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Selection of yield-associated traits using correlation and path analysis in Cucumber (*Cucumis sativus* L.)

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Abstract
The efficiency of a breeding programme is usually decided by the orientation and magnitude of the contribution of yield components, whereas each trait has a proportional importance in its contribution to yield. Practical understanding of this process would help in the stance process for the simultaneous development of multiple qualities in conventional breeding. During August 2021 to July 2022. Seventy genotypes were analysed at College Orchard HC&RI, Coimbatore, based on eleven variables explored for character, association and path coefficient analysis with respect to yield and yield contributing traits. According to correlation studies, vine length has the most positive association with fruit yield per vine, followed by fruit girth, fruit number, and average fruit weight. Direct selection for these characteristics would increase yield. The analysis of path coefficients confirmed that day to first male flower, number of fruits per vine, and days to first fruit harvest had a direct positive phenotypic and genotypic effect on yield. However, in the era of climate change, increased human population, and high-quality demand of consumers, studies on cucumber fruit quality traits are limited Future breeding should concentrate on selecting traits with direct yield-improving benefits.

Keywords: Character association, genotypic correlation, phenotypic correlation, path coefficient, cucumber

Introduction
One of the most significant cucurbitaceous vegetable crops is cucumber *(Cucumis sativus* L.), which is widely cultivated in tropical and subtropical regions of the nation. Following tomato, cabbage, and onion as the most significant vegetable crops, it is ranked fourth. A thermophilic and frost-sensitive species, cucumbers thrive at temperatures over 20 °C. It is cultivated for its soft fruits, which are eaten fresh in salads, cooked like vegetables, or picked when still young. It includes a significant amount of vitamins B and C, carbohydrates, calcium, and phosphorus, Kumar *et al.*, [13]. The amount of importance placed on research in this country for improving this crop is extremely low. Character association analysis is a crucial approach that is effectively used to quantify the effect of distinct yield traits in different strains, resulting in the screening of potential genotypes to provide a fuller insight of the qualities that are being selected Ekka *et al*., [7] Correlation coefficient study assesses the mutual relationship among several attributes and aids in identifying which constituent trait to select for crop production improvement. As a result, understanding the desired and unfavourable relationship between the different attributes can greatly help prevent inversely connected compensating effects during selection. The path coefficient analysis simplifies the separation of correlation coefficients between direct and indirect contributions of various attributes to specific yields. As a result, it evaluates the direct effect of one variable on another. Therefore, the current study aimed to determine the nature and magnitude of the association between cucumber yield and its contributing attributes.

Materials and Methods
The present investigation was carried out at the College Orchard, Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, during August 2021 to July 2022 which is situated at 11° N latitude and 77° E longitude and at an elevation of 426.6 m above mean sea level. A total of 70 genotypes of

cucumber were raised in a Randomized Block Design (RBD) with two replications with the standard package of practices. Five plants were randomly selected and tagged in each replication of the treatment for data collection. Observations on growth, flowering behaviour, and physical parameters of fruit, and yield data were recorded. As per the procedures outlined by Al- Jibouri *et al.* [1] and Dewey and Lu [6], respectively, the correlation coefficient and path analysis were calculated. R software version 4.2.1 was used to statistically analyse data.

Results and Discussion

Correlation coefficients between genotype and phenotype for the eleven traits are furnished in Table 1. The genotypic correlation coefficients are more extensive than the phenotypic correlation coefficients. To assess the impact of other component characteristics on cucumber fruit yield, correlation coefficients were computed. The highest magnitude of genotypic correlation coefficients showed a strong intrinsic association between various variables in the study of Johnson *et al.*, [10]. This may be due to the environment masking or modifying the influence, modifying the articulation of parameters, and lessening the phenotypic effect Chandrasekhar and Reddy [3]. The dual nature of the phenotypic correlation, as indicated by genotypic and environmental correlations, as well as heritability character, resulted in a considerable difference between the two types of correlations between any two characters Ara *et al.*, [2].

The research revealed a positive and significant genotypic and phenotypic correlation between fruit yield per vine and vine length, fruit girth, fruit number, and average fruit weight. The findings suggested that vines with longer vines, longer fruits, better fruit yields per vine, and maximum fruit weight would produce more fruit per vine. According to Kumar *et al.*, [12], Pal *et al.*, [9], Mehedi and Khan [15], and Hossain *et al.*, [16] fruit weight and number of fruits per vine are the major determinants for a positive significant effect on yield. They concluded that cucumber plant yield had a strong, positive, and significant association with fruit length, average fruit weight, and number of fruits per plant. In addition, the node for the first male flower and fruit length exhibited positive but non-significant genotypic and phenotypic correlations. The possibility of increasing fruit yield per vine by improving vine length, fruit length, number of fruits per vine, and fruit weight were sufficiently revealed by this character expression. On contrary, yield per vine had significant negative associations with the attribute's days to the first male flower, days to the first female flower, and days to first fruit harvest at both the genotypic and phenotypic levels. These findings accord with those of Kumar, [14]; Chikezie *et al.*, [4]; and Nandi *et al.*, [18], fruit yield per vine showed a positive and significant correlation with vine length and fruit weight.

Among other attributes, vine length had a substantial positive correlation with fruits per vine, average fruit weight, and yield per vine, but a significant negative correlation with days to first male, female flower, and days to first fruit harvest. Day to the first male flowers and female flowers have a substantial genotypic and phenotypic positive connection with day to first harvest, which is relevant for the selection of early varieties. Similar yield correlation studies with other horticultural traits have been reported by Veena *et al.* [19], Hasan *et al.* [8], Chinatu *et al.* [5], and Sharma *et al.*, [17] and Karthick *et al.*, [11] in cucumber.

Although correlation gives evidence on the components of a complex entity such as yield, it does not provide a precise depiction of the direct and indirect contributions of the component characters to yield. Path coefficient analysis involves a method for differentiating the overall correlation between the dependent variable and the independent component variable, *i.e.*, the direct effect of the independent variable and its indirect effect on the dependent variable via a third variable. However, it gives a practical basis for allocating adequate weightage to various attributes while planning a pragmatic yield-improvement programme. Table 2 presents the findings of path coefficient analysis at the genotypic level, demonstrating the direct and indirect effects of crucial attributes on fruit yield per vine.

The results of the path analysis for the ten attributes revealed that days to first male flower had the highest direct positive effect on yield per vine, followed by the number of fruits per vine, while days to first female flowering had the highest direct negative impact on yield per vine, followed by nodes for the first male flower. The trait number of fruits per vine and average fruit weight had the highest positive indirect effects on yield per vine, but days to the first fruit harvest and days to the first female flower had the highest negative indirect effects on yield per vine. There was a 0.016 residual effect at the genotypic level. These findings accord with Sharma *et al.*, [17] and Karthick *et al.*, [11] in cucumber.

Table 1: Genotypic and phenotypic correlation coefficient between yield and yield attributes of 70 genotypes of cucumber

Trait		VL	NMF	NMF	DMF	DFF	DFH	FL	FG	FPV	AFW	YPV
VL	rg	1										
	rp	1										
NMF	rg	0.202*	1									
	rp	0.194*	1									
NMF	rg	0.003	0.576**	1								
	rp	0.011	0.560**	1								
DMF	rg	-0.652**	-0.087	0.091	1							
	rp	-0.626**	-0.082	0.084	1							
DFF	rg	-0.699**	-0.095	0.092	0.994**	1						
	rp	-0.666**	-0.090	0.096	0.954**	1						
DFH	rg	-0.650**	-0.200*	0.065	0.955**	0.965**	1					
	rp	-0.617**	-0.188*	0.058	0.893**	0.910**	1					
FL	rg	-0.165	-0.205*	-0.093	0.199*	0.145	0.165	1				
	rp	-0.162	-0.194*	-0.083	0.192*	0.146	0.146	1				
FG	rg	-0.298**	-0.118	-0.073	0.330**	0.352**	0.305**	0.201*	1			
	rp	-0.256**	-0.090	-0.073	0.259**	0.277**	0.230**	0.186*	1			
FPV	rg	0.757**	0.049	-0.093	-0.653**	-0.729**	-0.666**	-0.178*	-0.432**	1		
	rp	0.735**	0.048	-0.094	-0.635**	-0.705**	-0.636**	-0.174*	-0.358**	1		
AFW	rg	0.603**	0.130	-0.217**	-0.480**	-0.542**	-0.509**	-0.131	-0.065	0.599**	1	

	rp	0.572**	0.122	-0.194*	-0.467**	-0.509**	-0.468**	-0.123	-0.034	0.571**	1	
YPV	rg	0.784**	0.090	-0.148	-0.665**	-0.734**	-0.667**	0.188*	0.334**	0.973**	0.810**	1
	rp	0.757**	0.089	-0.142	-0.622**	-0.705**	-0.633**	0.187*	0.304**	0.943**	0.738**	1

** Significant at 1 percent level; * Significant at 5 percent level

VL: Vine length, NMF: Node for first male flower, NFF: Node for first female flower, DMF: Days to first male flower, DFF: Days to first female flower, DFH: Days taken for first fruit harvest, FL: Fruit length, FG: Fruit girth, FPV: Number of fruits per vine, AFW Average fruit weight YPV: Yield per vine

Table 2: Path coefficient analysis for direct and indirect effects of genotypes for yield and its related attributes in cucumber

	VL	**NMF**	**NMF**	**DMF**	**DFF**	**DFH**	**FL**	**FG**	**FPV**	**AFW**	YPV
VL	-0.033	0.017	0.000	-0.873	1.387	-0.324	0.019	-0.020	0.459	0.152	0.784
NMF	-0.007	0.083	-0.037	-0.116	0.188	-0.100	0.024	-0.008	0.029	0.033	0.090
NMF	0.000	0.048	-0.064	0.122	-0.182	0.033	0.011	-0.005	-0.056	-0.055	-0.148
DMF	0.021	-0.007	-0.006	1.339	-1.971	0.476	-0.023	0.022	-0.395	-0.121	-0.665
DFF	0.023	-0.008	-0.006	1.330	-1.983	0.481	-0.017	0.023	-0.441	-0.137	-0.734
DFH	0.021	-0.017	-0.004	1.278	-1.914	0.499	-0.019	0.020	-0.403	-0.129	-0.667
FL	0.005	-0.017	0.006	0.267	-0.288	0.082	-0.115	0.013	-0.108	-0.033	0.188
FG	0.010	-0.010	0.005	0.442	-0.698	0.152	-0.023	0.067	-0.261	-0.016	0.334
FPV	-0.025	0.004	0.006	-0.874	1.445	-0.332	0.021	-0.029	0.606	0.151	0.973
AFW	-0.020	0.011	0.014	-0.642	1.075	-0.254	0.015	-0.004	0.363	0.253	0.810

Residual effects: 0.01664 VL: Vine length, NMF: Node for first male flower, NFF: Node for first female flower, DMF: Days to first male flower, DFF: Days to first female flower, DFH: Days taken for first fruit harvest, FL: Fruit length, FG: Fruit girth, FPV: Number of fruits per vine, AFW: Average fruit weight YPV: Yield per vine

Data Availability

On reasonable request, the corresponding author will provide the datasets constructed during and/or evaluated during the current study.

Conflict of interest

The authors declare that they have no conflicts of interest.

Authors' contribution

Perception of research (RT and VR); Experimental design (RT and VR); Contribution of experimental materials (RT and VR); Field/lab experiment execution and data acquisition (RT and VR); Data analysis and interpretation (RT and VR); Manuscript preparation (RT and VR).

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References

1. Al-Jibouri HA, Miller PA, Robinson HF. Genetic and environmental variances and co-variances in an upland cotton cross of interspecific origin. Agron J. 1958;50:633-36.
2. Ara A, Narayan R, Ahmed N, Khan SH. Genetic variability and selection parameters for yield and quality attributes in tomato. Indian J Hortic. 2009;66:73-78.
3. Chandrasekhara B, Reddy CR. Association analysis for oil yield and dry matter production in sesame (*Sesamum indicum* L.). Ann Agric Res. 1993;14:40-44.
4. Chikezie OE, Peter EO, Christian UA, Uche PC. Studies of phenotypic and genotypic variation in sixteen cucumber genotypes. Chilean J Agric Res. 2016;76(3):307-313.
5. Chinatu LN, Onwuchekwa-Henry CB, Okoronkwo CM. Assessment of yield and yield components of cucumber (*Cucumis sativus* L.) in Southeastern Nigeria. Int J Agric Earth Sci. 2017;3:35-44.
6. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. J Agron Crop Sci. 1959;51:512-15.
7. Ekka RE, Sarawgi AK, Kanwar RR. Genetic variability and inter-relationship analysis for various yield attributing and quality traits in traditional germplasm of rice (*Oryza sativa* L.). Plant Arch. 2015;15:637-45.
8. Hasan R, Hossain MK, Nazmulalum, Bashar A, Islam S, Tarafder MJA. Genetic divergence in commercial cucumber (*Cucumis sativus* L.) genotypes. Bangladesh J Bot. 2015;44(2):201-207.
9. Hossain MF, Rabbani MG, Hakim MA, Amanullah ASM. Study on variability character association and yield performance of cucumber (*Cucumis sativus* L.). Bangladesh Res Publ J. 2010;4(3):297-311.
10. Johnson HE, Robinson HF, Comstock RE. Estimation of genetic and environmental variability in soybean. Agron J. 1955;47:314-18.
11. Karthick K, Arumugam T, Rajasree V, Ganesan KN, Karthikeyan M. Studies on correlation and path analysis of yield attributes in cucumber (*Cucumis sativus* L.). J Pharmacogn Phytochem. 2019;8(6):342-345.
12. Kumar A, Kumar S, Pal AK. Genetic variability and character association for fruit yield and yield traits in cucumber. Indian J Hortic. 2008;65(4):423-428.
13. Kumar S, Kumar D, Kumar R, Thakur KS, Dogra BS. Estimation of Genetic Variability and Divergence for Fruit Yield and Quality Traits in Cucumber (*Cucumis sativus* L.) in North-Western Himalayas. Univ J Plant Sci. 2013;1(2):27-36.
14. Kumar S, Kumar R, Gupta RK, Sephia R. Studies on correlation and path coefficient analysis for yield and its contributing traits in cucumber. Crop Improv. 2011;38(1):18-23.
15. Mehdi M, Khan FAS. Variability and character association analysis in cucumber germplasm. Agric Biol Res. 2009;25(2):87-91.
16. Pal S, Sharma HR, Das A, Pandav AK. Character association and path analysis for fruit yield and its contributing traits in cucumber (*Cucumis sativus* L.). Int J Agric Environ Biotechnol. 2017;10(2):163-168.
17. Sharma S, Kumar R, Chatterjee S, Sharma HR. Correlation and path analysis studies for yield and its attributes in cucumber (*Cucumis sativus* L.). Int J Chem Stud.

2018;6(2):2045-2048.
18. Suman N, Thapa U, Banerjee S, Mondal R. Character association and path analysis for fruit yield and its contributing traits in cucumber genotypes (*Cucumis sativus* L.) under naturally ventilated polyhouse during off season. J Pharmacogn Phytochem. 2019;8(6):2439-2442.
19. Veena R, Sidhu AS, Pitchaimuthu M, Souravi K. Character association for fruit yield and yield traits in Cucumber (*Cucumis sativus* L.). Electron J Plant Breed. 2013;4(1):1108-1112.