

GENETIC RESOURCES IN COCONUT

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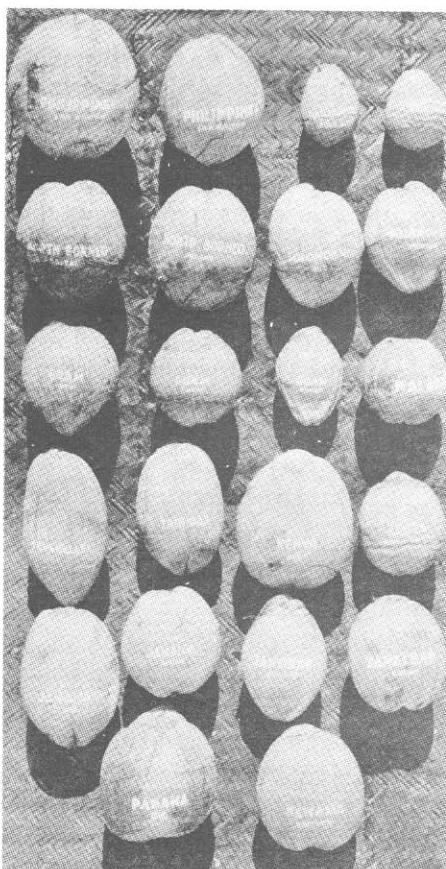


- *Genetic base for most estate crops is narrow, their cataloguing non-uniform. The collections may best be considered as plant samples and not population samples, since the exotic collections have been assembled through exchange programmes with limited sample size collected from fewer individual plants. In coconut, collection of exotic samples from the Indian Ocean islands, South America, Melanesia and Micronesia and indigenous samples from Gujarat, West Bengal, Andhra Pradesh and Orissa is top priority. Seed nut of coconut imposes serious limitation. Alternatively, collection of embryos for indigenous and pollen and embryos for exotic cultivars are aims of the future.*

It is presumed that the generic name *Cocos* as well as the popular name coconut are derived from Spanish word 'coco' meaning 'monkey face'—a probable reference to the three scars on the base of the shell resembling a monkey's face. Central American origin of the coconut is disputed because of the evidences of its cultivation in Sri Lanka by 300 BC and the discovery of a fossil (Pliocene) *Cocos* in New Zealand and deserts of Rajasthan. The palm apparently was domesticated in the Indo-Pacific region. The most widely accepted theory, traces the origin to the Old World, somewhere in South-East Asia or the Pacific Islands, from where it might have been transported to other regions either by man or by sea. The germination capacity of the coconut even after floating in the sea for more than 3 months points to natural dissemination between the Pacific and Indian Ocean Islands.

Genetic variability and varieties

Tall and dwarf are the two distinct varieties of coconut. The tall palms,



At the CPCRI, germplasm accessions of 41 indigenous and 86 exotic cultivars of coconut are maintained. The exotic collection from 22 countries comprises 72 tall, 12 dwarfs, 1 semi-tall and 1 hybrid. The process has been in progress since 1924.



'Dwarf Green' coconut. In general the dwarf varieties are early in bearing (3 years after planting), autogamous, without bole and fully grown fronds seldom exceeding 4 m in length. 'Dwarf Green' has a tendency of alternate bearing. It is also the earliest to germinate.

Table 1. Exotic coconut germplasm accessions at the CPCRI, Kasaragod

Source of accession	Tall	Dwarf	Total
Toromeo Islands	3	-	3
Indonesia	1	-	1
Malaysia	5	3	8
Philippines	7	-	7
Vietnam	1	-	1
Papua New Guinea	7	2	9
New Caledonia Islands	6	-	6
New Hebrides	1	-	1
Tonga Islands	3	-	3
Fiji Islands	7	2	9
American Samoa	2	1	3
French Polynesia	6	1	7
Guam	3	-	3
Lifou	1	-	1
Solomon Islands	3	-	3
Surinam	1	1	2
Jamaica	2	-	2
Trinidad	2	-	2
Panama	1	-	1
Nigeria	1	1	2
Kenya	1	-	1
Ivory Coast	2	1	3
Zanzibar	1	-	1
Sri Lanka	2	4	6
Seychelles	1	-	1
Total	70	16	86

referred to as var. *typica* Nar., are the most commonly cultivated in all the coconut-growing regions of the world. They grow 30-m tall, have a comparatively long pre-bearing age, are normally cross-pollinated, and their fruits are generally medium to large in size. 'West Coast Tall', 'Lakshadweep Ordinary', 'East Coast Tall', 'Benaulim' and 'Andaman Ordinary' are some of the distinct tall types from India.

Dwarf palms, or var. *nana* (Griff.) Nar., are characterized by their short stature and smaller nuts of varying colours—green, yellow and orange. They are presumed to have originated from the taller palms either through mutation or by inbreeding. 'Chowghat Green Dwarf', 'Chowghat Orange Dwarf' and 'Gangabondam'

Table 2. Indigenous coconut accessions at the CPCRI, Kasaragod

Source of collection	Tall	Dwarf	Total
Kerala	4	2	6
Tamil Nadu	3	5	8
Karnataka	2	1	3
Andhra Pradesh	4	1	5
Goa	3	-	3
Gujarat	1	-	1
Orissa	1	-	1
Andamans	10	1	11
Lakshadweep	2	1	3
Total	30	11	41

Table 3. Coconut germplasm available in the co-ordinating centres

Centre	Exotic	Indigenous	Total
Aliyarnagar	13	6	19
Ambajipet	6	5	11
Arsikere	11	2	13
Andamans	-	8	8
Coimbatore	2	5	7
Jagadapur	11	5	16
Jalalgarh	11	5	16
Konark	11	2	13
Mondouri	11	1	12
Policode*	28	34	62
Ratnagiri	11	6	17
Veppankulam	15	15	30

*Discontinued since April 1986

are the three important dwarf types from India. Distinct from the tall and dwarf types are 'Lakshadweep Micro', 'Kappadam', 'Andaman Giant', 'Calangute', 'Nadora' and 'Benaulim.'

Collection and conservation

From 1924 onwards, a number of exotic accessions from the Philippines, Malaysia, Fiji, Indonesia, Sri Lanka, Vietnam and other south-east Asian countries have been introduced either through direct introduction or through a germplasm exchange programme. The germplasm accessions of coconut maintained at the Central Plantation Crops Research Institute, Kasaragod, comprise 41 indigenous and 86 exotic cultivars—perhaps the largest assemblage in the

world. The exotic collections from 22 countries of south and south-east Asia, Caribbean Islands, Indian Ocean Islands, and African countries total 72 tall, 12 dwarfs, one semi-tall and one hybrid (Table 1). Twenty-four accessions (21 tall and 3 dwarfs) collected are from six Pacific Ocean territories. They are being maintained at the CPCRI World Coconut Germplasm Centre, Sipighat and the Andamans for quarantine consideration. The indigenous collections from Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Orissa, Andaman and Nicobar Islands, and Lakshadweep Islands comprise 30 tall and 11 dwarfs (Table 2).

Representative germplasm collections are also being maintained at the



Of Indian origin, coconut 'Benaulim', is distinct from the tall and dwarf types. At Ratnagiri, in a T X D cross of 'Benaulim' x 'Chowghat Orange Dwarf' the hybrid yields 138 nuts/palm/year compared with 93 nuts of coconut 'West Coast Tall'.

twelve centres under the All-India Co-ordinated Research Project on Palms (Table 3).

Documentation of coconut germplasm

The IBPGR Consultation on Coconut Genetic Resources held in January 1978 at the FAO Headquarters identified a minimum list of descriptors to be used in collecting the field data. The IBPGR descriptor's list is mainly based on the descriptors made available by the CPCRI and includes information on collection, evaluation, maintenance and occurrence of disease on coconut.

Evaluation

The evaluation of coconut germplasm is a long-drawn process due to its long juvenile phase and also the time taken for stabilization of yield. For evaluating at nursery stage, seedling characters such as the sprouting period of seed nuts, number of leaves, girth at collar and seedling height are generally used. Most of

Table 4. Performance of promising coconut cultivars at the CPCRI, Kasaragod

Cultivar	Mean yield of nuts/ palm/year(17-20years)		Copra yield		
	No.	% over 'WCT'	Per nut (g)	palm/year (kg)	% over 'WCT'
<i>Exotic</i>					
'Fiji Tall'	106	55.9	179	19.0	86.3
'Fiji Longtonwan'	104	52.9	210	21.8	113.7
'Philippines Ordinary'	108	58.8	198	21.4	109.8
'Philippines Laguna'	88	29.4	209	18.4	80.4
'S.S. Green'	108	58.8	189	20.4	100.0
<i>Indigenous</i>					
'Kappadam'	90	32.4	299	26.9	163.7
'Andaman Ordinary'	94	38.2	169	15.9	55.9
'Laccadive Ordinary'	98	44.1	169	16.6	62.7
'West Coast Tall'	68	-	150	10.2	-

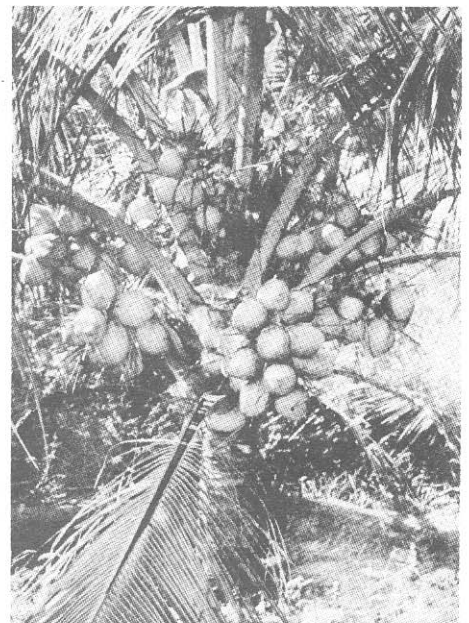
Source: PLACROSYM V, 1982, pp. 112-124



Rainfed but well managed palm of 'West Coast Tall' yields 60-80 nuts/year, with mean copra content of 165 g/nut and 72 per cent of oil by weight of copra. For 1 tonne of copra, 6,250 nuts of the variety are required.

these characters have correlation with the adult palm in bearing.

Usually the performance of a cultivar is evaluated against the local material only after stabilization of yield, which may take 15-20 years after planting. However, it is possible to evaluate the germplasm accession at



Highly superior in performance to the 'Dwarf Green' coconut, the 'Chowghat Orange Dwarf' yields 46-130 nuts/year, with mean copra content of 99.2 g/nut but a low 66 per cent of oil by weight of copra. The variety has a tendency for alternate bearing.

an early stage as the cumulative yield of first eight years had high correlation with the stabilized yield.

Exotic cultivars 'Fiji Tall', 'Fiji Longtongwan', 'Philippines Ordinary', 'Philippines Laguna' and 'Straight Settlement Green' from Malaysia, have been evaluated to be

superior to the local cultivar 'West Coast Tall', yielding more than 30 per cent nuts and 80-114 per cent copra. Among the indigenous cultivars, 'Kappadam', 'Andaman Ordinary', and 'Lakshadweep Ordinary' possess higher yield potential than the local 'West Coast Tall' (Table 4).

Based on the yield evaluation carried out at the four co-ordinating centres in Andhra Pradesh, Tamil Nadu, Karnataka, and Maharashtra, besides CPCRI, Kasaragod, 'Lakshadweep Ordinary' has been released as 'Chandra Kalpa'. The cultivar gave 33 per cent more yield in terms of nuts and 30 per cent more copra yield compared to the local cultivar. 'Banawali Green Round' another tall type from Goa, with a mean of 151 nuts/palm/year and copra outturn of 22.8 has also been released.

Though initiated in the thirties, screening for coconut genotypes resistant or tolerant to root-wilt received

considerable attention only in the eighties. *Inter-se* and *selfed* seed nuts are being generated from the World Coconut Germplasm Centre and the disease-free 'West Coast Tall' seedlings identified in the 'hot spot' areas in an attempt to evolve disease-tolerant varieties.

Future strategy

So far there is no breakthrough for root-wilt tolerance. The fact coconut belongs to the monotypic genus limits the possibility of tapping gene pools from related species. Most exotic collections assembled through exchange programmes have a limited sample size of individual palms. Genetic base may be broadened by collecting samples from Melanisia, Micronesia and Indian Ocean Islands, known to have wide variability. The taste should receive top priority. Among the indigenous collections, representative samples from Orissa, West Bengal and the north eastern regions are the gaps.

It is necessary to have a sizeable population (minimum 10 palms per accession) of the collections maintained preferably at more than one location. Maintenance of a duplicate set would help in meaningful evaluation and also as a stand-by in case of a disease outbreak. The size of seednut imposes serious constraints in sample size and transportation for exotic germplasm.

Embryo culture technique has been standardized in coconut that may be used for germplasm collection in the future. Though embryo collection procedure, response in relation to age and storage periods, medium for maintaining the embryos during transit and procedure involved in field planting need further exploration.

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Branched coconut:

A departure from convention

A rare phenomenon in coconut, branching is of importance since it provides for increased yields with less planting space. Forking or branching may occur at any stage of growth and from any region of the stem. Branched coconuts are usually unproductive, though few such palms do also bear normally.

This departure from normal expression may be due to injury caused to the terminal bud by rhinoceros beetle, lightning and by diseases, fire or storm. If, however, the growing point of a young palm is injured, the bole tends to throw out adventitious buds because of the meristematic activity of the ground tissue of the bole.