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Short Communication

Correlation and path analysis in oriental pickling melon

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Oriental pickling melon (*Cucumis melo* L.var *conomon*) is native of India and it belongs to cucurbitaceae family with chromosome number 2n=24. In Andhra Pradesh, the vegetable is popularly known as cooking melon (or) Dosa kaya (Telugu). It is a warm season crop, basically cross pollinated with predominately monoecious sex expression. It is commonly cooked as curry, added in sambar or soup, daal and also in making *dosa-aavakaaya* (Indian pickle) and chutney. The fruits contain 285 mg phosphorus, 150 mg calcium, and 100 mg iron per 100 gram of pulp. For a successful improvement programmae, it is extremely important to study the inter-relationships among various characters. Therefore, it is important to know the association between yield and its components as it would provide valuable information about the correlated response to selection. The knowledge of correlation alone does not present the complete picture, since the understanding of direct and indirect effects of important yield contributing traits is necessary for selecting high yielding genotypes. Path analysis separates the correlation coefficients into components of direct and indirect effects.

The experimental material consisted of 46 oriental pickling melon genotypes. Out of 46 germplasm lines of Oriental Pickling Melon 45 were obtained from NBPGR, Hyderabad and remaining 1 was obtained from Vegetable Research Station, ARI, Rajendranagar. The experiment was laid out in randomized block design with 46 treatments and two replications during kharif of 2012 at Vegetable Research Station, Agriculture Research Institute, Rajendranagar, Hyderabad, Andhra Pradesh. The seeds were sown at a spacing of 3m from row to row and 0.5 m from plant to plant with in a row. The recommended package of practices was followed. Necessary plant protection measures were carried out uniformly to safe guard the germplasm lines. Observations on node number of first male flower, node number of first female flower, days to first male flower, days to first female flower, number of primary branches per vine, vine length (cm), days to first fruit harvest, number of fruits per vine, fruit length (cm), fruit girth (cm), flesh thickness(cm), average fruit weight (g), placenta weight per fruit (g), seed cavity length (cm), seed cavity width (cm), 100 seed weight (g), total soluble solids (^{0}Brix) and yield per vine (kg) for each genotype were recorded from five randomly selected plants per replication. The analysis of variance was carried out according to the standard procedure suggested by Panse and Sukhatme (1967). The correlation coefficients at phenotypic and genotypic levels were estimated according to methods suggested by A1-Jibouri *et al* (1958) and path coefficient analysis was done according to Dewey and Lu (1959).

The phenotypic and genotypic correlation coefficients between different characters studied are presented in Table 1. From the perusal of table in general the magnitudes of genotypic correlation coefficients were higher than phenotypic correlation coefficients indicating strong association among various characters studied. The correlation study indicated that all the characters except node of first male flower, days to first male flower and vine length had significant positive association with fruit yield per vine at both phenotypic and genotypic levels and number of primary branches at phenotypic level. So improvement in fruit yield is possible by taking characters that had significant positive association with fruit yield per vine as criteria in selection scheme. Similar results were also reported by Ramana (2011) in oriental pickling melon; Reddy *et al*. (2007) in snap melon; Yadav and Ram (2002) and Tomar *et al*. (2008) in musk melon.

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Table 1: Association among eighteen yield components and fruit yield attributes in 46 genotypes of oriental pickling melon

Characters		Node number of first male flower	Days to first male flower	Node number of first female flower	Days to first female flower	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Flesh thickness (cm)	Placenta weight per fruit (g)	Days to first fruit harvest	Seed cavity width (cm)	Seed cavity length (cm)	TSS (°Brix)	Number of fruits per vine	Vine length (cm)	Number of primary branches per vine	100 Seed weight (g/fruit)	Yield per Vine (kg)
Node number of first male flower	P	1.000	0.766**	-0.010	-0.0007	0.106	0.062	-0.007	-0.0259	0.114	-0.073	-0.004	0.054	0.088	-0.069	-0.130	-0.108	0.084	0.122
	G	1.000	0.875**	-0.039	-0.047	0.117	0.067	-0.005	-0.029	0.127	-0.097	-0.015	0.043	0.096	-0.080	-0.072	-0.094	0.089	0.125
Days to	P		1.000	-0.065	-0.088	0.117	0.121	0.009	0.015	0.138	-0.149	0.081	0.136	0.127	-0.072	-0.062	-0.048	0.091	0.130
first male flower	G		1.000	-0.144	-0.159	0.201*	0.214*	0.078	0.049	0.233*	-0.194	0.124	0.196	0.220*	-0.178	-0.051	-0.078	0.146	0.160
Node number of first female flower	P			1.000	0.939**	0.635**	0.563**	0.478**	0.536**	0.629**	0.952**	0.352**	0.553**	0.479**	-0.520**	0.105	0.059	0.627**	0.564**
	G			1.000	1.068**	0.681**	0.621**	0.558**	0.572**	0.663**	0.977**	0.376**	0.601**	0.522**	-0.630**	0.186	0.087	0.662**	0.608**
Days to first female flower	P				1.000	0.517**	0.440**	0.385**	0.416**	0.516**	0.928**	0.243*	0.433**	0.386**	-0.437**	0.100	0.049	0.503**	0.470**
	G				1.000	0.712**	0.631**	0.568**	0.581**	0.698**	1.0008	0.332**	0.603**	0.545**	-0.706**	0.268**	0.118	0.688**	0.691**
Fruit weight (g)	P					1.000	0.932**	0.799**	0.881**	0.949**	0.552**	0.750**	0.914**	0.834**	-0.736**	-0.055	0.025	0.977**	0.856**
	G					1.000	0.935**	0.813**	0.882**	0.954**	0.618*	0.740**	0.918**	0.836**	-0.746**	0.080	0.099	0.984**	0.940**
Fruit length (cm)	P						1.000	0.836**	0.887**	0.885**	0.517**	0.753**	0.977**	0.815**	-0.617**	-0.147	-0.059	0.902**	0.809**
	G						1.000	0.826**	0.893**	0.896**	0.602**	0.740**	0.988**	0.809**	-0.563**	0.005	0.028	0.917**	0.935**
Fruit girth (cm)	P							1.000	0.830**	0.755**	0.410**	0.615**	0.796**	0.798**	-0.529**	0.029	0.119	0.783**	0.691**
	G							1.000	0.862**	0.763**	0.505**	0.597**	0.808**	0.805**	-0.412**	0.355**	0.295**	0.826**	0.882**
Flesh thickness (cm)	P								1.000	0.841**	0.465**	0.651**	0.829**	0.789**	-0.551**	-0.069	-0.004	0.855**	0.804**
	G								1.000	0.842**	0.525**	0.640**	0.834**	0.795**	-0.533**	0.040	0.061	0.856**	0.885**
Placenta weight	P									1.000	0.551**	0.695**	0.855**	0.743**	-0.682**	-0.023	0.008	0.904**	0.827**
per fruit (g)	G									1.000	0.607**	0.690**	0.864**	0.740**	-0.710	0.075	0.059	0.906**	0.896**
Days to first fruit harvest	P										1.000	0.304**	0.512**	0.418**	-0.437**	0.055	0.016	0.533**	0.503**
	G										1.000	0.341**	0.581**	0.482**	-0.564**	0.117	0.041	0.590**	0.553**
Seed cavity	P											1.000	0.750**	0.692**	-0.596**	-0.112	0.035	0.742**	0.561**
width (cm)	G											1.000	0.729**	0.684**	-0.583**	-0.007	0.106	0.742**	0.633**
Seed cavity	P												1.000	0.788**	-0.615**	-0.133	-0.045	0.890**	0.793**
length (cm)	G												1.000	0.791**	-0.597**	-0.019	0.020	0.902**	0.890**
TSS (°Brix)	P													1.000	-0.614**	-0.037	0.067	0.891**	0.724**
	G													1.000	-0.586**	0.149	0.172	0.832**	0.837**
Number of fruits per vine	P														1.000	0.712**	0.146	-0.713**	-0.345**
	G														1.000	-0.063	0.020	-0.751**	-0.502**
Vine length (cm)	P															1.000	0.877**	-0.043	0.137
	G															1.000	0.924**	0.038	0.113
Number of primary branches per vine	P																1.000	0.037	0.203*
	G																1.000	0.084	0.180
100 Seed weight (g/fruit)	P																	1.000	0.855**
	G																	1.000	0.919**

Table 2: Direct and indirect effects of component characters on fruit yield in 46 genotypes of oriental pickling melon

Characters		Node number of first male flower	Days to first male flower	Node number of first female flower	Days to first female flower	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Flesh thickness (cm)	Placenta weight per fruit (g)	Days to first fruit harvest	Seed cavity Width (cm)	Seed cavity Length (cm)	TSS (°Brix)	Number of fruits per vine	Vine length (cm)	Number of primary branches per vine	100 Seed weight (g/fruit)	Correlation with Yield per Vine (kg)
Node number of first male flower	P	0.0273	0.0209	-0.0003	0.0000	0.0029	0.0017	-0.0002	-0.0007	0.0031	-0.0020	-0.0001	0.0015	0.0024	-0.0019	-0.0035	-0.0030	0.00230	0.1220
	G	0.2249	0.1968	-0.0089	-0.0106	0.0264	0.0151	-0.0012	-0.0067	0.0286	-0.0219	-0.0034	0.0098	0.0216	-0.0180	-0.0162	-0.0212	0.0201	0.1251
Days to first male flower	P	0.0182	0.0237	-0.0015	-0.0021	0.0028	0.0029	0.0002	0.0004	0.0033	-0.0036	0.0019	0.0032	0.0030	-0.0017	-0.0015	-0.0011	0.0022	0.1301
	G	-0.2121	-0.2423	0.0349	0.0387	-0.0489	-0.0519	-0.0190	-0.0121	-0.0565	0.0470	-0.0301	-0.0477	-0.0543	0.0433	0.0124	0.0190	-0.0355	0.1608
Node number of first female flower	P	0.0017	0.0106	-0.1631	-0.1532	-0.1037	-0.0919	-0.0780	-0.0875	-0.1026	-0.1554	-0.0574	-0.0902	-0.0783	0.0849	-0.0172	-0.0097	-0.1023	0.5643
	G	0.0075	0.0272	-0.1890	-0.2019	-0.1287	-0.1173	-0.1055	-0.1082	-0.1255	-0.1847	-0.0711	-0.1136	-0.0987	0.1191	-0.0353	-0.0165	-0.1251	0.5087
Days to first female flower	P	0.0000	-0.0060	0.0643	0.0685	0.0355	0.0302	0.0264	0.0285	0.0354	0.0636	0.0167	0.0297	0.0265	-0.0299	0.0069	0.0034	0.0345	0.4706
	G	-0.0024	-0.0082	0.0548	0.0513	0.0365	0.0324	0.0292	0.0298	0.0358	0.0514	0.0171	0.0310	0.0280	-0.0363	0.0138	0.0061	0.0353	0.5192
Fruit weight (g)	P	0.0756	0.0830	0.4501	0.3665	0.7082	0.6603	0.5660	0.6242	0.6725	0.3910	0.5314	0.6479	0.5908	-0.5212	-0.0391	0.0183	0.6923	0.8563
	G	0.0005	0.0009	0.0030	0.0032	0.0045	0.0042	0.0036	0.0039	0.0043	0.0028	0.0033	0.0041	0.0037	-0.0033	0.0004	0.0004	0.0044	0.9403
Fruit length (cm)	P	-0.0135	-0.0262	-0.1211	-0.0947	-0.2005	-0.2150	-0.1797	-0.1909	-0.1903	-0.1112	-0.1620	-0.2101	-0.1754	0.1326	0.0316	0.0128	-0.1940	0.8099
	G	0.0083	0.0263	0.0762	0.0776	0.1148	0.1227	0.1014	0.1096	0.1100	0.0740	0.0909	0.1213	0.0993	-0.0691	0.0006	0.0035	0.1126	0.9350
Fruit girth (cm)	P	0.0010	-0.0012	-0.0584	-0.0470	-0.0976	-0.1021	-0.1221	-0.1014	-0.0896	-0.0501	-0.0752	-0.0972	-0.0975	0.0647	-0.0036	-0.0146	-0.0956	-0.6911
	G	0.0010	-0.0146	-0.1039	-0.1058	-0.1514	-0.1538	-0.1861	-0.1606	-0.1422	-0.0941	-0.1112	-0.1505	-0.1500	0.0767	-0.0662	-0.0550	-0.1538	0.8821
Flesh thickness (cm)	P	-0.0028	0.0017	0.0576	0.0447	0.0947	0.0953	0.0892	0.1074	0.0904	0.0500	0.0699	0.0891	0.0848	-0.0592	-0.0075	-0.0005	0.0918	0.8043
	G	-0.0018	0.0030	0.0339	0.0344	0.0522	0.0529	0.0510	0.0592	0.0498	0.0311	0.0379	0.0494	0.0471	-0.0316	0.0024	0.0036	0.0507	0.8854
Placenta weight per fruit (g)	P	0.0183	0.0222	0.1007	0.0826	0.1519	0.1415	0.1174	0.1346	0.1599	0.0881	0.1112	0.1368	0.1175	-0.1091	-0.0037	0.0014	0.1446	0.8275
	G	0.0562	0.1031	0.2934	0.3087	0.4219	0.3960	0.3376	0.3723	0.4420	0.2685	0.3052	0.3822	0.3273	-0.3140	0.0332	0.0262	0.4006	0.8967
Days to first fruit harvest	P	-0.0100	-0.0204	-0.1294	-0.1261	-0.0750	-0.0703	-0.0557	-0.0633	-0.0749	-0.1359	-0.0413	-0.0696	-0.0569	-0.0594	-0.0076	-0.0022	-0.0725	-0.5036
	G	-0.0058	-0.0116	-0.0585	-0.0599	-0.0371	-0.0361	-0.0303	-0.0315	-0.0364	-0.0599	-0.0204	-0.0348	-0.0289	-0.0338	-0.0070	-0.0025	-0.0354	-0.5531
Seed cavity width (cm)	P	0.0005	-0.0090	-0.0388	-0.0268	-0.0827	-0.0830	-0.0678	-0.0717	-0.0766	-0.0335	-0.1101	-0.0827	-0.0762	-0.0657	-0.0124	-0.0039	-0.0818	-0.5613
	G	0.0021	-0.0173	-0.0524	-0.0463	-0.1032	-0.1031	-0.0832	-0.0892	-0.0962	-0.0475	-0.1393	-0.1016	-0.0953	0.0813	-0.0011	-0.0148	-0.1035	-0.5336
Seed cavity length (cm)	P	0.0078	0.0194	0.0786	0.0615	0.1299	0.1388	0.1131	0.1178	0.1215	0.0728	0.1066	0.1420	0.1119	-0.0875	-0.0189	-0.0065	0.1264	0.7931
	G	0.0054	0.0245	0.0747	0.0750	0.1143	0.1228	0.1004	0.1037	0.1075	0.0722	0.0907	0.1243	0.0983	-0.0743	-0.0025	0.0025	0.1121	0.8907
TSS (°Brix)	P	0.0112	0.0161	0.0606	0.0488	0.1053	0.1029	0.1008	0.0997	0.0927	0.0528	0.0873	0.0994	0.1262	-0.0775	-0.0048	0.0085	0.1034	0.7249
	G	0.0248	0.0568	0.1347	0.1407	0.2157	0.2087	0.2078	0.2053	0.1910	0.1244	0.1764	0.2041	0.2579	-0.1513	0.0384	0.0444	0.2146	0.8379
No. of fruits per vine	P	-0.0395	-0.0412	-0.2972	-0.2493	-0.4199	-0.3520	-0.3023	-0.3144	-0.3892	-0.2496	-0.3404	-0.3514	-0.3505	0.5705	0.0984	0.0834	-0.4072	-0.3458
	G	-0.0326	-0.0727	-0.2562	-0.2874	-0.3036	-0.2291	-0.1675	-0.2168	-0.2889	-0.2295	-0.2373	-0.2431	-0.2385	0.4067	-0.0257	0.0084	-0.3058	-0.5025
Vine length (cm)	P	-0.0099	-0.0048	0.0080	0.0077	-0.0042	-0.0112	0.0023	-0.0053	-0.0017	0.0042	-0.0086	-0.0101	-0.0029	0.0131	0.0759	0.0666	-0.0033	0.1379
	G	-0.0086	-0.0061	0.0224	0.0322	0.0096	0.0006	0.0426	0.0048	0.0090	0.0140	-0.0009	-0.0024	0.0178	-0.0076	0.1197	0.1106	0.0046	0.1133
Number of primary branches per vine	P	-0.0031	-0.0014	0.0017	0.0014	0.0007	-0.0017	0.0035	-0.0001	0.0003	0.0005	0.0010	-0.0013	0.0019	0.0042	0.0254	0.0289	0.0011	0.2037
	G	0.0005	0.0004	0.0005	0.0006	0.0005	0.0002	0.0016	0.0003	0.0003	0.0002	0.0006	0.0001	0.0009	0.0001	0.0051	0.0055	0.0005	0.1803
100 seed weight(g)	P	0.0393	0.0426	0.2937	0.2359	0.4579	0.4227	0.3669	0.4005	0.4235	0.2499	0.3478	0.4169	0.3836	-0.3342	-0.0206	-0.0174	0.4684	0.8552
	G	0.0582	0.0955	0.4320	0.4490	0.6425	0.5986	0.5390	0.5585	0.5913	0.3853	0.4845	0.5884	0.5428	-0.4905	0.0253	0.0550	0.6523	0.9195

The estimation of direct and indirect effects of different characters on fruit yield per vine is presented in Table 2. The path coefficient analysis showed that 100 seed weight at both genotypic and phenotypic levels, placenta weight per fruit at genotypic level and fruit weight at phenotypic level exhibited high positive direct effect on yield per vine and these traits recorded significant, positive correlation with fruit yield per vine. It clearly indicates that direct selection based on these characters would be effective for an increase in yield. Similar results were also reported by Ramana (2011) in oriental pickling melon; Prasad *et al*. (1992) in cucumber; Singh and Lal (2005) in musk melon and Kumar *et al*. (2007) in bottle gourd.

Number of fruits per vine with high positive direct effect on yield at both genotypic and phenotypic levels showed negative significant correlation at genotypic and phenotypic levels suggesting restricted selection model to make use of the direct effect. Similar results were also reported by Hossain *et al*. (2010) in cucumber and Tomar *et al*. (2008) in musk melon. Selection of genotypes with heavier seeds and large fruits with higher placenta weight is desirable for improved yield in oriental pickling melon. In this study, the residual effect at genotypic level was low (0.0943) indicating that 90.57% of the variability in yield has been explained by the yield attributes included in the experiment. Correlation and path analysis revealed that the traits like fruit weight, placenta weight per fruit and 100 seed weight are regarded as primary yield contributing components which can be effectively utilized through selection in oriental pickling melon varietal improvement programmae.

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