0.040	0.136*	0.193**	0.060
	P										-0.021	0.148*	0.095	0.063
Day to 1st fruit harvest	G											-0.647**	0.449**	-0.434**
	P											-0.641**	0.385**	-0.418**
Number of fruit per plant	G												-0.048	0.810**
	P												-0.128*	0.785**
Duration of crop	G													-0.012
	P													-0.078
Yield q/hac	G													1.000
	P													1.000

*Significant at 5%, ** Significant at 1%

tion, day to 1st fruit set, number of leaf, day to 50% flowering. Similar results were also reported by Yadegari *et al*. (2012) in pumpkin. Number of primary branch showed significant and positively correlation with vine length while number of primary branches exhibited significant and negatively correlation with day to 1st flower initiation, day to 1st fruit set, day to 50% flowering and number of leaf. Our results are in line with, Kumar *et al*. (2007) and Raja *et al.* (2006) in bottle gourd. Number of leaf exhibited positively and significant correlation with vine length, day to 50% flowering, day to 1st flower initiation, day to 1st fruit set at phenotypic and genotypic level, respectively. Vine length possessed negatively correlation with day to 1st fruit set, day to 1st flower initiation, day to 50% flowering while day to 1st fruit set exhibited positive and significant correlation with day to 1st flower initiation, day to 50% flowering. Day to 50% flowering exhibited positive and significant correlation with day to 1st flower initiation at phenotypic and genotypic level respectively. The findings clearly indicated that genotypic correlations were higher magnitude to the corresponding phenotypic ones, thereby establishing storage inherent relationship among the character studied.

Path coefficient analysis

Genotypic path coefficient

Path coefficient analysis is an important tool partitioning the correlation coefficient into the direct effects of independent variables on a dependent variable. With the inclusion of more variables in correlation study their indirect associations become more complex. The data presented in Table 2 revealed that at genotypic level, day to first flower initiation showed the highest positive direct effect (0.8519) on yield of fruits q/hac followed by, fruit length (0.2004 cm), vine length (0.1818cm), fruit girth (0.1269cm), number of leaf (0.1191), duration of crop (0.1121), number of primary branch (0.0659), day to 1st fruit set (0.0546), number of fruit per plant

Table 2. Path coefficient analysis (direct and indirect) effects on different traits at genotypic and phenotypic levels

Characters		Day to 1st flower Initiation	Day to 50% flower	Day to 1st fruit set	Vine Length (cm)	Number of leaf	Number of primary branch	Fruit Length cm	Fruit girth cm	Average fruit weight (g)	Day to 1st fruit harvest	Number of fruit per plant	Duration of crop	Yield q/hac
Day to 1st flower	**G**	**0.8519**	-0.3898	0.0524	-0.0301	0.0148	-0.0247	-0.0516	-0.0123	0.0028	-0.1751	-0.5835	0.0313	-0.314**
Initiation	**P**	**0.2113**	-0.0663	0.0036	-0.0347	0.0158	-0.0390	-0.0143	-0.0050	0.0018	0.0190	-0.4048	-0.0007	-0.313**
Day to 50% flower	G	0.7574	**-0.4646**	0.0497	-0.0191	0.0193	-0.0212	-0.0464	-0.0037	0.0063	-0.1355	-0.3965	0.0329	-0.221**
	P	0.1694	**-0.0827**	0.0029	-0.0107	0.0121	-0.0290	-0.0133	-0.0012	0.0037	0.0137	-0.2652	-0.0006	-0.201**
Day to 1st fruit set	G	0.7760	-0.3330	**0.0546**	-0.0326	0.0099	-0.0241	-0.0504	-0.0058	0.0073	-0.1826	-0.5794	0.0284	-0.332**
	P	0.1940	-0.0615	**0.0040**	-0.0416	0.0117	-0.0377	-0.0135	-0.0030	0.0020	0.0191	-0.3871	-0.0005	-0.314**
Vine Length (cm)	G	-0.3063	0.1540	-0.0098	**0.1818**	0.0406	0.0046	0.0037	0.0197	-0.0578	0.0299	0.4569	-0.0045	0.513**
	P	-0.0387	0.0047	-0.0009	**0.1895**	0.0282	0.0094	0.0003	0.0087	-0.0250	-0.0027	0.3053	0.0000	0.479**
Number of leaf	G	0.2304	-0.2370	0.0046	0.0620	**0.1191**	-0.0102	-0.0500	-0.0053	-0.0149	0.0096	0.1206	0.0001	0.229**
	P	0.0297	-0.0089	0.0004	0.0476	**0.1121**	-0.0192	-0.0130	-0.0029	-0.0096	-0.0019	0.0880	0.0001	0.222**
Number of primary	G	-0.6935	0.4719	-0.0200	0.0128	-0.0185	**0.0659**	0.0294	0.0098	-0.0175	0.0894	0.4702	-0.0160	0.384**
branch	P	-0.0784	0.0228	-0.0014	0.0169	-0.0205	**0.1050**	0.0076	0.0046	-0.0070	-0.0093	0.3242	0.0003	0.365**
Fruit Length cm	G	-0.4772	0.3390	-0.0137	0.0033	-0.0297	0.0097	**0.2004**	-0.0612	-0.0637	0.0330	0.0818	-0.0111	0.011
	P	-0.0514	0.0187	-0.0009	0.0011	-0.0248	0.0136	**0.0586**	-0.0266	-0.0334	-0.0039	0.0615	0.0003	0.013
Fruit girth cm	G	-0.1794	0.0422	-0.0025	0.0283	-0.0049	0.0051	-0.0967	**0.1269**	0.0181	0.0133	0.3168	0.0167	0.284**
	P	-0.0190	0.0018	-0.0002	0.0300	-0.0059	0.0088	-0.0283	**0.0550**	0.0123	-0.0008	0.2163	-0.0004	0.270**
Average fruit weight	G	-0.0235	0.0423	-0.0018	0.0485	0.0082	0.0053	0.0589	-0.0106	**-0.2167**	-0.0104	0.1379	0.0217	0.060
(gm)	P	-0.0034	0.0026	-0.0001	0.0412	0.0094	0.0065	0.0170	-0.0059	**-0.1147**	-0.0006	0.1112	-0.0003	0.063
Day to 1st fruit harvest	G	0.7471	-0.2630	0.0384	-0.0209	-0.0044	-0.0227	-0.0254	-0.0065	-0.0086	**-0.2600**	-0.6582	0.0503	-0.434**
	P	0.1325	-0.0376	0.0025	-0.0169	-0.0069	-0.0322	-0.0076	-0.0015	0.0024	**0.0302**	-0.4814	-0.0012	-0.418**
Number of fruit per	G	-0.0621	0.5708	-0.0311	0.0816	0.0141	0.0305	0.0161	0.0395	-0.0294	0.1682	**0.0174**	-0.0054	0.810**
plant	P	-0.1139	0.0292	-0.0020	0.0771	0.0131	0.0453	0.0048	0.0159	-0.0170	-0.0194	**0.7511**	0.0004	0.785**
Duration of crop	G	0.5167	-0.4302	0.0138	-0.0073	0.0001	-0.0094	-0.0199	0.0189	-0.0419	-0.1167	-0.0486	**0.1121**	-0.012
	P	0.0447	-0.0155	0.0007	0.0004	-0.0025	-0.0094	-0.0051	0.0072	-0.0109	0.0116	-0.0965	**-0.0031**	-0.078

(0.0174) whereas, day to 50% flowering (-0.4646), day to 1st fruit harvest (-0.2600), average fruit weight (-0.2167) showed negative direct effects on fruit yield quintal per hectare. Similar results were obtained by Narayan *et al.* (1996) in bottle gourd.

Phenotypic path coefficient

At phenotypic level, number of fruit per plant (0.7511), displayed high order of direct effect on yield quintal per hectare followed by, day to first flower initiation (0.2113), vine length (0.1895), number of leaf (0.1121), number of primary branch (0.1050), fruit length (0.0586), fruit girth (0.0550), day to first fruit harvest (0.0302), day to first fruit set (0.0040), duration of crop (0.0031) but direct negative effect exhibited on average fruit weight (-0.1147), day to 50% flowering (-0.0827) and yield quintal per hacter. Similar findings were obtained by Tikka *et al*., 1974 in water melon, Lawanda and Patil, 1989 in bitter gourd and Rao *et al*., 1999 in ridge gourd.

Conclusion

It may be concluded from the study that yield quintal per hectare showed the high positive and significant correlation with number of fruit per plant, vine length, number of primary branch, fruit girth, number of leaf, average fruit weight and fruit length. Path coefficient analysis further suggested that fruit length, vine length, fruit girth, number of leaf, duration of crop, number of primary branches, day to 1st fruit set, number of fruit per plant have highest direct effects on the yield q/hac.

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