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Research Note

Genetic variability in coconut (*Cocos nucifera*)

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Abstract:
Genetic variability analysis of morphological growth characters, nut yield and nut characters in twenty eight coconut genotypes revealed a high degree of variability for nut yield, whole nut weight, dehusked nut weight and copra weight. Nut yield exhibits positive correlation with number of functional leaves, length of leaves and petiole. Path coefficient analysis revealed that the direct effect of number of functional leaves on nut yield was positive and high followed by petiole length and leaf length. Thus, these characters are to be given importance for nut yield improvement in coconut.

Key words:
Coconut, variability

One of the main objective in coconut breeding is to increase nut yield which is a complex character dependent on interaction of number of component characters. Selection of characters could be done only if there is genetic variation. The variability available in the population could be partitioned in to heritable and non heritable components, using genetic parameters, phenotypic and genotypic coefficients of variation, heritability and genetic advance based on which selection can be effectively carried out. For achieving a reasonable improvement in yield, an understanding of correlation between characters would be very useful. Earlier, Patel (1937), Satyabalan and Mathew (1984) and Ganesamoorthy *et.al*. (2002) had worked out correlation between characters. Although correlation is helpful in determining the components of complex character like yield, they do not provide an exact picture of the relative importance of direct and indirect influence of each of the complex characters towards yield. Path coefficient analysis is a useful tool to know the direct and indirect effects of component characters on nut yield. Hence, the present study was undertaken to the examine the extend of variability, association of yield components and direct and indirect effects of characters on yield in coconut.

Twenty eight coconut genotypes maintained at Coconut Research Station, Veppankulam, Tamil Nadu consisting of twenty talls and eight dwarfs, formed the base material for the study. The palms were planted in 1973 in a randomized block design with three replications. Observations on nut yield and yield components namely, number of functional leaves, length of leaf, petiole length, nut length, nut breadth, whole nut weight, dehusked nut weight and copra weight were recorded from four palms representing each genotype in each replication. The mean data were subjected to analysis. Standard statistical procedures were used for the analysis of variance, phenotypic and genotypic coefficient of variation (Burton, 1952), heritability (Hanson *et al*., 1956) and genetic advance (Johnson *et al*., 1955a). The genotypic correlation coefficient was computed using genotypic variance and covariance (Johnson et al., 1955 b). The path coefficient analysis was done as per the method suggested by Dewey and Lu (1959).

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Studies on the genetic parameters revealed that the phenotypic coefficient of variation was higher than the genotypic coefficient of variation for all the characters (Table.1) indicating the influence of environment on the genotype for the expression of the characters. The same trend was reported by Manju and Gopimony (2001). Medium to high phenotypic and genotypic coefficients of variation was observed for nut yield, whole nut weight, dehusked nut weight and copra weight. Similar results have been reported by Ganesamoorthy *et al*. (2002). Genetic variations observed in nut characters are shown in Fig. 1. Since the genotypic coefficient of variation is a measure of genetic variability the improvement through selection of characters can be effective, provided there is considerable extent of genetic variability available and the charecters are also highly heritable. Genotypic coefficient of variation together with heritability estimate can give the best picture of the genetic advance to be expected from selection (Burton, 1952). High heritability combined with high genetic advance were observed for nut yield, whole nut weight,dehusked nut weight and moderate genetic advance for copra weight. This indicates the predominance of additive genes, which can be considered as a desirable feature for selection (Panse, 1957). The high heritability observed for the above characters in the present study is in accordance with the findings of Ganesamoorthy *et al*. (2002) and Meunier *et al*. (1984). Manju and Gopimany (2001) also reported high heritability with high genetic advance for nut yield. Prepotency is comparable to GCA and the GCA in turn is governed by additive gene action, which is responsible for additive genetic variation (Welsh, 1981). Thus, high heritability estimates can be taken as a measure of prepotency of the palm with respect to the characters under consideration.The phenotypic and genotypic correlation coefficients of the characters are presented in Table. 2. Number of functional leaves, length of leaf and petiole length showed significant positive correlation with nut yield and could be considered as major contributing characters. Namboothiri *et.al*. (2007) observed significant positive correlation between nut yield and functional leaves. The leaf length also showed significant positive correlation with the characters studied. Similarly nut length and nut breadth showed significant positive correlation with all the characters except number of functional leaves and petiole length. Highly significant positive correlations were observed among whole nut weight, dehusked nut weight and copra weight. Satyabalan and Mathew (1984) reported the similar results.As correlation alone does not provide the true contribution towards the yield, the genotypic correlation coefficients were partitioned into direct and indirect effects through path-coefficient analysis. The path coefficient analysis is presented in Table. 3. In the present study number of functional leaves exerts the maximum direct effect on nut yield / palm followed by petiole length and length of leaf. These characters also showed positive correlation with nut yield. The selection for these characters simultaneously would bring out improvement in nut yield of coconut.

References :

Burton, G.W. 1952. Quantitative inheritance in grasses. Proc. *Siathi. Int. Grassland Congr*., **1**: 277-283

Dewey, D.R. and Lu. K.H. 1959. A correlation and path coefficient analysis of components of crested wheatgrass seed production. *Agron. J*., **51**: 515-518.

Ganesamoorthy, C. Natarajan, S. Rajarathinam, S. Vincent and H. H. Khan. 2002. Genetic variability and correlation of yield and nut characters in *coconut J. plantn. Crops,* **30**(2): 23-25.

Hanson, C.H., Robinson, H.F. and Comstock, R.E. 1956. The biometrical studies on yield in segregating population of Korean Laspedeza. *Agron. J*., **48**: 65-71.

Johnson, H.W., Robinson, H. F. and Comstock, R.E. 1955 a. Estimation of genetic and environmental variability in soybean. *Agron. J*., **47**:314-318.

Johnson, H.W. Robinson, H. F and Comstock, R.E. 1955 b. Genotypic and phenotypic correlations in soybean and their importance in selection. *Agron. J*., **47**: 477-483.

Liyanage, D.V and Abeywardena, V. 1957. Correlation between seednuts, seedlings and adult palm characters in coconut. *Trop. Agriculturist,* **113**: 1-16.

Manju, P. and R. Gopimany. 2001. Variability and genetic parameters of mother palm characters in coconut palm. J. of *Tropical Agriculture,* **39**: 159-161.

Meunier, J. Sangare, A. Le Saint, J. P and Bonnot, F. 1984. Genetic analysis of yield characters in some hybrids of coconut. *Oleagineux,* **39**: 581-586.

Namboothiri, C. G. N, Niral V. and Parthasarathy, V. A. 2007. Correlation and path analysis in the F2 populations in coconut, *Indian J. Hort.,* **64** (4).

Patel, J. S. 1937. Coconut Breeding. *Proc. Assoc. Econ. Biol*., **5**: 1-16.

Satyabalan, K. and Jacob Mathew. 1984. Correlation studies on the nut and copra characters of West Coast Tall coconut harvested during different months of the year. *J. Plantn Crops*, **12** (1) : 17-22.

Panse, V. G. 1957. Genetics of quantitative characters in relation to plant breeding. *Indian J. Genet*., **17**: 318-328.

Welsh, R.J. 1981. *Fundamentals of Plant Genetics and Breeding.* John Wiley and Sons, New York.

Table 1. Mean, Variability, Heritability and Genetic advance in coconut

Character	Mean	PCV %	GCV %	Heritability %	Genetic advance as % of mean
No. of functional leaves(No/Palm)	31.65	8.59	7.49	76.0	13.45
Length of leaf (cm)	448.33	10.38	9.53	84.0	18.01
Petiole length (cm)	120.45	15.64	15.09	93.0	29.99
Nut length (cm)	22.35	12.06	11.38	89.0	22.13
Nut breadth (cm)	16.61	11.27	10.61	89.0	20.56
Whole nut weight (g)	983.31	36.90	36.68	99.0	75.10
Dehusked nut weight (g)	564.42	36.88	36.64	99.0	74.99
Copra wt (g)	143.83	22.27	21.93	97.0	44.50
Annual nut yield(No./palm)	118.75	41.63	41.31	99.0	84.46

Table 2. Phenotypic and genotypic correlation coefficients in coconut

Character		Length of leaf	Petiole length	Nut length	Nut breadth	Whole nut weight	Dehusked nut weight	Copra wt	Annual nut yield
No. of functional leaves	G	0.421**	0.216*	-0.072	0.073	-0.003	-0.037	0.126	0.717**
	P	0.529**	0.307*	0.099	0.224	0.042	0.014	0.188	0.673**
Length of leaf	G		0.504**	0.243*	0.259*	0.376*	0.306*	0.455**	0.270*
	P		0.549**	0.339*	0.356*	0.380*	0.318*	0.477**	0.288*
Petiole length	G			-0.056	0.163	0.184	0.100	0.219	0.301*
	P			0.032	0.234*	0.200	0.121	0.251	0.317*
Nut length	G				0.718**	0.780**	0.725**	0.676**	-0.282*
	P				0.748**	0.764**	0.714**	0.684**	-0.231*
Nut breadth	G					0.858**	0.786**	0.911**	0.006
	P					0.836**	0.770**	0.901**	0.041
Whole nut weight	G						0.963**	0.887**	-0.245
	P						0.963**	0.886**	-0.233
Dehusked nut weight	G							0.838**	-0.292
	P							0.838**	-0.279
Copra wt	G								-0.022
	P								0.004

G – Genotypic correlation coefficients P – Phenotypic correlation coefficients

Table. 3 Path coefficient analysis in coconut

Character	No. of functional leaves	Length of leaf	Petiole length	Nut length	Nut breadth	Whole nut weight	Dehusked nut weight	Copra wt	Correlation with nut yield
No. of functional leaves	**0.5741**	0.0565	0.0336	0.0090	0.05729	0.0325	-0.0051	0.0122	0.717
Length of leaf	0.2415	**0.1344**	0.3783	-0.0305	0.2039	-0.3548	0.0417	-0.0441	0.270
Petiole length	0.1242	0.0677	**0.1554**	0.0070	0.1281	-0.1735	0.0136	-0.0212	0.301
Nut length	-0.0412	0.0326	-0.0087	**-0.1257**	0.5648	-0.7368	0.0987	-0.0656	-0.282
Nut breadth	0.0418	0.0348	0.0253	-0.0903	**0.1102**	-0.1344	0.1070	-0.0883	0.006
Whole nut weight	-0.0020	0.0505	0.0285	-0.0981	0.6755	**-0.9446**	0.1311	-0.0860	-0.245
Dehusked nut weight	-0.0214	0.0412	0.0155	-0.0912	0.6187	-0.9096	**0.1361**	-0.0813	-0.292
Copra wt	0.0721	0.0611	0.0340	-0.0850	0.7165	-0.8379	0.1140	**-0.0970**	- 0.022

Residual effect = 0.5206

Fig. 1. Genetic variation in coconut