INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

www.ijabpt.com Volume-5, Issue-1, Jan-Mar-2014 Coden : IJABPT Copyrights@ 2014

ISSN : 0976-4550

Received: 15th Oct-2013 *Revised: 28th Oct-2013* *Accepted: 04th Nov-2013*

Research article

CORRELATION AND PATH COEFFICIENT ANALYSIS IN GROUNDNUT *(ARACHIS HYPOGAEA L.)*

C. Pavan Kumar[1], R. Rekha[1], O. Venkateswarulu[2] and R.P. Vasanthi[2]

[1]Department of Genetics and Plant Breeding, S.V. Agricultural College, Tirupati-517502, A.P, India
[2]Senior scientist (PB), Agricultural Research Station, Podalakur, Nellore -524 034, Andhra Pradesh, India.
[3]Senior scientist (PB), Regional Agricultural Research Station, Tirupati-517 502, Andhra Pradesh, India.

ABSTRACT: Sixty six genotypes of groundnut were used to study the correlation and path analysis for yield and yield contributing characters. Correlation studies revealed that kernel yield was significantly and positively associated with pod yield per plant, number of mature pods per plant, shelling percentage, harvest index, sound mature kernel percentage, specific leaf weight at 60 DAS, protein content and oil content. Path coefficient analysis indicated that pod yield per plant and shelling percentage had high positive direct effect on kernel yield signifying the importance of these traits in the improvement of seed yield.

Key words: Correlation, Path coefficient analysis.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the chief protein rich vegetable oilseed crops of the world, which ranks thirteenth in its importance among the world food crops. It is a segmental allotetraploid (2n=40), self-pollinating annual legume and it is grown throughout the tropical, sub-tropical and warm temperate regions of the world. Its seeds are valued both for its oil and protein contents. The seeds contain about 40-48 per cent oil, 25 per cent protein and 18 per cent carbohydrates and are rich source of B-complex vitamins, especially thiamine and nicotinic acid but deficient in fat soluble vitamins A and D and almost lacking vitamin C. Groundnut oil contains a higher proportion of unsaturated fatty acids including essential fatty acids like linolenic acid and linoleic acids (Desai *et al.*, 1999). Thus, the crop has great future as oilseed as well as food crop. Correlation which is the primary tool of breeding programme only provides the amount of association of characters, while path coefficient analysis measures the direct influence of one variable upon another and facilitates the separation of correlation coefficients into components of direct and indirect effects (Dewey and Lu, 1959). Therefore, it is essential to identify the component characters through which yield can be improved. Thus, correlation in conjunction with path analysis would provide a better picture of cause and effect relationship between character pairs. Keeping this in view, the present study was carried out to formulate the selection strategies for improvement of kernel yield in groundnut.

MATERIAL AND METHODS

The material for the present investigation comprised of 66 genotypes of groundnut studied in randomized block design with three replications, during *rabi*, 2008-09 at Dryland Farm of Regional Agricultural Research Station, Tirupati. Each genotype was sown in two rows of 3 m length adopting recommended spacing of 22.5 x 10 cm. The biometrical observations were recorded for seventeen traits *viz.*, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of mature pods per plant, pod yield per plant, kernel yield per plant, 100 kernel weight, sound mature kernel percentage, shelling percentage, SPAD chlorophyll meter reading (SCMR) at 60 DAS, specific leaf area (SLA) at 60 DAS, specific leaf weight (SLW) at 60 DAS, harvest index, protein content (Lowry *et al.* 1951), sucrose content (Sadasivam and Manickam, 1961) and oil content (Yadav and Misra, 1994) for ten randomly selected plants per genotype per replication. The genotypic and phenotypic coefficients of correlation were calculated using the method given by Johnson *et al.* (1955) and path coefficient analysis were worked as suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of variance revealed the existence of significant differences among the genotypes for all the characters. The data on all the twelve characters which showed significant differences among the entries were subjected to statistical analysis. Estimation of correlation coefficients at phenotypic and genotypic levels was presented in Table 1.

The values of genotypic coefficients were higher than phenotypic coefficients revealed the influence of environment on the phenotypic expression. Kernel yield was significantly and positively correlated with pod yield per plant (r_p= 0.9397**, r_g= 0.9453**), number of mature pods per plant (r_p= 0.8145**, r_g= 0.8304**), shelling percentage (r_p= 0.7539**, r_g= 0.7730**), harvest index (r_p= 0.5291**, r_g= 0.5590**), sound mature kernel percentage (r_p= 0.4495**, r_g= 0.4247**), specific leaf weight at 60 DAS (r_p= 0.3274**, r_g= 0.4247**), protein content (r_p= 0.3520**, r_g= 0.3829**) and oil content (r_p= 0.3247**, r_g= 0.3407**). Such association indicates the possibility of selection of genotypes with higher pod yield, number of mature pods, shelling percentage, harvest index, sound mature kernel percentage, specific leaf weight at 60 DAS, protein content and oil content. Similar kind of positive association of kernel yield with pod yield shelling percentage were also reported by Mahalakshmi *et al.* (2005). Positive significant association of kernel yield with mature pods per plant and harvest index were also reported by Jayalakshmi *et al.* (2000). To know the direct and indirect effects of these traits on kernel yield, correlations were further partitioned into direct and indirect effects through path coefficient analysis (Table 2). The path analysis revealed that pod yield per plant and shelling percentage exerted high and positive direct effect for seed yield. These results were in accordance with Lakshmidevamma *et al.* (2004) for pod yield per plant and Durgarani *et al.* (1987) for shelling percentage. Pod yield per plant had positive indirect effects through number of mature pods per plant, harvest index, shelling percentage and sound mature kernel percentage whereas shelling percentage had positive indirect effects through sound mature kernel percentage. The results of correlation and path analysis indicated that pod yield per plant and shelling percentage were the major yield contributing characters as they showed positive and significant association with kernel yield and also had high positive effects. Thus these characters could be considered as the most important for selection in order to improve the kernel yield in groundnut.

Table 1: Phenotypic (r_p) and genotypic (r_g) correlation coefficients among seventeen characters in 66 genotypes of groundnut

Characters		Days to maturity	Plant height	Primary branches/ plant	Secondary branches/ plant	No. of mature pods/ plant	Pod yield/ plant	100 Kernel weight	Shelling per cent	Sound mature kernel (%)	SLA at 60 DAS	SLW at 60 DAS	SCMR at 60 DAS	Harvest Index	Oil content	Protein content	Sucrose content	Kernel yield/ plant
Days to maturity	r_p	1.0000	-0.1459	0.3552**	0.4014**	-0.0496	-0.0406	0.3518**	-0.1765	-0.1387	-0.3409**	-0.3200**	0.1360	-0.4705**	-0.1721	-0.1939	0.0968	-0.1017
	r_g	1.0000	-0.1438	0.3748**	0.4089**	-0.0526	-0.0509	0.3739**	-0.1883	-0.1427	-0.5610**	-0.3880**	0.2208	-0.4787**	-0.1746	-0.1967	0.0965	-0.1149
Plant height	r_p		1.0000	-0.1055	-0.0616	0.1906	0.2003	0.0055	0.3062**	0.0936	0.1129	0.2317	-0.0894	0.0366	0.1971	0.4307**	0.1784	0.2656*
	r_g		1.0000	-0.1122	-0.0664	0.2041	0.2156	0.0005	0.3302**	0.1011	0.2381*	0.2840*	-0.1497	0.0377	0.2134	0.4463**	0.2047	0.2829*
Primary branches/ plant	r_p			1.0000	0.3803**	-0.2054	-0.2008	0.1393	-0.2784*	-0.0988	-0.2106	-0.2469*	0.0868	-0.4207**	-0.1403	-0.2133	0.0892	-0.2544*
	r_g			1.0000	0.4009**	-0.2226	-0.2164	0.1593	-0.2971*	-0.0999	-0.2748*	-0.3018**	0.1542	-0.4455**	-0.1429	-0.2329	0.0987	-0.2720*
Secondary branches/ plant	r_p				1.0000	-0.2427*	-0.3010**	0.4552**	-0.3407**	-0.2661*	-0.3544**	-0.3720**	-0.1541	-0.5256**	0.0155	-0.1986	0.0604	-0.3532**
	r_g				1.0000	-0.2555*	-0.3182**	0.4872**	-0.3612**	-0.2748*	-0.5636**	-0.4578**	-0.2698*	-0.5337**	0.0168	-0.2127	0.0665	-0.3720**
No. of mature pods / plant	r_p					1.0000	0.9171**	-0.0039	0.3323**	0.2067	0.0503	0.2622*	-0.0602	0.5002**	0.2326	0.2795*	0.0616	0.8145**
	r_g					1.0000	0.9403**	-0.0331	0.3504**	0.2141	0.0581	0.3426**	-0.1228	0.5306**	0.2420*	0.3078**	0.0747	0.8304**
Pod yield/ plant	r_p						1.0000	-0.0002	0.4969**	0.3292**	0.0840	0.2775*	0.0221	0.5361**	0.2806*	0.3008**	0.0857	0.9397**
	r_g						1.0000	-0.0465	0.5315**	0.3452**	0.0995	0.3631**	0.0536	0.5723**	0.2955*	0.3368**	0.0988	0.9453**
100 Kernel weight	r_p							1.0000	0.0259	0.0324	-0.1659	-0.1497	0.0483	-0.3370**	0.1586	-0.1306	-0.0610	0.0158
	r_g							1.0000	0.0018	0.0281	-0.3302**	-0.1875	0.0624	-0.3585**	0.1725	-0.1509	-0.0577	-0.0277
Shelling percentage	r_p								1.0000	0.5485**	0.2924*	0.3140**	0.2150	0.3525**	0.3063**	0.3510**	0.0280	0.7539**
	r_g								1.0000	0.5760**	0.4004**	0.4055**	0.3393**	0.3721**	0.3275**	0.3857**	0.0348	0.7730**
Sound mature kernel %	r_p									1.0000	0.2177	0.2643*	0.1289	0.1795	0.3417**	0.0968	0.0029	0.4495**
	r_g									1.0000	0.3720**	0.3283**	0.1778	0.1846	0.3477**	0.0971	0.0007	0.4684**
SLA at 60 DAS	r_p										1.0000	0.3253**	0.0062	0.2354	0.0236	0.2331	-0.1052	0.1787
	r_g										1.0000	0.5962**	0.2107	0.3930**	0.0425	0.4384**	-0.2217	0.2212
SLW at 60 DAS	r_p											1.0000	-0.0359	0.3665**	0.0816	0.2621*	-0.0998	0.3274**
	r_g											1.0000	-0.0472	0.4605**	0.1039	0.2919*	-0.1341	0.4247**
SCMR at 60 DAS	r_p												1.0000	-0.1256	-0.1140	-0.0547	-0.0723	0.1062
	r_g												1.0000	-0.1901	-0.1733	-0.1349	-0.0654	0.1840
Harvest index	r_p													1.0000	0.2127	0.2546*	0.0224	0.5291**
	r_g													1.0000	0.2142	0.2679*	0.0238	0.5590**
Oil Content	r_p														1.0000	0.0314	0.2238	0.3247**
	r_g														1.0000	0.0377	0.2325	0.3407**
Protein content	r_p															1.0000	0.0913	0.3520**
	r_g															1.0000	0.1082	0.3859**
Sucrose content	r_p																1.0000	0.0798
	r_g																1.0000	0.0919
Kernel yield/ plan	r_p																	1.0000
	r_g																	1.0000

* Significant at 5% level ** Significant at 1% level

Table 2: Phenotypic (P) and genotypic (G) path coefficients for kernel yield per plant and other yield components in 66 genotypes of groundnut

Character		Days to maturity	Plant height	Primary branches/ plant	Secondary branches/ plant	No. of mature pods/ plant	Pod yield/ plant	100 Kernel weight	Shelling per cent	Sound mature kernel (%)	SLA at 60 DAS	SLW at 60 DAS	SCMR at 60 DAS	Harvest Index	Oil content	Protein content	Sucrose content	Correlation with kernel yield/ plant
Days to maturity	P	-0.0178	0.0005	-0.0001	0.0005	0.0000	-0.0311	0.0026	-0.0682	0.0019	-0.0026	-0.0009	0.0010	0.0084	0.0008	0.0022	0.0010	-0.1017
	G	-0.0299	0.0000	-0.0021	0.0033	0.0003	-0.0388	0.0026	-0.0695	0.0013	0.0082	-0.0056	0.0063	0.0063	0.0006	0.0013	0.0009	-0.1149
Plant height	P	0.0026	-0.0032	0.0000	-0.0001	-0.0002	0.1533	0.0000	0.1182	-0.0013	0.0009	0.0007	-0.0006	-0.0007	-0.0010	-0.0049	0.0018	0.2656*
	G	0.0043	0.0001	0.0006	-0.0005	-0.0012	0.1643	0.0000	0.1219	-0.0009	-0.0035	0.0041	-0.0043	-0.0005	-0.0007	-0.0029	0.0020	0.2829*
Primary branches/ plant	P	-0.0063	0.0003	-0.0002	0.0005	0.0002	-0.1536	0.0010	-0.1075	0.0013	-0.0016	-0.0007	0.0006	0.0075	0.0007	0.0024	0.0009	-0.2544*
	G	-0.0112	0.0000	-0.0055	0.0033	0.0013	-0.1649	0.0011	-0.1097	0.0009	0.0040	-0.0044	0.0044	0.0059	0.0005	0.0015	0.0010	-0.2720*
Secondary branches/ plant	P	-0.0071	0.0002	-0.0001	0.0012	0.0002	-0.2303	0.0034	-0.1315	0.0036	-0.0027	-0.0011	-0.0011	0.0094	-0.0001	0.0023	0.0006	-0.3532**
	G	-0.0122	0.0000	-0.0022	0.0082	0.0015	-0.2426	0.0033	-0.1334	0.0025	0.0083	-0.0067	-0.0077	0.0070	-0.0001	0.0014	0.0007	-0.3720**
No. of mature pods / plant	P	0.0009	-0.0006	0.0000	-0.0003	-0.0008	0.7017	0.0000	0.1283	-0.0028	0.0004	0.0008	-0.0004	-0.0089	-0.0011	-0.0032	0.0006	0.8145**
	G	0.0016	0.0000	0.0012	-0.0021	-0.0059	0.7168	-0.0002	0.1294	-0.0019	-0.0009	0.0050	-0.0035	-0.0070	-0.0008	-0.0020	0.0007	0.8304**
Pod yield/ plant	P	0.0007	-0.0007	0.0000	-0.0004	-0.0007	0.7651	0.0000	0.1919	-0.0044	0.0006	0.0008	0.0002	-0.0096	-0.0014	-0.0034	0.0009	0.9397**
	G	0.0015	0.0000	0.0012	-0.0026	-0.0056	0.7623	-0.0003	0.1963	-0.0031	-0.0015	0.0053	0.0015	-0.0075	-0.0010	-0.0022	0.0010	0.9453**
100 Kernel weight	P	-0.0063	0.0000	0.0000	0.0005	0.0000	-0.0002	0.0074	0.0100	-0.0004	-0.0013	-0.0004	0.0004	0.0060	-0.0008	0.0015	-0.0006	0.0158
	G	-0.0112	0.0000	-0.0009	0.0040	0.0002	-0.0355	0.0068	0.0007	-0.0003	0.0048	-0.0027	0.0018	0.0047	-0.0006	0.0010	-0.0006	-0.0277
Shelling per cent	P	0.0031	-0.0010	0.0001	-0.0004	-0.0003	0.3802	0.0002	0.3861	-0.0074	0.0022	0.0009	0.0016	-0.0063	-0.0015	-0.0040	0.0003	0.7539**
	G	0.0056	0.0000	0.0016	-0.0029	-0.0021	0.4051	0.0000	0.3693	-0.0052	-0.0059	0.0059	0.0097	-0.0049	-0.0011	-0.0025	0.0003	0.7730**
Sound mature kernel %	P	0.0025	-0.0003	0.0000	-0.0003	-0.0002	0.2519	0.0002	0.2118	-0.0135	0.0016	0.0008	0.0009	-0.0032	-0.0017	-0.0011	0.0000	0.4495**
	G	0.0043	0.0000	0.0006	-0.0022	-0.0013	0.2632	0.0002	0.2127	-0.0091	-0.0055	0.0048	0.0051	-0.0024	-0.0012	-0.0006	0.0000	0.4684**
SLA at 60 DAS	P	0.0061	-0.0004	0.0000	-0.0004	0.0000	0.0643	-0.0012	0.1129	-0.0029	0.0076	0.0009	0.0000	-0.0042	-0.0001	-0.0027	-0.0011	0.1787
	G	0.0168	0.0000	0.0015	-0.0046	-0.0003	0.0759	-0.0023	0.1479	-0.0034	-0.0147	0.0087	0.0060	-0.0052	-0.0001	-0.0028	-0.0022	0.2212
SLW at 60 DAS	P	0.0057	-0.0008	0.0001	-0.0004	-0.0002	0.2123	-0.0011	0.1213	-0.0036	0.0025	0.0029	-0.0003	-0.0065	-0.0004	-0.0030	-0.0010	0.3274**
	G	0.0116	0.0000	0.0017	-0.0037	-0.0020	0.2768	-0.0013	0.1498	-0.0030	-0.0087	0.0145	-0.0013	-0.0061	-0.0004	-0.0019	-0.0013	0.4247**
SCMR at 60 DAS	P	-0.0024	0.0003	0.0000	-0.0002	0.0000	0.0169	0.0004	0.0830	-0.0017	0.0000	-0.0001	0.0073	0.0022	0.0006	0.0006	-0.0007	0.1062
	G	-0.0066	0.0000	-0.0009	-0.0022	0.0007	0.0409	0.0004	0.1253	-0.0016	-0.0031	-0.0007	0.0285	0.0025	0.0006	0.0009	-0.0006	0.1840
Harvest index	P	0.0084	-0.0001	0.0001	-0.0006	-0.0004	0.4102	-0.0025	0.1361	-0.0024	0.0018	0.0011	-0.0009	-0.0178	-0.0010	-0.0029	0.0002	0.5291**
	G	0.0143	0.0000	0.0025	-0.0044	-0.0031	0.4362	-0.0024	0.1374	-0.0017	-0.0058	0.0067	-0.0054	-0.0132	-0.0007	-0.0017	0.0002	0.5590**
Oil Content	P	0.0031	-0.0006	0.0000	0.0000	-0.0002	0.2147	0.0012	0.1183	-0.0046	0.0002	0.0002	-0.0008	-0.0038	-0.0049	-0.0004	0.0023	0.3247**
	G	0.0052	0.0000	0.0008	0.0001	-0.0014	0.2253	0.0012	0.1210	-0.0032	-0.0006	0.0015	-0.0049	-0.0028	-0.0035	-0.0002	0.0023	0.3407**
Protein content	P	0.0034	-0.0014	0.0000	-0.0002	-0.0002	0.2302	-0.0010	0.1355	-0.0013	0.0018	0.0008	-0.0004	-0.0045	-0.0002	-0.0114	0.0009	0.3520**
	G	0.0059	0.0000	0.0013	-0.0017	-0.0018	0.2567	-0.0010	0.1424	-0.0009	-0.0064	0.0042	-0.0038	-0.0035	-0.0001	-0.0064	0.0011	0.3859**
Sucrose content	P	-0.0017	-0.0006	0.0000	0.0001	-0.0001	0.0656	-0.0005	0.0108	0.0000	-0.0008	-0.0003	-0.0005	-0.0004	-0.0011	-0.0010	0.0103	0.0798
	G	-0.0029	0.0000	-0.0005	0.0005	-0.0004	0.0753	-0.0004	0.0129	0.0000	0.0032	-0.0019	-0.0019	-0.0003	-0.0008	-0.0007	0.0098	0.0919

Phenotypic Residual effect : 0.0148 Genotypic Residual effect: 0.00664 * Significant at 5% level ** Significant at 1% level
Bold : Direct effects

REFERENCES

B.B. Desai, P.M. Kotecha and D.K. Salunkhe (1999). Science and technology of groundnut, biology production, processing and utilization. Kalyani Publishers, New Delhi, p.5.

C.M.V. Durgarani, D. Subramanyam, N. Sreerama Reddy and G.V. Hanumantha Rao (1987). Correlation and path analysis in groundnut (*Arachis hypogaea* L.). The Andhra Agricultural Journal 34(3): 321-324.

D.R. Dewey and K.H. Lu (1959). A correlation and path coefficient analysis of components of crested wheat grass. Agronomy Journal 51: 515-518.

H.W. Johnson, H.O. Robinson and R.E. Comstock (1955). Estimates of genetic and environmental variability in soybean. Agronomy Journal. 47: 314-318.

O.H. Lowry, N.J. Rosebrough, A.L. Farr and R.J. Randall (1951). Protein measurement with the folin phenol reagent. Journal of Biological Chemistry. 193: 265-276.

P. Mahalakshmi, N. Manivannan and V. Muralidharan (2005). Variability and correlation studies in groundnut (*Arachis hypogaea* L.). Legume Research 28(3): 194-197.

S. Sadasivam and A. Manikam (1961). Biochemical methods for Agricultural Sciences. Wiley Eastern Limited, New Delhi pp.187-188.

S.K. Yadav and J.B. Misra (1994). Evaluation of predictability of oil content of groundnut kernels on the basis of their specific gravity. Journal of Oilseeds Research 11(2): 222-228.

V. Jayalakshmi, C.R. Reddy, P.V. Reddy and G.L.K. Reddy (2000). Character association among morpho-physiological attributes in parental genotypes and groundnut hybrids. Legume Research 23: 102-105.

T.N. Lakshmidevamma, M. Byregowda and P. Mahadeva (2004). Character association and path analysis in groundnut (*Arachis hypogaea* L.). Mysore Journal of Agricultural Sciences 38(2): 221-226.

How to cite this article:
C.Pavan Kumar, R.Rekha, O.Venkateswarulu and R.P.Vasanthi. Correlation and Path Coefficient Analysis in Groundnut *(Arachis Hypogaea L.)* IJABPT. 2014, Vol-5, Issue-1 P.No9 to11