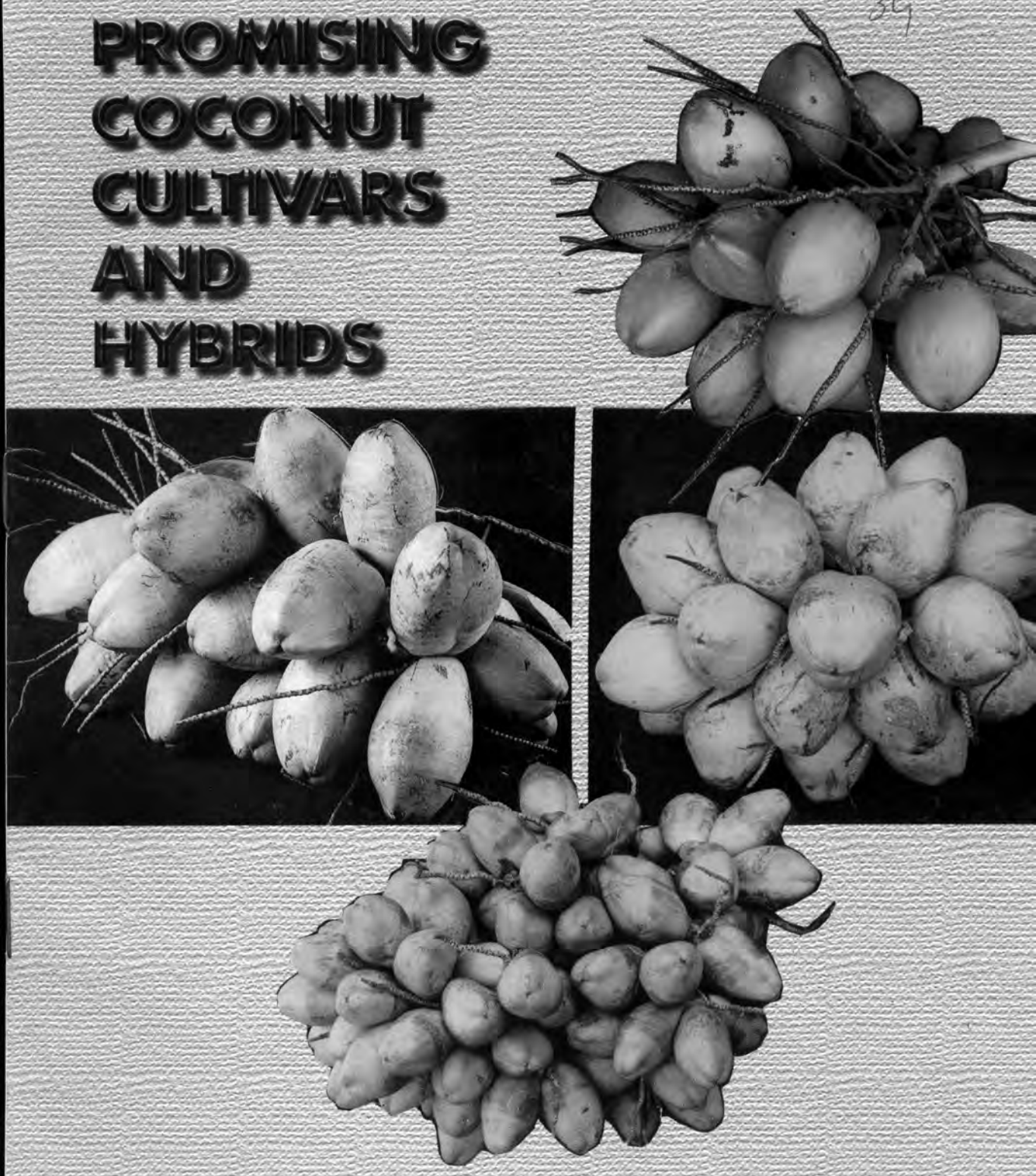
PROMISING COCONUT CULTIVARS AND HYBRIDS



CENTRAL PLANTATION CROPS RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
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PROMISING COCONUT CULTIVARS AND HYBRIDS

The coconut (*Cocos nucifera* L.) is one of the most useful palms in the world which provides food, shelter and a number of industrial by-products. The palm is grown in varying soil and climatic conditions. Grown in more than 80 countries of the tropics, India ranks first in terms of nut production. It is estimated that the production in the country is 12,988 million nuts with an estimated area of 1.89 million ha (1996-'97). Though represented by a monotypic species, because of its predominantly cross-pollinating nature, several cultivars or types, widely differ from each other in the morphological characters, particularly in respect of fruit, exist.

Basically in coconut, there are two types viz., the talls and the dwarfs.

The tall cultivars are grown on plantation scale for copra, oil and fibre. They are generally identified by the location of cultivation or collection. They grow to a height of 15-18 metres with 25-40 fronds on the crown and their life-span extends from 60 to 80 years or more. The tall cultivars are predominantly cross-pollinated and exhibit high degree of variability in respect to crown shape, colour, shape and size of fruits, copra and oil content. They come to bearing in about 6-7 years under favourable conditions and attain steady bearing in about 12-15 years, after flowering. The nuts are generally medium to big in size with colours varying from green, greenish yellow and brown. The nuts have good quality and quantity of copra and fairly high oil content (68-70%) as compared to those of dwarf cultivars.

The dwarf cultivars, as the name imply, are short in stature, growing to a height of 5 to 7 metres with closely arranged leaf scars on the stem. The palms commence bearing in about 3 to 4 years after planting. They are short-lived with a life span of about 40-50 years. The dwarf palms are predominantly self pollinated and hence the variability within a cultivar is comparatively less. However, they differ from each other in the production of bunches, yield of nuts and copra. The nuts of dwarf cultivars are smaller, and copra soft, leathery with low oil content (65-67%) and therefore has little demand in the market. The dwarf cultivars are invariably known by the colour of their fruits viz., those producing green, yellow and orange fruits and location of collection/ occurrence. Though dwarfs are grown for ornamental as well as tendernut purposes, their usefulness as a parent in Dwarf x Tall and Tall x Dwarf crosses has been fully recognized and exploited by coconut breeders all over the world.

The practical identification of cultivars/ hybrids is very important for the growers as well as for the research workers. To make one familiar with common varieties of coconut, a brief account of the characteristic features of the promising cultivars as well as hybrids released for commercial cultivation, is given below:

1. TALL CULTIVARS

1.1 WEST COAST TALL (WCT) : This is the ordinary or common tall cultivar, extensively cultivated along the west coast regions of India. It is majestic in appearance, long-lived and sturdy which yields economically for about 75 years or more. A fully grown palm of 27-30 years of age has an average of 36 functional leaves, with spherical or hemispherical crown, and shows 80% regularity in bearing, producing 12-13 inflorescences per year. The WCT palms normally come to bearing in about 6-7 years under favourable conditions. The average annual yield under rainfed condition ranges from 40 to 100 nuts per palm with a mean of 80 nuts. It has a copra content of 176 g per nut (the range being 135 to 200 g) with an oil content of 68 per cent. About 5000 to 7400 nuts are required to make one tonne of copra. The WCT palm grows well

in all types of soil and is somewhat tolerant to moisture stress in the soil and hence is recommended for large scale cultivation in the coastal regions of Kerala and Karnataka.

1.2 EAST COAST TALL (ECT) : This is a common cultivar grown extensively on the east coast of India. It resembles WCT in gross morphology. The palms take about 6-8 years to commence flowering. The average annual yield is 70 nuts per palm with a range of 40 to 120 nuts. The nuts are smaller than those of WCT. The copra content varies from 100 to 140 g per nut with a mean of 125 g per nut. It has an oil content of 64 per cent. To make one tonne of copra, 7000-10000 nuts are required.

1.3 TIPTUR TALL (TPT) : This is a popular tall cultivar of Karnataka State. The palms resemble WCT in most of the morphological characters. In this cultivar also, the colour of nut varies from green, greenish yellow to brown. The palms take about 6 to 7 years for flowering. The size of the nut is round/oval and the average yield of nuts per palm is 86, the range being 70 to 110 nuts. The mean copra content is 178 g. Approximately 4780-6800 nuts are required to make one tonne of copra. The oil content in copra is 68 per cent.

1.4 BENAULIM TALL (BENT) (PRATAP) : This is a popular cultivar in Goa, Konkan and coastal Maharashtra. The palm resembles West Coast Tall in appearance, but the nuts are smaller and round. This cultivar normally comes to bearing in about 7-8 years. The bunches are heavy and attractive with closely packed round nuts. The average annual yield of nuts is 150 with a range of 139 to 160 nuts per palm. It has a mean copra content of 152 g per nut with a range of 120 to 160 g. The oil content in copra is 64 per cent. This cultivar has been released under the name 'Pratap' for commercial cultivation in Maharashtra State.

1.5 LAKSHADWEEP ORDINARY (LCT) ('CHANDRAKALPA'): This indigenous cultivar from Lakshadweep Islands resembles WCT in growth habit and nut characters except for the comparatively smaller nuts with three prominent ridges seen on the triangular nut. The nut colour varies from green to yellow through various shades of brown. The average annual yield is 100 nuts with a range of 80 to 178 nuts per palm. It has a copra content of 176 g with 72% oil content. These palms are considered good for tapping sweet toddy. About 5600 to 7000 nuts are required to make one tonne of copra. The palm grows in all types of soil and it can withstand moisture stress. This cultivar was released by CPCRI during 1985 under the name 'Chandrakalpa' for large scale cultivation in the states of Kerala, Karnataka, Andhra Pradesh and Maharashtra.

1.6 LAKSHADWEEP MICRO (LMT) : This cultivar is another introduction from Lakshadweep Island. This is a profuse bearing tall palm and resembles WCT in morphological characters. As the name indicates, the nuts are very small in size. The nut colour varies from green to shades of brown. The bunches are heavy with large number of small and closely packed nuts. The average annual yield of the palm is over 200 nuts with a range of 100 to 320. The copra content in this cultivar is 80 to 100 g per nut with 75 per cent oil, the highest recorded among the cultivars. This cultivar is best suited for the production of 'ball copra'. This palm exhibits alternate bearing tendency. Barren nut production is usually associated with this cultivar. About 10,000 to 13,000 nuts are required to make one tonne of copra.

1.7 ANDAMAN ORDINARY (ADOT) : This cultivar is largely grown in Andaman & Nicobar Islands. The palms are tall, massive and comparatively more vigorous than WCT palms in vegetative growth. The nuts are fairly large in size with an average yield of 94 nuts per palm

per year. Copra content is 169 g per nut with 66% oil in copra. Nearly 5900 nuts are required to make one tonne of copra. This cultivar is used as a female parent in the production of the released hybrid 'Anandaganga'.

1.8 PHILIPPINES ORDINARY (PHOT) : This exotic cultivar from the Philippines grows to a height of 10-12 m. It is a good yielder and the annual yield of nuts varies from 90 to 200 with an average of 110 nuts per palm. The average copra content is 189 g per nut with 66 per cent oil in copra. Because of its high yield potential, this cultivar was recommended for release as a 'National variety' during 1995 for commercial cultivation in the west coast including Konkan region, coastal Andhra Pradesh and West Bengal.

2. DWARF CULTIVARS

2.1 CHOWGHAT ORANGE DWARF (COD) : This indigenous dwarf cultivar is found sparsely cultivated throughout the west coast region of India, particularly in the Chavakkad area of Thrissur District of Kerala. The palm has a thin stem with closely arranged leaf scars, a small compact crown with characteristic orange colour on leaf petioles, inflorescences and nuts. This is an early flowering cultivar and takes about 3-4 years for initial flowering. The average annual yield is about 65 nuts per palm with a range of 50 to 120 nuts. It has a mean copra content of 150 g per nut and 66 per cent oil. This cultivar is known as 'Gowrigathram' or 'Chenthengu' and 'Kenthali' in Kerala and Karnataka respectively. This is largely a self pollinating type. Traditionally this cultivar was being grown as an ornamental palm or as a source of tendernut water. The tendernut water of this cultivar is sweet with a total sugar content of 7 % and has 20 ppm of sodium and 2000 ppm of potassium. This cultivar was recommended for release by CPCRI in 1991, for commercial cultivation for the states of Kerala and Karnataka as a tendernut variety. COD has been planted in isolated blocks in the seed gardens in Kerala, Karnataka and Tamil Nadu for the production of Dwarf x Tall hybrids.

2.2 CHOWGHAT GREEN DWARF (CGD) : This indigenous dwarf cultivar was also reported from the Chavakkad area of Thrissur District in Kerala. This is the earliest flowering cultivar. The first inflorescence emerges from the 18th leaf axil and hence popularly knows as 'Pathinettam Pattai' palm in Kerala as well as in Tamil Nadu. The leaf petioles, leaves and nuts are dark green in colour. The nuts have a characteristic 'beak' when fully mature. Retention of unfertilized female flowers and distribution of large number of female flowers per spike are the characteristic features associated with this cultivar. These palms have been found to have a good degree of field tolerance to Root wilt disease and hence healthy palms located in the Root wilt hotspots have been extensively used in breeding for disease tolerance in combinations with the disease resistant WCT palms occuring in similar areas. The mean annual yield is 66 nuts per palm with a range of 30 to 107 nuts. The copra content is low with a mean of 60 g per nut with 66 per cent oil. The copra is of poor quality as it is leathery and has no demand in the market. The tendernut water is sweet, but the quantity of water is low (approx. 80 ml/nut). This cultivar exhibits alternate bearing habit.

2.3 GANGABONDAM DWARF (GBD) : This is a dwarf green cultivar mainly grown in the East Godavari District of Andhra Pradesh. The palm exhibits dwarfish characters like short and narrow stem with closely arranged leaflets and compressed internodes. This cultivar has distinct and characteristic papaya-shaped green nuts. The palms are highly self pollinated. They start bearing by 3rd or 4th year of planting. The mean annual yield is 67 nuts per palm with a range of 50 to 90 nuts. The copra content is 153 g per nut with 67% oil.

Because of its good combining ability, Gangabondam Dwarf is used as a male parent in the production of Tall x Dwarf hybrids like Lakshaganga (LOT x GBD), Keraganga (WCT x GBD) and Anandaganga (AOT x GBD).

2.4 MALAYAN YELLOW DWARF (MYD): This is a dwarf cultivar introduced from Malaysia. The leaf petioles, inflorescences and nuts of this cultivar are yellow in colour. It comes to bearing in about 4 years after planting. The mean annual yield is 66 nuts per palm with a range of 35 to 90. The average copra content per nut is 140 g. The oil content in copra is 66 per cent. This cultivar is available in large numbers in the Seed Garden Complex, Munderi Farm, Nilambur, Kerala. MYD was introduced mainly for hybrid seed production, and is more homogeneous than the other dwarfs.

3. HYBRIDS

Hybrids are the intervarietal crosses between the two morphological forms of coconut. They exhibit earliness in flowering, increased yield, higher quantity and have better quality of copra and oil compared to the parents. The first coconut hybrid in the world was produced in India in 1934 by Dr. J.S. Patel with West Coast Tall (WCT) as female parent and Chowghat Green Dwarf (CGD) as male parent.

Hybrids are produced in two ways with tall as female parent and dwarf as male parent (Tall x Dwarf) or dwarf as female parent and tall as male parent (Dwarf x Tall). Besides, intervarietal hybrids like Tall x Tall and Dwarf x Dwarf are also produced.

3.1 CHANDRASANKARA (COD X WCT): This is the most popular Dwarf x Tall hybrid with COD as female parent and WCT as male parent. This hybrid can be easily identified in the nursery as the seedlings exhibit vigorous growth with bronze-coloured petioles. The palms come to bearing early when compared to tall palms. It is a heavy yielder and produces around 116 nuts/palm with a range of 100-150 nuts. The nuts are round to oblong in shape and bronze coloured. The copra content in nut is 215 g with a range of 160 to 230 g. The oil content in copra is 68 per cent. The hybrid performs better under good management conditions. However, it is susceptible to drought and hence irrigation is required during summer months. Chandrasankara was released by CPCRI in 1985 for general cultivation in Kerala and Karnataka.

3.2 KERASANKARA (WCT X COD): This is a popular Tall x Dwarf hybrid between West Coast Tall as female parent and Chowghat Orange Dwarf (COD) as male parent. The hybrid palms are precocious and exhibit higher productivity than the parents.

The palm comes to bearing by the 4th year of planting. The mean annual yield of nuts is 108 with a range of 70-130 nuts. The copra content is 187 g/nut with 68 per cent oil. This hybrid was recommended for release by CPCRI in 1991, for large scale cultivation in Kerala, coastal Andhra Pradesh and coastal Maharashtra.

3.3 CHANDRALAKSHA (LCT X COD): This is a Tall x Dwarf hybrid between Lakshadweep Ordinary as female parent and Chowghat Orange Dwarf as male parent. The hybrid comes to bearing in about 4-5 years after planting. The mean annual yield is 109 nuts per palm with a copra content of 195 g per nut, the range being 150 to 210 g. The oil content is 69 per cent. This hybrid performs better than Chandrasankara and Kerasankara under moisture stress situation. This hybrid has been released by CPCRI during 1985 for cultivation in Kerala, Karnataka and Tamil Nadu.

3.4 LAKSHAGANGA (LCT X GBD): This is another Tall x Dwarf hybrid between Lakshadweep Ordinary as female parent and Gangabondam Dwarf as male parent. It is an early bearer and comes to bearing in about 5

CHANDRASANKARA

KERASANKARA

CHANDRALAKSHA

WEST COAST TALL

TIPTUR TALL

PRATAP

CHOWGHAT ORANGE DWARF

CHOWGHAT GREEN DWARF

GANGABONDAM DWARF

MALAYAN YELLOW DWARF

CHANDRAKALPA

LACCADIVE MICRO

ANDAMAN ORDINARY

PHILIPPINES ORDINARY

years. The mean annual yield is 108 nuts, the range being 70 to 135 nuts. The nuts are round to oblong in shape and have a mean copra content of 195 g per nut with a range of 165 to 200 g. The oil content in copra is 70 per cent. This is yet another drought tolerant hybrid and can grow well even under rainfed condition. This hybrid was released by Kerala Agricultural University during 1987 for general cultivation in Kerala.

3.5 KERAGANGA (WCT X GBD) : This is another Tall x Dwarf hybrid between West Coast Tall as female parent and Gangabondam Dwarf as the male parent. The hybrid comes to bearing in about 4-5 years after planting. The mean annual yield is 100 nuts per palm with yield potential of 220 nuts per palm. It has a copra content of 201 g per nut and 69 per cent oil content. This hybrid also was released by Kerala Agricultural University in 1988 for commercial cultivation in Kerala.

3.6 ANANDAGANGA (ADOT X GBD) : This is a hybrid between Andaman Ordinary and Gangabondam Dwarf and released by Kerala Agricultural University. The palms are tall in stature and produce around 95 nuts per year and highest production of nuts per palm is 214. The hybrid flowers in about 5 years of planting. The mean copra content in the nut is 216 g with 68 per cent oil content.

3.7 KERASREE (WCT X MYD) : This is yet another hybrid released by Kerala Agricultural University. The parents of this hybrid are West Coast Tall (female) and Malayan Yellow Dwarf (male). The palms take about 5 years for flowering. It is a heavy yielder with mean annual yield of 130 nuts per palm. The nuts are medium in size with light green colour. The mean copra content per nut is 216 g with 66 per cent oil. This hybrid was released in 1992 for cultivation in Kerala state.

3.8 KERASOWBHAGYA (WCT X SSAT): This hybrid is between West Coast Tall as female parent and Strait Settlement Apricot Tall (SSAT) as male parent. The palms come to bearing in about 5 years after planting. The mean annual yield is around 116 nuts per palm. The copra content is 196 g with 65 per cent oil. This hybrid was released by Kerala Agricultural University during 1993 for large scale cultivation in Kerala State.

3.9 VHC - 1 (ECT x DG) : This is a hybrid between East Coast Tall and Dwarf Green, released by the Tamil Nadu Agricultural University in 1982 under the name 'Veppankulam Hybrid Combination-1 (VHC-1) for general cultivation in Tamil Nadu. The hybrid has early bearing habit and comes to bearing in about 4 years after planting. The mean annual yield of nuts is 98 with a range of 80-145 nuts. The copra content per nut is 135 g and oil content in copra is 70 per cent. The bunches have a tendency for buckling which is to be prevented by providing support.

3.10 VHC-2 (ECT x MYD) : This hybrid also was released by Tamil Nadu Agricultural University during 1987. The female parent in this hybrid is East coast Tall and the male parent is Malayan Yellow Dwarf. This gives around 107 nuts per palm, the range being 70 to 120 nuts. The nuts are medium in size and oval in shape with 152 g copra per nut having 69 per cent oil.

3.11 GODAVARIGANGA (ECT x GBD) : The parents of this hybrid are East Coast Tall (female) and Gangabondam (male). It comes to bearing in 4-5 years after planting. This is a high yielder with an average yield of 140 nuts per palm per year. The copra content is 150 g/nut with 68 per cent oil. This hybrid has been released by Andhra Pradesh Agricultural University in 1991 for general cultivation in Andhra Pradesh.

The comparative performance of the cultivars and hybrids described above is given in the table below :

Comparative performance of promising cultivars and hybrids

Cultivar/Hybrid	Habit	Crown shape	Time taken for flowering (months)	Shape of nut	Nut yield/ palm/year	Copra content/ nut (g)	Copra yield/ palm/year (kg)	Oil content (%)
I. TALLS								
West Coast Tall (WCT)	Tall	Circular/ Semi circular	72-84	Oval	80	176	14.0	68
East Coast Tall (ECT)	Tall	Circular	72-96	Oval	70	125	8.7	64
Tiptur Tall (TPT)	Tall	Circular/ Semi circular	72-84	Oval	86	178	15.3	68
Benaulim Tall (BENT) (Pratap)	Tall	Circular	84-96	Round	150	152	22.8	64
Lakshadweep Ordinary (LCT) (Chandrakalpa)	Tall	Circular	60-72	Oval with prominent ridges	100	176	17.6	72
Lakshadweep Micro (LMT)	Tall	Circular	96-108	Round to oblong	200	90	18.0	75
Andaman Ordinary (ADOT)	Tall	Circular	72-96	Oval	94	169	15.9	66
Philippines Ordinary (PHOT)	Tall	Circular	60	Round	110	189	20.8	66

Cultivar/Hybrid	Habit	Crown shape	Time taken for flowering (months)	Shape of nut	Nut yield/ palm/year	Copra content/ nut (g)	Copra yield/ palm/year (kg)	Oil content (%)
II. DWARFS								
Chowghat Orange Dwarf (COD)	Dwarf	Circular	36-48	Round	65	150	9.7	66
Chowghat Green Dwarf (CGD)	Dwarf	Circular	36-48	Oblong with prominent beak	66	60	4.0	66
Gangabondam Dwarf (GBD)	Dwarf	Circular	36-48	Oblong and papaya shaped	67	153	10.2	67
Malayan Yellow Dwarf (MYD)	Dwarf	Circular	48	Round	66	140	9.2	66
III. HYBRIDS								
Chandrasankara (COD x WCT)	Semi-Tall	Circular	36-48	Round	116	215	24.9	68
Kerasankara (WCT x COD)	Tall	Circular	48	Oval to round	108	187	20.2	68
Chandralaksha (LCT x COD)	Tall	Circular	48-60	Oval	109	195	21.3	69
Lakshaganga (LCT x GBD)	Tall	Circular	60	Oval to round	108	195	21.1	70

Cultivar/Hybrid	Habit	Crown shape	Time taken for flowering (months)	Shape of nut	Nut yield/ palm/year	Copra content/ nut (g)	Copra yield/ palm/year (kg)	Oil content (%)
Keraganga (WCT x GBD)	Tall	Circular	48-60	Oval	100	201	20.1	69
Anandaganga (ADOT x GBD)	Tall	Circular	60	Oval	95	216	20.5	68
Kerasree (WCT x MYD)	Tall	Circular	60	Oval	130	216	28.1	66
Kerasowbhagya (WCT x SSAT)	Tall	Circular	60	Oval	116	196	22.7	65
VHC-1 (ECT x DG)	Tall	Circular	48	Oval	98	135	13.2	70
VHC-2 (ECT x MYD)	Tall	Circular	48	Oval	107	152	16.3	69
Godavariganga (ECT x GBD)	Semi-Tall/Tall	Circular	48-60	Oval	140	150	21.0	68