



COCONUT VARIETAL IMPROVEMENT EFFORTS OF AICRP ON PALMS



भाकृअनुप - केन्द्रीय रोपण फसल अनुसंधान संस्थान
कासरगोड़, केरल - 671 124, भारत

ICAR-Central Plantation Crops Research Institute
Kasaragod – 671 124, Kerala, India



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H.P. Maheswarappa

S. Sumitha

B. Augustine Jerard

V. Niral



ICAR-Central Plantation Crops Research Institute

Kasaragod – 671 124, Kerala, India

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Dr. P. Chowdappa
Director,
ICAR- Central Plantation Crops Research Institute,
Kudlu Post, Kasaragod,
Kerala 671 124.
Phone – 04994 232893/232894/232895
Website : www.cpcri.gov.in
Email : director.cpcri@icar.gov.in

Compiled and edited by

H.P. Maheswarappa
S. Sumitha
B. Augustine Jerard
V. Niral

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Coconut (*Cocos nucifera* L.) is one of the most important tropical crops in the world, and is grown in more than 93 countries in an area of 12.19 million hectares, with an annual production of 61,165 million nuts. Indonesia is the largest coconut producing country, with an area of 3.8 million hectares and annual production of 3.77 million tonnes of copra equivalent, followed by the Philippines with an area of 3.3 million hectare and annual production of 2.49 million tonnes of copra equivalent. India, with 1.9 million hectares and annual production of 2.74 million tonnes copra equivalent occupies the third place. Coconut is the most important export earner and plays an important role in the local economy and culture of our country. More than 100 products are being made from the coconut palm. At present, majority of the coconut plantations are old and the palms have become senile. As a consequence, the plantations are becoming unproductive. In addition, there are a number of serious insect pests and diseases and nutritional deficiencies that are also reducing yield. A further issue is that many of the planting material being produced are from local varieties with inherent low productivity. Most of the problems listed above are being addressed by research-driven activities undertaken at the international, national or regional level.

All India Coordinated Research Project on Palms (AICRPP), has been an important contributor to the region's specific coconut research and development effort. The concept of AICRP on Palms came into existence in 1972 to carry out the location specific research, and to address the region specific problems. At present, the project is implemented in 29 centers with its headquarters at Kasaragod; 15 centers are conducting research on coconut, eight on oil palm, four on arecanut, and two on palmyrah. The coordinating centers are located in 13 states and one union territory covering 13 State Agricultural Universities, one Central Agricultural University and four ICAR institutes.

Genetic resources in coconut

In coconut, the palms are commonly categorized into two broad categories – talls and dwarfs, based on the plant habit. The tall palms are commonly cultivated for commercial production in all coconut growing regions of the world. Dwarf palms have gained importance in recent times due to the tender nut water qualities and resistance to certain diseases, ease of climbing. The major distinguishing features of talls and dwarf cultivars are as follows:

General characteristics of tall and dwarf coconut varieties

Features	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 greens and browns	Either pure green, yellow, red (orange) or brown
Arrangement of leaf scars on the stem	Widely spaced	Closely spaced
Fruit size	Very small to very big	Small to medium
Phenotypic variation Within cultivar Between cultivar	High High	Low High
Leaf and bunch attachment to the stem	Very strong	Fragile
Root distribution	Generally more dense and plentiful	Less dense and few
Productive life span	About 60 years	About 40 years

Varietal improvement

Evaluation of coconut germplasm and hybrids for their performance in different agro-climatic regions is one of the priority areas of research under AICRP on Palms. The conserved germplasm available at different centre's are used in the

breeding programmes. Based on the comparative performance 20 high yielding varieties/hybrids have been released so far, targeting higher productivity. The salient features of these varieties/hybrids are presented here.

I. Varieties developed through selection by AICRPP Centres

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	: 145 g/nut, 3.5 t/ha
Oil content	: 68 %
Recommended region :	Konkan region of Maharashtra





2. Kamrupa

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.
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 %
Special attributes	: Tall palms with high nut yield, early bearing, ability to withstand moisture stress.

4. Gouthami 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/ 100 ml, Potassium - 2035 ppm, Sodium – 23 ppm and Amino acid content - 1.7 mg /100 ml.
Special attributes	: 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.
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 content	: 154 g/nut, 12.3 kg/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
Special attributes	: Moderately tolerant to moisture stress.
Recommended region	: West Bengal.





7. Kera Keralam

Year of release : 2007

Research institute : ICAR- CPCRI,
Kasaragod : 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 : 67.8%

Special attributes : Moderately tolerant to moisture
stress.

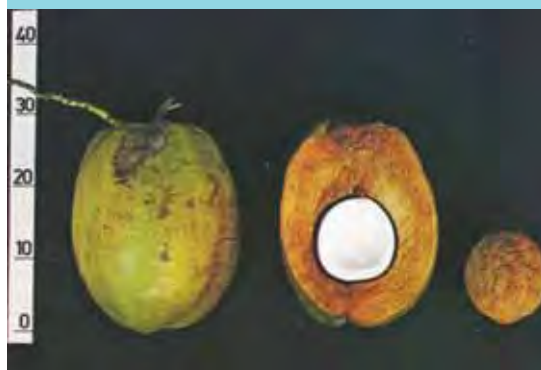
This variety shows wide adaptability
and comes up well in varied
types of soil including sandy, sandy
loam and red sandy loam.

Recommended region : Kerala, Tamil Nadu and West
Bengal

II. Varieties developed through selection by ICAR-CPCRI along with AICRPP Centres

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	: Commences 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 ; 22,794 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
Special attributes	: High yielding and moisture stres 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's
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 nnuts/ha/year
Copra yield	: 256.37 g/nut, 4.07 t/ha
Oil content	: 67 %
Tender nut water	: 448 ml Nutritive value: Total sugars – 5.5 g/100 ml; free amino Acids – 1.1 mg/100 ml; Potassium – 2150 ppm; Sodium – 21.7 ppm.
Special attributes	: Dual purpose variety for copra and tender nut.
Recommended region	: Kerala, Maharashtra, interior zone of Tamil Nadu and coastal zone of Andhra 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 7-8 years and fruits are large, oval in shape and yellowish green in colour.
Nut yield	: 80 nuts/palm/year, 13973 nuts/ha
Copra yield	: 241.1 g/nut , 3.37 t/ha;
Oil content	: 66.50 %
Tender nut water	: 495 ml
Nutritive value	: Total sugars – 5.7g/100 ml; free Amino acids – 1.3 mg/100 ml; Potassium – 2150 ppm; Sodium – 23.5 ppm.
Special attributes	: 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 Aliayarnagar Centre's.
Parentage	: Selection from IND125, 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	: 176g/nut ; 3.59 t/ha
Oil content	: 67.2 % , 2.45 t/ha;
Tender nut water	: 265 ml
	Nutritive value: Total sugars – 5 g/100ml; free amino acids – 2.9 mg/100 ml; Potassium – 3200 ppm; Sodium – 60 ppm
Special attributes	: This variety is recommended 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 fruits 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 – 6.2g/100 ml; free amino acids – 1.7 mg/100 ml; potassium – 1998 ppm; sodium – 36 ppm.
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 (MYD)
Characters	: The palms are dwarf in habit with a compact spherical canopy and drooping frond tip. Commence flowering 59 months after planting. The fruits 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 – 6.7g/100 ml; free amino acids – 1.8 mg/100 ml; Potassium – 2142 ppm; Sodium – 35 ppm.
Recommended region	: Kerala, Karnataka and Tamil Nadu.

III. Hybrids developed by AICRPP Centres

14. 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%.
Recommended region	: Andhra Pradesh.





15. Konkan Bhatye Coconut Hybrid -1

Year of release	: 2007
Research institute	: AICRP on Palms, Bhatye Centre.
Parentage	: GBGD x ECT
Character	: 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 %
Special attributes	: It is a high yielder with better copra outturn 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

16. 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 in 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 6.20Brix.
Recommended region	: Andhra Pradesh and Karnataka states based on its precocity.



17. 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 %
Special attributes	: Short stature and suitable for ball copra production.
Recommended region	: Karnataka.





18. VHC – 4

Year of release	: 2015
Research institute	: AICRP on Palms, Veppankulam Centre.
Parentage	: LCT × 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
Recommended region	: Tamil Nadu

IV. Hybrids developed by ICAR-CPCRI along with AICRPP Centres

19. Kalpa Samrudhi

Year of release	: 2009
Research institute	: ICAR- CPCRI, Kasaragod ; AICRP on Palms, Kahikuchi Centre
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.
Parentage	: MYD x WCT
Nut yield	: 117 nuts per palm. 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 – 4.17g/100 ml; free amino acids – 2.08 mg/100 ml; Potassium – 2370 ppm; Sodium – 35.1 ppm.
Special attributes	: The hybrid is suitable for copra and tender nut purpose and relatively moisture stress tolerant.
Recommended region	: Kerala and Assam.





20. 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 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/100 ml; amino acids – 1.34 mg/100 ml; Potassium – 2081 ppm; Sodium – 33.3 ppm
Special attributes	: The hybrid is suitable for copra, tender nut and ball copra production.
Recommend region	: Kerala and Karnataka

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
GBGD	Gangabondam Green Dwarf
ha	Hectare
ICAR	Indian Council of Agricultural Research
JVT	Java Tall
MYD	Malayan Yellow Dwarf
PHOT	Philippines Ordinary Tall
ppm	parts per million
SAU's	State Agricultural Universities
TPT	Tiptur Tall
TSS	Total Soluble Solids
VHC	Veppankulam Hybrid Coconut
WCT	West Coast Tall
MLT	Multi Location Trial
AICRPP	All India Coordinated Research Project on Palms

For planting material requirements and further information contact:

Director,
ICAR- Central Plantation Crops Research Institute,
Kudlu Post , Kasaragod, Kerala 671 124.
Phone – 04994 232893/232894/232895
Website : www.cpcri.gov.in
Email : director.cpcri@icar.gov.in,
directorcpcri@gmail.com,

Project Coordinator,
ICAR- All India Coordinated Research Project on Palms,
ICAR- Central Plantation Crops Research Institute,
Kudlu Post , Kasaragod, Kerala 671 124.
Phone – 04994232733
Website : www.aicrpalms.res.in
Email : pcpalms.cpcri@icar.gov.in ,
aicrpalms@yahoo.com

Professor and Head,
Horticultural Research Station,
Ambajipeta, East Godavari District 533 214.
Andhra Pradesh.
Phone: 08856-244436/243711
Email : aicrpalmsambajipet@gmail.com

Professor and Head.
Coconut Research Station.
Aliyarnagar 642 101. Coimbatore district, Tamil Nadu.
Phone: 04253-288722/288662
Email: aicrpalmsaliyar@gmail.com

Professor and Head,
Coconut Research Station,
Veppankulam - 614 906, Thanjavur District, Tamil Nadu.
Phone: 04373-260205/202534
Email : aicrpalmsvpm@gmail.com

Scientist In charge (AICRP on Palms),
Regional Coconut Research Station,
Bhatye 421 612, Ratnagiri District.
Maharashtra.
Phone : 02352-255077
Email : aicrpratnagiri@gmail.com

Professor and Head,
Horticultural Research Station,
Arsikere - 573 103,
Hassan District, Karnataka.
Phone: 08174-291565/291711
Email : aicrppalmsarsikere@gmail.com

Professor and Head,
Horticultural Research Station,
Kahikuchi, 781 017,
Kamrup District.
Phone : 0361-2840232
Email: aicrpkahikuchi@gmail.com

Scientist In charge (AICRP on Palms),
Directorate of Research,
Kalyani P.O. - 741 235,
Nadia District, West Bengal.
Phone :033-25827574
Email : aicrppalmsbckv062@gmail.com

Scientist In charge (AICRP on Palms)
Saheed Gundadhoor College of Agriculture & Research
Station,
Kumharawand Farm, Jagadalpur - 494 005,
Chhatisgarh.
Phone : 07782-229360
Email : aicrppalmsjagdalpur@gmail.com



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