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Research Note

Study on correlation and path analysis of F_2 population of cucumber (*Cucumis sativus* L.)

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Abstract
An investigation was conducted to study the correlation and path analysis in 150 F_2 population of cross Dharwad x Belgaum Local in cucumber along with parents and check during *Kharif,* 2019 at ZAHRS, Shivamogga. The results revealed that the correlation coefficient for fruit yield per vine had highly significant (P<0.01) and positive with the number of fruits per vine (0.719), the number of nodes at which the first male flower appear (0.271) and the number of branches per vine (0.256). Fruit yield per vine also exhibited positive and significant (P<0.05) association with fruit length (0.201), number of leaves per vine (0.194), days to last harvest (0.181) and inter nodal length (0.158). The path analysis revealed that maximum direct effect of traits *viz.,* number of fruits per vine, days to first female flower appearance, number of seeds per fruit, number of branches per vine, fruit diameter, fruit length, total soluble solids and total sugars on fruit yield. The superior transgressive segregants were identified which surpassed the limits of check hybrid 'Chitra' for a yield and quality attributing traits in the F_2 population.

Key words: Cucumber, quality, segregating population, yield

Cucumber (*Cucumis sativus* L.) originated in India and the progenitor is closely related to the wild *Cucumis sativus* L. *var. hardwickii,* which was found in the Himalayan foothills of Nepal. Being native to India, this crop is endowed with huge variability for different traits. Intensive research efforts are needed in several areas, particularly, selection of superior genotypes. The variability observed in any population could be due to genetic and environmental factors and their interactions. The variability in the segregating population has greater importance in genetic crop improvement. The knowledge of the nature and magnitude of characters association of yield and yield attributing traits is of great importance in selecting the promising lines in the F_2 population. Formulation of the effective breeding programme the study of component characters is prime criteria in increasing the yield per vine. Hence, the present study was conducted to know the interrelationship between the different yield and quality attributing traits *via* correlation (Wright, 1921) and path coefficient analysis (Dewey and Lu, 1959) in the F_2 population of cucumber.

The present experiment was conducted at Zonal Agriculture and Horticulture Research Station, Shivamogga, during *Kharif,* 2019. The experimental site is located at an altitude of 650 meters above mean sea level (MSL) in the Southern Transition Zone of Karnataka (Zone-7). Two diverse parents *viz.,* Dharwad (Fruits were medium in size, vigorous growth of the vine, early bearing and medium fruit yielding habit) and Belgaum Local (Fruits were dark green in colour, oblong to the cylindrical shape of fruits, free from bitterness and more fruit yielder) were included in the hybridization programme. The F_1 generation was raised during 2018-19 and selfing was done to get 150 F_2 population. The experiment was evaluated in randomized block augmented design and

experimental material comprised of 150 F_2 population along with their parents (Dharwad and Belgaum Local) and standard check (Chitra). The genotypes were grown at a spacing of 90 x 75 cm. with a standard package of practices (Anon., 2013). The observations were recorded and analysed for quantitative and qualitative attributes by using the software SPSS 16.00 and WINDOSTAT V 9.2.

Fruit quality and yield are the important polygenic traits in cucumber crop improvement. The characters associated with yield and association among themselves can be easily examined through correlation analysis. Correlation of fruit yield with other yield attributing characters was examined (**Table 1**) and observed significant (P<0.01) positive association with traits *viz.,* the number of fruits per vine (0.719), the number of nodes at which first male flower appear (0.271) and the number of branches per vine (0.256). Fruit yield per vine also exhibited positive and significant (P<0.05) association with fruit length (0.201), the number of leaves per vine (0.194), days to last harvest (0.181) and inter nodal length (0.158). This indicates that, as the number of branches per vine, the number of leaves per vine, node at which first male flower appears, inter nodal length, the number of fruits per vine, fruit length and days to last harvest increases the yield per vine also increases positively. The obtained results are in close proximity with the evidences of Mehdi and Khan (2009) and Kumar *et al.* (2011).

The path coefficient study determined the inter-relationship between yield and yield component characters for direct and indirect effects (**Table 2**). The experimental results revealed that maximum direct effect of traits *viz.,* the number of fruits per vine (0.7254), days to first female flower appearance (0.1223), total sugars (0.1233), the number of seeds for fruit (0.0911), node at which first female flower appear (0.0420), the number of branches per vine (0.0035), fruit diameter (0.0176), fruit length (0.0064) and total soluble solids (0.0796). This implies that as the number of branches per vine increases the number of fruits per vine also increases. As they showed a positive direct effect towards yield per vine. The maximum indirect effects towards yield were contributed through the traits *viz.,* days to last harvest (0.1937), fruit length (0.1533) and vine length (0.1009) *via* the number of fruits per vine. This indicates that as the days to last harvest increase, the length of the fruits gets increases along with an increase in vine length. Hence, the yield per

Table 1. Estimation of phenotypic correlation coefficient for yield and quality attributes of F_2 population (Dharwad × Belgaum Local) of cucumber

Trait	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19
X1	**1.000**	0.124	0.034	0.134	**-0.160***	0.126	-0.013	0.114	**0.197***	**-0.209****	**-0.273****	-0.089	0.199	-0.016	0.004	0.025	-0.043	-0.062	**0.017**
X2		**1.000**	0.138	**0.264****	0.004	-0.150	**-0.276****	0.151	**0.217****	**-0.202***	**-0.301****	0.069	0.131	-0.047	**-0.164***	0.155	0.012	-0.067	**0.158***
X3			**1.000**	0.073	0.149	**-0.019***	-0.133	-0.088	**0.170****	-0.132	**-0.208****	0.005	**0.362****	-0.068	**0.233***	**0.163***	**0.162***	**0.174***	**0.256****
X4				**1.000**	0.155	-0.198	**-0.326****	**0.186***	0.075	**-0.253****	-0.047	**0.166***	**0.235****	0.112	-0.136	0.011	-0.032	-0.079	**0.194***
X5					**1.000**	**-0.242****	**-0.321****	0.101	0.039	0.082	0.015	0.057	-0.054	-0.157	**-0.205***	0.090	-0.132	-0.076	**0.004**
X6						**1.000**	**0.695****	-0.098	0.053	**0.171***	0.146	-0.075	-0.075	-0.107	**0.161***	**-0.230****	0.059	-0.002	-0.125
X7							**1.000**	-0.108	-0.035	**0.257****	**0.189***	**-0.204***	-0.027	**-0.166***	**0.168***	**-0.234****	0.041	0.049	-0.117
X8								**1.000**	0.109	-0.101	**0.169***	-0.092	**0.222****	0.153	-0.005	-0.035	-0.001	0.031	**0.271****
X9									**1.000**	-0.157	**-0.189***	-0.119	-0.140	0.025	-0.088	0.018	0.033	0.014	-0.049
X10										**1.000**	0.045	-0.005	-0.119	-0.090	0.017	0.060	-0.005	-0.078	-0.111
X11											**1.000**	0.014	**0.267****	0.027	0.021	-0.004	-0.090	-0.040	**0.181***
X12												**1.000**	0.024	**-0.181***	-0.121	0.032	-0.064	-0.064	-0.055
X13													**1.000**	**0.211****	-0.156	-0.101	-0.089	-0.107	**0.719****
X14														**1.000**	**0.483****	0.031	**0.3622****	**0.330****	**0.201***
X15															**1.000**	-0.082	**0.509****	**0.457****	-0.121
X16																**1.000**	-0.132	-0.052	-0.077
X17																	**1.000**	**0.777****	**-0.587****
X18																		**1.000**	-0.116
X19																			**1.000**

*Level of significance at 5% **Level of significance at 1%

X1= Vine length, X2= Inter nodal length, X3= Number of branches/vine, X4= Number of leaves/vine, X5= Diameter of vine, X6= Days to first male flower appearance, X7= Days to first female flower appearance, X8= Number of node at which first male flower appear, X9= Number of node at which first female flower appear, X10= Days to first harvest, X11= Days to last harvest, X12= Number of seeds/fruit, X13= Number of fruits/vine, X14= Fruit length, X15= Fruit diameter , X16= Rind thickness , X17= Total soluble solids, X18= Total sugars, X19= Yield/vine

Table 2. Path coefficient analysis for yield and quality attributes of F_2 population (Dharwad × Belgaum Local) of cucumber

Trait	VL	NBV	DFFA	NFFA	DFH	DLH	NSF	NFV	FL	FD	RT	TSS	TS
VL	**-0.1389**	-0.0049	0.0019	-0.0274	0.0290	0.0380	0.0125	-0.0193	0.0023	-0.0006	-0.0035	0.0060	0.0087
NBV	-0.0001	**0.0035**	0.0005	-0.0006	0.0005	0.0007	0.0000	0.0013	0.0002	-0.0008	-0.0006	-0.0006	-0.0006
DFFA	0.0017	0.0163	**0.1223**	0.0044	-0.0315	-0.0232	0.0250	0.0034	0.0204	-0.0206	0.0286	-0.0050	-0.0061
NFFA	0.0083	0.0072	-0.0015	**0.0420**	-0.0066	-0.0080	-0.0050	-0.0059	0.0011	-0.0037	0.0008	0.0014	0.0006
DFH	0.0037	0.0024	-0.0046	0.0028	**-0.0178**	-0.0008	0.0001	0.0021	0.0016	-0.0003	-0.0011	0.0001	0.0014
DLH	0.0106	0.0080	-0.0073	0.0073	-0.0017	**-0.0306**	-0.0006	-0.0103	-0.0010	-0.0008	0.0000	0.0035	0.0016
NSF	0.0082	-0.0005	0.0186	0.0109	0.0005	-0.0013	**0.0911**	-0.0022	0.0165	0.0111	-0.0030	0.0059	0.0059
NFV	0.1009	-0.2633	-0.0201	-0.1016	-0.0866	0.1937	0.0176	**0.7254**	0.1533	-0.1136	-0.0784	-0.0652	-0.0780
FL	0.0001	0.0004	0.0011	-0.0002	0.0006	-0.0002	0.0012	-0.0014	**0.0064**	-0.0031	-0.0002	-0.0023	-0.0021
FD	0.0001	0.0041	0.0030	-0.0016	0.0003	0.0004	-0.0021	-0.0028	0.0085	**0.0176**	-0.0014	0.0090	0.0081
RT	-0.0001	-0.0005	0.0007	-0.0001	-0.0002	0.0000	-0.0001	0.0008	-0.0001	0.0003	**-0.0031**	0.0004	0.0002
TSS	-0.0035	0.0129	0.0033	0.0027	-0.0004	0.0072	-0.0051	-0.0072	0.0288	0.0406	-0.0106	**0.0796**	0.0619
TS	0.0077	-0.216	-0.0061	-0.0017	0.0097	0.0050	0.0079	0.0133	-0.0408	0.0565	0.0065	-0.959	**0.1233**
Y	0.0176	0.2568	-0.1175	0.239	-0.1111	0.1813	-0.0550	0.7195	0.2018	-0.1218	-0.077	-0.0587	-0.1164

*Significant characters were considered for path analysis

Residual effect: 0.3590

Where, VL= Vine length, DFH= Days to first harvest, FD= Fruit diameter, NBV= Number of branches per vine, NSF= Number of seeds per fruit RT= Rind thickness DFFA= Days to first female flower appearance, NFV= Number of fruits per vine, TSS= Total soluble solids (°*B*), NFFA= Node at which first female flower appear, FL= Fruit length, TS= Total sugars, Y= Yield per vine

vine increases through indirect as well as direct effects of traits under study. These results are in agreement with Cramer and Wehner (2000), Khan *et al*. (2015), Gupta *et al.* (2018) and Sultana *et al.* (2018). The superior promising lines or transgressive segregants over the standard check (Chitra) were identified. The significant contribution of component characters on yield and quality attributes, the plants were selected based on fruit yield per vine which was on account of the presence of traits *viz.,* the number of branches per vine, node at which first female flower appear, the number of fruits per vine and fruit diameter. Similar results were reported by earlier workers Shukla *et al.* (2014) and Kanimozhi *et al.* (2015).

From the characters association study in the F_2 population of cucumber, it can be concluded that the correlation coefficient results revealed that fruit yield per vine had a highly significant and positive association with the number of fruits per vine, the number of nodes at which first male flower appears, the number of branches per vine, fruit length, the number of leaves per vine, days to the last harvest and inter nodal length. The results of path analysis revealed that the high maximum direct effect towards yield per vine was contributed from the traits *viz.,* the number of fruits per vine, days to first female flower appearance, the number of seeds for fruit, the node at which first female flower appears, the number of branches per vine, fruit diameter, fruit length, total sugars, and total soluble solids. Thus, the segregants were identified for yield and quality attributes in segregating population of cucumber.

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