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Character association and path analysis of sweet potato [*Ipomoea batatas* (L.) Lam.] genotypes

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ABSTRACT

A field experiment was conducted using 30 sweet potato genotypes to study the relationship between yield and yield attributing characters. The genotypes were characterized based on response for 11 quantitative and 7 qualitative characters Correlation and path coefficient analyses were carried out for 18 characters of yield and its components. Character association indicated that tuber yield per hectare was positively and significantly associated with number of tubers per plant, tuber yield per plant and â-carotene content at phenotypic and genotypic correlation levels and tuber yield per plant had positively and significantly associated with vine length, vine internodal length, leaf area and tuber girth at both phenotypic and genotypic levels. Path analysis indicated that number of branches per plant, root length, root yield per plant and starch had direct effect on tuber yield per hectare; the remaining characters had negligible to low and moderate indirect effects through other component characters. Number of tubers per plant, tuber yield per plant and â-carotene content can be used for improvement of sweet potato.

***Keywords*:** Correlation studies, direct effects, sweet potato, indirect effects, tuber yield,

Sweet potato, [*Ipomoea batatas* (L.) Lam.] is a dicotyledonous plant belonging to the family convolvulaceae. It is an important tuber crop grown in over more than 166 countries of the tropics, sub-tropics and warm temperate regions of the world. Sweet potato is a highly heterozygous cross pollinated crop in which many of the traits show continuous variation. Breeding programes to develop high yielding varieties depends on the nature and magnitude of variation in available genotypes. However, yield is a complex character and its direct improvement is difficult. Crop improvement for yield is possible through selection for desired component characters. Therefore knowledge of the relationship that exists between storage root yield and other yield contributing characters and also interrelationships among various characters and their direct and indirect contribution toward yield is necessary to be able to design appropriate selection criteria in sweet potato breeding programme (Grafuis, 1959).

Correlation analysis provides information about the degree of relationship between important plant traits and is also a good index to predict yield response in relation to the change of a particular character. When higher numbers of variables are considered in correlation, the association becomes more complex. Use of path coefficient analysis would be more appropriate because it describes direct and indirect associations and identifies the most reliable yield-contributing characters (Dewey and Lu, 1959). This research was undertaken to characterize quantitative and qualitative characters and identification of yield-contributing characters to determine the relationship among characters and their association with yield of sweet potato.

MATERIALS AND METHODS

The experiment was conducted at the experimental farm of the Dept. of Vegetable Science, Horticultural College & Research Institute of Dr. Y.S.R. Horticultural University, Andhra Pradesh, India. This location was at 16.83^0 N latitude and 81.5°E longitude with an average rainfall of 900 mm at an altitude of 34 m above mean sea level. Well matured healthy and disease free cuttings of previous season of 30 genotypes were used as planting material for the experiment. The cuttings of 20-30 cm in length were planted in primary nursery at a distance of 30 cm between rows and 20 cm in the row. Ultimately when the nursery vines reach a sufficient length, the cuttings were made and planted in the secondary nursery. After one month, healthy cuttings of 20-30 cm in length with 3-4 nodes were planted in the main field. The cuttings obtained from apical and middle portion of vine have been found to produce larger number of sprouts and higher yield of tubers than basal cuttings. (Nedunchezhiyan *et al.* 2008). Manures and fertilizers were applied as per the recommendations of Central Tuber Crop Research Institute (ICAR) *i.e.* 10 t

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ha^{-1} of farmyard manure and $N:P_2O_5:K_2O$ @ 70:60:100 kg ha^{-1}. The field was brought to a fine tilth and 10 t ha^{-1} of well-decomposed cow dung manure was mixed with the soil during land preparation. The experiment was arranged in a Randomized Complete Block Design with three replications in 3.0 × 2.4 m plots. Seven-week old cuttings of at least 20-30 cm length with 3 to 4 nodes were transplanted manually at a spacing of 60 × 20 cm between and within rows and 5-7cm depth. Plots were kept free from weeds by regular hand weeding. Observations were recorded for 11 quantitative characters (vine length, vine intermodal length, petiole length, number of branches per plant, number of leaves per plant, total leaf area, number of roots per plant, root length, root girth, root yield per plant and root yield per hectare) and 7 qualitaty related traits like, plant dry matter content, root dry matter content and, â-carotene content, starch content, total sugars, reducing sugars and non reducing sugars. For each character data were recorded on five randomly selected plants from the middle two rows of each plot and expressed on per plant basis. The mean values of five plants were used for statistical analysis.

The phenotypic and genotypic correlation coefficients between variables were calculated using covariance (AlJibouri *et al.*, 1958). The phenotypic and genotypic correlations among yield and other character were computed as:

$$r_g\,(xy) = \frac{Cov_g\,(xy)}{\sqrt{ó^2_g\,(x)\cdot ó^2_g\,(y)}}$$

$$r_p\,(xy) = \frac{Cov_p\,(xy)}{\sqrt{ó^2_p\,(x)\cdot ó^2_p\,(y)}}$$

where $r_g(xy)$ and $r_p(xy)$ are the genotypic and phenotypic correlation coefficients, respectively; Cov_g and Cov_p are the genotypic and phenotypic covariance of x and y, respectively; and $ó^2_g$ and $ó^2_p$ are the genotypic and phenotypic variance of x and y, respectively. The significance of the correlation coefficients was tested by comparing phenotypic correlation coefficients with table values (Fisher and Yates, 1963) at *n* " 2 degrees of freedom at the 5% and 1% levels where *n* denotes the total number of pairs of observations used in the calculation. Direct and indirect contributions of various characters to yield were calculated through path coefficient analysis according to Wright (1921) and elaborated by Dewey and Lu (1959). Path coefficients were obtained by simultaneous selection of the following equations, which express basic relationships between genotypic correlation *r* and path coefficients (*P*) as:

r14: P14 + P24 r12 +P34 r13
r24:P14 r21 +P24 +P34 r23
r34:P14 r31 +P24 r32 +P34

where, *r*14, *r*24, and *r*34 are genotypic correlations of component characters with yield (dependent variables) and *r*12, *r*13, and *r*23 are genotypic correlations among component characters (independent variables). Direct effects were calculated by the following set of equations:

P14 =C11 r14 +C12 r24 +C13 r34
P24 =C21 r14 +C22 r24 +C23 r34
P34 =C31 r14 +C32 r24 +C33 r34

where, C11, C12, C23, and C33 are constants. Doulittle technique as described by Goulden (1959); r12 P24, r13 P34, r21 P14, r23 P34, r31 P14, r32 P24 are indirect effects.

Residual effect

Residual effect measures the role of other possible independent variables not included in the study on the dependent variable. The residual effect is estimated with the help of direct effects and simple correlation coefficients were calculated as:

$P^2X4=1- P^214+P^224+P^234$ - 2 r12 P14P24 - 2 r13P14 P34 - 2 r23P24 P34

RESULTS AND DISCUSSION

Characters association

Phenotypic and genotypic correlation coefficients between yield and yield attributing characters varied (Table 1). In general, genotypic correlation was higher than the phenotypic correlation, indicating reduced environmental influence on characters.

Root yield per hectare was positively and significantly correlated with number of roots per plant, root yield per plant and â-carotene content where as negatively correlated with petiole length, total sugar, reducing sugar, non reducing sugars and plant dry matter content at both phenotypic and genotypic levels. These findings are in conformity with the results of Pillai and Amma (1990), Zhang and Xu (1994), Alam *et al.* (1998), Parida *et al.* (1999) and Hossain *et al.* (2000).

Vine length and Vine intermodal length was positively associated with number of branches per plant, number of leaves per plant, leaf area and root yield per plant. Number of branches per plant was positively associated with number of leaves per plant and leaf area. Total sugar was positively associated with reducing and non reducing sugars.

Number of roots per plant, root length and root girth was positively and significantly correlated with root yield per plant. Ibrahim *et al.* (1987) reported that number of roots per plant was positively and

Table 1: Phenotypic (P) and genotypic (G) correlation matrix among yield and yield attributes in sweet potato genotypes

Characters		Vine length (em)	Vine inter model length (cm)	Petiole length (cm)	No. of branches per plant	No. of leaves per plant	Total leaf area (cm^2)	No. of roots Plant^{-1}	Root length (cm)	Root girth (cm)	Root yield Plant^1 (g)	â-carotenc content (mg 100^{-1}g f.w.)	Strch %	Total sugar (%)	Reducing sugar (%)	Non reducing sugar (%)	Plant dry matter (%)	Root dry matter (%)
Vine length (cm)	G	1.0000																
	P	1.0000																
Vine inter nodal length(cm)	G	0.932**	1.000															
	P	0.745**	1.000															
Petiole length (cm)	G	- 0.254*	-0.237*	1.000														
	P	-0.172	-0.145	1.000														
No. of branches per plant	G	0.368**	0.466**	-0.534**	1.000													
	P	0.265*	0.328**	-0.464**	1.000													
No. of leaves per plant	G	0.504**	0.515**	-0.280**	0.324**	1.000												
	P	0.457**	0.414**	-0.265*	0.255*	1.000												
Total leaf area (È000 cm^2)	G	0.431**	0.312**	-0.267*	0.442**	0.535**	1.000											
	P	0.377**	0.272**	-0.237*	0.369**	0.520**	1.000											
No. of roots per plant	G	0.285**	0.296**	-0.252*	0.340**	0.260*	0.036	1.000										
	P	0.149	0.140	-0.161	0.147	0.174	0.017	1.000										
Root length (cm)	G	-0.422**	-0.243*	0.149	-0.454**	0.076	-0.305**	0.211*	1.000									
	P	-0.265*	-0.163	0.084	-0.198	0.028	-0.220*	0.035	1.000									
Root girth (cm)	G	-0.019	0.008	0.113	-0.019	-0.066	-0.149	0.197	0.071	1.000								
	P	0.001	0.006	0.096	-0.023	-0.063	-0.149	0.165	0.107	1.000								
Root yield per plant (g)	G	0.231*	0.268*	-0.342**	0.173	0.190	-0.170	1.097**	0.298**	0.367**	1.000							
	P	0.211*	0.210*	-0.269*	0.162	0.175	-0.142	0.647**	0.186	0.283**	1.000							
â-carotene (mg 100^{-1} g f.w.)	G	-0.100	-0.083	0.087	-0.240*	-0.289**	-0.209*	0.277**	0.438**	-0.042	0.284**	1.000						
	P	-0.083	-0.065	0.085	-0.218*	-0.275**	-0.201*	0.162	0.285**	-0.043	0.265*	1.000						
Starch (%)	G	-0.053	-0.206	0.043	-0.260*	0.214*	-0.028	0.071	-0.145	0.172	0.039	-0.334**	1.000					
	P	-0.020	-0.140	0.051	-0.256*	0.212*	-0.011	0.050	-0.085	0.159	0.041	-0.327**	1.000					
Total sugar (%)	G	-0.458**	-0.344**	0.280**	-0.219*	-0.209*	-0.192	-0.356**	0.190	-0.208*	-0.294**	-0.042	0.201*	1.000				
	P	-0.403**	-0.261*	0.250*	-0.210*	-0.205*	-0.183	-0.173	0.145	-0.165	-0.288**	-0.044	0.194	1.000				
Reducing sugar (%)	G	-0.449**	-0.319**	0.352**	-0.256*	-0.235*	-0.204*	-0.315**	0.176	-0.200	-0.286**	-0.004	0.196	0.982**	1.000			
	P	-0.393**	-0.242*	0.315**	-0.249*	-0.230*	-0.191	-0.141	0.132	-0.162	-0.288**	-0.007	0.190	0.980**	1.000			
Non reducing sugar (%)	G	-0.241*	-0.262*	-0.203*	0.071	0.023	-0.030	-0.342**	0.148	-0.132	-0.167	-0.192	0.110	0.521**	0.352**	1.000		
	P	-0.208*	-0.188	-0.178	0.084	0.023	-0.038	-0.211*	0.115	-0.078	-0.115	-0.181	0.093	0.493**	0.308**	1.000		
Plant dry matter (%)	G	-0.035	0.020	0.360**	-0.502**	-0.273**	-0.308**	-0.399**	0.125	-0.331**	-0.363**	0.181	-0.310**	-0.320**	-0.206*	-0.661**	1.000	
	P	0.020	0.068	0.120	-0.209*	-0.085	-0.161	-0.140	0.049	-0.123	-0.221*	0.093	-0.140	-0.125	-0.074	-0.270**	1.000	
Root dry matter (%)	G	0.378**	0.097	-0.004	0.286**	-0.200	0.355**	-0.232*	-0.647**	-0.103	-0.286**	-0.165	-0.074	-0.144	-0.203*	-0.207*	0.739**	1.000
	P	0.129	0.162	-0.055	0.185	-0.069	0.169	-0.002	-0.185	-0.035	-0.184	-0.075	-0.058	-0.044	-0.058	-0.044	0.299**	1.000
Root yield (t ha^{-1})	G	0.130	0.168	-0.415**	0.263*	0.060	-0.079	1.022**	0.196	0.276**	0.920**	0.278**	0.020	-0.319**	-0.291**	-0.268*	-0.409**	-0.285**
	P	0.162	0.160	-0.319**	0.157	0.063	-0.062	0.576**	0.148	0.199	0.732**	0.230*	0.020	-0.253*	-0.225*	-0.224*	-0.265*	-0.177

Table 1: Phenotypic (P) and genotypic (G) path matrix among yield and yield attributes in sweet potato genotypes

Characters		Vine length (em)	Vine inter model length (cm)	Petiole length (cm)	No. of branches per plant	No. of leaves per plant	Total leaf area (cm^2)	No. of roots $Plant^{-1}$	Root length (cm)	Root girth (cm)	Root yield $Plant^1$ (g)	â-carotenc content (mg 100^{-1}g f.w.)	Strch %	Total sugar (%)	Reducing sugar (%)	Non reducing sugar (%)	Plant dry matter (%)	Root dry matter (%)
Vine length (cm)	G	**-0.227**	-0.212	0.058	-0.084	-0.115	-0.098	-0.065	0.096	0.004	-0.053	0.023	0.012	0.104	0.102	0.055	-0.008	-0.086
	P	**0.046**	0.034	-0.008	0.012	0.021	0.017	0.007	-0.012	0.000	0.010	-0.004	-0.001	-0.018	-0.018	-0.009	0.001	0.006
Vine inter nodal length(cm)	G	0.191	**0.205**	-0.049	0.096	0.106	0.064	0.061	-0.050	0.002	0.055	-0.017	-0.042	-0.071	-0.066	-0.054	0.004	0.020
	P	0.041	**0.055**	-0.008	0.018	0.023	0.015	0.008	-0.009	0.000	0.012	-0.004	-0.008	-0.014	-0.013	-0.010	0.004	0.009
Petiole length (cm)	G	0.056	0.052	**-0.219**	0.117	0.061	0.058	0.055	-0.033	-0.025	0.075	-0.019	-0.010	-0.061	-0.077	0.045	-0.079	0.001
	P	0.042	0.036	**-0.245**	0.114	0.065	0.058	0.040	-0.021	-0.024	0.066	-0.021	-0.013	-0.061	-0.077	0.043	-0.029	0.014
No. of branches per plant	G	0.120	0.151	-0.174	**0.324**	0.105	0.144	0.110	-0.147	-0.006	0.056	-0.078	-0.084	-0.071	-0.083	0.023	-0.163	0.093
	P	-0.006	-0.007	0.010	**-0.022**	-0.006	-0.008	-0.003	0.004	0.001	-0.004	0.005	0.006	0.005	0.005	-0.001	0.005	-0.004
No. of leaves per plant	G	-0.218	-0.223	0.121	-0.140	**-0.432**	-0.231	-0.112	-0.033	0.028	-0.082	0.125	-0.093	0.090	0.101	-0.010	0.118	0.086
	P	-0.082	-0.075	0.048	-0.046	**-0.180**	-0.094	-0.031	-0.005	0.011	-0.031	0.050	-0.038	0.037	0.041	-0.004	0.015	0.012
Total leaf area (cm^2)	G	0.019	0.014	-0.012	0.020	0.024	**0.045**	0.002	-0.014	-0.007	-0.008	-0.009	-0.001	-0.009	-0.009	-0.001	-0.014	0.016
	P	0.024	0.017	-0.015	0.024	0.033	**0.064**	0.001	-0.014	-0.010	-0.009	-0.013	-0.001	-0.012	-0.012	-0.002	-0.010	0.011
No. of roots per plant	G	0.054	0.056	-0.048	0.064	0.049	0.007	**0.189**	0.040	0.037	0.207	0.052	0.013	-0.067	-0.059	-0.065	-0.075	-0.044
	P	0.024	0.023	-0.026	0.024	0.029	0.003	**0.165**	0.006	0.027	0.106	0.027	0.008	-0.029	-0.023	-0.034	-0.023	0.000
Root length (cm)	G	-0.221	-0.128	0.078	-0.238	0.040	-0.159	0.110	**0.523**	0.037	0.156	0.229	-0.076	0.099	0.092	0.078	0.065	-0.339
	P	-0.026	-0.016	0.008	-0.019	0.003	-0.021	0.003	**0.097**	0.010	0.018	0.028	-0.008	0.014	0.013	0.011	0.005	-0.018
Root girth (cm)	G	0.001	-0.001	-0.007	0.001	0.004	0.010	-0.013	-0.005	**-0.065**	-0.024	0.003	-0.011	0.013	0.013	0.009	0.021	0.007
	P	0.000	0.000	-0.001	0.000	0.001	0.002	-0.002	-0.001	**-0.010**	-0.003	0.000	-0.002	0.002	0.002	0.000	0.001	0.000
Root yield /plant (g)	G	0.138	0.160	-0.204	0.103	0.114	-0.102	0.654	0.178	0.219	**0.597**	0.169	0.023	-0.176	-0.171	-0.100	-0.217	-0.171
	P	0.101	0.101	-0.130	0.078	0.084	-0.068	0.311	0.089	0.136	**0.481**	0.127	0.020	-0.138	-0.139	-0.055	-0.106	-0.089
â-carotene (mg 100^{-1} g f.w.)	G	0.008	0.007	-0.007	0.019	0.023	0.017	-0.022	-0.035	0.003	-0.023	**-0.080**	0.027	0.003	0.000	0.015	-0.015	0.013
	P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**-0.001**	0.000	0.000	0.000	0.000	0.000	0.000
Starch (%)	G	-0.019	-0.073	0.015	-0.092	0.076	-0.010	0.025	-0.051	0.061	0.014	-0.118	**0.353**	0.071	0.069	0.039	-0.110	-0.026
	P	-0.001	-0.004	0.002	-0.008	0.006	0.000	0.002	-0.003	0.005	0.001	-0.010	**0.031**	0.006	0.006	0.002	-0.004	-0.002
Total sugar (%)	G	0.104	0.078	-0.064	0.050	0.047	0.044	0.081	-0.043	0.047	0.067	0.010	-0.046	**-0.227**	-0.223	-0.118	0.073	0.033
	P	1.426	0.924	-0.884	0.741	0.726	0.647	0.613	-0.512	0.583	1.017	0.156	-0.685	**-3.534**	-3.462	-1.741	0.442	0.155
Reducing sugar (%)	G	-0.066	-0.047	0.052	-0.038	-0.035	-0.030	-0.046	0.026	-0.029	-0.042	-0.001	0.029	0.145	**0.147**	0.052	-0.030	-0.030
	P	-1.287	-0.794	1.031	-0.815	-0.753	-0.627	-0.462	0.432	-0.532	-0.944	-0.021	0.624	3.210	**3.277**	1.009	-0.243	-0.190
Non reducing sugar (%)	G	0.059	0.065	0.050	-0.018	-0.006	0.007	0.084	-0.037	0.033	0.041	0.047	-0.027	-0.128	-0.087	**-0.246**	0.162	-0.051
	P	-0.108	-0.098	-0.092	0.044	0.012	-0.020	-0.109	0.059	-0.040	-0.059	-0.093	0.048	0.254	0.159	**0.516**	-0.140	0.023
Plant dry matter (%)	G	0.001	0.001	0.015	-0.021	-0.011	-0.013	-0.016	0.005	-0.014	-0.015	0.007	-0.013	-0.013	-0.008	-0.027	**0.041**	-0.030
	P	-0.004	-0.013	-0.023	0.040	0.016	0.031	0.027	-0.009	0.023	0.042	-0.018	0.027	0.024	0.014	0.051	**-0.190**	-0.057
Root dry matter (%)	G	0.065	0.017	-0.001	0.049	-0.034	0.061	-0.040	-0.111	-0.018	-0.049	-0.028	-0.013	-0.025	-0.035	0.035	-0.127	**0.172**
	P	-0.005	-0.007	0.002	-0.008	0.003	-0.007	0.000	0.008	0.001	0.008	0.003	0.002	0.002	0.002	-0.001	-0.013	**-0.042**
Root yield (t ha^{-1})	G	0.131	0.169	-0.415	0.264	0.060	-0.079	1.022	0.196	0.276	0.920	0.278	0.020	-0.319	-0.291	-0.268	-0.409	-0.286
	P	0.162	0.160	-0.319	0.157	0.063	-0.062	0.576	0.148	0.199	0.732	0.230	0.020	-0.253	-0.225	-0.223	-0.265	-0.177

Note: Phenotypic Residual effect = ***0.5881*** *; Genotypic Residual effect =* ***0.2285*** *; Bold and Diagonal (under lined) values indicates direct effect* significantly associated with root yield per plant. Naskar *et al.* (1986) reported that root length was positively associated with root yield per plant.

Number of roots per plant, root length, root girth and root yield per plant was positively and significantly correlated with â-carotene content. The results are similar to the findings of Evoor *et al.* (2008).

Path coefficient analysis

The correlation and path coefficients in combination can better describe cause-and-effect relationships between character pairs (Table 2). It was determined that the characters number of branches per plant, root length, root yield per plant, starch, reducing sugars and non reducing sugars had positive direct effect on root yield per hectare. Similar results were reported by Sahu *et al.* (2005) and Tirkey *et al.* (2011).

The indirect causal factors should be considered simultaneously for selection. Number of branches per plant, root length, root yield per plant, starch, reducing sugars and non reducing sugars were the important components for selection for higher yielding sweet potato genotypes.

Correlation study indicated that genotypic correlation coefficients were higher than phenotypic correlation coefficients indicating lesser phenotypic expression under the influence of environment. Number of roots per plant, root yield per plant and â-carotene content registered a positive significant correlation at both phenotypic and genotypic levels with root yield per hectare indicating the importance of these traits in selection for yield and are identified as yield attributing characters on which selection can be relied upon for the genetic improvement of yield of sweet potato.

Path coefficient analysis revealed that number of branches per plant, number of roots per plant, root length, root yield per plant, starch and reducing sugar exerted a high positive direct effect on root yield per hectare (t ha^{-1}). The high direct effect of these traits appeared to be the main factors for their strong association with root yield per hectare. Hence, direct selection for these traits should be effective indicating the effectiveness of direct selection. The estimates of residual variability demonstrate that most of the traits have been considered in the evaluation of selective potential of present material.

REFERENCES

Alam, S., Narzary, B. D. and Deka, B. C. 1998. Variability, character association and path analysis in sweet potato (*Ipomoea batatas* (L.) Lam.). *J. Agril. Sci. Soc.* **11**:77-81.

Al-Jibouri, H. A., Miller, P. A. and Robinson, H. V. 1958. Genotypic and environmental variances and co-variances in an upland cotton cross of interspecific origin. *Agron. J*., **50**:533-36.

Dewey, D. R. and Lu, K. H. 1959. Correlation and path analysis of components of crested wheat grass seed production. *Agron. J.*, **51**: 515-18.

Evoor, S., Patil, M. P., Madalageri, M. B., Mulge, R. and Gasti, V. D. 2008. Correlation and path analysis studies in sweet potato, *Ipomoea batatas* (L.) Lam. *Env. Eco.*, **26**:422-26.

Fisher, R. A. and Yates, F. 1963. *Statistical Tables for Biological, Agricultural and Medical Research.* Oliver and Boyd, London, pp. 46-63.

Goulden, C. H. 1959. *Methods of Statistical Analysis*. John Wiley & Sons, New York. USA.

Grafuis, J. E. 1959. Heterosis in barley. *Agr. J.*, **51**: 554-67.

Hossain, M. D., Rabbani, M. G. and Mollah, M. L. R. 2000. Genetic variability, correlation and path analysis of yield contributing characters in sweet potato. *Pak. J. Sci. Industr. Res.*, **43**:314-18.

Ibrahim, K.K. 1987. Correlation, causation and predictability for yield in sweet potato, *Ipomoea batatas* (L.) Lam. *J. Root Crops*, **13**: 21-24.

Naskar, S. K., Ravindran, C. D. and Srinivasan, G. 1986. Correlation and path analysis in sweet potato. *J. Root Crops*, **12**: 33-35.

Nedunchezhiyan, M., Naskar, S. K. and Byju, G. 2008. Performance of sweet potato, *Ipomoea batatas* (L.) Lam. varieties under shaded and open field conditions. *Indian J. Agril. Sci.*,**78**:974-77.

Parida, A. K., Bera, M. K. and Nandi, S. 1999. Identification of parameters influencing sweetpotato tuber yield under late planted rainfed condition. *Env. Eco.*, **17**: 971-74.

Pillai, P.K.T. and Amma, E. 1990. Variability in the hybrid progenies of sweet potato. *J. Root Crops*, **16**: 8-12.

Sahu, G. D., Singh, J. and Mehta, N. 2005. Correlation and path coefficient analysis in sweet potato. *Env. Eco.*, **23**: 207-11.

Tirkey, P. L., Singh, J., Chaurasia, P. C. and Sarnaik, D. A. 2011. Character association and path coefficient studies in sweet potato, *Ipomoea batatas* (L.) Lam. genotypes. *J. Pl. Dev. Sci.*, **3**:137-43.

Wright, S. 1921. Correlation and causation. *J. Agril. Res*., **20**: 557-85.

Zhang, L.Y. and Xu, P.L. 1994. Studies on the yield structure of sweet potatoes. *Jiangsu J. Agril. Sci*., **10**: 13-17.