

Studies on character association in bitter gourd (*Momordica charantia* L.) under salt stress

V. SUNDARAM

Accepted : March, 2010

ABSTRACT

Twenty genotypes of bitter gourd (*Momordica charantia* L.) were evaluated for fourteen biometric traits under saline sodic soil to find out the association of yield related traits with yield and the inter correlation among themselves. The trait viz., number of female flowers per vine, number of fruits per vine, vine length and fruit weight had recorded significant positive association with yield. The maximum positive inter correlation was observed between number of female flowers per vine and number of fruits per vine. Sex ratio of male to female flower has shown significant negative association with yield and it had recorded the maximum negative inter correlation with the number of female flowers per vine. The path coefficient analysis also revealed the highest positive direct effect on yield by number of fruits per vine, while the highest negative direct effect on yield was recorded by number of female flowers per vine. The number of female flowers produced per vine had exerted the maximum indirect positive effect on yield through number of fruits per vine, indicating that the number of fruits per vine and number of female flowers produced per vine could be regarded as primary yield determinants in bitter gourd under salt stress and exercising selection on these traits would throw desired results.

Correspondence to :

V. SUNDARAM

Pandit Jawahar Lal Nehru
College of Agriculture and
Research Institute,
KARAIKAL
(PUDUCHERRY) INDIA

Key words : Bitter gourd, *Momordica charantia* L., Salinity, Correlation, Path analysis, Direct effect, Indirect effect

Bitter gourd (*Momordica charantia* L.) is an important cucurbitaceous vegetable grown all over India. Although many varieties and hybrids with higher yields had been developed, the potential could be harnessed only under favourable edaphic conditions. The ever increasing demand for vegetables and shrinking land and other agricultural resources necessitates cultivation of crops even under marginal soils. Salinity of soil and water being the major global concern, identifying genotypes for salinity assumes significance. A rational choice of characters on which selection is to be exercised for higher yields requires an understanding on the association of characters with yield and association among themselves. Further path coefficient analysis is an efficient tool to elucidate the direct and indirect effect of each character towards yield. Hence, the present investigation was taken up to study the association among yield and its component characters under salt stress in bitter gourd.

MATERIALS AND METHODS

The present investigation was taken up involving 20 genotypes of bitter gourd during 2008 in a Randomised Block Design with 3 replications. The soil of the experimental plot was saline sodic, with the saturation extract having a pH of 8.9, EC 4.78 dSm⁻¹ and ESP 20.21 per cent. Observations were recorded on fourteen biometric traits viz., days to first male flower appearance,

days to first female flower appearance, node of first male flower appearance, node of first female flower appearance, number of male flowers per vine, number of female flowers per vine, sex ratio (M/F), fruit length (cm), fruit girth (cm), individual fruit weight (g), vine length (m), number of primary branches per vine, number of fruits per vine and yield of fruits per vine (g). The correlation coefficient was computed as suggested by Panse and Sukathme (1967). Path coefficient analysis was carried out using the formula of Dewey and Lu (1959).

RESULTS AND DISCUSSION

The estimation of correlation coefficient between yield and other characters and inter correlation among various yield contributing traits are presented in Table 1.

The highest positive significant association (0.981**) was observed between number of female flowers per vine and number of fruits per vine. The association between days to first male flower appearance and days to first female flower appearance (0.839**), node of first male flower appearance and node of first female flower appearance (0.838**), days to first male flower appearance and node of first female flower appearance (0.819**) and number of fruits per vine and yield of fruits per vine (0.793**) were also found to be positive and significant.

The characters viz., number of fruits per vine

Table 1 : Correlation coefficients among yield and yield components in bitter gourd

	Days to first male flower appearance	Days to first female flower appearance	Node of first male flower appearance	Node of first female flower appearance	Number of male flowers per vine	Number of female flowers per vine	Sex ratio (M/F)	Fruit length	Fruit girth	Number of primary branches per vine	Vine length	Fruit weight	Number of fruits per vine	Yield of fruits per vine
Days to first male flower appearance	1.000	0.839**	0.727**	0.819**	-0.176	-0.183	0.118	0.537**	-0.323	-0.187	0.588**	0.347	-0.085	0.074
Days to first female flower appearance		1.000	0.674**	0.718**	-0.015	-0.262	0.293	0.565	-0.209	0.025	0.592**	0.474*	-0.170	0.071
Node of first male flower appearance			1.000	0.838**	-0.145	-0.077	0.028	0.626**	-0.201	-0.451*	0.782**	0.587**	-0.010	0.292
Node of first female flower appearance				1.000	-0.239	-0.115	-0.036	0.436*	-0.184	0.583**	0.025	-0.221	0.362	0.156
Number of male flowers per vine					1.000	0.287	0.575**	-0.308	-0.184	0.583**	0.025	-0.221	0.362	0.156
Number of female flowers per vine						1.000	-0.567**	-0.210	-0.254	-0.167	0.199	-0.191	0.981**	0.771**
Sex ratio							1.000	-0.055	0.060	0.629**	-0.063	0.057	-0.472*	-0.431*
Fruit length								1.000	-0.124	-0.297	0.591**	0.734**	-0.187	0.279
Fruit girth									1.000	0.240	-0.294	0.410*	-0.303	-0.007
Number of primary branches per vine										1.000	-0.378	-0.066	-0.124	-0.196
Vine length											1.000	0.419*	0.289	0.520**
Fruit weight												1.000	-0.179	0.428*
Number of fruits per vine													1.000	0.793**
Yield of fruits per vine														1.000

* and ** indicate of significance of values at P = 0.05 and 0.01, respectively.

Table 2 : Path coefficient analysis in bitter gourd

	Days to first male flower appearance	Days to first female flower appearance	Node of first male flower appearance	Node of first female flower appearance	Number of male flowers per vine	Number of female flowers per vine	Sex ratio (M/F)	Fruit length (cm)	Fruit girth (cm)	Number of primary branches per vine	Vine length (m)	Fruit weight (g)	Number of fruits per vine
Days to first male flower appearance	-0.1460	0.2338	0.2286	-0.4280	0.0642	0.1834	0.0289	0.1494	-0.1327	0.0163	0.0757	0.0164	-0.1760
Days to first female flower appearance	-0.1333	0.2558	0.2150	-0.3630	0.0024	0.2513	0.0670	0.1566	-0.1009	-0.0021	0.0784	0.0218	-0.3480
Node of first male flower appearance	-0.1117	0.1842	0.2986	-0.4160	0.0546	0.0746	0.0057	0.1637	-0.0823	0.0399	0.1011	0.0258	-0.0302
Node of first female flower appearance	-0.1317	0.1959	0.2620	-0.4741	0.0970	0.1165	-0.0093	0.1156	-0.0888	0.0365	0.0946	0.0137	-0.1490
Number of male flowers per vine	0.0255	-0.0016	-0.0444	0.1252	-0.3672	-0.2719	0.1297	-0.0840	-0.0795	-0.0508	0.0037	-0.0103	0.7724
Number of female flowers per vine	0.0279	-0.0671	-0.0232	0.0576	-0.1041	-0.9588	-0.1266	-0.0567	-0.1058	0.0144	0.0255	-0.0085	2.1101
Sex ratio	-0.0190	0.0770	0.0077	0.0197	-0.2138	0.5450	0.2227	-0.0155	0.0205	-0.0551	-0.0103	0.0022	-1.0281
Fruit length	-0.0850	0.1558	0.1901	-0.2132	0.1199	0.2115	-0.0134	0.2571	-0.0545	0.0255	0.0783	0.0320	-0.4264
Fruit girth	0.0493	-0.0657	-0.0625	0.1071	0.0742	0.2579	0.0116	-0.0356	0.3933	-0.0216	-0.0391	0.0185	-0.7010
Number of primary branches per vine	0.0284	0.065	-0.1418	0.2062	-0.2221	0.1646	0.1463	-0.0780	0.1010	-0.0839	-0.0467	-0.0034	-0.2765
Vine length	-0.0928	0.1683	0.2534	-0.3766	-0.0114	-0.2055	-0.0192	0.1691	-0.1291	0.0329	0.1191	0.0200	0.6614
Fruit weight	-0.0559	0.1297	0.1794	-0.1514	0.0877	0.1900	0.0114	0.1920	0.1697	0.0066	0.0556	0.0429	-0.4206
Number of fruits per vine	0.0120	-0.0417	-0.0042	0.0331	-0.1330	-0.9487	-0.1074	-0.0514	-0.1293	0.0109	0.0369	-0.0085	2.1325

Residual factor 0.1960 Bold diagonal values indicate direct effects

(0.793**), number of female flowers per vine (0.771**), vine length (0.520**) and fruit weight (0.428*) had shown significant positive association with yield. Positive and significant association between number of fruits per vine and yield of fruits per vine were also reported by Srivastava and Srivastava (1976), Singh *et al.* (1977), Mangal *et al.* (1981) and Lawande and Patil (1989).

Negative and significant association on yield was exerted by sex ratio (m/f). The inter correlation among number of female flowers per vine and sex ratio (-0.567**), sex ratio and number of fruits per vine (-0.472*), node of first male flower appearance and number of primaries per vine (-0.451*) and node of first female flower appearance and number of primaries per vine (-0.393*) were found negative and significant. Significant negative association between days to flowering and number of fruits per vine had already been reported by Mangal *et al.* (1981).

Significant and positive inter correlations were also observed between node of first male flower appearance and vine length, number of female flowers per vine and yield of fruits per vine, fruit length and fruit weight, days to first male flower appearance and node of first female flower appearance as well as days to first female flower appearance and node of first male flower appearance.

The partitioning of correlation coefficients into direct and indirect effects revealed that the highest positive direct effect on yield was recorded by number of fruits per vine (2.1325), followed by fruit girth (0.3933) and node of first male flower appearance (0.2986). The maximum positive direct effect on yield by number of fruits per vine had been reported earlier by Srivastava and Srivastava (1976). The number of female flowers produced per vine had shown the highest negative direct effect on yield (-0.9588) followed by number of male flowers per vine (-0.3672).

The maximum value for the indirect positive effect on yield was recorded for number of female flowers per vine through number of fruits per vine (2.1101). The indirect effects of number of male flowers per vine and vine length through number of fruits per vine were also found considerable and significant (Table 2).

The indirect effect of number of fruits per vine on yield through number of female flowers per vine (-0.9487) was negative and significant. The indirect effect of fruit girth (-0.7010) on yield through number of fruits per vine was also found negative and significant. Sex ratio had recorded high negative indirect effect (-1.0281) on yield through number of fruits per vine.

The characters number of female flowers per vine and number of fruits per vine could be regarded as primary yield determinants in bitter melon for selection of desirable genotypes under salt stress. The traits *viz.*, number of male flowers per vine, vine length and fruit weight were also of significance while exercising selection in bitter melon for higher yields under salt stress.

REFERENCES

- Dewey, D.R.** and Lu, K.H. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.*, **51**: 515 – 518.
- Lawande, K.E.** and Patil, A.V. (1989). Correlation studies in bitter melon. *Maharashtra agric. Univ.*, **14** (1): 77-79.
- Mangal, J.L.,** Dixit, J, Pandita, M.L. and Sindhu, A.S. (1981). Genetic variability and correlation studies in bitter melon (*Momordica charantia* L.). *Indian J. Hort.*, **38** (1&2): 94 – 99.
- Panse, V.G.** and Sukathme, P.V. (1967). *Statistical Methods For Agricultural Workers*. Indian Council of Agricultural Research, New Delhi.
- Singh, H.N.,** Srivastava, J.P. and Prasad, R. (1977). Genetic variability and correlation studies in bitter melon. *Indian J. Agric. Sci.*, **47** (12): 604 – 607.
- Srivastava, V.K.** and Srivastava, L.S. (1976). Genetic parameters, correlation coefficients and path coefficient analysis in bitter melon (*Momordica charantia* L.). *Indian J. Hort.*, **33** (1): 66-70.
