

Tender coconuts for nutritional security

The coconut palm (*Cocos nucifera*) nick-named as Kalpa vriksha, is a multipurpose palm grown widely in humid tropics, providing nutritious food and refreshing drink, oil for edible and non-edible uses, fibre, shell for fuel and industrial uses, timber and a variety of miscellaneous products for domestic and industrial uses. Its crop is of greater significance in generating employment, alleviating poverty and enhancing income to rural areas. It provides livelihood for 10 million people, contributing 6 per cent to the national vegetable oil pool.

COCONUT is grown predominantly in tropical regions in 12.47 million ha worldwide with an annual production of 72,758 million nuts. Nine million ha (about 75 per cent of the total area) is confined to Indonesia, the Philippines and India. In India, it is grown in 2.07 million ha with an annual production of 23,351 million nuts. In India, coconut is cultivated in 18 states and 3 union territories. Kerala, Tamil Nadu, Karnataka and Andhra Pradesh account for 90% of the total coconut cultivation in India. The cultivation of coconut has also spread to non-traditional states, Bihar, Chhattisgarh, Gujarat, West Bengal and North-Eastern states. Lakshadweep and Andaman and Nicobar also have coconut as the major crop.

COCONUTS FOR NUTRITIONAL SECURITY

Coconut Types

In coconut, palms are commonly categorized into two categories, tall and dwarfs, based on the plant habit. The tall palms are most commonly cultivated for commercial production in coconut-growing regions worldwide. Dwarf palms have gained importance in recent years due to tender nut qualities and resistance to certain diseases. The general features of tall and dwarf are listed in Table 1.

Table 1 General characteristics of tall and dwarf coconut varieties

Trait	Tall	Dwarf
Stem circumference	Sturdy with bole at base	Thin without bole at base
Initiation of flowering	Late (5-7 years)	Early (3-4 years)
Mode of pollination	Predominantly cross-pollinated	Predominantly self pollinated
Colour of fruits and petioles	Generally mixtures of green and brown	Either pure green, yellow, red (orange) or brown
Arrangement of leaf scars on the trunk	Widely spaced	Closely spaced
Fruit size	Very small to very big	Small to medium
Phenotypic variation		
Within cultivar	High	Low
Between cultivars	High	High
Leaf and bunch attachment	Very strong	Fragile
Root distribution	Generally more dense and plentiful	Less dense and few
Productive life span	About 60 years	About 40 years



Kalpa Jyothi



Kalpa Haritha



Chandralaksha



Kalpa Surya



Chandrasankara



CARI C1 Annapoorna

Table 2 Improved coconut varieties for copra and tender nut

Variety	Important traits	Nut yield (yield/ha/year)	Tender nut water (ml/nut)	Copra yield (tonnes/ha/year)	Recommended for
Tall					
Kera Chandra	High yield	19,470	450	3.86	Kerala, Karnataka, Konkan region, Andhra Pradesh, West Bengal
Kalpa Pratibha	High yield	16,107	448	4.12	Kerala, Andhra Pradesh, Tamil Nadu, Maharashtra
Kalpa Haritha	Green fruits, Less eriophyid mite damage	20,886	440	3.70	Kerala, Karnataka
Kalyani Coconut 1	High yield	14,160	274	3.84	West Bengal
Dwarf/semi-tall					
Kalparaksha	Semi-tall, High yield, green fruits	17,748	290	3.34	Kerala
Kera Madhura	Semi-tall, high yield	24,480	-	4.80	Kerala
Gouthami Ganga	Dwarf, Green fruits	11,505	-	1.8	Andhra Pradesh
Kalpasree	Dwarf, green fruits	15,930	240	1.54	Kerala
CARI-C1 (Annapurna)	Dwarf, high copra content, green fruits	9,133	470	2.20	Andaman and Nicobar Islands

Table 3 Coconut hybrids for copra and tender nut

Hybrid variety	Source population of parents	Important traits	Nut yield (yield/ha/year)	Vol. of tender nut water (ml/nut)	Copra yield (tonnes/ha)	Area recommended
Chandra Sankara	COD × WCT	High yield	20532	347	4.27	Kerala, Karnataka, Tamil Nadu
Chandra Laksha	LCT × COD	High yield, drought tolerant	19293	339	3.76	Kerala, Karnataka
Kalpa Samrudhi	MYD × WCT	Drought tolerant, higher nutrient use efficiency	20744	346	4.35	Kerala, Asom
Kalpa Sankara	MYD × TPT	High yield	29227	368	6.28	Kerala, Karnataka

Table 4 Dwarf varieties for tender nut and ornamental purpose

Variety	Important traits	Nut yield (yield/ha/year) [@]	Vol. of tender nut water (ml/nut)	Copra yield (tonnes/ha) [@]	Recommended for
Dwarf/Semi tall					
Chowghat	Orange fruits, less eriophyid mite damage	19824	351	2.78	All coconut growing regions
Orange Dwarf					
Kalpa Jyothi	Yellow fruits	21771	380	4.07	Kerala, Karnataka, Assam
Kalpa Surya	Orange fruits	9133	400	2.20	Kerala, Karnataka, Tamil Nadu
CARI-C2 (Surya)	Ornamental purpose, orange fruits	24072	155	1.77	Andaman and Nicobar Islands
CARI-C3 (Omkar)	Ornamental purpose, yellow fruits	16373	346	1.67	Andaman and Nicobar Islands
CARI-C4 (Chandan)	Ornamental purpose, orange fruits	11505	368	1.80	Andaman and Nicobar Islands

Till today, 15 hybrids and 27 varieties have been developed and released for commercial cultivation.

Coconut Water

The tender coconut water serves as a mineral drink with therapeutic value that help in regaining the vitality of human body. It has become popular as an emerging, natural and healthy product. The water of tender coconut fruit, technically the liquid endosperm of coconut fruit, is referred to as tender nut water. It is considered as a natural and refreshing health drink. "It is a natural isotonic beverage with the same level of electrolytic balance as we have in our blood. It is the fluid of life, so to speak," says Mr Morton Satin, Chief of FAO. Tender coconut water increases semen levels, promotes

digestion and clears the urinary path.

Tender coconut water is readily accepted by human body and hence, this has been used as an intra-veinal fluid (IV fluid) during the exigencies of World War II. The major chemical constituents of coconut water are sugars and minerals, followed by minor amounts of nitrogenous compounds (proteins/amino acids). The quantity and composition of tender nut water changes with variety, agro-ecological conditions, age of palm as well as progress of nut maturity. In general, tender nut water content reduces during nut maturation, coupled with reducing potassium content and increasing sodium content. Overall, seven month old coconut is harvested as tender nuts which contain sugar and sodium-potassium content.



Kalpa Haritha Bunch



Kalpa Sreshta



Kalpa Surya Bunch

Table 5 Biochemical constituents of tender nut water in coconut tender nut varieties

Variety	Water (ml)	TSS (°Brix)	Total sugars (g/100 ml)	Free amino acids (mg/100 ml)	Potassium (ppm)	Sodium (ppm)
Tall						
Kera Chandra	450	-	5.86	1.3	2273	24
Kalpa Pratibha	448	-	5.5	1.1	2150	21.7
Kalpa Haritha	440	5.85	-	-	2100	17.5
Dwarf/Semi-tall						
Chowghat Orange Dwarf	351	-	7.0	1.8	2003	20
Kalpa Jyothi	380	-	6.2	1.7	1998	36
Kalpa Surya	400	-	4.1	1.8	2142	35
Kalparaksha	290	-	4.92	-	2100	19.5
Kalpasree	240	-	4.8	-	2150	22.4
CARI-C1 (Annapurna)	470	5.4	2.52	1.48	2216	71
CARI-C2 (Surya)	154	6.3	2.27	1.52	2279	69
CARI-C3 (Omkar)	117	5.7	2.32	1.44	2133	62
CARI-C4 (Chandan)	198	4.9	2.38	1.44	2651	70
Hybrid						
Chandra Sankara	347	6.58	5.99	1.73	2193	23.77
Chandra Laksha	339	6.51	5.72	1.76	2226	23.83
Kalpa Samrudhi	346	6.0	4.17	2.08	2370	35.1
Kalpa Sreshta	368	5.89	5.81	1.34	2081	33.3

Varieties for Tender Nut

The quantity and quality of tender coconut water varies across varieties and regions. The quantity of tender coconut water is correlated to the size of coconut fruit and the endosperm cavity. It varies from negligible (Laccadive Mini Micro Tall) to more than 800 ml (San Ramon Tall). The sweetness of water and mineral content also varies.

Tender nuts are harvested from the existing tall, due to high demand caused by health benefits of tender coconut water. This resulted in sacrificing the quality of nut water valuable copra and oil. The traits of improved varieties for tender nut/dual purposes released for cultivation in the country are given in Tables 2, 3, 4 and 5.

Nutritive Value

The tender coconut water contains both organic and inorganic compounds. Sugars are major constituent of total soluble solids in tender nut water, major sugars being sucrose, sorbitol, glucose and fructose, followed by minor sugars, namely, galactose, xylose and mannose. The second major constituents in quantitative terms are minerals, with potassium being the predominant mineral with chlorine, sodium, calcium, sulphur, phosphorus in variable quantities. In addition trace amounts of manganese, aluminium, zinc and copper are found in tender nut water. The protein

fraction of tender coconut water contains amino acids, viz. arginine, glutamic acid, aspartic acid, alanine, tyrosine, histidine, cysteine, proline, leucine, lysine, phenyl alanine, and serine. The levels of alanine, arginine, cysteine and serine in tender nut water, are reportedly higher than in cow's milk. Further, vitamins (vitamin C, B complex), enzymes and traces of fat (<0.1%) are also present in the tender nut water. In addition, tender nut water contains organic acids and aroma compounds, which have not yet been fully characterized, and contribute to the taste and flavor of the tender nut water.

SUMMARY

In India, enterprising farmers in Tamil Nadu, especially in Pollachi and Coimbatore districts, have planted a sizeable coconut plantations with tender nut varieties for meeting the domestic demand are also for exploring avenues for tapping the export market. The trend is picking up in Kerala, Karnataka, Andhra Pradesh, Maharashtra and West Bengal. To enhance the profitability of growers and to avoid market fluctuations, growing tender nut varieties are strongly advocated.

For further interaction, please write to:

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