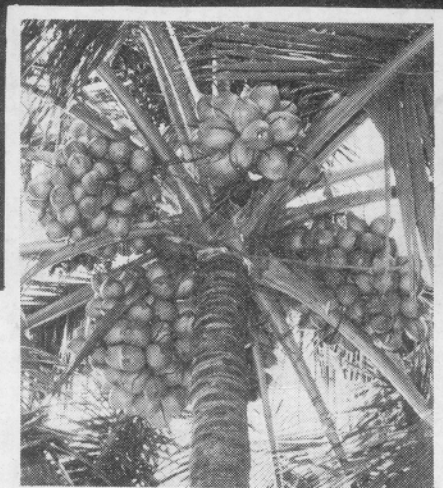
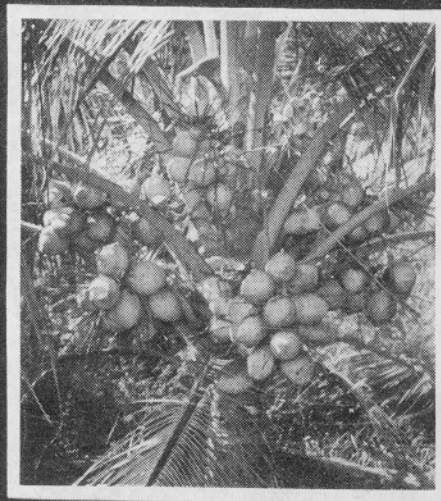
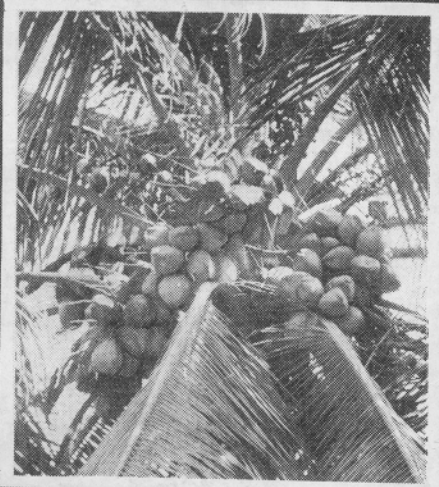


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PROMISING COCONUT CULTIVARS AND HYBRIDS



CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

KASARAGOD 670 124 KERALA INDIA.

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PROMISING COCONUT CULTIVARS AND HYBRIDS

The coconut palm (*Cocos nucifera* L.) is one of the most useful palms grown throughout the tropical regions of the world. Because of its predominantly cross-pollinating nature, several cultivars or types widely differing from each other in their morphological characters, particularly in respect of fruit exist in these regions. Coconut palms are broadly classified into two groups, the Talls and the Dwarfs.

The Tall cultivars are most extensively grown on a plantation scale in all coconut tracts of the world. They are taller in stature growing to a height of 15 to 18m. Their life span extends from 60 to 80 years or more. They normally come to bearing in about 5 to 7 years after planting and attain steady bearing in about 12 to 15 years after flowering. The nuts of the Tall cultivars are generally medium to big in size with good quality and quantity of copra and fairly high oil content (68-75%) as compared to those of the Dwarf cultivars.

The Dwarf cultivars are characterised by short stature and earliness in bearing. The palms commence bearing in about 3-4 years after planting. They are short-lived with a life span of about 40-50 years. The nuts are smaller, the copra soft, leathery and oil content low (66-68%) with little demand in the market. The dwarf cultivars exhibit three different nut colours viz. green, yellow, and orange. In earlier years though Dwarfs were grown for ornamental purposes, or for tender nut use, their usefulness as parents in the production of T × D and D × T hybrids has been fully

recognized now by breeders all over the world.

A brief account of the characteristic features of the promising Tall and Dwarf cultivars as well as cultivars and hybrids released for commercial cultivation are given below:

Tall cultivars

West Coast Tall (WCT)

This is the common tall cultivar extensively cultivated along the West Coast of India. It is a long lived and sturdy palm which yields economically for about 75 years. The WCT palm normally comes to bearing in about 5 to 7 years. The average annual yield ranges from 50 to 100 nuts per palm with a mean of 80 nuts. It has a copra content of 176 g per nut with a range of 135 to 207 g and an oil content of 68 per cent. Between 4831 to 7407 nuts are required to make one tonne of copra. This grows well in all types of soil, is tolerant to moisture stress in the soil and is recommended for large scale cultivation in the coastal regions of Kerala and Karnataka.

Laccadive Ordinary (Chandrakalpa)

This cultivar has been introduced from the Lakshadweep Islands. The palm is similar to WCT in growth habit and nut characters except for the prominent ridges seen on the triangular nut. The palms are considered very good for tapping as the yield of toddy is nearly double the quantity obtained from the WCT. The average annual yield is 98 nuts with a range of 80

TALL CULTIVARS



WEST COAST TALL



CHANDRA KALPA



LACCADIVE MICRO



BENAULLIM

to 178 nuts/palm. It has a copra content of 140 to 180 g/nut. The oil content is about 72 per cent. From 5556 to 7143 nuts are required to make one tonne of copra. This cultivar has been released by CPCRI, Kasaragod under the name 'Chandrakalpa' for cultivation in Kerala, Tamil Nadu, Andhra Pradesh and Maharashtra States.

Laccadive Micro (LM)

This is another introduction from the Lakshadweep Islands. The palm is tall and resembles the WCT in gross morphology. As the name indicates, the nuts are very small. On an average each palm produces 400 to 500 female flowers in each bunch. The bunches are heavy and attractive with a large number of closely packed nuts. The average annual yield varies from 100 to 320 nuts. Even though the nuts are small, the kernel is thick with an average copra content of 117 g per nut and a range of 60 to 132 g. The oil content is 75 per cent, the highest recorded among the cultivars studied so far. This cultivar is ideally suited for the production of ball copra, which is considered as a special grade and fetches premium price in the market, particularly in North India. The palm has an irregular bearing tendency. Between 7576 to 16667 nuts are required to make one tonne of copra. Occurrence of barren nuts is a character usually associated with this cultivar.

East Coast Tall (ECT)

This is the common tall cultivar extensively cultivated along the East Coast of India and hence its name. It is similar to W C T in gross morphology. The palms take about 6 to 8 years to commence bearing. The average annual yield is 73 nuts per palm with a range of 40 to 120 nuts. The nuts are smaller in size compared

to W C T with an average copra content of 125 g/nut ranging between 100 to 140 g, and an oil content of 64 per cent. Between 7143 to 10,000 nuts are required to make one tonne of copra. This cultivar is extensively cultivated in Tamil Nadu and Andhra Pradesh.

Banawali Green Round (BGR)

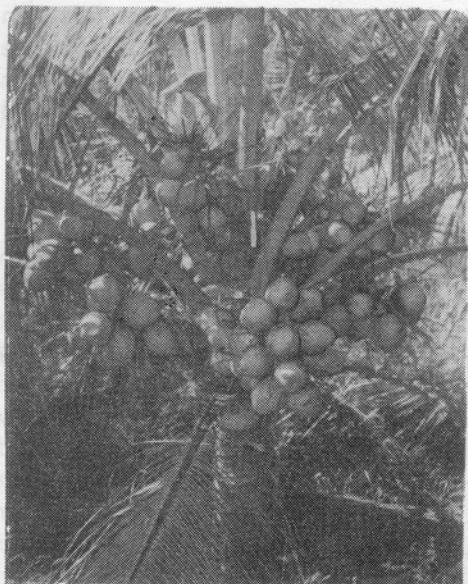
This is a popular cultivar in Goa, Konkan and Coastal Maharashtra. The palms resemble WCT in gross morphology but the nuts are small and roundish. They normally come to bearing in about 7-8 years. The bunches are heavy with closely packed nuts. The average annual yield ranges from 139 to 160 nuts with a mean of 151 nuts. The copra content is 150 g per nut and the range being 120 to 160 g and oil content is 59.7 per cent. This cultivar has been released in 1987 for commercial cultivation in Coastal Maharashtra.

Dwarf cultivars

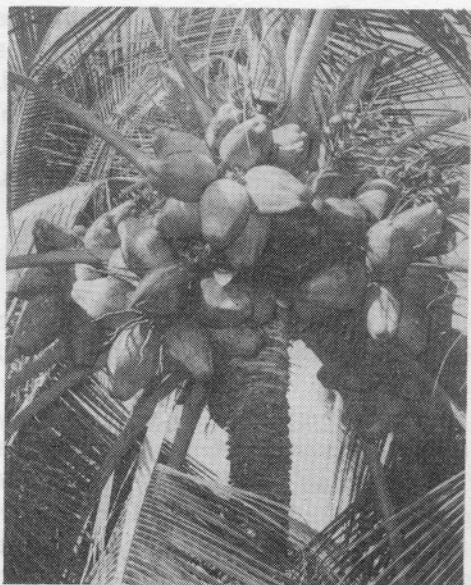
Chowghat Orange Dwarf (COD)

This indigenous dwarf cultivar is found sparsely cultivated throughout the West Coast of India particularly in the Chowghat (Chavakkad) area of Trichur District of Kerala. The cultivar derives its name from the place (Chavakkad) from where it was reported first. The palms have a characteristic orange colour on the nuts, spadices and leaf petioles. During seedling stage before the commencement of flowering, they resemble very closely to the Malayan Orange Dwarf. However, the former can be distinguished from the latter by their erect leaf tips, whereas in the Malayan Orange Dwarf leaf tip of inner whorl has characteristic bending. This cultivar commences flowering in about 4 years after planting. The average annual yield is 63 nuts per palm with a range of 50 to 120 nuts. The nuts are ovoid in shape

DWARF CULTIVARS



CHOWGHAT ORANGE DWARF



CHOWGHAT GREEN DWARF

MALAYAN YELLOW DWARF



GANGABONDAM



with out ridges. It has a mean copra content of 158 g per nut with a range of 112 to 198 g and 66 per cent of oil in copra. The quality of the copra is poor. This variety is known as "Gowrigathram" or as "Chenthengu" in some parts of Kerala. This cultivar is largely self-pollinated owing to a distinct overlap of the male and female phases in the same spadix. Traditionally this cultivar is being grown as an ornamental palm or as a source of tendernut water and also for raising the natural cross of Dwarfs (NCD) known as "Komadan". The tendernut water (7 month old nuts) is sweet with a total sugar content of 6.87 g/100 ml.

Chowghat Green Dwarf (CGD)

This indigenous Dwarf cultivar was also reported first from Chowghat area of Trichur District in Kerala. It is known as 'Pathinettampattai' in Tamil Nadu as well as in Kerala, because the inflorescence emergence is generally from the eighteenth leaf axil. The nuts, leaves and the petioles are dark green in colour. Nuts are smaller than those of COD and possess prominent beak when fully mature. Another characteristic feature of the cultivar is the production of 2—3 female flowers per spike. It is an early bearer and starts bearing by 3rd or 4th year. The mean annual yield is 77 nuts/palm; the range being 34 to 114 nuts. The copra is leathery and has no demand in the market. The copra content is very low with a mean of 60 g per nut, the range being 38 to 100 g. The oil content is 66 per cent. Tender nut water is good, although quantity is low (60 to 100 ml). This cultivar shows pronounced irregular bearing habit. This is generally grown as ornamental palm in house compounds. Here the overlap of male and female phases in the same spadix is more pronounced than in COD, and it lasts for 4 days.

Malayan Green Dwarf (MGD)

This is an introduction from Malaysia. It was first introduced about 40 years ago at the New Ambady Estate, Kulasekharam in Tamil Nadu from Srilanka. In spite of its long voyage from Malaysia to India via Sri Lanka, it has retained its original characteristic as described in the literature. It is early bearing and produces medium sized green nuts. The mean annual yield is 89 nuts with a range of 39 to 128 nuts/palm/year. The copra content is 167 g with a range of 137 to 168 g and oil content in copra is 67 per cent. Since the copra of this dwarf is of good quality and high yield is obtained under irrigation, this can be cultivated in our country as an economical type. This cultivar of Malayan Dwarf exhibits greater heterozygosity than the other two types viz. Yellow and Orange.

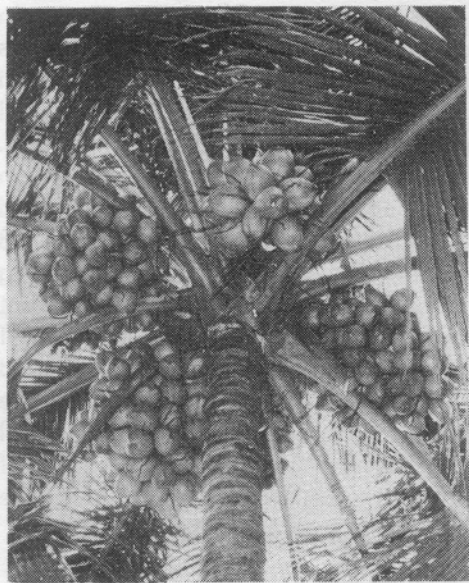
Malayan Yellow Dwarf (MYD)

This is another introduction from Malaysia. The nuts, spadices and petioles are yellow in colour. It starts bearing by 3rd or 4th year like the other dwarfs. The yield is about 66 nuts/palm/yr. with a range of 35 to 89 nuts. The copra content per nut is 140 g, the range being 125 to 167 g. The oil content in the copra is 66 per cent. Heavy bearing is observed under well distributed rainfall or under irrigation during summer months. In India a large scale direct introduction of MYD has been done recently (1985) at the Seed Garden Complex, Munderi Farm, Nilambur, Kerala for utilizing as a parental material in producing hybrids.

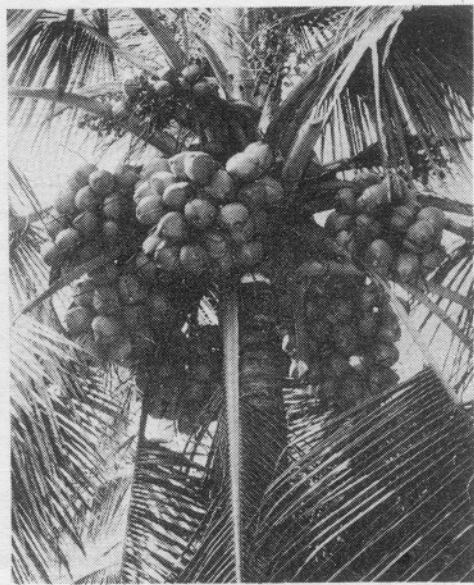
Gangabondam (GB)

This is another Dwarf green cultivar from East Godavari District in Andhra Pradesh. The palm exhibits dwarfish characters like short, narrow and closely arranged leaflets and compressed internodes. Leaves,

HYBRIDS



WCT x COD



CHANDRA SANKARA (COD x WCT)



CHANDRA LAKSHA (LO x COD)



LAKSHA GANGA (LO x GB)

petioles and nuts are green. The cultivar has characteristic, medium sized, papaya shaped nuts and marked overlapping of male and female phases. It is an early bearer and starts bearing by 3rd or 4th year. The mean annual yield is 68 nuts/palm with a range of 50 to 74 nuts. The copra content is 157 g with a range of 110-160 g and oil content in copra is 67 per cent. In crosses with LO as a female parent, this has yielded a prolific bearing hybrid released by KACU as Laksha Ganga. (PHC-1)

Hybrids:

Hybrid vigour in crosses between Tall and Dwarf coconut cultivars was first reported from India in the year 1937 from the erstwhile Coconut Research Station, Kasaragod and Nileshwar. Subsequent observations made in several other countries have also confirmed this finding. As a consequence, hybrid seed gardens were established or are being established in most of the coconut growing countries of the world for exploitation of hybrid vigour. Hybrids are produced in two ways, with tall as female parents (Tall × Dwarf or T × D) or with Dwarfs as female parents (Dwarf × Tall or D × T).

For producing hybrid coconuts, various cultivars of Tall and Dwarfs are being used as parents in different countries. In India, the popular T × D combination at present is WCT × Chowghat Orange Dwarf. In earlier years, West Coast Tall as female and Chowghat Green Dwarf as male was used. This T × D (WCT × COD) hybrid palm comes to bearing in about 4—5 years and attains steady bearing by 6th or 7th year after flowering. It yields well but sometimes exhibits irregular bearing tendency. The mean annual yield is around 108 nuts/palm, the range being 60 to 130 nuts. It has a copra content of 187 g/nut with the range of 104 to 196 g. The oil content in

copra is 68 per cent. About 5102 to 9615 nuts are required to make one tonne of copra. This hybrid has been recommended for release by the Central Plantation Crops Research Institute, Kasaragod in 1989 for general cultivation in Kerala, Coastal Maharashtra and Coastal Andhra Pradesh.

Chandra Sankara (COD × WCT)

The most common D × T hybrid is between Chowghat Orange Dwarf as female and West Coast Tall as male parent. This hybrid has been released by the CPCRI, Kasaragod in 1985 under the name 'Chandra Sankara'. This is also early bearing compared to Tall forms. It is a higher yielder giving about 116 nuts per palm per annum, the range being 55 to 158 nuts. The copra content is 215g/nut with a range of 160 to 230 g. The oil content in copra is 68 per cent. This hybrid is susceptible to drought situation and hence irrigation or well distributed rainfall during summer is required to get good yield. About 4350 to 6250 nuts are required to make one tonne of copra.

Chandra Laksha (LO × COD)


This is a Tall × Dwarf combination between Lakshadweep Ordinary as female parent and Chowghat Orange Dwarf as a male parent. The hybrid comes to bearing in about 6 years. 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 WCT × COD and Chandra Sankara under moisture stress situations. This hybrid has been officially released by the CPCRI, Kasaragod in 1985 under the name 'Chandra Laksha' for cultivation in Kerala. About 4760 to 6670 nuts are required to make one tonne of copra.

Laksha Ganga (LO × GB)

This is a Tall × Dwarf combination between Lakshadweep Ordinary as female parent and Gangabondam as a male parent. It is an early bearer and comes to bearing in about 5 years. The mean annual yield is 108 nuts with a range of 70 to 236 nuts. It has a mean copra content of 195 g per nut, the range being 165 g to 200 g. and an oil content of 70 per cent. This hybrid can be successfully cultivated under rainfed conditions as it has some degree of tolerance to drought situations. Over 5000 nuts are required to make one tonne of copra. This is a hybrid released by the Kerala Agricultural University under the name 'Laksha Ganga (PHC-1)' for general cultivation in Kerala.

VHC-1

This is a T × D hybrid between the East Coast Tall and Chowghat Green Dwarf released by the Tamil Nadu Agricultural University for cultivation in Tamil Nadu. The hybrid has early flowering character as well as high productivity under good management with irrigation. The palms come to flowering in about 4 years and gives an annual mean yield of 98 nuts. The range being 82-145 nuts under good management. The copra content per nut is about 135 g. A total of 7407 nuts are required for one tonne of copra. There is good demand for this hybrid in Tamil

Nadu. Because of the heavy bunches  there are chances for buckling which is to be prevented by tying the bunches and providing support from the base.

VHC-2

This is the second T × D hybrid in coconut released by the Tamil Nadu Agricultural University for Tamil Nadu. The female parent is East Coast Tall and the male parent is Malayan Yellow Dwarf. Copra content per nut is around 152 g. A total of 6580 nuts are required for a tonne of copra. Under good management and irrigation, this hybrid give around 107 nuts/palm/year, the range being 69 to 121 nuts. One important character noticed in this hybrid is that the bunches generally do not buckle which was not seen in VHC-1. The nuts are medium in size.

It is important to bear in mind that the performance of the cultivars and hybrids will vary depending upon the ecological conditions where they are grown and the attention given to them by the farmer. The performance will be superior only when they are raised under good management conditions following the practices recommended by this Institute to the various extension agencies. The yield figures given above are from palms growing under rainfed conditions. The potential can be doubled under irrigated conditions.

TABLE 1: COMPARATIVE PERFORMANCE OF COCONUT CULTIVARS AND HYBRIDS

Character Cultivar/ Hybrid	Habit	Crown shape	Funct- ional leaves (No.)	Time taken for flow- ering (Months)	Nut Yield/ Palm/ Year (No.)	Copra content/ Nut (g)	Copra Yield/ Palm/ Year (Kg)	Oil content (%)	Shape of nut
Talls									
WCT	Tall	Circular	36	60-84	80	176	14.08	68	Oblong
LO (Chandra Kalpa)	Tall	Circular	28	63-65	98	160	15.68	72	Oblong with pro- minent ridges
L. Micro	Tall	Circular	30	96-100	100-320	117	11.70 to 37.44	75	Round to Oblong
ECT	Tall	Circular	35	72-96	73	125	9.13	64	Oblong
BGR	Tall	Circular	32	84-96	151	150	22.65	59.7	Round
Dwarfs									
COD	Dwarf	Circular	22	48	63	158	9.95	66	Ovoid
CGD	Dwarf	Circular	28	36-48	77	60	4.62	66	Oblong with prominent beak
MGD	Semi Tall	Circular	31	73-76	89	167	14.86	67	Oblong
MYD	Dwarf	Circular	31	42-48	66	140	9.24	66	Round
GB	Dwarf	Circular	26	36-48	68	157	10.68	67	Papaya- shaped
Hybrids									
WCT × COD	Tall	Circular to Semi- circular	34	48-60	108	187	20.20	68	Oblong to Round
COD × WCT (Chandra Sankara)	Tall	Circular to semi- circular	33	60	116	215	24.94	68	Oblong to Round
LO × COD (Chandra Laksha)	Tall	Circular	35	48	109	195	21.26	69	Oblong
LO × GB (Laksha Ganga)	Tall	Circular	33	60	108	195	21.06	70	Oblong to Round
VHC-1	Tall	Circular	32	48	98	135	13.20	70	Oblong
VHC-2	Tall	Circular	33	48	107	152	16.26	69	Oblong