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Genetic Variability in Coconut Palm (*Cocos nucifera*. L)

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Phenotypic and genotypic variability in coconut palm was studied in a collection of 25 varieties and two hybrids. A wide range of phenotypic variation was observed in the varieties. Among the characters, number of leaves per year, number of leaves on the crown, number of spathes per year, number of female flowers per palm, setting percentage and number of nuts were found to have high genetic advance, and these characters may be considered reliable for excercising selection.

The study of variability in genetic stock of coconut palms with regard to phenotypic and genotypic variability, and genetic advance is a prerequisite for any breeding programme. But the estimation of these parameters in coconut is difficult due to its long pre-bearing period, a period of unstbility in yield during the beginning years and a steady period of stablised yield over a number of years followed by a decline due to senility. Senility normally sets in at the sixtieth year or a little earlier (Davis, 1958).

Louis and Chandra Sekharan (1976) reported that the growth and yield characters of coconut palm are highly influenced by environment. Hence study of phenotypic variation may fail to indicate the genetic variability. Liyanage (1967) reported that palms of higher yield value could be identified within 3 years and six months.

Reports on heritability estimates in coconut palm are limited. The present investigation was undertaken in a divergene stock of 25 genotypes, and two hybrids of coconut palm from the germplasm collection in order to find out the genetic progress that could be realised through selection.

MATERIAL AND METHODS

Twenty five genotypes and two hybrids from the germplasm maintained at the Coconut Research Station, Veppankulam, of the Tamil Nadu Agricultural University, were utilised for the study. The palms were planted one per plot with the normal spacing of 25' × 25' replicated six times in Randomised block Design. Observations on the girth at collar, height of seedlings, number of leaves per year during the first three years, number of leaves on the crown, number of spathes, setting percentage from palms of 15-18 years old were recorded.

The mean of five consecutive years was considered for analysing the factors of yield such as number of spathes, female flowers setting percentage and number of nuts per year.

The analyses of variance, and coefficient of variations were worked out according to conventional methods

Genotypic and phenotypic coefficient of variations were estimated according to the formula by Burton and Vane (1953). Heritability in broad sense, and genetic advance were calculated as suggested by Johnson *et. al* 1955.

RESULTS AND DISCUSSION

Varieties Fiji, Federated Malayan States, and Sam Ramon bore large number of leaves on the crown. Laccadive small and spicata produced significantly high number of spathes per year. Variety Ayirankachi produced large number female flowers followed by the hybrid (Tall × Dwarf Green), Andaman ordinary and Semi Tall Yellow (Table I).

Maximum phenotypic coefficient of variation was recorded for the number of female flowers (66.66), followd by setting percentage (63.06), Number of nuts per year (58.69), height of the seedlings at the third year (65.95), length of leaf (56.79) and number of spothes per year (50.74) Table II.

In the present study high phenotypic coefficient of variation and moderate genotypic variation combined with low heritability for the number of female flowers per year indicated that this is highly influenced by environment setting percentage had high phenotypic coefficient of variation coupled with low genetic coefficient of variation and heritability, suggesting that this character was less stable and highly susceptible for random environmental effects. Thus, it may be noted that more high number of female flowers per year itself may not mean much unless it is accompanied by high setting rate. Nambiar et. *al* (1970) found substantial additive genetic variation for the number of female flowers and percentage of set. In the present study "the low genetic advance for characters like setting percentage indicated the predominance of non-additive gene effects.

The finding by Thankamma Pillai *et al* (1976) that yield improvement can be achieved by selection for characters with low heritability superimposed with high nut set appear to be in agreement with the results of the present study.

High genotypic coefficient of variation for the height of seedlings at the third year, number of leaves produced per year, length of leaves, number of spathes per year and number of nuts per year indicate that these characters are less susceptible to random environment.

Inspite of high heritability for height of the seedlings, girth at collar, number of leaves per year, number of spathes the genetic advance varied but was considerably high and selection may be possible for such characters.

Moderately high genetic advance was combined with moderately high heritability for the length of leaf, and leaves on the crown indicating the predominance of additive genes, a

TABLE I Mean values of Growth and Quality Characters palms over five years of steady

Variety/Hybrid	Girth at Collar (M)	Leaves per year		Leaves on the Crown	Length of leaf (m)	Duration for flowering on month	Number of spathes per year	Number of Female flowers	Setting percentage	Nuts per palm
		3rd year	15th year							
Andaman Dwarf	0.73	10.0	16	30	4.0	75	10	310	16.6	56
Dwarf Green	0.63	8.0	15	27	3.8	53	13	489	15.7	66
Dwarf Natural Cross	0.81	10.0	15	31	5.4	81	11	309	19.7	59
Semi Tall Green	0.74	12.0	13	24	4.7	58	13	386	26.6	97
Semi Tall Yellow	0.70	11.0	17	35	4.3	58	13	404	18.8	76
Semi Tall red	0.69	11.0	20	32	3.6	58	13	448	14.4	65
Ayirankachi	0.69	11.0	13	25	4.1	44	10	721	21.9	105
Gangabandom	0.89	11.0	12	30	4.1	43	13	400	17.9	72
Strait Settlement	0.69	12.0	15	33	4.0	49	14	420	21.4	71
F. M. S.	0.83	8.0	16	38	5.4	87	13	380	17.7	54
Cochin China	0.84	8.0	16	36	4.7	65	14	410	16.3	65
Fiji	0.79	10.0	16	40	5.0	64	13	374	21.7	77
Laccadive Small	0.78	9.0	15	31	4.3	78	15	371	20.8	81
Laccadive ordinary	0.72	12.0	15	32	4.2	59	12	292	20.0	66
Laccadive Pink	0.74	9.0	16	35	4.5	56	13	330	20.9	63
New Guinea	0,80	10,0	15	33	4,5	68	13	308	12,2	39

Philippines	0.85	9.0	16	37	5.2	77	12	304	13.3	48
Siam	0.84	8.0	16	34	4.5	76	13	200	25.9	48
Andaman Giant	0.85	9.0	15	33	4.8	76	13	399	18.4	58
Andaman ordinary	0.85	9.0	16	35	4.6	69	14	513	17.1	87
Jawa Giant	0.76	8.0	16	35	5.6	81	13	342	21.9	65
Ordinary Tall	0.79	7.0	15	31	4.6	86	12	368	32.2	104
Kappadam	0.89	11.0	14	32	3.8	49	12	206	22.3	44
Spicata	0.89	10.0	14	27	4.2	50	12	207	5.1	64
Laccadive Micro	0.90	13.0	12	31	4.3	49	15	429	19.5	83
Strait Settlement X Andaman Dwarf	0.79	9.0	14	32	5.5	76	11	375	21.5	77
Tall X Dwarf Green	0.73	11.0	13	35	4.3	53	13	546	25.8	137
Malasian Yellow	0.57	12.0	15	35	4.3	58	13	404	18.8	76
Goa	0.78	9.0	11	31	5.7	74	11	274	23.1	63
S. E.	0.0978			3.262	0.4537		1.448		4.5202	5.90
C. D.	0.27			9.13	1.27		4.058		9.13	16.35
C. V.	37.60	25.77		26.80	—	—	5.60	63.20	62.10	48.50

desirable feature for effective selection. Bavappa *et. al* 1976 suggested the necessity for selection pressure on number of nuts, keeping in view the variability and heritability for these characters.

Number of nuts per year had moderately high phenotypic coefficient of variation and a moderate value for heritability but the expected genetic advance was rather low. This indicated that non-additive gene action is low important for this character. On the other hand Nambiar and Nambiar (1970) found substantial additive genetic variation for this character. The selection strategy for yield of nuts may be indirectly based on component characters. Such as number of leaves, leaevs on the crown number of spathes per year and female flowers with high nut set.

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TABLE II

Characters	Mean	Range	Phenotypic Coefficient of variation	Genotypic Coefficient of variation	h^2 (b)	Expected Genetic-advance	% of. G.A.
Girth at Collar (m)	0.68	0.11-1.31	19.18	10.29	56.31	0.41	60.29
Height (m)	3.29	1.12-4.50	65.95	40.12	60.87	1.84	55.93
Length of leaf (m)	4.12	2.00-5.47	56.79	26.70	47.14	1.48	35.92
Number of leaves per year	9.11	4.8-13.2	40.61	31.39	59.77	4.56	50.05
Leaves on the crown at 15th year	29.82	14.4-39.9	35.46	23.23	42.90	9.35	31.35
Number of spathes per year	10.26	4.90-14.6	50.74	37.14	53.57	5.74	55.95
Number of female flowers per year	345.12	105.2-721.0	66.66	21.00	9.93	1.67	0.483
Setting percentage	17.82	6.3-36.0	63.06	10.57	2.81	0.65	3.65
Number of nuts per year	63.21	25.9-136.9	58.69	33.05	31.69	5.00	7.91