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Association and path co-efficient analysis among yield and its components in bitter gourd (*Momordica charantia* L.)

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ABSTRACT : Correlation and path analysis were carried out in order to quantify the contribution of explanatory characters towards yield for bitter gourd cultivation.The characters like number of fruits per plant and fruit length had significant and positive correlation with yield. Number of fruits per plant and average fruit weight had the highest positive direct effect on fruit yield per plant.

KEY WORDS : Bitter gourd, Association, Path co-efficient

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Bitter gourd is an important monoecious and cross-pollinated vegetable crop of the family Cucurbitaceae. It is extensively cultivated throughout the country under two situations *i.e.* rainy season (July to August) and summer season (Febuary to March).

According to Chakravatry (1959) bitter gourd is believed to have originated in the tropics of the old world and is widely distributed in China, Malaya, India, tropical Africa and certain other countries. In terms nutritive value, bitter gourd ranks first among cucurbits, the most important nutritional contribution being vitamins and minerals especially iron, phosphorus and ascorbic acid. Fruit also contains two alkaloids *viz.*, momordicin and cucurbitacin, momordicin is the momordicosides glycosides of tetracyclic triterpinoides with cucurbitane skeleton (Chandra Vadana and Subhash Chandra, 1990). Fruits and other part of bitter gourd are reported to have cooling, stomachic, appetitising, carminative, antipyrietic, antihelminthic, aphrodisiac and vermifuge properties (Blatter *et al.*,1935). Various medicinal uses with clinical properties of insulin has been isolated from this species (Baldwa *et al.*, 1977). Among the traditional vegetables bitter gourd occupied important position in export trade.The fruits are used as fried, stuffed, dried and pickled (Morton, 1967). However, inspite of its important, adoptability and export potential, research priority given to this crop is quite meagre especially on genetic improvement.

RESEARCH METHODS

The experiment was carried out during the summer season of 2010-11 at vegetable Research Farm, Department of Horticulture, P.G. College, Ghazipur (U.P.). The materials for the present study comprised of thirty germplasm of bitter gourd which were planted in Randomized Block Design and replicated thrice. Correlation co-efficients were calculated for all quantitative character combinations at phenotypic and genotypic level by the formula given by Al-Jibouri *et al.* (1958). The direct and indirect contribution of various charactesr to yield was calculated through path co-efficient analysis as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

RESEARCH FINDINGS AND DISCUSSION

Correlation co-efficient is a statistical tool which is used to find out the degree and direction of relationship between two or more variable. A positive value shows that the change of two variables are in the same direction *i.e.* values of one variable associated with the other variables whereas a negative value shows that the movements of variable are in opposite direction.

Result of the present investigation indicated that genotypic correlation co-efficient in general was of higher magnitude than the corresponding phenotypic correlation co-efficient on the basis of data, co-efficient of correlation of yield and its component traits have been depicted in Table 1. Fruit yield per plant exhibited a positive and significant correlation with number of fruit per plant (rp= 0.8073), but was negatively correlated with days to first pistillate flower anthesis, days to first harvest and vine length (rp=-0.0118) days to first staminate flower anthesis showed significant and positive association with the node number to first staminate flower anthesis (rp=0.7309), node number to first pistillate flower anthesis (rp=0.6429) and days to first pistillate flower anthesis (rp= 0.4139), whereas days to first pistillate flower anthesis showed significant and positive correlation with node number to first staminate flower anthesis (rp= 0.4253)and days to first harvest (rp= 0.4999), whereas negatively and non-significant associated with fruit diameter average fruit weight and number of fruit per plant. Similar findings were reported by Srivastava and Srivastava (1976); Mangal *et al.* (1981);Verma (2007); Singh (2006) and Islam *et al.* (2009).

Node number to first staminate flower anthesis showed highly significant and positive correlation with node number to first pistillate flower anthesis (rp= 0.7361) and days to first harvest (rp= 0.5238), node number to first pistillate flower anthesis showed significant and positive correlation with days to first harvest (rp= 0.3926) whereas non-significant negative association with fruit length, fruit diameter and average fruit weight. Similar observation reported by Rahman *et al.* (2010).

Days to first harvest showed non-significant and positive correlation with fruit length and vine length.

Table 1 : Estimates of phenotypic and genotypic correlation co-efficients for yield and its contributing characters in bitter gourd

Sr. No.	Characters	Days to first staminate flower anthesis	Days to first pistillate flower anthesis	Node number to first staminate flower anthesis	Node number to first pistillate flower anthesis	Days to first harvest	Fruit length (cm)	Fruit diameter (cm)	Average fruit weight (g)	Vine length (m)	Number of fruits per plant	Fruit yield per plant (kg)
1.	Days to first staminate flower anthesis	rp	0.4139*	0.7309**	0.6429**	0.3450	-0.1062	-0.2747	-0.1475	0.1502	-0.0125	0.1375
		rg	0.4730	0.8544	0.7099	0.3804	-0.1491	-0.2983	-0.1649	0.1910	-0.0302	0.1504
2.	Days to first pistillate flower anthesis	rp		0.4253*	0.3310	0.4999**	0.0536	-0.1967	-0.0193	0.1608	-0.2222	-0.0058
		rg		0.5081	0.3183	0.5375	0.0131	-0.2905	-0.0044	0.2118	-0.2793	-0.0111
3.	Node no. to first staminate flower anthesis	rp			0.7361**	0.5238**	-0.0091	-0.2710	-0.2008	0.0999	0.0619	0.1423
		rg			0.8029	0.5437	-0.0540	-0.3729	-0.2271	0.0785	0.0416	0.1627
4.	Node no. to first pistillate flower anthesis	rp				0.3926*	-0.0842	-0.1905	-0.0800	0.1472	0.0957	0.2171
		rg				0.3865	-0.0963	-0.2805	-0.0805	0.1681	0.0876	0.2236
5.	Days to first harvest	rp					0.0871	-0.2619	-0.1857	0.1037	-0.1648	-0.1686
		rg					0.0788	-0.3546	-0.1812	0.0821	-0.1875	-0.1810
6.	Fruit length (cm)	rp						0.1923	-0.3533*	0.1958	0.4646**	0.3109
		rg						0.2140	-0.3814	0.2078	0.4952	0.3436
7.	Fruit diameter (cm)	rp							-0.0944	-0.1675	0.2558	0.0576
		rg							-0.0909	-0.2023	0.3180	0.0759
8.	Average fruit weight (g)	rp								-0.1253	-0.2303	0.0368
		rg								-0.1318	-0.2400	0.0344
9.	Vine length (m)	rp									0.0344	-0.0118
		rg									0.0235	-0.0326
10.	Number of fruits per plant	rp										0.8073**
		rg										0.8632

* and ** indicate significance of values at P=0.05 and 0.01, respectively   rp-Phenotypic correlation coefficient   rg-Genotypic correlation coefficient

Table 2 : Genotypic and phenotypic path analysis showing direct and indirect effect on fruit yield plant^{-1} of bitter gourd

Sr. No.	Characters		Days to first staminate flower anthesis	Days to first pistillate flower anthesis	Node number to first staminate flower anthesis	Node number to first pistillate flower anthesis	Days to first harvest	Fruit length (cm)	Fruit diameter (cm)	Average fruit weight (g)	Vine length (m)	Number of fruits per plant	Phenotypic and genotypic correlation coefficient for yield
1.	Days to first staminate flower anthesis	G	0.2848	0.1655	-0.3158	0.1213	-0.0726	-0.0074	0.0781	-0.0324	-0.0396	-0.0316	0.1504
		P	0.0983	0.0865	-0.0391	0.0717	-0.0576	-0.0044	0.0388	-0.0321	-0.0134	-0.0111	0.1375
2.	Days to first pistillate flower anthesis	G	0.1347	0.3500	-0.1878	0.0544	-0.1026	0.0006	0.0761	-0.0008	-0.0439	-0.2918	-0.0111
		P	0.0407	0.2092	-0.0227	0.0369	-0.0835	0.0022	0.0278	-0.0042	-0.0143	-0.1977	-0.0058
3.	Node no. to first staminate flower anthesis	G	0.2434	0.1778	-0.3695	0.1372	-0.1038	-0.0026	0.0977	-0.0447	-0.0162	0.0435	0.1627
		P	0.0718	0.0889	-0.0535	0.0821	-0.0875	-0.0003	0.0383	-0.0437	-0.0089	0.0551	0.1423
4.	Node no. to first pistillate flower anthesis	G	0.2022	0.1114	-0.2967	0.1709	-0.0737	-0.0048	0.0735	-0.0158	-0.0348	0.0916	0.2236
		P	0.0632	0.0692	-0.0394	0.1116	-0.0656	-0.0035	0.0269	-0.0174	-0.0131	0.0852	0.2171
5.	Days to first harvest	G	0.1083	0.1881	-0.2009	0.0660	-0.1909	0.0039	0.0929	-0.0356	-0.0170	-0.1959	-0.1810
		P	0.0339	0.1045	-0.0280	0.0438	-0.1671	0.0036	0.0370	-0.0404	-0.0092	-0.1467	-0.1685
6.	Fruit length (cm)	G	-0.0424	0.0046	0.0199	-0.0164	-0.0150	0.0497	-0.0560	-0.0750	-0.0430	0.5175	0.3436
		P	-0.0104	0.0112	0.0004	-0.0094	-0.0145	0.0417	-0.0271	-0.0769	-0.0174	0.4135	0.3109
7.	Fruit diameter (cm)	G	-0.0849	-0.1016	0.1378	-0.0479	0.0677	0.0106	-0.2620	-0.0179	0.0419	0.3323	0.0759
		P	-0.0270	-0.0411	0.0145	-0.0212	0.0437	0.0080	-0.1413	-0.0205	0.0149	0.2277	0.0576
8.	Average fruit weight (g)	G	-0.0469	-0.0015	0.0839	-0.0137	0.0346	-0.0189	0.0238	0.1968	0.0273	-0.2508	0.0344
		P	-0.0145	-0.0040	0.0107	-0.0089	0.0310	-0.0147	0.0133	0.2177	0.0111	-0.2050	0.0368
9.	Vine length (m)	G	0.0544	0.0741	-0.0290	0.0287	-0.0156	0.0103	0.0530	-0.0259	-0.2072	0.0245	-0.0326
		P	0.0147	0.0336	-0.0053	0.0164	-0.0173	0.0081	0.0236	-0.0272	-0.0892	0.0307	-0.0118
10.	Number of fruits per plant	G	-0.0086	-0.0977	-0.0154	0.0149	0.0358	0.0246	-0.0833	-0.0472	-0.0048	1.0450	0.8632
		P	-0.0012	-0.0464	-0.0033	0.0106	0.0275	0.0193	-0.0361	-0.0501	-0.0030	0.8901	0.8073

Genotypic residual effect = 0.1886 Phenotypic residual effect = 0.4586

While non significant and negative association with fruit diameter, average fruit weight and number of fruit per plant. Fruit length showed positive and significant association with number of fruit per plant (rp= 0.4646) whereas negative and significant correlation with average fruit weight (rp=-0.3533).

Fruit diameter showed non-significant and positive correlation with number of fruit per plant and yield per plant, while negative and non-significant correlation with average fruit weight and vine length. Average fruit weight showed non significant and positive correlation with yield per plant ,while non-significant and negative correlation was recorded with vine length and number of fruit per plant. Vine length showed non-significant and positive correlation with number of fruit per plant while negative and non-significant correlation with yield per plant. Similar observation were also reported by Kumar *et al.* (2011) and Bahve *et al.* (2003).

Path co-efficient analysis is simply a standardized partial regression co-efficient which splits the correlation co-efficient in to the measures of direct and indirect effect. In other words, it measures the direct and indirect contribution of various independent character on a dependent character. The results of path co-efficient studies on the phenotypic data basis showing direct and indirect effects on yield and its component using fruit yield per plant as dependent variable have been given in Table 2. Path co-efficient analysis of different traits contributing towords fruit yield per plant showed that number of fruit per plant (0.8901) had the highest positive direct effect followed by average fruit weight (0.2177) and days to first pistillate flower anthesis (0.2092), negative direct effect was recorded by days to first harvest (-0.1671) followed by fruit diameter (-0.1413), vine length (-0.0892). Similar observation were also reported by Verma (2007); Islam *et al.* (2009) and Rahman *et al.* (2010).

Fruit length (0.4135), fruit diameter (0.2277), node number to first pistillate flower anthesis (0.0852),node number to first staminate flower anthesis (0.0551) and vine length (0.0307)showed considerable positive indirect effect on fruit yield per plant *viz.*, number of fruit per plant residual effect was 0.4586. Similar observations were also reported by Dora *et al.* (2002); Sharma and Bhutani (2001) and Solanki and Shah (1992).

The path co-efficient analysis estimated at genotypic level is presented in Table 2. Number of fruit per plant (1.0450), days to first pistillate flower anthesis (0.3500) and days to first staminate flower anthesis (0.2848) exerted high order positive direct effect on fruit yield per plant. Fruit length (0.5175), fruit diameter (0.3323), node number to first pistillate flower anthesis (0.0916),while node number to first staminate flower anthesis (0.0435) and vine length (0.0245) indicated substantial indirect positive contribution on fruit yield *viz.*, number of fruit per plant. Whereas days to first pistillate flower anthesis (-0.2918), average fruit weight (-0.2508), days to first harvest (-0.1959) and days to first staminate flower anthesis (-0.0316) had made considerable indirect negative contribution on fruit yield *viz.*, number of fruit per plant.The contribution residual factors towords variation in fruit yield per plant was 0.1886. Similar observations were also reported by Kumar *et al.* (2011), Rajput *et al.* (1995) and Singh and Singh (1988).

REFERENCES

Al-Jibouri, H.A., Miller, P.A. and Robinson, H.F (1958). Genotypic and environmental variance and covariances in an upland cotton crops of interspecific origin. *Agron J.,* **50** : 633-36.

Baldwa ,V.S., Bhandari, C. M., Pangaria, A. and Goyal, R. K. (1977). Clinical trial in patients with diabetes mellitus of an insulin like compound obtained from plant source uppasala. *J. Med. Sci*., **82** : 85-89.

Bahve, S.G., Bendale, V.W., Pethe, V.B., Berde, S.A. and Mehta, J.L. (2003). Correlation and path analysis in segregating generations of bitter gourd. *J. Soil & Crops,* **13**(1) : 33-40.

Blatter, E., Caius, J.F. and Mahaskar, K.S. (1935). *Indian medicinal plants*. 2nd Edn; M/S Bishan Singh, Dehradun: pp. 1130-1132.

Chakravatry, H.L.(1959). Monograph on Indian cucurbitaceae Records. *Bot. Survey India,* **17** (1) : 86-90.

Chandrav Vandana and Subhash Chandra, M. (1990). Sub cellular distribution of momordicine –II in *Momordica charantia* leaves. *Indian. J. Exp. Biol.,* **28** : 185-186.

Dewey, D.R. and Lu, K.H.(1959). A correlation and path coefficient analysis of component of crested wheat grass seed production. *Agron. J.,* **51** : 515-518.

Dora, D.K., Acharya, G.C. and Das, S. (2002). Path analysis in pointed gourd (*Trichosanthes dioica* Roxb). *Veg Sci.,* **29**(2) : 180-181.

Islam, M. R., Hossain, M. S., Bhuiyan, M. S. R., Husna, A. and Syed, M.A. (2009). Genetic variability and path coefficient analysis of bitter gourd (*Momordica charantia*). *Internat. J. Sust. Agric.,* **1**(3) : 53-57.

Kumar, K.H., Patil, M.G., Hanchinamani, C.N., Goud, Shanker and Hiremath,S.V. (2011). Genetic relationship of growth and development traits with fruit yield in F2 population of BGDL x Hot season of cucumber (*Cucumis sativus* L.). *Karnataka J. Agric. Sci.,* **24**(4) : 497-500.

Mangal, J.L., Dixit, J., Pandita, M. L. and Sindhu, A. S. (1981). Genetic variability and correlation studies in bitter gourd (*Momordica charantia* L.). *Indian J. Hort*., **38** : 94-99.

Morton, J.F. (1967). The balsam pear an edible medicinal and toxic plant. *Eco. Bot.,* **21** : 57-68.

Rahman, M.A., Hossain, M., Heritability, D., Islam, M.S, Biswas, D.K. and Aniduzzaman (2010). Genetic variability and path analysis in snake gourd (*T. orguinal* L.). *Pak. J. Bio. Sci.,* **13**(3) : 284-286.

Rajput, J.C., Paranjape, S.P. and Jamadagni, B.M. (1995). Correlation and path analysis studies to fruit yield in bitter gourd. *J. Maharashtra. Agric. Univ.,* **20**(3) : 377-379.

Sharma, N.K. and Bhutani, R.D. (2001). Correlation and path analysis studies in bitter gourd (*M. charantia* L.). *Haryana J. Hort. Sci.,* **30**(1/2) : 84-86.

Singh, A.K. (2006). Genetic variability and correlation studies for yield and its component traits in bitter gourd (*Momordica charantia* L). Ph.D. Thesis, N.D. University of Agriculture and Technology, Faizabad, U.P. (INDIA).

Singh, N.K. and Singh, R.K. (1988). Correlation and path coefficient analysis in water melon. *Veg. Sci.,* **15**(1) : 95 – 100.

Solanki, S.S. and Shah, Achal (1992). Path analysis of fruit yield component in cucumber. *Prog. Hort.,* **21**(3-4) : 322-423.

Srivastava, V.K. and Srivastava, L.S. (1976). Genetic parameters correlation coefficient and path coefficient analysis in bitter gourd. *Indian J. Hort.,* **33**(1):66-70.

Verma, S.K. (2007). Germplasm evaluation for yield and its compound traits in bitter gourd (*Momomrdica charantia* L.). M.Sc. (Ag.) Thesis, N.D. University of Agriculture and Technology, Faizabad, U.P. (INDIA).