

SEEDLING PROGENY ANALYSIS IN COCONUT TYPES

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Abstract: The study was undertaken to identify prepotent palms from among five coconut types viz., three Komadan generations, West Coast Tall and Natural Cross Dwarf based on growth rate of seedlings at the 9th month of germination. For most of the seedling characters, Komadan generations (Manju, 1992) showed significant superiority over WCT and they behaved as a distinct group with regard to total leaf area over both WCT and NCD. They were also found to be significantly superior to WCT for seedling vigour index and number of seedlings with split leaves. The three Komadan generations were on par regarding recovery of quality seedlings and were significantly superior to WCT. Based on this character, 20 per cent of the palms in Komadan were identified to be prepotent.

Key words: Coconut, Komadan, NCD, prepotency, progeny analysis.

INTRODUCTION

Prepotency is the capacity of a parent under open pollination to impress characteristics on its offsprings so that they resemble that parent and each other more closely than usual (Allard, 1960). It may be due to the high additive genetic value and or the general combining ability of the palm. It is possible to fix prepotency by selfing and making selections. It is possible to identify prepotent palms by conducting seedling progeny analysis in the nursery on the basis of growth rate and seedling vigour index (Satyabalan and Mathew, 1977). Such palms can be used as pollen parent for hybrid seed production.

MATERIALS AND METHODS

The study was undertaken in the Department of Plant Breeding, College of Agriculture, Vellayani to identify palms of superior genetic value (prepotent) from among five types viz., first generation Komadan from its centre of origin (K I), second generation Komadan from the Instructional Farm, College of Agriculture, Vellayani (K II) third generation Komadan (K III) originated from (K II) growing in farmers' fields, West Coast Tall (WCT) from Instructional Farm, College of Agriculture, Vellayani and Natural Cross Dwarf (NCD) from the Regional Agricultural Research Station,

Pilicode. Ten mother palms were selected randomly from among the five populations identified on the basis of their separate origin. Age group of K II and WCT was the same. Identification of prepotency was based on seedling growth analysis, seedling vigour index and recovery of quality seedlings at the 9th month of germination. For seedling progeny analysis, a Compact Family Block Design (5 x 10) with four replications and ten seedlings per plot was employed. Each replication consisted of five treatments and each treatment had 100 seednuts. Observations were recorded on germination percentage, days taken for germination, height of seedling, number of leaves, girth at collar, number of plants with split leaves and total leaf area.

The seedling vigour index of the progenies belonging to the five coconut types was computed based on five traits viz., days taken for germination, height of seedling, number of leaves, girth at collar and total leaf area. The progenies were then ranked on the basis of their vigour indices.

Recovery of quality seedlings was estimated based on the index score method of Singh and Chaudhary (1979). The range of variability for each of the three traits viz., height of seedling, number of leaves and girth at collar

Table 1. Seedling characters

Type	Germination % of seednuts	Days taken for germination	Height of seedling, cm	No. of leaves	Girth at collar, cm	Total leaf area, cm ²	No. of seedlings with split leaves
KI	90.76 (9.52)	116.37	115.39	7.33	11.52	4094.62	1.68
KII	79.00 (8.77)	57.92	108.75	7.61	11.97	4836.80	2.20
KIII	76.18 (8.62)	107.24	96.84	7.26	11.14	4170.04	1.15
WCT	70.35 (8.35)	126.80	86.95	6.12	9.78	2569.23	0.10
NCD	75.85 (8.59)	122.85	100.10	7.03	10.79	2902.90	0.80
CD (0.05)	(0.636)	6.794	11.190	0.295	0.746	591.865	1.000

Figures in parentheses are square root transformed values

was classified into three groups using the criterion $X \pm 2 SE$. Based on this grouping, the percentage of quality seedlings to total number of seednuts sown was worked out and subjected to **analysis** of variance.

RESULTS AND DISCUSSION

Significant differences were noticed among live types for all the seedling characters studied (Table 1). The first generation Komadan recorded the **maximum** germination percentage of nuts and was significantly superior to all other types which were on par. The mean number of days taken for germination of seednuts was lowest in the second generation Komadan compared to that of the third and first generation Komadan. This may be due to the favourable conditions enjoyed by the seednuts of second generation Komadan in harvest and storage in Vellayani campus compared to the seednuts of the first and third generation Komadan which had to be harvested and transported from the farmers' fields outside Vellayani campus. In general, the seednuts of Komadan germinated earlier than those of WCT and NCD. The height was maximum for the seedlings in the first generation Komadan and the lowest height was recorded for seedlings of WCT. Number of leaves in the three Komadan generations was on par with NCD and significantly superior to WCT. Regarding girth at collar, the seedlings

Table 2. Seedling vigour index

Pro-genies	KI	KII	KIII	WCT	NCD	Mean
1	4.39	4.88	4.48	3.57	4.05	4.27
2	4.39	4.66	4.82	3.67	3.59	4.23
3	4.10	4.65	4.30	3.30	3.93	4.06
4	4.69	4.85	4.56	4.05	4.26	4.48
5	4.34	4.59	4.12	3.66	4.33	4.21
6	4.63	4.41	4.26	3.27	4.70	4.25
7	4.39	4.74	4.52	4.06	4.17	4.38
8	4.28	4.77	4.05	3.56	4.15	4.16
9	4.83	4.45	4.69	3.89	4.62	4.50
10	4.64	4.75	4.19	3.83	4.71	4.42
Mean	4.47	4.68	4.40	3.69	4.25	-
F	1.76	0.55	2.28*	1.41	7.66**	-
SE	0.34	0.42	0.34	0.46	0.26	-
CD (0.05)	(i) Types = 0.189					
	(ii) Two progenies within same type = 0.518					
	(iii) Two progenies within different types = 0.524					

* Significant at 5 per cent level

** Significant at 1 per cent level

in the second and first generation Komadan were on par and were significantly superior to

Table 3. Percentage of quality seedlings to total number of seednuts

Progenies	KI	KII	KIII	WCT	NCD	Mean
1	65.00	65.00	40.00	60.00	55.00	57.00
2	35.00	20.00	90.00	42.50	5.00	38.50
3	45.00	52.50	30.00	17.50	55.00	40.00
4	77.50	67.50	77.50	72.50	52.50	69.50
5	82.50	72.50	42.50	35.00	57.50	58.00
6	77.50	52.50	57.50	22.50	70.00	56.00
7	35.00	22.50	67.00	65.00	55.00	48.90
8	57.50	72.50	40.00	47.50	40.00	51.50
9	72.50	52.50	67.50	40.00	50.00	56.50
10	72.50	75.00	37.50	40.00	85.00	62.00
Mean	62.00	55.25	54.95	44.25	52.50	
F	5.67 **	5.56 **	6.34 **	3.41 **	4.33 **	
SE	15.07	16.88	15.74	19.10	19.81	
CD (0.05)	(i) Types = 8.45					
	(ii) Two progenies within same type = 24.388					
	(iii) Two progenies within different types = 26.528					

** Significant at 1 per cent level

others. The three Komadan generations behaved as a distinct group with regard to total leaf area and showed superiority over WCT and NCD. Number of seedlings with split leaves was more in Komadan types. The lowest value for this character was noticed in WCT which was significantly inferior to the three Komadan generations and NCD.

Table 2 shows the seedling vigour index computed based on the seedling characters and days taken for germination. The three Komadan generations recorded a higher vigour index which was significantly superior to WCT. Percentage recovery of quality seedlings to total number of seednuts sown was higher in the three Komadan generations (Table 3). NCD was found to be on par with Komadan types for this character. WCT recorded the

lowest recovery of quality seedlings and was significantly inferior to the three Komadan groups.

The results revealed that Komadan as a single group has shown definite superiority over WCT in most of the seedling characters studied. However, NCD was found to be on par with one or more of the three Komadan generations for majority of the characters. Total leaf area is an important character related with productivity and Komadan types exhibited superiority for this character. Mathes *et al.*, (1989) reported the importance of total leaf area as the character which determines the total biological productivity through photosynthesis.

The seedling vigour index computed on the basis of the five seedling characters revealed the superiority of Komadan over WCT. This is in agreement with the findings of Rethinakumar *et al.*, (1991) where similar seedling characters when considered were reported to have contributed to high index score even at 4th month of growth.

The usefulness of selecting seedlings based on height, leaf production, girth at collar, total leaf area and split leaf production for the genetic upgrading of coconut has been emphasised by many workers (Menon and Pandalai, 1958; Shylaraj, 1982; Satyabalan, 1984 and Mathes *et al.*, 1989). So the constant superior expressions of many seedling characters by Komadan group indicate its genetic superiority over WCT (Manju, 1992). This was also confirmed by the recovery of quality seedlings obtained in the present study where all the three Komadan generations were found to be on par and superior to WCT and NCD for this character. As per package of practices recommendations, the maximum recovery of quality seedlings is fixed as 60 to 65 per cent (KAU, 1989). Considering mother palms which produce a minimum of 65 per cent quality seedlings, only 20 per cent of such trees were found in both WCT and NCD while 40 to 60 per cent high yielding palms were present in

the Komadan groups which may be considered as prepotent. Occurrence of prepotent palms among coconut varieties was reported by Nampoothiri *et al.*, (1975), Gopimony (1982) and Ramanathan (1989).

The prepotent palms which can be identified from these populations based on seedling progeny analysis can be used for the commercial production of superior progenies. The pollen from such palms can be used for the production T x T hybrids also.

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