E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(8): 25-28
Received: 04-06-2024
Accepted: 15-07-2024

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Assessment of correlation and path coefficient analysis for pod yield and it's attributing traits in groundnut (*Arachis hypogaea*) germplasm

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DOI: https://doi.org/10.33545/2618060X.2024.v7.i8Sa.1218

Abstract
Correlation and path co-efficient analysis were carried out for pod yield and its attributing traits in 105 groundnut germplasm. The pod yield per plant had highly significant and positive correlation at phenotypic level with kernel yield per plant, number of matured pods per plant, harvest index, hundred kernel weight, hundred pod weight, haulm yield per plant, oil content and days to 50 percent flowering. Path analysis revealed that days to maturity, number of matured pods per plant, hundred pod weight, haulm yield per plant, kernel yield per plant and harvest index exhibited positive direct effects on pod yield. Hence, these are most important traits which could be used as selection criteria for effective improvement of pod yield.

Keywords: Groundnut, correlation, path analysis

Introduction
Groundnut is the king of oilseeds is commonly known as 'monkey nut' or 'peanut' or 'wonder nut'. It belongs to the family fabaceae. It self-pollinated allotetraploid legume with the basic chromosome number of 2n=4x=40. In groundnut, pod yield is contributed by different yield components which make it a quantitatively inherited trait. Direct selection is not very effective for the improvement of complex characters like pod yield therefore selection through the associated traits would be effective. Hence correlation coefficients are helpful in identification of these traits. Information on the correlation coefficient between the yield components and pod yield is the pre-requisite for crop improvement. Though the correlations give information about the component traits, they do not provide a true picture of relative importance of direct and indirect effects of these component traits on pod yield. Therefore, path coefficient analysis could provide a more realistic picture of the interrelationship, as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficient. Hence, the present study was carried out to obtain information on the magnitude of relationship of individual yield components on yield, interrelationships among themselves.

Materials and Methods
The material for the present study consists of 105 groundnut germplasm, laid out in a Augmented Randomized Block Design during *Kharif* 2021 at MARS, University of Agricultural Sciences, Raichur. Experimental plot was divided into five blocks each containing 20 genotypes and five checks. Each genotype was sown in single row of 4m length and spacing followed was 30 cm between the rows and 10 cm between the plants and standard agronomic practices were followed as per package of practice. Observations were recorded on five randomly selected plants in each row and correlation and path coefficient analysis were studied on the following traits, days to 50 percent flowering, days to maturity, number of matured pods per plant, pod yield per plant, 100-pod weight, kernel yield per plant, 100-kernel weight, shelling percentage, haulm yield per plant, harvest index oil content and disease scoring of late leaf spot at 105 DAS. The phenotypic correlation coefficients were estimated calculated using the method given by Johnson *et al.* (1955) [6]. The correlation studies were carried out using "Agricoale and correlation plot" was graphically represented using 'corrplot' and the correlation coefficients

were used to find out the direct and indirect effects of the component traits on pod yield as suggested by Dewey and Lu (1959) [4] and the direct and indirect effects are rated as follows by Lenka and Mishra (1973) [10].

Results and Discussion

Analysis of variance revealed that highly significant differences among the genotypes were observed for all the traits. Which indicating the presence of good amount of genetic variability among the material studied. The nature and extent of association of various morphological traits with the trait of economic importance would help in selecting and developing a suitable plant type. Direct selection is not very effective for the improvement of complex characters like pod yield therefore selection through the associated traits would be effective. The correlation coefficient is measure of degree of symmetrical association between two traits which helps in understanding the nature and magnitude of association between yield and its related attributes and knowledge about inter-relationship between yield and yield contributing characters facilitates the choice of a suitable breeding method to be applied and selecting the parents for crop improvement.

In groundnut, pod yield is complex trait which shows multiplicative interactions of yield components. The phenotypic correlation coefficient analysis represented in Table 1 and fig 1. The association has been worked out between pod yield and its related attributing traits and described below.

In the present study, pod yield per plant was found to be significantly and positively correlated with kernel yield per plant (0.978), followed by number of matured pods per plant (0.816), harvest index (0.708), hundred kernel weight (0.652), hundred pod weight (0.628), haulm yield per plant (0.468), oil content (0.431) and days to 50 percent flowering (0.262).

Positive and significant correlation between pod yield per plant and kernel yield per plant was also reported by Reddy and Gupta (1992) [20] and Nagda *et al*. (2000) [14]; Mathews *et al*. (2001) [12] and Giri *et al*. (2009) [5] for days to 50 percent flowering; Yadav *et al*. (1984) [31] and Deshmukh *et al*. (1986) [3] for number of matured pods per plant; Shetter (1974) [21] and Mathews *et al*. (2001) [12] for hundred kernel weight; Vaddoria and Patel (1992) [26] and Yogendra *et al*. (2001) [32] for harvest index for oil content; Mothilal (2003) [13] for hundred pod weight.

Present investigation results revealed that kernel yield per plant, number of pods per plant, haulm yield per plant, hundred kernel weight, hundred pod weight, harvest index, oil content and days to 50 percent flowering are the important pod yield contributing traits due to their high magnitude of positive correlation. These traits can be used for selection to improve pod yield in groundnut.

Significant and negatively associated with LLS disease scoring at 105 DAS (-0.347) also reported by Parameshwarappa *et al*. (2008) [16], Narasimhulu *et al*. (2013) [15], Sudini *et al*., (2015) [22]. Non-significant positive correlation with days to maturity (0.192) and non-significant and negatively associated with shelling percentage (-0.058), similar findings are in agreement with those reported by Vasanthi *et al.* (2015) [27] and Patil *et al*. (2015) [17].

Path coefficient analysis was given by Wright (1921) [30] and elaborated by Dewey and Lu (1959) [4] and divided the correlation coefficients into direct and indirect effects of other traits on pod yield and it helps to know whether the association of the yield related traits with pod yield is either due to their direct effect on yield or due to their indirect effect via some other traits.

In present study path coefficient analysis has been carried out for the pod yield per plant and its attributing traits at phenotypic level. Path co-efficient analysis gives a realistic relationship of traits and helps to identify the effective components of pod yield in groundnut. The residual effect accurately explains the interaction pattern of other possible components of yield. This means that the residual effect measures the role of other unrelated variables not included in the study on the dependent variable.

Path coefficient analysis for pod yield per plant was carried out at phenotypic level for 11 traits and presented in Table 2. In present study, it was found that kernel yield per plant (0.696) exerted maximum direct effects toward pod yield per plant, followed by harvest index (0.261), haulm yield per plant (0.205), hundred pod weight (0.046), days to maturity (0.027), number of matured pods per plant (0.014) and indicated that selection for these traits would be highly effective for increasing yield in groundnut. The characters shelling percentage (-0.118), days to 50 percent flowering (-0.042), hundred kernel weight (-0.017), LLS disease screening at 105 days (-0.016) and oil content (-0.009) exerted negative direct effect on pod yield.

Table 1: Phenotypic correlation coefficient between pod yield and yield attributing traits in groundnut germplasm

Traits	DFF	DTM	NMPP	HPW	HYP	KYP	HKW	SH	HI	OC	DS	PYP
DFF	1.000	0.795**	0.186	0.188	0.428**	0.248*	0.146	-0.048	-0.014	0.182	-0.503**	0.262**
DTM		1.000	0.088	0.138	0.411**	0.185	0.123	-0.000	-0.092	0.197*	-0.410**	0.192
NMPP			1.000	0.275**	0.387**	0.805**	0.350**	-0.050	0.587**	0.350**	-0.302**	0.816**
HPW				1.000	0.434**	0.619**	0.875**	0.121	0.354**	0.325**	-0.379**	0.628**
HYP					1.000	0.416**	0.398**	-0.173	-0.257**	0.026	-0.593**	0.468**
KYP						1.000	0.663**	0.113	0.722**	0.491**	-0.314**	0.978**
HKW							1.000	0.220*	0.417**	0.483**	-0.331**	0.652**
SH								1.000	0.067	0.311**	0.110	-0.058
HI									1.000	0.449**	0.080	0.708**
OC										1.000	-0.114	0.431**
DS											1.000	-0.347**
PYP												1.000

*,** Significant @ 5% and 1% level of significance, respectively.

DFF= Days to 50 percent flowering DTM= Days to maturity NMPP= Number of matured pods per plant HPW=Hundred pod weight (g) HYP=Haulm yield per plant (g) KYP=Kernel yield per plant (g) HKW=Hundred kernel weight (g) SH=Shelling percentage (%) HI=Harvest index (%) OC=Oil content (%) DS=Disease scoring PYP= Pod yield per plant (g)

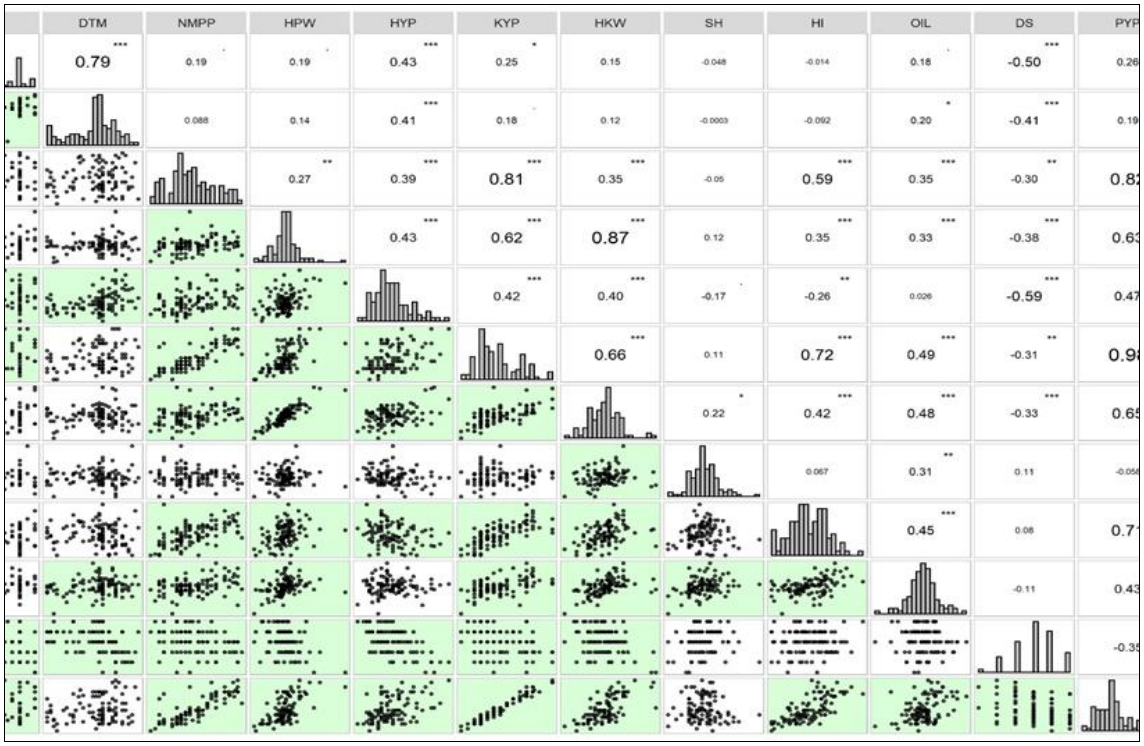

Fig. 2: Diagrammatic representation of phenotypic correlation of quantitative traits in groundnut

Table 2: Phenotypic path coefficient among pod yield and related traits in groundnut germplasm

Traits	DFF	DTM	NMPP	HPW	HYP	KYP	HKW	SH	HI	OC	DS	rp (PYP)
DFF	-0.042	0.021	0.003	0.009	0.088	0.174	-0.003	0.006	-0.003	-0.002	0.008	0.262**
DTM	-0.033	0.027	0.001	0.006	0.084	0.125	-0.002	0.000	-0.023	-0.002	0.007	0.192
NMPP	-0.008	0.002	0.014	0.012	0.080	0.564	-0.006	0.006	0.154	-0.003	0.005	0.816**
HPW	-0.008	0.004	0.004	0.046	0.088	0.431	-0.015	-0.014	0.091	-0.003	0.006	0.628**
HYP	-0.018	0.011	0.006	0.02	0.205	0.292	-0.007	0.02	-0.068	0.000	0.010	0.468**
KYP	-0.01	0.005	0.012	0.028	0.086	0.696	-0.011	-0.013	0.188	-0.004	0.005	0.978**
HKW	-0.006	0.003	0.005	0.04	0.082	0.459	-0.017	-0.026	0.11	-0.004	0.005	0.652**
SH	0.002	0.000	-0.001	0.005	-0.035	0.077	-0.004	-0.118	0.018	-0.003	-0.002	-0.058
HI	0.000	-0.002	0.008	0.016	-0.053	0.501	-0.007	-0.008	0.261	-0.004	-0.001	0.708**
OC	-0.008	0.005	0.005	0.015	0.006	0.341	-0.008	-0.037	0.117	-0.009	0.002	0.431**
DS	0.021	-0.011	-0.004	-0.017	-0.121	-0.216	0.006	-0.013	0.021	0.001	-0.016	-0.347**

DFF= Days to 50 percent flowering DTM= Days to maturity NMPP= Number of matured pods per plant HPW=Hundred pod weight (g) HYP=Haulm yield per plant (g) KYP=Kernel yield per plant (g) HKW=Hundred kernel weight (g) SH=Shelling percentage (%) HI=Harvest index (%) OC=Oil content (%) DS= LLS disease scoring at 105 day

Similarly, high and positive direct effects of kernel yield per plant towards pod yield per plant (Kumar *et al*., 2012; Rao *et al*., 2014) [8, 18], number of mature pods per plant towards pod yield (Suneetha *et al.,* 2005; Parameshwarappa *et al.,* 2008) [24, 16], harvest index towards pod yield per plant (Vijayasekhar, 2002; Mane *et al.,* 2008) [29, 11], days to maturity towards pod yield per plant (Thakur *et al*., 2013 and Rao *et al*., 2019) [25, 19] have been reported earlier; The characters days to 50 percent flowering (Vaddoria and Patel, 1992 and Suneetha *et al.,* 2004) [26, 23]; hundred kernel weight (Kadam *et al*., 2007 and Bhakal *et al*., 2017) [7, 1]; shelling percentage (Lakshmidevamma, 2004 and Patil *et al*., 2015) [9, 17]; oil content (Venkataravana *et al*., 2000) [28] and disease screening of late leaf spot at 105 days (Parameshwarappa *et al*., 2008) [16] exerted negative direct effect on pod yield.

Residual effect

Residual effect resulted from path analysis was found to be low in germplasm at phenotypic level *i.e.*, 0.004, indicating that there was maximum and sufficient effects of characters evaluated on pod yield in germplasm of groundnut.

Conclusion

The study evaluated the correlation and path coefficient analysis for pod yield and its attributing traits in 105 groundnut germplasm. Significant positive correlations were observed between pod yield and kernel yield, number of matured pods, harvest index, hundred pod weight, haulm yield, and oil content. Path analysis indicated that days to maturity, number of matured pods, hundred pod weight, haulm yield, kernel yield, and harvest index had positive direct effects on pod yield, making them key traits for selection. The low residual effect (0.004) suggests the evaluated traits sufficiently explain the variation in pod yield, reinforcing their relevance in breeding programs for improving pod yield in groundnuts.

References

1. Bhakal M, Lal GM. Estimation of genetic variability, correlation and path analysis in groundnut (*Arachis hypogaea* L.) germplasm. Chem Sci. 2017;6(22):1107-1112.
2. Chishti SAS, Akbar M, Aslam M, Anwar M. Morphogenetic evaluation for pod yield and its components

in early Spanish genotypes of groundnut (*Arachis hypogaea* L.). Pak J Biol Sci. 2002;3(5):898-899.
3. Deshmukh SN, Basu MS, Reddy PS. Genetic variability, character association and path co-efficients of quantitative traits in Virginia bunch varieties of groundnut. Indian J Agric Sci. 1986;56:816-821.
4. Dewey DR, Lu KH. Correlation and path-coefficient analysis of components of crested wheatgrass seed production. Agron J. 1959;51:515-518.
5. Giri RR, Toprope VN, Jagtap PK. Genetic variability, character association and path analysis for yield, its components traits and late leafspot, *Phaeoisariopsis personata* (Berk and Curt), in groundnut. Int J Pl Sci. 2009;4(2):551-555.
6. Johnson HW, Robinson HF, Comstock RE. Genotypic and phenotypic correlations in soybeans and their implications in selection. Agron J. 1955;47(10):477-483.
7. Kadam PS, Desai DT, Jagdish U, Chauhan DA, Shelke BL. Variability, heritability and genetic advance in groundnut. J Maharashtra Agric Univ. 2007;32(1):71-78.
8. Kumar DR, Sekhar MR, Reddy KR, Ismail S. Character association and path analysis in groundnut (*Arachis hypogaea* L.). Int J Appl Biol Pharm. 2012;3:385-389.
9. Lakshmidevamma TN, Gowda BM, Mahadevu P. Character association and path analysis in groundnut (*Arachis hypogaea* L.). Mysore J Agric Sci. 2004;38(2):221-226.
10. Lenka D, Mishra B. Path coefficient analysis of yield in rice varieties. Indian J Agric Sci. 1973;43:376-379.
11. Mane PS, Lad DB, Jagtap PK. Correlation and path coefficient analysis in summer bunch groundnut. J Maharashtra Agric Univ. 2008;33(2):174-176.
12. Mathews C, Nagada AK, Sharma UC. A study of path analysis in groundnut. Madras Agric J. 2001;87:480-481.
13. Mothilal A. Genetics of vegetative and reproductive traits in groundnut (*Arachis hypogaea* L.). PhD Thesis, Tamil Nadu Agricultural University, Coimbatore; c2003.
14. Nagda AK, Ranwah BR, Sharma GS. Characters association in groundnut (*Arachis hypogaea* L.). National seminar on Plant Physiology at Interface of Agri-Horti and Industry, 30-31 December 1999 and January 2000, MPUAT, Udaipur, Rajasthan. p. 50.
15. Narasimhulu R, Kenchanagoudar PV, Gowda MVC, Sekhar L. Genetic variability and correlation studies for selection of multiple disease resistance lines in two crosses of peanut. Bioinfolet. 2013;10(1B):183-186.
16. Parameshwarappa KG, Malabasari TA, Lingaraju BS. Analysis of correlations and path effects among yield attributing traits in two crosses of large seeded groundnut (*Arachis hypogaea* L). J Oilseeds Res. 2008;25(1):4-7.
17. Patil SK, Irappa BM, Shweta, Shivanna S. Genetic variability and character association studies for yield and yield attributing components in groundnut (*Arachis hypogaea* L.) germplasm. Int J Recent Sci Res. 2015;6(6):4568-4570.
18. Rao VT, Venkanna V, Bhadru D, Bharthi D. Studies on variability, character association and path analysis on groundnut (*Arachis hypogaea* L.). Int J Pure App Biosci. 2014;2(2):194-197.
19. Rao V, Venkanna V. Studies on character association and path analysis in groundnut (*Arachis hypogaea* L.). J Pharmacogn Phytochem. 2019;8:76-78.
20. Reddy KR, Gupta RVS. Variability and inter-relationship of yield and its component characters in groundnut. J Maharashtra Agric Univ. 1992;17(2):224-226.
21. Shetter BI. Variability pattern and formulation of selection index for yield in groundnut (*Arachis hypogaea* L.). Mysore J Agric Sci. 1974;8:296-297.
22. Sudini H, Upadhyaya HD, Reddy SV, Mangala UN, Rathore A, Kumar KV. Resistance to late leaf spot and rust diseases in ICRISAT's mini core collection of peanut (*Arachis hypogaea* L.). Australas Plant Pathol. 2015;44(5):557-566.
23. Suneetha K, Dasarada C, Rami Reddy, Ramana JV. Genetic variability and character association in groundnut (*Arachis hypogaea* L.). National Symposium Enhancing productivity of groundnut for sustaining food and nutritional security. NRCG, Junagadh; c2004. p. 19-20.
24. Suneetha K, Reddy CDR, Ramana JV. Genetic variability and character association in groundnut (*Arachis hypogaea* L.). Andhra Agric J. 2005;52(1,2):43-47.
25. Thakur SB, Ghimire SK, Chaudhary NK, Shrestha SM, Mishra B. Determination of relationship and path co-efficient between pod yield and yield component traits of groundnut cultivars. Nepal J Sci Technol. 2013;14(2):1-8.
26. Vaddoria MA, Patel VJ. Character association and path analysis in Virginia runner groundnut (*Arachis hypogaea* L.). Madras Agric J. 1992;79(9):500-504.
27. Vasanthi RP, Suneetha N, Sudhakar P. Genetic variability and correlation studies for morphological, yield and yield attributes in groundnut (*Arachis hypogaea* L.). Legume Res. 2015;38(1):9-15.
28. Venkataravana P, Sheriff AA, Kulkarni RS, Shantaranarayani V, Fathima PS. Correlation and path analysis in groundnut (*Arachis hypogaea* L.). Mysore J Agric Sci. 2000;34:321-325.
29. Vijayasekhar C. Genetic divergence studies through D2 statistic and isozyme analysis in Spanish bunch groundnut (*Arachis hypogaea* L.). MSc Thesis, Acharya N.G. Ranga Agricultural University, Hyderabad (India); c2002.
30. Wright S. Correlation and causation. J Agric Res. 1921;20:557-585.
31. Yadav TP, Kumar P, Thakral SK. Association of pod yield with some quantitative traits in bunch group of groundnut (*Arachis hypogaea* L.). J Res Hissar Agric Univ. 1984;14:85-88.
32. Yogendra Prasad, Verma AK, Haider ZA, Jayalal M. Correlation and path analysis in Spanish bunch groundnut (*Arachis hypogaea* L.). J Res Birsa Agric Univ. 2001;13:201-204.