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Correlation And Path Coefficient Analysis For Certain Metric Traits In Okra (Abelmoschus Esculentus (L.) Monech) Using Line X Tester Analysis

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Abstract:
The present investigation was conducted to find out the Correlation and Path coefficient effects in okra to identifying the desirable combiners. The experiment comprising 60 hybrids obtain by crossing using 19 parents (four lines viz., Arka Anamika, Arka Abhay, Parbhanikranthi, Varsha uphar and fifteen testers viz., IC-332453, IC-433640, IC-326893, IC-332454, IC-433672, IC-433670, IC-328942, IC-433690, IC-433673, IC-33102 , IC-433695, IC-331067, IC-433675, IC-433645 and IC-331217. The observation was recorded on plant height, days to 50% flowering, days to maturity, the node at which first flower appears, number of branches per plant, number of fruits per plant, length of the fruit, the diameter of the fruit, ten pods weight, fruit yield per plant, fruit yield per hectare, the node at which mosaic disease appears and days of first mosaic symptom appear were worked out through line x tester analysis. All the hybrids along with their parents were grown in a Randomized Block Design (RBD) with three replications at Student farm, college of Horticulture, Acharya N. G. Ranga Agricultural University, Rajendranagar, AndhraPradesh, India during Kharif-2009 and Spring Summer-2010. Results pertaining that, fruit yield per plant showed highly significant positive association with a number of branches per plant and number of fruits per plant at phenotypic and genotypic levels in F1s. The path coefficient analysis was done to determine the direct and indirect effects on fruit yield per plant viz., plant height, days to 50% flowering, days to maturity, the node at which first flower appears, number of branches per plant, number of fruits per plant, length of the fruit, the diameter of the fruit, ten pods weight, the node at which mosaic disease appears and days of first mosaic symptom appear.

Key words: *Correlation*, *Path coefficient*, *okra*

1.Introduction

Okra (Abelmoschus esculentus (L.) Moench) commonly known as Lady's finger or bhendi belongs to the family Malvaceae. It is considered to be a native of tropical and subtropical Africa, South Africa, West Indies and India. It is a warm season fruit vegetable grown in the tropical and subtropical countries of the world**.** The crop is grown over a wide range of soils and climatic conditions both in summer and rainy seasons. Okra is especially valued for its tender and delicious pods in different parts of the country for internal and export markets as fresh vegetables, along with soothing properties for digestion.

Study of association of traits between each other and their influence on the yield of fruits to aid in selection programme is of significant importance as it contributes indirectly to the success of the selection. The association between the traits especially in crosses reflect gene linkages and thus helps the breeder in assembling a specific combination of traits from two parents of a cross. Further, selection of one trait invariably affects a number of other associated characters. Correlations and path coefficient analysis of quantitative characters would be of help in choosing the component characters whose selection would result in the improvement of

complex characters that are positively correlated. Path coefficient analysis facilitates partitioning of the correlation coefficients of genetic parameters of crop plants into direct and indirect effects of various traits influencing the yield per plant.

2.Materials And Methods

The present study was carried out at Student farm, college of Horticulture, Acharya N. G. Ranga Agricultural University, Rajendranagar, during Kharif-2009 and Spring Summer-2010. The experiment comprising 60 hybrids obtain by crossing using 19 parents (four lines viz., Arka Anamika, Arka Abhay, Parbhanikranthi, Varsha uphar and fifteen testers viz., IC-332453, IC-433640, IC-326893, IC-332454, IC-433672, IC-433670, IC-328942, IC-433690, IC-433673, IC-33102 , IC-433695, IC-331067, IC-433675, IC-433645 and IC-331217 to generate 60 F1 hybrids were grown in a Randomized Block Design (RBD) with three replications. The observation was recorded for quantitative characters on the single plant basis. Five randomly selected plants from each of F1s and parents in each replication were tagged before maturity. The average of five plants was taken as the mean of a particular treatment, the following observations on various characters were recorded viz., plant height, days to 50% flowering, days to maturity, the node at which first flower appears, number of branches per plant, number of fruits per plant, length of the fruit, the diameter of the fruit, ten pods weight, the node at which mosaic disease appears and days of first mosaic symptom appear.

3.Results And Discussion

Correlation coefficient analysis measures the mutual relationship between various plant characters and determines the component on which selection can be based for improvement in yield. Therefore, knowledge of correlation coefficients between yield and its components may be a valuable indication regarding the components, where selection could be profitable exercised in order to obtain as an increase in yielding ability. The genotype correlations were higher than the corresponding phenotype correlations both in parents and crosses indicating that strong inherent associations were marked as phenotypic level due to environmental effects.

A perusal of the results of the present study indicated that in parents (Table-1), the fruit yield was positively correlated with plant height (RP = 0.1145, reg = 0.0001), number of branches per plant (RP = 0.0192, reg = 0.7094), number of fruits per plant (RP = 0.7667; reg = 0.0608), ten pods weight (RP = 0.3074; reg = 0.9640) both at the phenotypic and genotypic level. High correlation coefficients were noticed for ten pods weight at the genotypic level followed by a number of branches per plant and number of fruits per plant at the genotypic level. Similar results of significant positive correlation have been reported by Kaul *et al*. (1978) for plant height and branches per plant, Agarwal *et al*. (1984) for plant height, branches and fruits per plant, Mishra and Singh (1985) for plant height, fruits per plant and fruit weight with trait yield per plant. Similar to the present findings Elangovan *et al*. (1980) reported a positive association of fruits per plant and branches per plant with fruit yield. Arumugam and Muthukrishan (1981) for plant height and fruits per plant, Sivagamasundari *et al*. (1992) for fruits per plant, fruit weight with fruit yield were considered as functional factors of yield in okra. In the present investigation the inter-correlations between plant height, number of branches per plant, number of fruits per plant, ten pods weight were also positive both at a phenotypic and genotypic level in parents. These findings are in agreement with the results reported by Kirthi Singh *et al*. (1974) who observed significant positive inter-correlations between fruit yield and it's contributing characters plant height, branches per plant, number of fruits per plant. The positive inter correlations were found to exist between days to 50 % flowering, first flowering node, plant height and branches per plant. Similarly, positive inter correlations between first flowering node, days to 50 % flowering, plant height and number of branches per plant also existed, similar have been reported by Dhankhar B. S, Dhankhar S. K, (2002) and Krushna D, et.al., (2007). Thus indicating that the simultaneous selection for these traits would result in improvement in obtaining early fruiting genotypes in okra.

With regard to crosses (Table-2), the association analysis revealed a significant positive correlation of fruits per plant, average ten pods weight, length of the fruit, the diameter of the fruit, number of branches per plant, first flowering node and plant height. The inter se correlations among fruits per plant, first flowering node, plant height, diameter of the fruit and ten pods weight showed positive association, thus indicated that the simultaneous selection of these traits would result in improvement of fruit yield in okra. Moreover the direct effects of ten pods weight, diameter of the fruit, length of the fruit, number of fruits per plant, number of branches per plant, first flowering node and plant height were also positive though not significant (Table-4). Their indirect effects on fruit yield through number of fruits per plant, branches per plant, first flowering node and ten pods weight were also positive. A nonsignificant negative association of days to 50 % flowering, days to maturity, the node at mosaic disease appears and days of first mosaic symptom appears. Moreover, the attributes days to 50 % flowering, days to maturity, the node at mosaic disease appears, days of first mosaic symptom appears at both levels had direct negative effects on fruit yield and also had high indirect negative effects through plant height, number of branches per plant, number of fruits per plant, length of the fruit and ten pods weight.

Association analysis revealed that in parents fruit yield per plant was positively correlated with plant height, number of fruits per plant, ten pods weight. The inter-correlations between these yield contributing attributes were also positive. All these characters except days to 50 % flowering, the diameter of the fruit, the node at mosaic disease appears, days of first mosaic symptom appears had positive effects on fruit yield.

In crosses, significant positive correlations were established between the number of branches per plant, number of fruits per plant, the diameter of the fruit, ten pods weight and fruit yield. The inter-correlations between these traits were also positive besides having direct positive effects on fruit yield per plant.

The positive association between plant height, number of fruits per plant, ten pods weight, length of the fruit and fruit yield and the negative association of number of branches per plant and diameter of the fruit with fruit yield per plant established in parents (Table-3), were however broken in crosses, whereas the negative association of days to first flower, node at which first flower appears, node

at which mosaic disease appears, days at first mosaic symptoms appears and positive association of plant height, number of fruit, fruit length and ten pods weight with fruit yield existed in parents were maintained even in the crosses. The characters number of fruits per plant, number of branches, fruit length and ten pods weight, which established positive association with fruit yield, could be employed in selection programme.

S. No.	Treatements		Plant height	Days to 50% flowering	First flowering node	No.of branches/plant	No.of fruits/ plant	Diameter of the fruit	Ten pods wt	Node at mosaic daisease appears	Days at first mosaic symptom appear	Fruit yield/ plant
1	Plant height	r_p	1.0000	-0.0716	0.0725	0.2757*	0.0731	-0.1811	0.1107	0.0905	0.2102	0.1145
		r_g	1.0000	-0.1073	0.2066	0.3168*	0.7605	-0.2576	-0.0046	0.1968	0.3143	0.0001
2	Days to 50% flowering	r_p		1.0000	0.1653	-0.1706	0.1091	0.0611	0.0683	-0.2116	-0.2010	0.1862
		r_g		1.0000	0.3191	-0.1917	0.3643	0.0984	0.1558	-0.1855	-0.1368	-0.9716
3	First flowering node	r_p			1.0000	-0.0276	-0.2885*	-0.0795	-0.0409	-0.0333	0.0334	-0.3263
		r_g			1.0000	-0.0916	0.3524	0.0576	0.1311	-0.3700	-0.3401	0.3124
4	No.of branches/plant	r_p				1.0000	0.0821	-0.3110*	-0.1636	-0.1864	-0.1175	0.0192
		r_g				1.0000	0.2463	-0.3488	-0.6112	-0.2321	-0.1051	0.7094
5	No.of fruits/plant	r_p					1.0000	-0.2041	-0.3351*	-0.0348	0.0708	0.7667
		r_g					1.0000	-0.6355	0.1251	-0.0119	0.2300	0.0608
6	Diameter of the fruit	r_p						1.0000	0.0885	-0.2625*	-0.3556	-0.0942
		r_g						1.0000	0.1295	-0.4363	-0.5517	0.6348
7	Ten Pods wt	r_p							1.0000	0.1737	0.0919	0.3074
		r_g							1.0000	0.5236	0.4381	0.9640
8	Node at mosaic daisease appears	r_p								1.0000	0.8590	-0.0551
		r_g								1.0000	0.9231	-0.3393
9	Days at first mosaic symptom appear	r_p									1.0000	-0.1339
		r_g									1.0000	-0.3302
10	Fruit yield/plant	r_p										1.0000
		r_g										1.0000

Table 1: Phenotypic(Rp) And Genotypic(Rg) Correlation Coefficients Between Yield Contributing Characters And Fruit Yield Per Plant In Nineteen Parents Of Okra
** ,** Significant At 5% And 1% Levels Respectively*

S. No.	Treatments		Plant height	Days to 50% flowering	Days to maturity	First flowering node	No.of branches/ plant	No.of fruits/plant	Length of the fruit	Diameter of the fruit	Ten pods weight	Node at mosaic daisease appears	Days at first mosaic symptom appear	Fruit yield/plant
1	Plant height	r_p	1.0000	-0.0450	-0.1341	-0.0183	0.0104	0.1890	0.1666	0.1614	0.1872	0.0363	-0.0261	0.2710
		r_g	1.0000	-0.0698	-0.2223	-0.0366	-0.0029	0.2165	0.2525	0.2275	0.2932	-0.0048	-0.0644	0.3537
2	Days to 50% flowering	r_p		1.0000	0.3670	-0.0509	-0.3976	-0.0923	-0.3188	-0.2118	-0.0753	-0.0502	-0.0396	-0.1272
		r_g		1.0000	0.4554	-0.0594	-0.4659	-0.1440	-0.3701	-0.2613	-0.1162	-0.0659	-0.0830	-0.1858
3	Days to maturity	r_p			1.0000	-0.1482	-0.4390	-0.2089	-0.2113	-0.2343	-0.1751	0.1055	0.0884	-0.2736
		r_g			1.0000	-0.2664	-0.5142	-0.2346	-0.2450	-0.3079	-0.2231	0.1596	0.1385	-0.3203
4	First flowering node	r_p				1.0000	0.0811	0.1431	-0.0176	-0.1683	-0.0339	-0.0944	-0.0023	0.1114
		r_g				1.0000	0.1085	0.2524	-0.0353	-0.1806	-0.0382	-0.1103	0.0229	0.1824
5	No.of branches/plant	r_p					1.0000	0.2187	0.1988	0.1028	-0.0079	-0.2097	-0.1618	0.1984
		r_g					1.0000	0.2762	0.2523	0.1579	0.0073	-0.2446	-0.1760	0.2496
6	No.of fruits/plant	r_p						1.0000	0.0957	0.0171	0.0226	0.0173	0.0096	0.8749
		r_g						1.0000	0.1911	0.1002	0.1028	-0.1489	-0.1987	0.8569
7	Length of the fruit	r_p							1.0000	0.4451	0.4299	0.0283	-0.0486	0.2884
		r_g							1.0000	0.5579	0.5451	0.0509	-0.0465	0.4343
8	Diameter of the fruit	r_p								1.0000	0.4921	0.0253	-0.0207	0.2401
		r_g								1.0000	0.7070	0.1113	-0.0175	0.4362
9	Ten pods weight	r_p									1.0000	-0.1233	-0.1991	0.4873
		r_g									1.0000	-0.2033	-0.2964	0.5908
10	Node at mosaic daisease appears	r_p										1.0000	0.8691	-0.0916
		r_g										1.0000	0.9274	-0.2866
11	Days at first mosaic symptom appear	r_p											1.0000	-0.1329
		r_g											1.0000	-0.3746
12	Fruit yield/plant	r_p												1.0000
		r_g												1.0000

Table 2: Phenotypic(Rp) And Genotypic(Rg) Correlation Coefficients Between Yield Contributing Characters And Fruit Yield Per Plant In Sixty Crosses In Okra
** ,** Significant At 5% And 1% Levels Respectively*

S. No.	Treatments		Plant height	Days to 50% flowering	Node at which First flower appear	No.of branches/ plant	No.of fruits/ plant	Diameter of the fruit	Ten pods weight	Node at which mosaic disease appears	Days at first mosaic symptom appear	Correlation with fruit yield per plant
1	Plant height	P	-0.0432	0.0031	-0.0031	-0.0119	-0.0032	0.0078	-0.0048	-0.0039	-0.0091	0.1145
		G	-0.1587	0.0170	-0.0328	-0.0503	-0.1207	0.0409	0.0007	-0.0312	-0.0499	0.0001
2	Days to 50% flowering	P	-0.0035	0.0491	0.0081	-0.0084	0.0054	0.0030	0.0034	-0.0104	-0.0099	0.1862
		G	0.2026	-1.8876	-0.6023	0.3618	-0.6876	-0.1858	-0.2940	0.3502	0.2582	-0.9716
3	First flowering node	P	-0.0021	-0.0048	-0.0288	0.0008	0.0083	0.0023	0.0012	0.0010	-0.0010	-0.3263
		G	-0.0488	-0.0754	-0.2364	0.0217	-0.0833	-0.0136	-0.0310	0.0875	0.0804	0.3124
4	No.of branches/plant	P	0.0123	-0.0076	-0.0012	0.0448	0.0037	-0.0139	-0.0073	-0.0084	-0.0053	-0.0192
		G	-0.1631	0.0987	0.0472	-0.5147	-0.1267	0.1795	0.3146	0.1194	0.0541	-0.7094
5	No.of fruits/plant	P	0.0706	0.1054	-0.2786	0.0793	0.9658	-0.1971	-0.3236	-0.0336	0.0684	0.7667
		G	0.4892	0.2344	0.2267	0.1584	0.6433	-0.4088	0.0805	-0.0077	0.1480	-0.0608
6	Diameter of the fruit	P	-0.0132	0.0045	-0.0058	-0.0227	-0.0149	0.0730	0.0065	-0.0192	-0.0260	-0.0942
		G	-0.0168	0.0064	0.0038	-0.0228	-0.0416	0.0654	0.0085	-0.0285	-0.0361	0.6348
7	Ten pods weight	P	0.0707	0.0436	-0.0261	-0.1044	-0.2138	0.0565	0.6381	0.1108	0.0586	0.3074
		G	-0.0084	0.2871	0.2417	-1.1269	0.2306	0.2387	1.8435	0.9652	0.8077	0.9640
8	Node at mosaic disease appears	P	-0.0107	0.0251	0.0040	0.0221	0.0041	0.0311	-0.0206	-0.1186	-0.1018	-0.0551
		G	-0.4313	0.4067	0.8111	0.5087	0.0261	0.9563	-1.1476	-2.1920	-2.0235	-0.3393
9	Days at first mosaic symptom appear	P	0.0336	-0.0321	0.0053	-0.0188	0.0113	-0.0568	0.0147	0.1373	0.1599	-0.1339
		G	0.1354	-0.0589	-0.1466	-0.0453	0.0991	-0.2378	0.1888	0.3978	0.4310	-0.3302

Table 3: Phenotypic(Rp) And Genotypic(Rg) Path Coefficients Of Yield Components On Fruit Yield Per Plant In Parents Of Okra

Residual Effect (Phenotypic) = 0.2063

Diagonal: Direct Effects

** , ** Significant At 5% And 1% Levels Respectively*

Residual Effect (Genotypic) = 0.0952

Non-Diagonal : Indirect Effects

S. No.	Treatements		Plant height	Days to 50% flowering	Days to maturity	First flowering node	No.of branches/plant	No.of fruits/ plant	Length of the fruit	Diameter of the fruit	Ten pods weight	Node at mosaic daisease appears	Days at first mosaic symptom appear	Correlation with fruit yield per plant
1	Plant height	P	0.0233	-0.0010	-0.0031	-0.0004	0.0002	0.0044	0.0039	0.0038	0.0044	0.0008	-0.0006	0.2710
		G	0.0412	-0.0029	-0.0092	-0.0015	-0.0001	0.0089	0.0104	0.0094	0.0121	-0.0002	-0.0027	0.3537
2	Days to 50% flowering	P	0.0007	-0.0161	-0.0059	0.0008	0.0064	0.0015	0.0051	0.0034	0.0012	0.0008	0.0006	-0.1217
		G	0.0011	-0.0161	-0.0073	0.0010	0.0075	0.0023	0.0059	0.0042	0.0019	0.0011	0.0013	-0.1585
3	Days to maturity	P	0.0004	-0.0010	-0.0028	0.0004	0.0012	0.0006	0.0006	0.0007	0.0005	-0.0003	-0.0002	-0.2736
		G	-0.0012	0.0025	0.0056	-0.0015	-0.0029	-0.0013	-0.0014	-0.0017	-0.0012	0.0009	0.0008	-0.3203
4	First flowering node	P	0.0000	0.0001	0.0002	-0.0012	-0.0001	-0.0002	0.0000	0.0002	0.0000	0.0001	0.0000	0.1114
		G	-0.0003	-0.0005	-0.0021	0.0079	0.0009	0.0020	-0.0003	-0.0014	-0.0003	-0.0009	0.0002	0.1824
5	No.of branches/plant	P	0.0000	0.0019	0.0021	-0.0004	-0.0048	-0.0010	-0.0009	-0.0005	0.0000	0.0010	0.0008	0.1984**
		G	0.0000	-0.0016	-0.0018	0.0004	0.0035	0.0010	0.0009	0.0005	0.0000	-0.0008	-0.0006	0.2496**
6	No.of fruits/plant	P	0.1625	-0.0793	-0.1796	0.1230	0.1881	0.8598	0.0823	0.0147	0.0194	0.0149	0.0082	0.8749**
		G	0.1684	-0.1120	-0.1824	0.1963	0.2148	0.7777	0.1486	0.0779	0.0800	-0.1158	-0.1546	0.8569**
7	Length of the fruit	P	0.0009	-0.0017	-0.0011	-0.0001	0.0011	0.0005	0.0053	0.0024	0.0023	0.0002	-0.0003	0.2884
		G	0.0020	-0.0029	-0.0019	-0.0003	0.0020	0.0015	0.0079	0.0044	0.0043	0.0004	-0.0004	0.4343*
8	Diameter of the fruit	P	-0.0013	0.0017	0.0018	0.0013	-0.0008	-0.0001	-0.0035	-0.0079	-0.0039	-0.0002	0.0002	0.2401**
		G	0.0053	-0.0061	-0.0072	-0.0042	0.0037	0.0023	0.0131	0.0235	0.0166	0.0026	-0.0004	0.4362**
9	Ten pods weight	P	0.0852	-0.0343	-0.0796	-0.0154	-0.0036	0.0103	0.1955	0.2238	0.4549	-0.0561	-0.0905	0.4873
		G	0.1333	-0.0528	-0.1015	-0.0174	0.0033	0.0468	0.2479	0.3215	0.4547	-0.0924	-0.1347	0.5908*
10	Node at mosaic daisease appears	P	-0.0013	0.0017	-0.0036	0.0033	0.0072	-0.0006	-0.0010	-0.0009	0.0043	-0.0345	-0.0300	-0.0916
		G	0.0001	0.0018	-0.0044	0.0031	0.0068	0.0041	-0.0014	-0.0031	0.0056	-0.0278	-0.0257	-0.2866*
11	Days at first mosaic symptom appear	P	0.0006	0.0008	-0.0019	0.0000	0.0034	-0.0002	0.0010	0.0004	0.0042	-0.0183	-0.0211	-0.1329
		G	0.0037	0.0048	-0.0080	-0.0013	0.0102	0.0115	0.0027	0.0010	0.0171	-0.0536	-0.0578	-0.3746*

Table 4: Phenotypic(Rp) And Genotypic(Rg) Path Coefficients Of Yield Components On Fruit Yield Per Plant In Crosses Of Okra

Residual Effect (Phenotypic) = 0.1116

Residual Effect (Genotypic) =0.0599

Diagonal : Direct Effects

Non-Diagonal : Indirect Effects

** , ** Significant At 5% And 1% Levels Respectively*

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