Environment & Ecology 27 (3) : 1066—1069, 2009
 ISSN 0970-0420

Character Association and Path Coefficient Studies in Cucumber (*Cucumis sativus* L.)

RAGHVENDRA SINGH*, SANJAY KUMAR, ANAND KUMAR SINGH
B. K. SINGH AND MANOJ KUMAR[1]

Department of Horticulture, [1]Department of Genetics and Plant Breeding
Institute of Agricultural Sciences, Banaras Hindu University
Varanasi 221005, India
E-mail : singh.raghvendrabhu@gmail.co
**correspondence*

Abstract

An experiment with 15 diverse genotypes was carried out to assess the association between characters and the contribution toward fruit yield. The trial was conducted during *kharif* season of 2006 and 2007. Positive and significant correlation coefficient were recorded for fruit per plant with number of primary branches per plant, number of fruits per plant and weight per fruit while, number of fruit per plant and weight per fruits also had positive direct effect on fruit yield per plant indicating desirable improvement toward fruit yield per plant. Number of primary branches per plant, number of fruit per plant and weight of per fruit was given high priority in the selection program of cucumber.

Key words : *Cucumis sativus,* Correlation coefficient, Path analysis, Character association.

Cucumber (*Cucumis sativus*) is one of the most important fruit vegetable crop grown under green house condition. Among the cucurbits, cucumber is the second most widely cultivated crop after watermelon in the country. It is a warm season vegetable crop grown through out the world, under tropical and sub-tropical condition. It is grown primarily for processing (pickling) and fresh market (slicing). The fruit of cucumber is said to have cooling effect, prevent constipation and checks jaundice and indigestion (1). Like other vegetables, the economic characters like number of fruits/plant in cucumber are also complex in inheritance and may involve several simply inherited factors whose association with yield can be known through correlation studies. This study gives the relationship of one character with the other, but the actual dependence is worked out with the help of path coefficient analysis studies. The information derived on correlation and path analysis studies will be helpful in identifying the desirable component characters for bringing out improvement in yield. Thus, the present investigation was initiated to assess the association among important metric traits with fruit yield and path coefficient analysis in diverse genotypes of cucumber.

Methods

Fifteen diverse genotypes of cucumber, namely CH-20, CC-4, CC-7, VRC-18, VRC-11-2, CH-6, Swarna Ageta, CH-129, BC-2, CU-5, CH-127, BC-2, CC-5, BSC-2 and CHC-1 were grown at Vegetable Research Farm Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi in a randomized block design with three replications during the *kharif* season of 2006 and 2007 following spacing of 0.6 × 1.5 m. All the recommended cultural and management practice were followed to raise healthy crop. Five competitive plants were randomly selected from each replication for recording observation on parameters, namely number of days to 50% germination, number of days to first male flower anthesis, number of days to first female flower anthesis, number of node to first male flower, number of node to first female flower, vine length (m), number of node per vine, number of primary branches, length of fruit (m), weight per fruits (g), number of fruits per plant and fruit yield per plant (kg). The analysis of variance was done as suggested by Panse and Sukhatme (2). Correlations of various biometrical characters were undertaken following the procedure suggested by Al-

Table 1. Genotypic (G) and phenotypic (P) correlation coefficient for different pairs of characters. *, ** Significant at 5% and 1% level, respectively.

Characters		Days to 50% germination	Days to first male flower anthesis	Days to first female flower anthesis	Node number to first male flower	Node number to first female flower	Vine length (m)
Days to 50%	G		–0.094	–0.084	0.307	0.105	–.055
germination	P		–0.056	–0.008	0.137	–0.019	–.027
Days to first	G			1.000**	0.142	0.388	0.114
male flower anthesis	P			0.974**	0.023	0.095	0.090
Days to first female	G				0.089	0.342	0.019
flower anthesis	P				0.023	0.094	0.003
Node number to	G					0.927**	0.435
first male flower	P					0.855**	0.337
Node number to	G						0.460
first female flower	P						0.315
Vine length (m)	G						
	P						
Number of	G						
nodes per vine	P						
Number of primary	G						
branches per plant	P						
Length of fruit	G						
(m)	P						
Weight per fruit	G						
(g)	P						
Number of fruits	G						
per plant	P						

Table 1. Continued.

Characters		Number of nodes per vine	Number of primary branches per plant	Length of fruit (m)	Weight per fruit (g)	Number of fruits per plant	Fruit yield per plant (kg)
Days to 50%	G	–0.023	–0.176	–.520*	–0.505*	–0.103	–0.416
germination	P	–0.059	–0.183	–0.288	–0.364	–0.026	–0.274
Days to first	G	0.201	0.061	0.175	–0.192	0.271	0.038
male flower anthesis	P	0.131	0.134	0.188	–0.153	0.182	0.009
Days to first	G	0.174	0.122	0.233	–0.207	0.269	0.026
female flower anthesis	P	0.095	0.139	0.209	–0.158	0.209	0.023
Node number	G	0.476	–0.006	–0.130	0.003	0.301	0.215
to first male flower	P	0.340	0.036	–0.141	0.043	0.115	0.122
Node number to	G	0.345	0.199	0.224	0.057	0.605**	0.476
first female flower	P	0.264	0.121	0.008	0.044	0.348	0.122
Vine length (m)	G	0.555*	–0.018	–0.276	–0.046	0.291	0.181
	P	0.531*	0.032	–0.183	–0.029	0.223	0.170
Number of	G		–0.040	0.052	0.058	0.116	0.080
nodes per vine	P		0.031	0.095	0.108	0.095	0.112
Number of	G			0.106	0.680**	0.625**	0.927**
primary branches per plant	P			0.153	0.604**	0.311	0.673**
Length of fruit	G				0.017	0.343	0.220
(m)	P				0.113	0.201	0.219
Weight per fruit	G					–0.024	0.673**
(g)	P					–0.095	0.632**
Number of fruits	G						0.721**
per plant	P						0.706**

Jibouri et al. (3) along with path coefficient analysis by Dewey and Lu (4).

Results and Discussion

The analysis of variance revealed significant differences among the genotypes for all the traits under study. The results of genotypic and phenotypic correlation coefficients (Table 1) indicated that the genotypic correlation coefficients were higher than the phenotypic correlation coefficients thereby indicating a strong inherent association between various traits and the masking effect of environment in the total expression of genotypes.

Table 1 reveals that yield per plant had significant and positive genotypic and phenotypic correlation with number of primary branches per plant, number of fruits per plant and weight of individual fruit. The number of fruits per plant had positive and significant correlation with number of primary branches per plant and node number to first female flower at both the levels of genotypic and phenotypic. The weight of individual fruit had positive and significant genotypic and phenotypic correlation with number of primary branches per plant. Report of various workers substantiates the present findings (5, 6). Number of node per vine had positive and significant correlation with vine length . A positive and significant correlation was also observed between number of days to first male flower anthesis and number of days to first female flower anthesis, node number to first male flower and node number to first female flower ; vine length and number of node per vine.

However, negative and significant correlation were also observed for weight of fruit yield and number of fruit per plant had negative and non significant correlation with days to fifty percent germination at both the levels of genotypic and phenotypic.

Correlation studies alone are not adequate to establish clear associations among the characters as number of variables are considered to be correlated indirectly become more complex, less obvious and some what perplexing. So, the assessments of real contribution of individual characters towards the fruit yield become essential. Path coefficient analysis gives an idea of direct and indirect effects of certain characters on correlation.

The perusal of path coefficient analysis revealed that number of fruits per plant exhibited maximum di-

Table 2. Genotypic path coefficient analysis (direct and indirect effect) of 12 yield contributing characters. Residual effect (–0.00160). Bold values show direct effect.

Characters	Days to 50% germination	Days to first male flower anthesis	Days to first female flower anthesis	Node number to first male flower	Node number to first female flower	Vine length (m)
Days to 50% germination	**0.027**	–0.036	0.032	0.001	–0.005	0.002
Days to first male flower anthesis	–0.003	**0.382**	–0.385	0.000	–0.018	–0.003
Days to first female flower anthesis	0.002	0.382	**–0.385**	0.000	–0.016	–0.001
Node number to first male flower	0.008	0.054	–0.034	**0.003**	–0.044	–0.012
Node number to first female flower	0.003	0.148	–0.131	0.003	**–0.047**	–0.014
Vine length (m)	–0.001	0.044	–0.007	0.001	–0.022	**–0.031**
Number of nodes per vine	–0.001	0.077	–0.067	0.001	–0.016	–0.017
Number of primary branches per plant	–0.005	0.023	–0.047	0.000	–0.009	0.001
Length of fruit (m)	–0.014	0.067	–0.090	0.000	–0.011	0.008
Weight per fruit (g)	–0.014	–0.074	0.079	0.000	–0.003	0.001
Number of fruits per plant	–0.003	0.104	–0.103	0.001	–0.029	–0.009

Table 2. Continued.

Characters	Number of nodos per vine	Number of primary branches per plant	Length of fruit (m)	Weight per fruit (g)	Number of fruits per plant	Genotypic correlation coefficient with yield
Days to 50% germination	0.001	0.012	0.016	–0.380	–0.086	–0.416
Days to first male flower anthesis	–0.008	–0.004	–0.005	–0.145	0.227	0.038
Days to first female flower anthesis	–0.007	–0.009	–0.007	–0.155	0.225	0.026
Node number to first male flower	–0.019	0.000	0.004	0.003	0.253	0.215
Node number to first female flower	–0.015	–0.016	–0.007	0.013	0.507	0.476
Vine length (m)	–0.022	0.001	0.008	–0.035	0.244	0.181
Number of nodes per vine	**–0.039**	0.003	–0.002	0.044	0.097	0.080
Number of primary branches per plant	0.002	**–0.070**	–0.003	0.511	0.024	0.927**
Length of fruit (m)	–0.002	–0.007	**–0.031**	0.013	0.287	0.220
Weight per fruit (g)	–0.002	–0.048	–0.001	**0.753**	–0.020	0.673**
Number of fruits per plant	–0.005	–0.044	–0.010	–0.018	**0.838**	0.721**

rect effect on fruit yield followed by weight of individual fruit and number of days to first male flower anthesis (Table 2). However, number of days to first female flower anthesis, number of primary branches per plant, node number to first female flower and number of node per vine had negative direct effects on fruit yield. High direct effect of number of fruits per plant and weight of individual fruit on fruit yield was earlier reported by Dhiman and Chander. (7) and the characters which showed maximum direct effect were considered in this programme for improving fruit yield. Indirect effect towards fruit yield through various characters suggested for selecting genotypes with higher fruit yield. The indirect influence of different traits should be given due weightage along with characters which exerted direct effects to break the yield pattern. Thus, it can be concluded that the selection of genotypes from the present material on the basis of number of fruits per plant and weight per fruit could lead to a proportionate increase in the fruit yield in cucumber.

References

1. Nandkarni K. M. 1972. Indian material medica. Nandkarni and Co., Bombay, India.
2. Panse V. G. and P. V. Sukhatme. 1967. Statistical methods for agricultural workers. ICAR, New Delhi, India.
3. Al-Jibouri H.A., P. A. Millar and H. F. Robinson. 1958. Genotypic and environmental variances and covariances in an upland cotton cross of inter-specific origin. Agron. J. 50 : 633—636.
4. Dewey D. R. and K. H. Lu. 1959. A correlation and path coefficient analysis of components of creasted wheat grass seed production. Agron. J. 51 : 515—518.
5. Rastogi K. B., D. Arya and A. Deep. 1990. A note on inter relationship between yield and important plant characters of cucumber (*Cucumis sativus* L.). Veg. Sci. 17 : 102—104.
6. Choudhary B. R., M. S. Fageria and R. S. Dhaka. 2004. Correlation and path analysis in muskmelon (*Cucumis melo* L.). Indian J. Hort. 61 : 158 —162.
7. Dhiman M. R. and P. Chander. 2003. Genotypic and phenotypic correlations and path coefficient analysis involving 15 diverse genotypes of cucumber (*Cucumis sativus* L.). Haryana J. Hort. Sci. 34 : 11—112.