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Correlation and Path Analysis for Yield and Yield Components in Pointed Gourd (*Trichosanthes dioica* Roxb.)

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A B S T R A C T

Correlation and path analysis for 17 traits were conducted for 22 genotypes of pointed gourd during 2016-17 at College of Horticulture, Dr. Y. S. R. Horticultural University, Venkataramannagudem, West Godavari district, Andhra Pradesh. The genotypic correlation coefficients were greater than the phenotypic correlation coefficient. Correlation study indicated that the number of nodes per vine, fruit length, fruit weight, pulp weight per fruit, pulp seed ratio, number of fruits per plant had significant positive association with fruit yield (t/ha) at both phenotypic and genotypic levels. So, improvement in fruit yield per plant is possible by taking above characters as criteria in selection scheme. Path analysis revealed that number of fruits per plant and number of nodes per vine had the greatest direct effect on yield both at phenotypic and genotypic level. Thus, selection for these characters will improve the yield. The results indicated that number of fruits per plant and number of nodes per vine can be considered during selection for improved yield in pointed gourd.

Introduction

Pointed gourd (*Trichosanthes dioica* Roxb.), commonly known as parwal is one of the most important cucurbitaceous vegetable in India. It is a perennial and dioecious vegetable grown as vine with a pencil thickness stem. It is widely cultivated in Bihar, West Bengal, Odisha, Assam and Uttar Pradesh. Recently, it has been introduced in and around Hyderabad and Bangalore. The fruit is the edible part of the plant, which is cooked in various ways either alone or in combinations with other vegetables or meats. The fruits are easily digestible and diuretic in nature. Pointed gourd is rich in vitamin and minerals and contains 9.0 mg Mg, 2.6 mg Na, 83.0 mg K, 1.1 mg Cu and 17 mg S per 100 g edible part. Being rich in protein and vitamin A, it has certain medicinal properties and many reports are available regarding its role in circulatory system, especially in lowering total cholesterol and blood sugar (Chandrasekar *et al.*, 1988 and Sharma *et al.*, 1988).

Yield is a complex character which is highly influenced by environment, hence selection based on yield alone may limit the improvement, whereas yield component characters are less complex in inheritance and influenced by the environment to a lesser

extent. Thus, effective improvement in yield may be brought about through selection of various yield component characters, which show association among themselves and also with yield. Plant breeder has to find simple correlation and the extent of direct and indirect effects of attributes with seed yield that could be useful to predict superior cross combinations and to identify traits for ideal plant type and aid in indirect selection. Thus, the present investigation was undertaken with the view to estimate character association and direct and indirect effects in pointed gourd.

Materials and Methods

The present study was conducted at the College of Horticulture, Venkataramannagudem, and West Godavari District India during *Kharif* season of 2016. The location falls under the Agro-climatic zone no.10, East Coast Plain and Hills (Krishna-Godavari zone) with an average rainfall of 900 mm at an altitude of 34 m (112 feet) above mean sea level. Its geographical position is 16.83^0 N latitude and 81.5°E longitude. It experiences hot humid summer and mild winters. The treatment comprised of twenty two genotypes of pointed gourd. Twenty two pointed gourd genotypes were collected from Odisha, West Bengal, Bihar and Jharkhand (Table 1). The experiment was laid out in a Randomized Block Design (RBD) with three replications. Recommended cultural practices were followed through the growth period to raise a good crop.

Pits of size 50 x 50 x 30 cm were dug and filled with soil, cow dung and sand mixed in equal proportion Manures and fertilizers were applied as per recommendation of Rashid (1993) N, P_2O_5 and K_2O (62.10 kg, 86.40kg and 60 kg) were applied in the form of Urea, Single Super Phosphate (SSP) and Muriate of Potash (MOP). All the cultural practices were followed in order with almost care and attention. The observations were recorded on main vine length, number of nodes per vine, internodal length, days to opening of first male flower appeared, days to opening of first female flower appeared, node at which first male flower appeared, node at which first female flower appeared, days to first harvest, fruit length, fruit breadth, fruit weight, pulp weight per fruit, pulp seed ratio, number of fruits per plant, fruit yield, number of seeds per fruit and seed weight per fruit.

Results and Discussion

Correlation studies showed that for most of the characters, genotypic correlation was higher than the corresponding phenotypic correlation (Table 1). This could be interpreted on the basis that there was a strong inherent genotypic relationship between the characters under study, but their phenotypic expression was impeded by the influences of environmental factors. The correlation coefficient at both genotypic and phenotypic levels indicated that fruit yield per plant was significantly and positively correlated with number of nodes per vine, fruit length, fruit weight, pulp weight per fruit, pulp seed ratio, number of fruits per plant at both genotypic and phenotypic level. Similar results were also reported by Singh *et al.*, (1993), Sarkar *et al.*, (1999), Dora *et al.*, (2002), Singh *et al.*, (2007) and Khan *et al.*, (2009) in pointed gourd. Negative and significant correlation of fruit yield per plant was observed with days to opening of first female flower, node at which first male flower, node at which first female flower, days to first harvest, main vine length, internodal length at both genotypic and phenotypic level (Figs. 1 and 2).

The path analysis (Table 2) indicated that number of fruits per plant, nodes per vine, internodal length, node at which first male flower appeared, days to first harvest and pulp weight per fruit had direct positive effects on fruit yield (t/ha) at phenotypic and genotypic levels.

Table.1 Genotypic and phenotypic correlation matrix among different characters in genotypes of pointed gourd

S. No.	Characters		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Main vine length(m)	r_g	**1.0000**															
		r_p	**1.0000**															
2.	Number of nodes Per vine	r_g	-1.000**	**1.000**														
		r_p	-0.747**	**1.000**														
3.	Inter nodal length(cm)	r_g	1.000**	-1.000**	**1.000**													
		r_p	0.914**	-0.939**	**1.000**													
4.	Days to opening 1st male flower	r_g	-0.402**	0.072	-0.279*	**1.000**												
		r_p	-0.155	0.076	-0.159	**1.000**												
5.	Days to opening 1st female flower	r_g	-0.158*	-0.086	-0.120	1.000**	**1.000**											
		r_p	-0.022	0.014	-0.054	0.343**	**1.000**											
6.	Node at which 1st male flower appeared	r_g	0.556**	-0.542**	0.498**	0.735**	0.478**	**1.000**										
		r_p	0.205	-0.463**	0.356*	0.335	0.181	**1.000**										
7.	Node at which 1st female flower appeared	r_g	0.309*	-0.365**	0.303*	0.750**	0.616**	0.956**	**1.000**									
		r_p	0.138	-0.332**	0.237*	0.313**	0.249*	0.751**	**1.000**									
8.	Days to 1st harvest	r_g	0.524**	-0.554**	0.506**	0.039	-0.213	0.486**	0.468**	**1.000**								
		r_p	0.289*	-0.363**	0.343**	0.092	-0.015	0.329**	0.241*	**1.000**								
9.	Fruit length (cm)	r_g	-0.816**	0.751**	-0.762**	0.170	-0.160	-0.393**	-0.368**	-0.541**	**1.000**							
		r_p	-0.561**	0.621**	-0.642**	0.023	-0.000	-0.236	-0.110*	-0.167	**1.000**							
10.	Fruit breadth (cm)	r_g	-0.163	0.158	-0.206	0.325**	0.495**	0.033	0.081	0.033	-0.336**	**1.000**						
		r_p	-0.053	0.109	-0.136	0.194	0.112	-0.010	0.088	0.049	-0.152	**1.000**						
11.	Fruit weight (g)	r_g	-1.000**	0.948**	-0.939**	0.181	-0.113	-0.546**	-0.460**	-0.457**	0.836**	0.193	**1.000**					
		r_p	-0.720**	0.826**	-0.833**	0.087	-0.103	-0.388**	-0.346**	-0.237*	0.658**	0.170	**1.000**					
12.	Pulp weight per fruit(g)	r_g	-0.982**	0.920**	-0.912**	0.146	-0.193	-0.519**	-0.446**	-0.425**	0.855**	0.176	1.000**	**1.000**				
		r_p	-0.693**	0.846**	-0.838**	0.095	-0.050	-0.449**	-0.429**	-0.271*	0.638**	0.184	0.915**	**1.000**				
13.	Pulp seed ratio	r_g	-0.763**	0.685**	-0.698**	0.283*	-0.192	-0.199*	-0.214	-0.284*	0.587**	0.178	0.765**	0.755**	**1.000**			
		r_p	-0.575**	0.632**	-0.658**	0.107	-0.102	-0.146	-0.139	-0.143	0.495**	0.142	0.716**	0.694**	**1.000**			
14.	Number of fruits per plant	r_g	-0.794**	0.820**	-0.752**	-0.175	-0.492**	-0.631**	-0.638**	-0.632**	0.752**	-0.012	0.860**	0.875**	0.707**	**1.000**		
		r_p	-0.542**	0.745**	-0.678**	-0.090	-0.265*	-0.492**	-0.508**	-0.306*	0.626**	0.006	0.760**	0.770**	0.633**	**1.000**		
15.	Number of seeds per fruit	r_g	-0.025	0.065	-0.012	-0.259*	-0.176	-0.030	0.058	0.148	0.044	-0.234	0.043	0.023	-0.349**	-0.113	**1.000**	
		r_p	0.001	0.042	0.001	-0.175	-0.062	0.005	0.040	0.019	-0.018	-0.114	0.034	0.060	-0.320**	-0.101	**1.000**	
16.	Seed weight per fruit (g)	r_g	-0.125	0.105	-0.110	-0.103	0.184	-0.188	-0.156	-0.257*	0.168	-0.026	0.140	0.147	-0.501**	-0.014	0.574**	**1.000**
		r_p	0.010	0.103	-0.067	0.028	0.104	-0.178	-0.166	-0.152	0.127	-0.013	0.068	0.116	-0.532**	0.035	0.467**	**1.000**
17.	Fruit yield(t/ha)	r_g	-0.921**	0.907**	-0.856**	-0.113	-0.465**	-0.628**	-0.553**	-0.566**	0.824**	-0.064	0.945**	0.935**	0.726**	0.999**	-0.016	0.054
		r_p	-0.627**	0.843**	-0.774**	-0.081	-0.194	-0.475**	-0.481**	-0.255*	0.695**	0.012	0.835**	0.867**	0.665**	0.899**	-0.017	0.055

*significant at 5% level, ** significant at 1 % level

Table.2 Genotypic and phenotypic path coefficient analysis among different characters in pointed gourd genotypes

S. No.	Characters		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Main vine length (m)	G	**-0.349**	0.390	-0.367	0.140	0.090	-0.194	-0.108	-0.183	0.285	0.057	0.350	0.343	0.266	0.277	0.008	0.043
		P	**-0.383**	0.286	-0.350	0.059	0.008	-0.078	-0.053	-0.110	0.215	0.020	0.272	0.266	0.220	0.207	-0.000	0.003
2.	Number of nodes Per vine	G	-0.928	**0.831**	-0.834	0.060	-0.071	-0.451	-0.303	-0.460	0.624	0.131	0.788	0.765	0.570	0.681	0.054	0.087
		P	-0.620	**0.831**	-0.780	0.063	0.012	-0.385	-0.276	-0.302	0.516	0.090	0.687	0.703	0.525	0.619	0.034	0.086
3.	Inter nodal length (cm)	G	0.346	-0.331	**0.329**	-0.092	-0.039	0.164	0.100	0.166	-0.251	-0.068	-0.309	-0.300	-0.230	-0.248	-0.004	-0.036
		P	0.855	-0.878	**0.936**	-0.148	-0.051	0.333	0.222	0.320	-0.600	-0.127	-0.780	-0.784	-0.616	-0.634	0.001	-0.063
4.	Days to opening 1st male flower	G	-0.067	0.012	-0.047	**0.168**	0.181	0.123	0.126	0.006	0.028	0.054	0.030	0.024	0.047	-0.029	-0.043	-0.017
		P	0.011	-0.005	0.011	**-0.074**	-0.025	-0.024	-0.023	-0.006	-0.001	-0.014	-0.006	-0.007	-0.008	0.006	0.013	-0.002
5.	Days to opening 1st female flower	G	-0.010	-0.003	-0.004	0.042	**0.039**	0.018	0.024	-0.008	-0.006	0.019	-0.004	-0.007	-0.007	-0.019	-0.006	0.007
		P	0.000	-0.000	0.001	-0.010	**-0.029**	-0.005	-0.007	0.000	0.000	-0.003	0.003	0.001	0.003	0.007	0.001	-0.003
6.	Node at which 1st male flower appeared	G	0.316	-0.308	0.283	0.417	0.272	**0.568**	0.543	0.276	-0.223	0.019	-0.310	-0.295	-0.113	-0.358	-0.017	-0.106
		P	0.013	-0.031	0.024	0.022	0.012	**0.067**	0.050	0.022	-0.016	-0.000	-0.026	-0.030	-0.009	-0.033	0.000	-0.012
7.	Node at which 1st female flower appeared	G	-0.211	0.250	-0.207	-0.513	-0.422	-0.654	**-0.684**	-0.321	0.252	-0.055	0.315	0.305	0.146	0.437	-0.039	0.107
		P	-0.004	0.010	-0.007	-0.009	-0.007	-0.022	**-0.030**	-0.007	0.006	-0.002	0.010	0.013	0.004	0.015	-0.001	0.005
8.	Days to 1st harvest	G	0.155	-0.164	0.150	0.011	-0.063	0.144	0.139	**0.296**	-0.160	0.010	-0.135	-0.126	-0.084	-0.187	0.043	-0.076
		P	0.018	-0.022	0.021	0.005	-0.000	0.020	0.015	**0.062**	-0.010	0.003	-0.014	-0.016	-0.008	-0.019	0.001	-0.009
9.	Fruit length (cm)	G	0.173	-0.159	0.161	-0.036	0.034	0.083	0.078	0.114	**-0.212**	0.071	-0.177	-0.181	-0.124	-0.159	-0.009	-0.035
		P	-0.068	0.076	-0.078	0.002	-0.000	-0.029	-0.025	-0.020	**0.122**	-0.018	0.080	0.078	0.060	0.0767	-0.002	0.015
10.	Fruit breadth (cm)	G	0.037	-0.036	0.047	-0.074	-0.113	-0.007	-0.018	-0.007	0.077	**-0.229**	-0.044	-0.040	-0.040	0.002	0.053	0.006
		P	0.000	-0.001	0.001	-0.002	-0.001	0.000	-0.000	-0.000	0.001	**-0.010**	-0.001	-0.001	-0.001	-0.000	0.001	0.000
11.	Fruit weight (g)	G	0.248	-0.235	0.233	-0.045	0.028	0.135	0.114	0.113	-0.207	-0.048	**-0.248**	-0.259	-0.190	-0.213	-0.010	-0.034
		P	0.000	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	-0.000	**-0.000**	-0.000	-0.000	-0.000	0.000	0.000
12.	Pulp weight per fruit(g)	G	-0.003	0.002	-0.002	0.000	-0.000	-0.001	-0.001	-0.001	0.002	0.000	0.003	**0.003**	0.002	0.002	0.000	0.000
		P	-0.278	0.339	-0.336	0.038	-0.020	-0.180	-0.172	-0.108	0.256	0.073	0.367	**0.401**	0.278	0.309	0.024	0.046
13.	Pulp seed ratio	G	0.095	-0.086	0.087	-0.035	0.024	0.025	0.026	0.035	-0.073	-0.022	-0.096	-0.094	**-0.125**	-0.088	0.043	0.062
		P	0.027	-0.029	0.031	-0.005	0.004	0.006	0.006	0.006	-0.023	-0.006	-0.033	-0.032	**-0.047**	-0.029	0.015	0.025
14.	Number of fruits per plant	G	-0.715	0.738	-0.677	-0.157	-0.443	-0.568	-0.575	-0.570	0.677	-0.010	0.775	0.788	0.637	**0.900**	-0.102	-0.012
		P	-0.199	0.274	-0.250	-0.033	-0.097	-0.181	-0.187	-0.112	0.230	0.002	0.280	0.283	0.233	**0.368**	-0.037	0.013
15.	Number of seeds per fruit	G	0.000	-0.002	0.000	0.008	0.005	0.001	-0.001	-0.004	-0.001	0.007	-0.001	-0.000	0.011	0.003	**-0.031**	-0.018
		P	0.000	-0.002	-0.000	0.010	0.003	-0.000	-0.002	-0.001	0.001	0.006	-0.002	-0.003	0.018	0.005	**-0.058**	-0.027
16.	Seed weight per fruit (g)	G	-0.009	0.008	-0.008	-0.008	0.014	-0.014	-0.012	-0.020	0.013	-0.002	0.010	0.011	-0.039	-0.001	0.044	**0.077**
		P	0.000	-0.002	0.001	-0.000	-0.002	0.004	0.003	0.003	-0.002	0.000	-0.001	-0.002	0.012	-0.000	-0.010	**-0.023**
17.	Fruit yield(t/ha)	G	**-0.921**	**0.907**	**-0.856**	**-0.113**	**-0.465**	**-0.628**	**-0.553**	**-0.566**	**0.824**	**-0.064**	**0.945**	**0.935**	**0.726**	**0.999**	**-0.016**	**0.054**
		P	**-0.627**	**0.843**	**-0.774**	**-0.081**	**-0.194**	**-0.475**	**-0.481**	**-0.255**	**0.695**	**0.012**	**0.835**	**0.867**	**0.665**	**0.899**	**-0.017**	**0.055**

Genotypic Residual effect = SQRT (1-1.0321), Phenotypic Residual effect = 0.2686; Diagonal (under lined) values indicate direct effects

Fig.1 Genotypic path diagram representing direct and indirect effects for fruit yield (t/ha) of pointed gourd

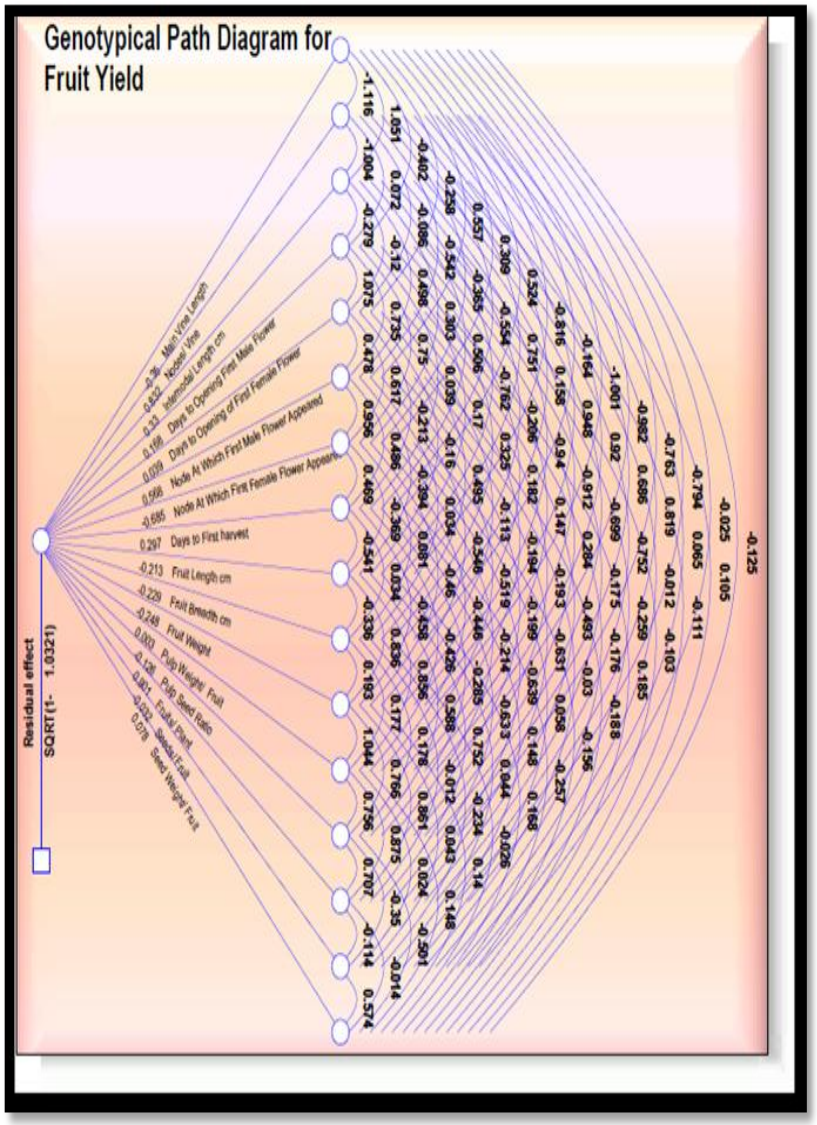
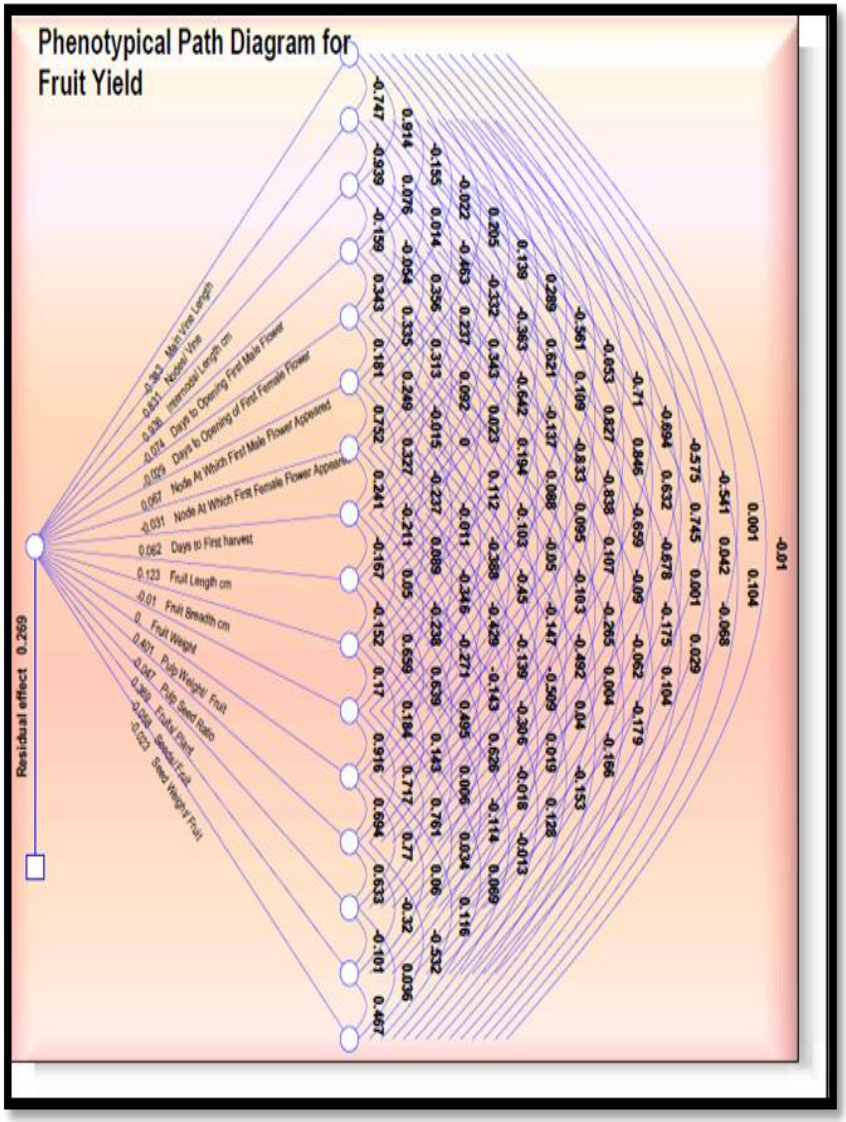


Fig.2 Phenotypic path diagram representing direct and indirect effects for fruit yield (t/ha) of pointed gourd



Based on the results of path analysis, the present study revealed that major emphasis should be laid on number of fruits per plant, number of nodes per vine, internodal length and pulp weight per fruit, and there should be economic balance among these traits to get higher fruit yield.

Therefore, effective selection could be made based on these characters for improvement of fruit yield in pointed gourd.

Corroborating the findings of present investigation positive and direct effect on fruit yield per plant has also been reported by Singh and Prasad (1989), Singh *et al.*, (1993) in pointed gourd and by Islam *et al.*, (2009) in bitter gourd.

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