Golden Jubilee Publication

IMPROVED VARIETIES OF COCONUT, ARECANUT AND OIL PALM

Contributions of ICAR – AICRP on Palms

AICRP (Palms)

भा.कृ.अनु.प. - अखिल भारतीय समन्वित ताड़ अनुसंधान परियोजना
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ICAR-CENTRAL PLANTATION CROPS RESEARCH INSTITUTE
KASARAGOD, KERALA, INDIA - 671 124

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IMPROVED VARIETIES OF COCONUT, ARECANUT AND OIL PALM:

Contributions of ICAR – AICRP on Palms

The All India Coordinated Research Project on Palms of Indian Council of Agricultural Research (ICAR) under National Agricultural Research System (NARS) started functioning from 1972 is an unique mechanism for testing location-specific and need-based innovations in different agro-climatic conditions of the country. Plantation crops constitute an important segment of horticulture in Indian agriculture scenario. Palms such as Coconut (*Cocos nucifera* L.), Oil palm (*Elaeis guineensis* Jacq.), Arecanut (*Areca catechu* L.), and Palmyrah (*Borassus flabellifer* L.) along with fruit crops like Cocoa (*Theobroma cocoa L.*) have contributed significantly for the rural economy of our country. The Project provides a platform and opportunities to the scientists for exchanging ideas and materials for working on similar problems in different agro-ecological regions for collectively developing solutions. They work together in varietal development, effective crop management, plant protection modules and disseminating the technology in the region towards stability and profitability of the crops with a prime objective of increasing profitability as well as farmer's income.

The project is implemented in 28 centers with its headquarters at ICAR-CPCRI, Kasaragod and at present, 15 centres are working on coconut, six on oil palm, four on arecanut, four on palmyrah and seven on cocoa. The coordinating centers are located in 14 states and one union territory covering 13 SAU's/SHU's, one Central Agricultural University and four ICAR Institutes. The centers are distributed in different agro-climatic zones covering the coconut, arecanut, oil palm, palmyra and cocoa growing zones in India.

Varietal Development

The diverse agro-climatic zones in India and availability of abundant locations specific germplasms was utilized in developing trait specific and general purpose varieties and hybrids for different regions. Indigenous and

exotic germplasms were evaluated for different traits and the better performing types are released for different crop growing zones. The research conducted in five decades has resulted in release of different varieties and hybrids. Following pages give a list of varieties and hybrids brought out through collaboration between the AICRP (Palm) project and different Universities and ICAR Institutes.

Coconut

Coconut (*Cocos nucifera* L.) is a perennial plantation crop with a very long productive period requiring identification of suitable variety/ hybrid to a particular agro-climatic region for achieving higher and sustained yields. There are two major forms available in coconut, *viz*., Tall (T) and Dwarf (D). The Tall type is primarily out-crossing, while the Dwarf type is mainly self pollinating (with a few exceptions). Tall cultivars are mainly grown for copra and oil purposes, while dwarfs are preferred for tender nuts. Crop Improvement research encompassing enrichment of coconut genetic resources, characterization, utilization and evaluation of germplasm / hybrids has resulted in development of improved coconut varieties. The coconut hybridization programmes aim to develop heterosis for traits such as early flowering and bearing, more nuts with high copra content and broader adaptability to different agro-climatic regions. A good number of T × D, D × T, T × T and D × D hybrid combinations have been developed and evaluated over the years in different locations *viz.*, Kerala, Assam, Coastal Andhra Pradesh, Tamil Nadu, Maharashtra and Karnataka. Based on the multi- location trials, superior lines have been selected and released for cultivation in different parts of the country. Till date, about 23 improved varieties of coconut, including eight hybrids have been released for cultivation in India through AICRP on Palms project with yield potential of 84-167 nuts/palm/year or 1.8 – 4.6 tonnes of copra /ha/year

1. Pratap

Year of release	:	1987
Research institute	:	AICRP on Palms, Bhatye Centre
Parentage	:	Selection from Banawali
Characters	:	Tall palm with semicircular canopy and green colour round shaped nuts. Commence flowering 7-8 years after planting
Nut yield	:	145 nuts/palm/year 25230 nuts/ha/year
Copra yield	:	145g/nut, 3.5 t/ha
Oil content	:	68 %
Important trait	:	High yield
Recommended region	:	Konkan region of Maharashtra

2. Kamrupa

Year of release	:	1987
Year of release	:	2001
Research institute	:	AICRP on Palms, Kahikuchi Centre
Parentage	:	Selection from Assam Tall
Characters	:	Commence flowering 6-7 years after planting
Nut yield	:	101 nuts/palm/year, 17600 nuts/ha/year
Copra yield	:	16.3 kg copra/palm/year, 2.86 t/ha
Oil content	:	65.0 %
Tender nut water	:	253 ml.
Nutritive value	:	Total sugars - 5.16 g/100ml; Potassium - 2294 ppm; Sodium - 39 ppm.
Important trait	:	High yield
Recommended region	:	Assam

3. ALR (CN) 1

Year of release	:	2002
Research institute	:	AICRP on Palms, Aliyarnagar Centre
Parentage	:	Selection from Arasampatti (Tall)
Characters	:	Time taken for first flowering is 48 months after planting, Small to medium sized, Oblong shaped, Green coloured fruits
Nut yield	:	126 nuts/palm/year, 22015 nuts/ha/year
Copra yield	:	131 g/nut, 16.5 kg/palm/year, 2.88 t/ha
Oil content	:	66.5 %
Important trait	:	Tall palm with high nut yield, early bearing, ability to withstand moisture stress.
Recommended region	:	Tamil Nadu

4. Gauthami Ganga

Year of release	:	2007
Research institute	:	AICRP on Palms, Ambajipeta Centre
Parentage	:	Selection from Gangabondam
Characters	:	Dwarf palm with semi circular canopy with oblong shaped green colour fruits. It starts yielding at the age of 36 months.
Nut yield	:	80 to 90 nuts/palm/year, 12813 nuts/ha/year
Copra yield	:	156.7 g/nut, 2.01 t/ha
Oil content	:	68 %
Tender nut water	:	467 ml /nut
Nutritive value	:	Total sugar content - 6.4 g/100ml, Potassium - 2035 ppm, Sodium - 23 ppm and Amino Acid content - 1.7 mg/100 ml.
Important trait	:	Excellent tender coconut variety.
Recommended region	:	Coastal zone of Andhra Pradesh.

5. Kera Bastar

Year of release	:	2007
Research institute	:	AICRP on Palms, Jagdalpur Centre
Parentage	:	Selection from Fiji Tall provided by ICAR-CPCRI for MLT
Characters	:	Excellent coconut variety with wide adaptability. Commence flowering 7-8 years after planting.
Nut yield	:	110 - 117 nuts/palm/year, 19400 nuts /ha/year
Copra yield	:	2.5 - 3.1 t /ha/year
Oil content	:	65.2 %
Tender nut water	:	332 ml; Total sugar content in tender nut is 6.2 g/100 ml.
Important trait	:	High yield
Recommended region	:	Coastal zone of Andhra Pradesh, Tamil Nadu, Konkan region of Maharashtra and Bastar region of Chhattisgarh.

6. Kalyani Coconut 1

Year of release	:	2007
Research institute	:	AICRP on Palms, Mondouri Centre
Parentage	:	Selection from Jamaican Tall provided by ICAR-CPCRI for MLT
Characters	:	Comes to bearing by 72 months
Nut yield	:	80 nuts/palm/year, 14066 nuts/ha/year
Copra yield	:	154 g/nut, 12.3kg /palm/year, 2.17 t/ha
Oil content	:	68.50 %
Tender nut water	:	350 ml
Nutritive value	:	Total sugars - 4.9 g/100ml, Amino acids - 1.8 mg/100 ml; Potassium - 2347 ppm; Sodium - 27 ppm.
Important trait	:	Moderately tolerant to moisture stress.
Recommended region	:	West Bengal.

7. Kera Keralam

Year of release	:	2007
Research institute	:	ICAR - CPCRI, AICRP on Palms, Aliyarnagar, Veppankulam and Mondouri Centre's.
Parentage	:	Selection from IND 069, West Coast Tall (WCT) provided by ICAR-CPCRI for MLT
Characters	:	Comes to flowering in 58 months
Nut yield	:	147 nuts/palm/year (irrigation) and 109 nuts/palm/year (rainfed) in North Kerala region. 112 to 120 nuts/palm/year (TN)
Copra yield	:	76 g/nut, 3.58 t/ha;
Oil content	:	67.80 %
Important trait	:	Moderately tolerant to moisture stress. This variety shows wide adaptability and comes up well in varied types of soil including sandy, sandy loam and red sandy loam.
Recommended region	:	Kerala, Tamil Nadu and West Bengal

8. Kalpa Dhenu

Year of release	:	2007
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Aliyarnagar centre.
Parentage	:	Selection from IND 006 (Andaman Giant Tall (AGT))
Characters	:	Commence flowering in 67 months after planting in the field. The palms are tall and robust. The fruits are large, oval in shape and green in colour.
Nut yield	:	128 nuts/palm/year, 22794 nuts/ha/year
Copra yield	:	243.9 g/nut, 3.66 tons/ha;
Oil content	:	65.5 %
Tender nut water	:	290 ml
Nutritive value	:	Total sugars - 4.92 g/100ml, Amino acids - 1.3 mg/100 ml; Potassium - 2650 ppm; Sodium - 24.6 ppm.
Important trait	:	High yielding and moisture stress tolerant
Recommended region	:	Kerala, Tamil Nadu and Andaman & Nicobar Islands.

9. Kalpa Pratibha

Year of release	:	2007
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Bhatye, Aliyarnagar and Ambajipeta centre.
Parentage	:	Selection from IND 016 (Cochin China Tall (CCNT))
Characters	:	The palms are tall in habit with a compact spherical canopy. Comes to bearing by 72 months. The fruits are large round in shape and predominantly green in colour.
Nut yield	:	98 nuts/palm/year, 17052 nuts/ha/year
Copra yield	:	256.37 g/nut, 4.07 tons/ha;
Oil content	:	67 %
Tender nut water	:	448 ml
Nutritive value	:	Total sugars - 5.5 g/100ml, Free Amino acids - 1.1 mg/100 ml; Potassium - 2150 ppm; Sodium - 21.7 ppm.
Important trait	:	Dual purpose variety for copra and tender nut.
Recommended region	:	Kerala, Maharashtra, interior zone of Tamil Nadu and coastal zone of Andra Pradesh

10. Kalpa Mitra

Year of release	:	2007
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Mondouri centre.
Parentage	:	Selection from IND 022, (Java Tall (JVT))
Characters	:	The palms are tall in habit with stout trunk and spherical canopy with large number of leaves. Commence flowering in 7-8 years and fruits are large. Oval in shape and yellowish green in colour.
Nut yield	:	80 nuts/palm/year, 13973 nuts/ha/year
Copra yield	:	241.1 g/nut, 3.37 t/ha;
Oil content	:	66.50 %
Tender nut water	:	495 ml
Nutritive value	:	Total sugars - 5.7 g/100ml, Amino acids - 1.3 mg/100 ml; Potassium - 2150 ppm;Sodium - 23.5 ppm.
Important trait	:	High yielding and relatively moisture stress tolerant.
Recommended region	:	Kerala and West Bengal.

11. Kalpatharu

Year of release	:	2009
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Arsikere and Aliyarnagar centre's.
Parentage	:	Selection from IND 125, Tiptur Tall (TPT)
Characters	:	The palms are tall with circular crown. Commence flowering 6 years after planting. The shape of fruit is oval with husked fruits being round in shape.
Nut yield	:	116 nuts/palm/year, 20709 nuts/ha/year
Copra yield	:	176 g/nut, 3.59 t/ha;
Oil content	:	67.20 %, 2.45 t/ha;
Tender nut water	:	265 ml
Nutritive value	:	Total sugars - 5 g/100ml, Amino acids -2.9 mg/100 ml; Potassium - 3200 ppm; Sodium - 60 ppm.
Important trait	:	Suitable for ball copra production.
Recommended region	:	Karnataka, Kerala, and Tamil Nadu.

12. Kalpa Jyothi

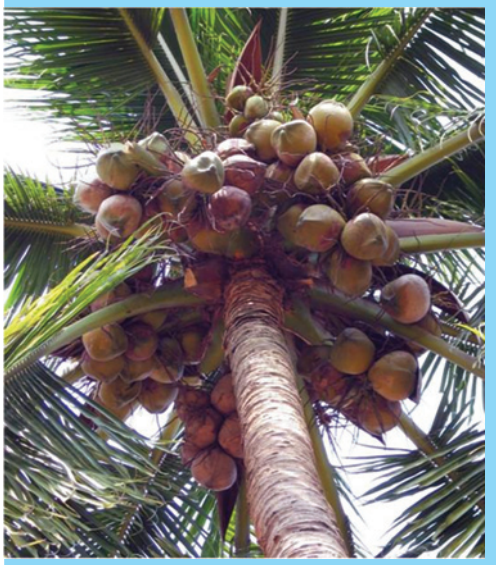
Year of release	:	2012
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Arsikere and Kahikuchi centre's.
Parentage	:	Selection from IND 058, (Malayan Yellow Dwarf)
Characters	:	The palms are dwarf in habit with a compact spherical canopy and drooping frond tip. Commence flowering 38 months after planting. The fruit are medium, oval in shape and yellow in colour.
Nut yield	:	114 nuts/palm/year, 20178 nuts/ha/year
Copra yield	:	142.4 g/nut, 2.86 t/ha;
Oil content	:	61.5 %,
Tender nut water	:	380 ml
Nutritive value	:	Total sugars - 6.2 g/100ml, Amino acids - 1.7 mg/100 ml; Potassium - 1998 ppm; Sodium - 36 ppm.
Important trait	:	Dwarf, Yellow colour fruits; tender nut purpose
Recommended region	:	Kerala, Karnataka and Assam.

13. Kalpa Surya

Year of release	:	2012
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Arsikere and Aliyarnagar centre's.
Parentage	:	Selection from IND 048, Malayan Orange Dwarf (MOD)
Characters	:	The palms are dwarf in habit with a compact spherical canopy and drooping frond tip. Commence flowering 59 months after planting. The fruit are medium, oval in shape and Orange in colour.
Nut yield	:	123 nuts/palm/year, 21771 nuts/ha/year
Copra yield	:	23 kg/palm/year, 4.07 t/ha;
Oil content	:	67 %,
Tender nut water	:	400 ml
Nutritive value	:	Total sugars - 6.7 g/100ml, Free Amino acids -1.8 mg/100 ml; Potassium - 2142 ppm; Sodium - 35 ppm.
Important trait	:	Dwarf, orange colour fruits; tender nut purpose
Recommended region	:	Kerala, Karnataka and Tamil Nadu.

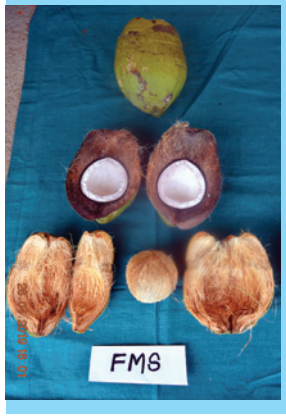
14. Kalpa Shatabdi

Year of release	:	2016
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Aliyarnagar centre.
Parentage	:	Selection from IND 034, San Ramon Tall
Characters	:	The variety is characterized by large fruits with average copra content of 272.9 g and higher volume (612 ml/ tender nut)
Nut yield	:	105 nuts/palm/year, 18375 nuts/ha/year
Copra yield	:	28.65 kg/palm/year, 5.01 t/ha;
Oil content	:	72 % %
Tender nut water	:	612 ml (TSS 6.2 Brix)
Nutritive value	:	Total sugars - 5.3 g/100ml, Reducing sugars - 3.66 g/100 ml Amino acids -2.20 mg/100 ml; Potassium - 2745 ppm; Sodium - 26.0 ppm.
Important trait	:	High copra out turn and tender nut quality
Recommended region	:	Kerala, Karnataka and Tamil Nadu



15. Kalpa Ratna

Year of release	:	2019
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Aliyarnagar centre.
Parentage	:	Selected from Federated Malay States (IND 010 S)
Characters	:	This variety comes for bearing from 5th year onwards and will give stabilized yield from 8th years after planting. The fruit is oval in shape, yellow to green in color with good amount of tender nut water (575 ml).
Nut yield	:	99.9 nuts per palm per year
Copra yield	:	14.7 kg per palm per year
Oil content	:	65.0 per cent
Tender nut water	:	575.0 ml
Nutritive value	:	TSS (o Brix) - 5.4, Total sugars (g/100 ml) - 5.6, Reducing sugars (g/100 ml) - 3.1, Amino acid (mg/100 ml) - 1.8, Sodium (ppm) - 28.0, Potassium (ppm) - 2356.0
Important trait	:	Suitable for tender nut, for tapping inflorescence sap. It is also tolerant to drought condition.
Recommended region	:	Kerala, Karnataka and Tamil Nadu



16. Godavari Ganga

Year of release	:	1991
Research institute	:	AICRP on Palms, Ambajipeta Centre.
Parentage	:	ECT x GBGD
Characters	:	The palm comes to bearing in four years after planting.
Nut yield	:	140 nuts/palm/year, 24360 nuts/ha/year
Copra content	:	150 g/nut, 2.79 t/ha;
Oil content	:	68 %,
Important trait	:	High yielding
Recommended region	:	Andhra Pradesh.

17. Konkan Bhatye Coconut Hybrid - 1

Year of release	:	2007
Research institute	:	AICRP on Palms, Bhatye Centre.
Parentage	:	GBGD x ECT
Characters	:	Tall palm with semi-circular canopy bearing at 66 months with green colour oval shaped fruit.
Nut yield	:	122 nuts/palm/year, 20300 nuts/ha/year
Copra yield	:	22.08 kg/palm/year, 3.65 t/ha;
Oil content	:	67.10 %,
Important trait	:	It is high yielder with better copra out-turn than West Coast Tall and Pratap and with better oil content than ECT. It is resistant to stem bleeding disease and is moderately resistant to leaf blight and bud rot.
Recommended region	:	Konkan region of Maharashtra

18. Vasista Ganga

Year of release	:	2013
Research institute	:	AICRP on Palms, Ambajipeta Centre.
Parentage	:	GBGD x PHOT (Selection of PHOT provided by ICAR- CPCRI)
Characters	:	Semi tall with circular crown and comes to bearing at 40 months after planting.
Nut yield	:	125 nuts/palm/year, 21750 nuts/ha/year
Copra yield	:	21.9 kg/palm/year, 3.88 t/ha;
Oil content	:	69 %,
Tender nut water	:	395 ml and TSS is 6.20 Brix.
Important trait	:	High yield and early flowering
Recommended region	:	Andhra Pradesh and Karnataka

19. Kalpa Ganga

Year of release	:	2013
Research institute	:	AICRP on Palms, Arsikere Centre.
Parentage	:	GBGD x FJT
Characters	:	It is a semi tall palm with circular crown, oblong shaped nuts of green color. The palms take about 4-5 years for flowering.
Nut yield	:	120 nuts/palm/year,20880 nuts/ha/year
Copra yield	:	3.38 t/ha;
Oil content	:	64.4 %,
Important trait	:	Short stature and suitable for ball copra production.
Recommended region	:	Karnataka

20. Abhaya Ganga

Year of release	:	2014
Research institute	:	AICRP on Palms, Ambajipeta centre.
Parentage	:	GBGD x LCT
Characters	:	High yielding, precocious; having heavy bunches with average nut yield (128 nuts/ palm/year)
Nut yield	:	128 nuts/palm/year, 22400 nuts/ha/year
Copra yield	:	21.7 kg/palm/year, 3.79 t/ha;
Oil content	:	72 % %
Tender nut water	:	346 ml (TSS 5.8 Brix)
Nutritive value	:	Total sugars - 5.8 g/100ml, Potassium - 2110.1 ppm; Sodium - 31.6 ppm.
Important trait	:	High yield
Recommended region	:	Andhra Pradesh

21. VHC - 4

Year of release	:	2015
Research institute	:	AICRP on Palms, Veppankulam Centre
Parentage	:	LCT x CCNT (Selection of CCNT provided by ICAR- CPCRI)
Nut yield	:	161 nuts/palm/year, 28014 nuts/ha/year
Copra content	:	149.8 g/nut,
Oil content	:	70 %
Tender nut water	:	368 ml with 4.8 Brix TSS
Important trait		High yield under rainfed conditions
Recommended region	:	Tamil Nadu

22. Kalpa Samrudhi

Year of release	:	2009
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Kahikuchi centre.
Parentage	:	MYD x WCT
Characters	:	The palms are semi-tall with compact spherical canopy. Regular bearers and commence flowering 5 years after planting The colour of the leaf petiole and fruits are green. The fruits are oval in shape, while the husked fruits are round in shape
Nut yield	:	117 nuts/palm/year, 20358 nuts/ha/year
Copra yield	:	219.5 g/nut, 4.38 t/ha;
Oil content	:	67.5 %,
Tender nut water	:	346 ml
Nutritive value	:	Total sugars - 4.17 g/100ml, Free Amino acids -2.08 mg/100 ml; Potassium - 2370 ppm; Sodium - 35.1 ppm.
Important trait	:	Dual purpose variety for copra and tender nut and relatively moisture stress tolerant.
Recommended region	:	Kerala and Assam

23. Kalpa Sreshta

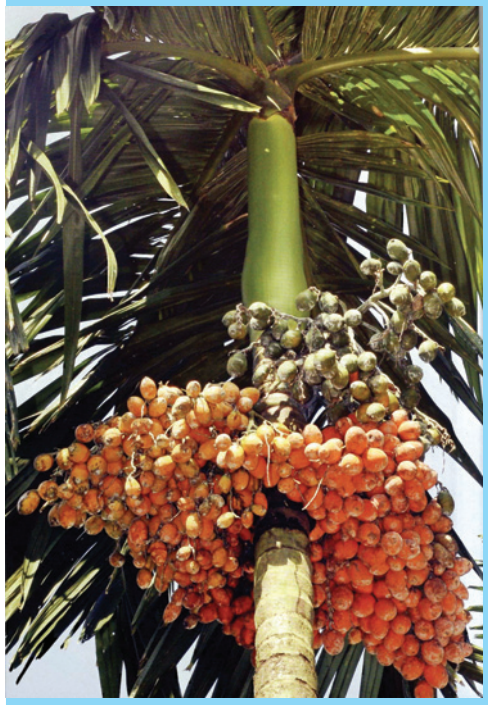
Year of release	:	2014
Research institute	:	ICAR- CPCRI, Kasaragod; AICRP on Palms, Arsikere centre.
Parentage	:	MYD x TPT
Characters	:	The palms are tall in habit without prominent bole. Commence flowering in 6-7 years after planting. The fruits of this variety are oval in shaped, with the husked fruits being round in shape.
Nut yield	:	167 nuts/palm/year, 29227 nuts/ha/year
Copra yield	:	35.9 kg/palm/year, 6.28 t/ha;
Oil content	:	64.1 %,
Tender nut water	:	368 ml (TSS 5.89 Brix)
Nutritive value	:	Total sugars - 5.81 g/100ml, Amino acids -1.34 mg/100 ml; Potassium - 2081 ppm; Sodium - 33.3 ppm.
Important trait	:	Dual purpose variety for copra and tender nut and also for ball copra production.
Recommended region	:	Kerala and Karnataka.

Arecanut

Arecanut (*Areca catechu* L) is an important commercial plantation crop of India. Many farming households depend on the sector for their livelihood. India ranks first in the world for arecanut cultivation in both area (49%) and production (50%). Commercial production is concentrated in the Southwest and Northeast regions. The states of Karnataka, Kerala, Assam, West Bengal and Meghalaya are the main producers; however, the products made from arecanut are widely available throughout the country. The Central Plantation Crops Research Institute (CPCRI) and State Agricultural/Horticultural Universities have over the years developed a large number of areca cultivars and hybrids for different areca growing states. The high yielding varieties like Mangala (VTL-3), Sumangala (VTL-11), Sreemangala (VTL-17), Mohitnagar (VTL-60) *etc.* and dwarf hybrids like Hirehalli Dwarf (HD), VTLAH 1 and VTLAH 2 have replaced/replacing the traditional cultivars. In the earlier periods, arecanut was a mandate crop of AICRP on Palms and trials on crop improvement were conducted at Coimbatore, Shriwardhani, Vittal, Koothali, Srisi, Andaman, Arsikere and Sakhigopal centers. The efforts in this line have resulted in release of following varieties of arecanut for cultivation.

1. Sumangala

Year of release	:	1985
Research institute	:	ICAR- CPCRI, Kasaragod, RS, Vittal
Parentage	:	Introduction, selection and evaluation from the accessions VTL 11 introduced as germplasm from Indonesia in the year 1957
Characters	:	Tall palms with long internodal length, flower initiation : 42 - 46 months after planting under irrigated conditions
Mean yield	:	3.28 kg dry kernel/palm/year 3900 - 4350 kg dry kernel/ha/year
Potential yield	:	5.60 kg dry kernel/palm/year 7400 - 7700 kg dry kernel/ha/year
Quality attributes	:	Meets the standard quality of chali/dried kernel and raw nut for chewing
Important trait	:	High kernel yield and high recovery of chali Relatively tolerant to water limited conditions
Recommended region	:	Areca growing areas of Karnataka and Kerala



2. Sreemangala

Year of release	:	1985
Research institute	:	ICAR- CPCRI, Kasaragod, RS, Vittal
Parentage	:	Introduction, selection and evaluation from the accessions VTL 17, introduced as germplasm from Singapore in the year 1957
Characters	:	Tall palms, partially drooping crown with long internodal length, flower initiation - 44 48 months after planting
Mean yield	:	3.18 kg dry kernel/palm/year 4240- 4500 kg dry kernel/ha/year
Potential yield	:	5.40 kg dry kernel/palm/year 7100 - 7300 kg dry kernel/ha/year
Quality attributes	:	Meets the standard quality of chali/dried kernel and raw nut for chewing
Important trait	:	High dry kernel yield and bold nuts Relatively tolerant to water limited conditions
Recommended region	:	Areca growing areas of Karnataka and Kerala

3. Mohitnagar

Year of release	:	1991
Research institute	:	ICAR- CPCRI, Kasaragod, RS, Vittal
Parentage	:	Selection and evaluation from the indigenous accessions VTL 60
Characters	:	Tall palms, partially drooping crown with long internodal length, flower initiation - 48 months after planting
Mean yield	:	3.67 kg dry kernel/palm/year 5030 kg dry kernel/ha/year
Potential yield	:	5.50 kg dry kernel/palm/year 7540 kg dry kernel/ha/year
Quality attributes	:	Meets the standard quality of chali/dried kernel and raw nut for chewing
Important trait	:	High dry kernel yield Relatively tolerant to water limited conditions
Recommended region	:	Areca growing areas of Karnataka, Kerala and North Bengal (West Bengal)

4. Samrudhi

Year of release	:	1995
Research institute	:	ICAR- CPCRI, Kasaragod, RS, Vittal
Parentage	:	Selection and evaluation from the indigenous accessions Calicut -17
Characters	:	Tall palm with long internodal length, round and bold nuts
Mean yield	:	4.37 kg dry kernel/palm/year 5987 kg dry kernel/ha/year
Quality attributes	:	Meets the standard quality of chali/dried kernel and raw nut for chewing
Important trait	:	High dry kernel yield with bold nuts
Recommended region	:	Areca growing areas of Andaman and Nicobar Islands.

5. SAS-1

Year of release	:	1996
Research institute	:	UAS, Dharwad
Parentage	:	Selection and evaluation Srisi
Characters	:	Tall palms with compact canopy , regular bearer, nuts are round and even sized
Mean yield	:	5.25 kg dry kernel/palm/year 7193 kg dry kernel/ha/year
Quality attributes	:	Meets the standard quality of chali/dried kernel and raw nut for chewing
Important trait	:	High dry kernel yield Better storage of dried nuts
Recommended region	:	Sirsi region (Hill zone) of Karnataka

Oil Palm

Oil palm (*Elaeis guineensis* Jacq.) is currently India's most important oil-yielding crop, with high productivity (4–6 t oil ha^{-1}) and a 25–30 year economic life cycle, divided into three phases: immature (1-3 years), stabilising (4–8 years), and stabilised (>8 years) phase. The genus *Elaeis* belongs to the Arecaceae family (monocot), which has a single terminal apical point from which leaves arise in a double spiral pattern at regular intervals (Rees, 13). Palm oil is produced from fleshy orange-yellow mesocarp of the fruits, while palm kernel oil (PKO) is derived from the stony seed's kernel. Generally, oil palm is referred to as a smallholder's irrigated crop grown under varied agro-climatic conditions of India. Andhra Pradesh, Karnataka, Kerala, Odisha, Tamil Nadu, and the North-eastern states of Arunachal Pradesh, Assam, and Mizoram are the key oil palm growing states. There are three naturally occurring forms of the oil palm fruit, referred to as *dura*, *tenera*, and *pisifera*. *Tenera* is natural cross between *dura* and *pisifera*, which produces fruit with higher oil content. As a result of planting *dura x pisifera* progenies, oil palm yield has increased substantially and the majority of hybrid evaluation studies carried out in India (MLT) involve *dura x pisifera* in different agro climatic regions *viz*., Tungabhadra command area (Karnataka); West Godavari (Andhra Pradesh) and Konkan regions (Maharashtra) and Cauvery delta regions of Tamil Nadu. Based on the long term experiment (for 12 years) following hybrid cross combination were released for cultivation.

1. Godavari Ratna

Year of release	:	2019
Research institute	:	ICAR- IIOPR; AICRP on Palms, Mulde centre.
Parentage	:	90 dura x 577 pisifera
Age of first flowering (Months)	:	30
Total number of inflorescence /year	:	13.6
Bearing habit	:	Regular
Number of bunches / year	:	6.79
Average bunch weight (kg/palm)	:	15.62
Fresh fruit bunch (FFB) (t/ha)	:	22.69
% of Mesocarp /fruit	:	68.7
% Kernal /fruit	:	7.7
% shell /fruit	:	13.4
% oil Bunch	:	26.5
Recommended for	:	Konkan region of Maharashtra

2. Godavari Swarna

Year of release	:	2019
Research institute	:	ICAR- IIOPR; AICRP on Palms, Vijayarai and Gangavathi centre.
Parentage	:	131 dura x 435 pisifera
Age of first flowering (Months)	:	32
Total number of inflorescence /year	:	27.67
Bearing habit	:	Regular
Number of bunches / year	:	11.72
Average bunch weight (kg/palm)	:	16.08
Fresh fruit bunch (FFB) (t/ha)	:	30.11
% of Mesocarp /fruit	:	74.22
% Kernal /fruit	:	7.78
% shell /fruit	:	18.00
% oil Bunch	:	21.25
Recommended for	:	West Godavari of Andhra Pradesh and Tungabadra command area of Karnataka

3. Godavari Gold

Year of release	:	2019
Research institute	:	ICAR- IIOPR; AICRP on Palms, Pattukottai centre.
Parentage	:	350 dura x 66 pisifera
Age of first flowering (Months)	:	32
Total number of inflorescence /year	:	14.70
Bearing habit	:	Regular
Number of bunches / year	:	11.74
Average bunch weight (kg/palm)	:	17.32
Fresh fruit bunch (FFB) (t/ha)	:	28.37
% of Mesocarp /fruit	:	70.09
% Kernal /fruit	:	7.1
% shell /fruit	:	14.5
% oil Bunch	:	21.28
Recommended for	:	Cauvery delta zone of Tamil Nadu

List of abbreviations

AICRP	All India Co-ordinated Research Project
AGT	Andaman Giant Tall
ALR (CN)	Aliyarnagar (Coconut)
CCNT	Cochin China Tall
CPCRI	Central Plantation Crops Research Institute
ECT	East Coast Tall
FJT	Fiji Tall
FFB	Fresh fruit bunch
GBGD	Gangabondam Green Dwarf
ha	Hectare
IIOPR	Indian Institute of Oil Palm Research
ICAR	Indian Council of Agricultural Research
JVT	Java Tall
MLT	Multi- location trial
MOD	Malayan Orange Dwarf
MYD	Malayan Yellow Dwarf
PHOT	Philippines Ordinary Tall
PKO	Palm kernel oil
ppm	parts per million
SAU's	State Agricultural Universities
SHU's	State Horticultural Universities
TPT	Tiptur Tall
TSS	Total Soluble Solids
VHC	Veppankulam Hybrid Coconut
VTL	Vittal
VTLAH	Vittal Arecanut Hybrid
WCT	West Coast Tall

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