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**Technical Bulletin**

# DOCUMENTATION OF ELITE COCONUT MOTHER PALMS FOR AUGMENTING QUALITY PLANTING MATERIAL PRODUCTION IN COCONUT GROWING REGIONS


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# Documentation of coconut mother palms for augmenting quality planting material production in coconut growing regions

Coconut is an important multi-purpose palm widely grown in the humid tropics and is referred to as 'Kalpavriksha' in India considering that it provides all necessities of life. The palm provides nutritious food and refreshing drink, oil for edible and non-edible uses, fibre of commercial value, shell for fuel, timber and a variety of miscellaneous products for domestic and industrial uses. In recent years, coconut is being increasingly considered as a healthy food, with virgin coconut oil, tender coconut water and sweet inflorescence sap being promoted for consumption. The palm, being a perennial crop with economic life span of more than sixty years, has a long gestation period of four to seven years depending on the cultivar. The full fruit bearing capacity of the palm is recognizable only after eight to twelve years of planting depending on the genetic and environmental factors. Hence, if the planting material happens to be inferior in quality, or poorly selected the garden will turn out to be highly uneconomical and the grower would incur continuous losses for many years. Replacing the poorly performing garden also takes considerable loss of time and resources. As coconut cultivation needs substantial pre bearing investment, greater emphasis is required on the selection of good quality planting materials of desired variety.

In the absence of any viable protocol for vegetative propagation methods, coconut is propagated through seed nuts from selected mother palms followed by careful seedling selection based on standards. Although several improved varieties have been released suitable for growing in different agro ecological conditions with higher yield potential, the spread of these varieties was observed to be slow due to lesser availability of mother palms of these improved varieties. Till now, over 60 per cent of the planting material requirement is met through palms from farmers' gardens and private entrepreneurs, which mostly belong to the local coconut populations of the growing region. On the other hand, increase in productivity depends on the higher yield potential of the palms and hence, planting of coconut gardens with quality planting material is a prerequisite for improving the productivity. Apart from establishment of mother gardens with newly released varieties in both public and private sector, the other viable option is to increase the production of quality seedlings through identification of elite mother palms in farmers' fields duly considering various parameters used for mother palms selection like age of the palm, growth and yield parameters and resistance / tolerance to major pests and diseases etc. Earlier reports indicate that selection of mother palms could bear better results if the palms are selected based on certain traits like nut yield per palm, copra yield, palm morphological traits such as crown shape, arrangement of bunches, regularity in leaf production, retention of leaves on the crown and number of female flowers etc. Once the better performing palms are selected, these

can be used to further production of quality seed nuts followed by seedling selection based on traits such as germination time, seedling collar girth, number of leaves produced and leaf splitting etc. This strategy will not only increase the availability of quality planting material in coconut but also empower the farmer to take care of planting material needs. The good mother palms available in the farmers' gardens could be better utilized for further increasing the quality planting material production in the country. Keeping all these in view and to increase the production of quality seedlings of local cultivars, documentation of elite mother palms were carried out in traditional coconut growing districts of Andhra Pradesh, Assam, Chhattisgarh, Maharashtra and Tamil Nadu. Although it is not the complete list of mother palms in the region, this document provides basic information on the mother palms available in selected localities and will help in identifying further more palms in the above mentioned regions with similar performance.

## 1. Mother palm selection

Based on the information from farmers, the yielding coconut plantations at different localities were visited for selection of mother palms. The following were the criteria used for choosing mother palms.

- Regular bearing palms with annual nut yield of not less than 100 nuts.
- Palms possessing spherical or semi-spherical crown shape

with 30 to 40 fully opened leaves on its crown.

- Petiole length and stalk of the bunches be short and strong in nature and be able to give effective support to the coconut bunches.
- Palms which have reached full bearing stage of 25-30 years of age and giving regularly high yield for at least four consecutive years.
- Shorter and stronger peduncle with no tendency of drooping.
- Palms having medium sized nuts with nearly spherical/ oblong shapes, husked fruits weighing more than 600 g with copra content of 150 g.
- Palms with barren nuts, alternate bearing habit, infested by either pests or diseases to be avoided.

Morphological and reproductive characters of the selected elite coconut palms in farmers' gardens were documented. Care was taken to obtain representative samples of the surveyed population that possess the maximum desirable attributes. Since seed nuts are the depiction of the population under survey for characterization and evaluation, fruits were collected from selected palms with proper labelling.

## 2. Characterization of mother palms

The following descriptor parameters were used to describe and document the elite coconut palms with respect to plant morphological characters, reproductive biology and harvest data.

### A) Palm Morphology

a) Age of palms (years)

b) Plant height (cm): Measured in cm from the base of the palm to the base of the crown.

c) Total number of leaves: Number of leaves present on the crown at the time of observation.

### B) Harvest Data

a) Number of bunches per year: Number of harvested bunches per palm per year.

b) Number of nuts per year: Number of fruits harvested per palm per year.

### C) Fruit Characteristics

a) Weight of fruit (g): Weight of matured whole fruit (10-11months old) expressed in grams.

b) Weight of husked fruit (g): Weight of the fruit after husking expressed in grams.

c) Weight of kernel (g) :Weight of the fresh kernel expressed in grams after separating it from the shell.

## 3. Details of Collection Sites

### 3.1. Andhra Pradesh

In Andhra Pradesh, coconut is cultivated over an area of around 1,05,990 ha with a total production of 1463 million nuts

and productivity of 13808 nuts / ha (CDB, 2014 -15). West Godavari, East Godavari, Srikakulam and Vishakhapatnam are the major coconut growing districts of the state. The coconut palms of this region belong to East Coast Tall population. Fifteen blocks spreading across three districts of Andhra Pradesh *viz*., East Godavari, West Godavari and Vishakhapatnam were surveyed by AICRP on Palms Centre, Ambajipetta and a total of 3000 elite palms were identified and marked for future exploitation (Table 1).

**Table 1. Mother palms details in Andhra Pradesh documented by AICRP – Palms centre, Ambajipetta**

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| East Godavari | Ambajipeta | 307 | Latitude: N:16°.59'38" Longitude: E : 81°.95'35" Altitude: 14 m above MSL |

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| | Ainivilli | 92 | Latitude: N:16°.66'00" Longitude: E : 82°.01'14" Altitude: 13 m above MSL |
| | Amalapuram | 129 | Latitude: N:16°.57'20" Longitude: E : 82°.00'08" Altitude: 13 m above MSL |
| | Mummidi-varam | 202 | Latitude: N:16°.64'14" Longitude: E : 82°.10'42" Altitude: 8 m above MSL |
| | P. Gannavaram | 40 | Latitude; N:16°.58'91" |
| | | | Longitude; E : 81°.89'05" |
| | | | Altitude:13 m above MSL |
| | Muramalla | 122 | Latitude: N:16°.67'40" Longitude: E : 82°.16'72" Altitude:5 m above MSL |

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| | Mandapeta | 78 | Latitude: N:16°.86'52" Longitude: E : 81°.92'61" Altitude:15 m above MSL |
| | Kothapeta | 30 | Latitude: N:16°.71'60" Longitude: E : 81°.89'57" Altitude:16 m above MSL |
| West Godavari | Yelamanchili | 365 | Latitude: N:18°.52'96" Longitude: E :83°.99'16" Altitude:38 m above MSL |
| | Chegallu | 65 | Latitude: N:16°.99'29" Longitude: E : 81°.66'67" Altitude:29 m above MSL |
| | Achanta | 84 | Latitude: N:16°.60'20" Longitude: E : 81°.80'76" Altitude:14 m above MSL |

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| | Pedavegi | 486 | Latitude: N:16°.81'01" Longitude: E : 81°.10'65" Altitude:44 m above MSL |
| Vishakha patnam | S. Rayavaram | 1000 | Latitude: N:17°.45'45" Longitude: E : 82°.80'61" Altitude:16 m above MSL |
| **Total** | | **3000** | |

## 3.2. Assam

In Assam, coconut occupies an area of 21,140 ha with a total production of 237 million nuts and productivity of 11234 nuts / ha (CDB, 2014 -15). The districts of Nagaon, Barpeta, Sonitpur, Nalbari and Kamrup contribute nearly 45 per cent of the total coconut area of the state. A total of 200 elite mother palms were identified by AICRP on Palms centre, Kahikuchi in six blocks spread over four districts of Assam as detailed in Table 2. The coconut palms of this region belong to Kamrup Tall population. Observations of morphological features were recorded in the 200 mother palms and documented (Table 2).

**Table 2. Mother palm location details in Assam documented by AICRP – Palms centre, Kahikuchi**

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| Kamrup | Hajo | 80 | Latitude: N: 26°.15', Longitude: E: 91°. 32' Altitude: 53 m above MSL |
| | Kamalpur | 40 | Latitude: N: 26°.12' Longitude: E: 91°.38' Altitude: 57 m above MSL |
| Nalbari | Tihu | 20 | Latitude: N: 26°.38' Longitude: E: 91°.20' Altitude: 52 m above MSL |
| | Borkhetri | 20 | Latitude: N: 26°.27' Longitude: E: 91°.17' Altitude: 43 m above MSL |
| Morigaon | Bhurbandha | 20 | Latitude: N: 26°.07' Longitude: E: 92°.12' Altitude: 59 m above MSL |

| Districts | Name of the blocks | Number of palms | GPS coordinates |
|---|---|---|---|
| Nagoan | Raha | 20 | Latitude: N: 26°.08' Longitude: E: 92°.19' Altitude: 48 m above MSL |
| | **Total** | **200** | |

## 3.3. Chhattisgarh

Coconut is cultivated in an area of 1710 ha in Chhattisgarh with a production of 27.85 million nuts and productivity of 16287 nuts / ha ( CDB, 2014 - 15). Survey for identification of elite mother palms was undertaken by AICRP on Palms Centre of Chhattisgarh in major coconut area of six districts of Chhattisgarh. A total of 73 elite palms belonging to East Coast Tall population were identified and morphological features were documented

**Table 3. Mother palm location details in Chhattisgarh documented by AICRP – Palms centre, Jagdalpur**

| Districts | Number of palms | GPS coordinates |
|---|---|---|
| Jagdalpur | 30 | Latitude: N 19°.05'23" Longitude: E 82°.01'52" Altitude: 561 m above MSL |

| Districts | Number of palms | GPS coordinates |
|---|---|---|
| Narayanpur | 4 | Latitude: N 19°.43'05" Longitude: E 81°.13'57" Altitude: 553 m above MSL |
| Sukma | 7 | Latitude: N 18°.34'72" Longitude: E 81°.43'71" Altitude: 260 m above MSL |
| Mahasamund | 6 | Latitude: N 21°.16'29" Longitude: E 82°.43'37" Altitude: 256 m above MSL |
| Bijapur | 2 | Latitude: N 18°.38'77" Longitude: E 81°.15'98" Altitude: 623 m above MSL |
| Dantewada | 24 | Latitude: N 18°.53'68" Longitude: E 81°.19'32" Altitude: 371 m above MSL |
| **Total** | **73** | |

## 3.4. Maharashtra

Coconut is grown in an area of 28,100 ha in Maharashtra, with a production of 187.44 million nuts and productivity of 6670 nuts / ha (CDB, 2014-15). Major coconut growing districts are Sindhudurga, Ratnagiri and Raigad. Considering the extent of area under coconut in these districts, a survey was carried out to identify elite mother palms. Accordingly, 3000 elite mother palms of the local cultivar Banawali were identified by AICRP- Palms Centre, Ratnagiri in the three districts (Table 4). Observations on yield and its attributes were recorded in all the elite palms and documented.

**Table 4. Mother palm location details in Maharashtra documented by AICRP - Palms centre, Ratnagiri**

| Districts | Blocks | GPS coordinates | Variety | Number of palms |
|---|---|---|---|---|
| Ratnagiri | Madangad | Latitude: N 17°.99'28" Longitude: E 73°.27'25" Altitude: 271 m above MSL | Banawali | 9 |
| | Dapoli | Latitude: N 17°.77'78" Longitude: E 73°.21'04" Altitude: 128 m above MSL | Banawali | 126 |

| Districts | Blocks | GPS coordinates | Variety | Number of palms |
|---|---|---|---|---|
| | Guhagar | Latitude: N 17°.49'89" Longitude: E 73°.20'46" Altitude: 104 m above MSL | Banawali | 865 |
| Raigad | Alibag | Latitude: N 18°.67'96" Longitude: E 72°.89'91" Altitude: 50 m above MSL | Banawali | 350 |
| | Murud | Latitude: N 17°.53'55" Longitude: E 73°.90'83" Altitude: 662 m above MSL | Banawali | 350 |
| | Shri wardhan | Latitude: N 18°.07'25" Longitude: E 73°.03'82" Altitude: 14 m above MSL | Banawali | 300 |
| Sindhu-durga | Dudamarg | Latitude: N 15°.69'13" Longitude: E 73°.97'24" Altitude: 15 m above MSL | Banawali | 200 |

| Districts | Blocks | GPS coordinates | Variety | Number of palms |
|---|---|---|---|---|
| | Sawant-wadi | Latitude: N 15°.91'63" Longitude: E 73°.82'89" Altitude: 99 m above MSL | Banawali | 200 |
| | Vengurle | Latitude: N 15°.91'63" Longitude: E 73°.82'89" Altitude: 99 m above MSL | Banawali | 200 |
| | Malvan | Latitude: N 15°.86'82" Longitude: E 73°.65'43" Altitude: 18 m above MSL | Banawali | 200 |
| | Kudal | Latitude: N 16°.01'87" Longitude: E 73°.70'65" Altitude: 29 m above MSL | Banawali | 200 |
| | **Total** | | | **3000** |

## 3.5 Tamil Nadu

Tamil Nadu ranks third among the states in the country with regard to area under coconut cultivation (4, 65,110 ha) and first with respect to coconut production (6917.46 million nuts), with the productivity of 14873 nuts/ha. Among the districts,

Coimbatore, Tiruppur, Thanjavur, Dindigul, Kanyakumari, Vellore, Thiruvarur and Theni are the major coconut growing districts with an area of more than 20,000 ha in each district. In terms of productivity, Kanyakumari (23214 nuts / ha), Thanjavur (17542 nuts / ha) and Thiruvarur (17097 nuts / ha) occupy prime position in the state.

In Tamil Nadu, survey of elite mother palms was undertaken by two AICRP on Palms Centres *viz.*, Aliyarnagar and Veppankulam, covering the major coconut growing districts of Tamil Nadu. The coconut palms of these regions belong to East Coast Tall as well as West Coast Tall selections.

### 3.5.1. Aliyarnagar

Survey of mother palms was undertaken in three districts, *viz.*, Coimbatore, Tirupur and Erode districts. In the three districts chosen for documentation, a total of 2709 elite mother palms of the variety WCT were documented in 256 farmers holdings spread around 180 villages of 12 blocks (Table 5).

**Table 5. Mother palm location details in Tamil Nadu documented by AICRP – Palms centre, Aliyarnagar**

| Districts | Name of the blocks | Variety | Number of palms | GPS coordinates |
|---|---|---|---|---|
| Coimbatore | Anamalai | WCT | 1010 | Latitude: N 10°.48'81" Longitude.: E 76°.96'57" Altitude: 292 m above MSL |
| | Pollachi (N) | | | Latitude: N 10°.67'70" Longitude.: E 76°.97'00" Altitude: 256 m above MSL |
| | Pollachi (S) | | | Latitude: N 10°.62'68" Longitude.: E 77°.11'14" Altitude: 364 m above MSL |

| Districts | Name of the blocks | Variety | Number of palms | GPS coordinates |
|---|---|---|---|---|
| Tirupur | Udumalpet | WCT | 1040 | Latitude: N 10°.49'55" Longitude: E 77°.22'21" Altitude: 390 m above MSL |
| | Madathu -kulam | | | Latitude: N 10°.48'12" Longitude: E 77°.36'97" Altitude: 315 m above MSL |
| | Jallipatti | | | Latitude: N 10°.84'98" Longitude: E 77°.27'55" Altitude: 357 m above MSL |
| | Sultanpet | | | Latitude: N 10°.87'86" Longitude: E 77°.22'50" Altitude: 380 m above MSL |
| | Kurichi kottai | | | Latitude: N 10°.50'82" Longitude: E 77°.22'86" Altitude: 381 m above MSL |

| Districts | Name of the blocks | Variety | Number of palms | GPS coordinates |
|---|---|---|---|---|
| Erode | Anthiyur | WCT | 659 | Latitude: N 11°.57'70" Longitude: E 77°.58'77" Altitude: 225 m above MSL |
| | Kodumudi | | | Latitude: N 11°.07'88" Longitude.: E 77°.77'62" Altitude: 193 m above MSL |
| | Moda kuruchi | | | Latitude: N 11°.23'39" Longitude: E 77°.71'80" Altitude: 220 m above MSL |
| | Chenni-malai | | | Latitude: N 11°.47'15" Longitude: E 77°.35'27" Altitude: 225 m above MSL |
| | | **Total** | **2709** | |

### 3.5.2. Veppankulam

Morphological features of a total of 3000 mother palms were recorded in eight blocks of three districts Thanjavur, Thiruvarur and Nagapattinam in Tamil Nadu by AICRP on Palms Centre, Veppankulam (Table 6). The selected coconut palms of this region are belonging to East Coast Tall population.

**Table 6. Mother palm location details in Tamil Nadu documented by AICRP – Palms centre, Veppankulam**

| District | Name of the blocks | GPS coordinates | No. of mother palms observed |
|---|---|---|---|
| Thanjavur | Orathanadu | Latitude: N 10°.62'86" Longitude: E 79°.25'30" Altitude: 40 m above MSL | 1000 |
| | Pattukkottai | Latitude: N 10°.42'52" Longitude: E 79°.31'40" Altitude: 28 m above MSL | |
| | Peravurani | Latitude: N 10°.28'60" Longitude: E 79°.20'04" Altitude: 28 m above MSL | |

| District | Name of the blocks | GPS coordinates | No. of mother palms observed |
|---|---|---|---|
| Thiruvarur | Mannargudi | Latitude.: N 10°.66'48" Longitude: E 79°.45'07" Altitude: 21mabove MSL | 1000 |
| | Vadaseri | Latitude: N 10°.73'45" Longitude: E 78°.52'49" Altitude: 114 m above MSL | |
| | Peruga valanthan | Latitude.: N 10°.48'16" Longitude.: E 79°.49'56" Altitude: 12 m above MSL | |
| Naga -pattinam | Thiruthurai poondi | Latitude.: N 10°.52'51" Longitude: E 79°.63'61" Altitude: 5 m above MSL | 1000 |
| | Keelvelur | Latitude: N 10°.69'64" Longitude: E 79°.72'14" Altitude: 5 m above MSL | |
| | | **Total** | **3000** |

## 4. Yield Contributing Features of Elite Mother Palms

### 4.1. Andhra Pradesh

The average age of mother palms in Andhra Pradesh ranged from 24 years in Vishakhapatnam to 29 years in East Godavari district. The mean palm height ranged from 1060.4 cm in Vishakhapatnam to 1489.4 cm in East Godavari district (Table 7). But the palms observed in East Godavari district showed wide variation for plant height as indicated by the SD value. Number of leaves per palm showed little variation across the districts. But, wide variation was noticed among the palms observed in Vishakhapatnam.

Similar trend was observed for number of harvested bunches per palm per year and number of nuts harvested per year per palm. Among the three districts surveyed, fruit weight, nut weight and kernel weight were maximum in the mother palms observed in Visakhapatnam district (Fig.1).

The palms of Vishakhapatnam district also showed wide variation for nut characters. Among the three districts surveyed, the East Coast Tall (ECT) mother palms observed in Vishakhapatnam could be exploited as source of seed nuts for production of high yielding seedlings.

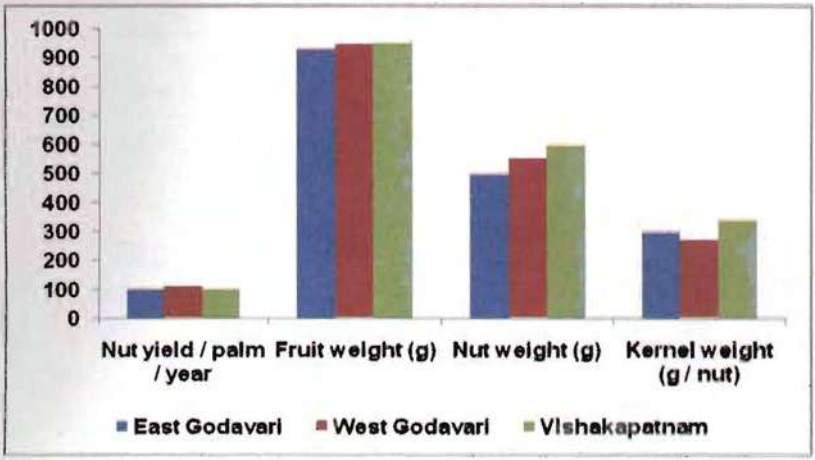


**Fig.1. Nut Yield and fruit characters of elite palms in Andhra Pradesh**

## 4.2. Assam

Survey of elite mother palms was undertaken in four districts of Assam and maximum of 120 elite mother palms were located in Kamrup district. The average age of the palms ranged from 28 to 33 years (Table 7). The average palm height was observed to be high (1503 cm) in Nalbari district. The average number of leaves and number of harvested bunches per palm per year was almost similar in all the districts surveyed. Maximum number of harvested nuts per year per palm was observed in Kamrup district (167.4 nuts) with a standard deviation of 47.8 nuts. Among the elite palms identified in the four districts, best performing ones were located in the district of Morigaon with better fruit weight, nut weight and kernel weight (Fig. 2).

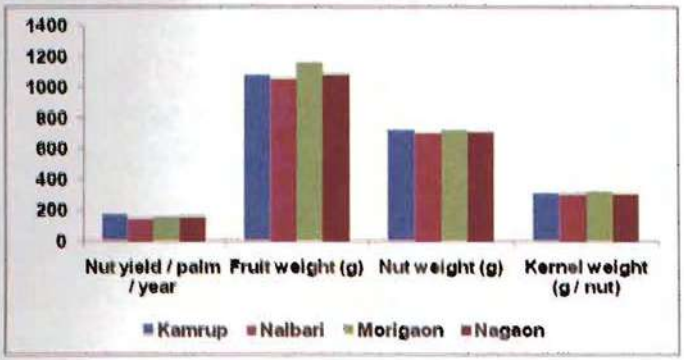


**Fig.2. Nut Yield and fruit characters of elite palms in Assam**

## 4.3. Chhattisgarh

A total of six districts were surveyed. Average age of the palms in the surveyed districts ranged from 18 to 23 years. Average palm height was observed to be maximum (1408 cm) in Mahasamund district. Among the 73 palms studied in the state, majority of the elite palms were located in Jagdalpur and Dantewada districts. For most of the yield and nut traits studied, palms in both the districts were observed to be almost similar (Fig.3).

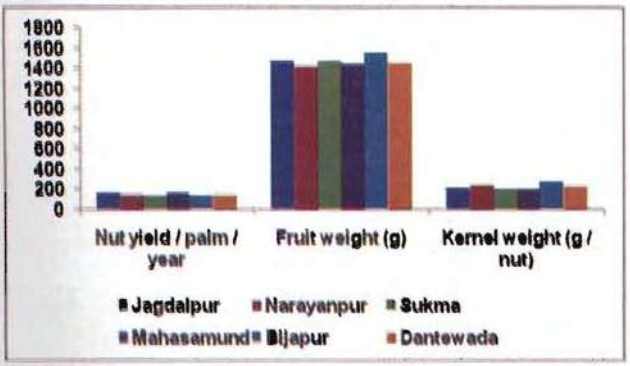


**Fig. 3. Nut Yield and fruit characters of elite palms in Chhattisgarh**

## 4.4. Maharashtra

Three thousand elite palms of the variety Banawali were observed in three districts *viz.*, Ratnagiri, Raigad and Sindhudurga, of Maharashtra and their age ranged from 29 to 37 years. Except for the trait kernel weight, all the mother palms were observed to be similar in their performance. The elite palms of Ratnagiri district were observed to have higher average kernel weight (183.7 g), coupled with better nut yield and fruit weight. This could ultimately result in better copra yield. Better quality seed nuts could be obtained from these elite palms for production of seedlings with improved yielding ability and this could result in over all yield improvement of coconut in the state (Table 7) (Fig. 4).

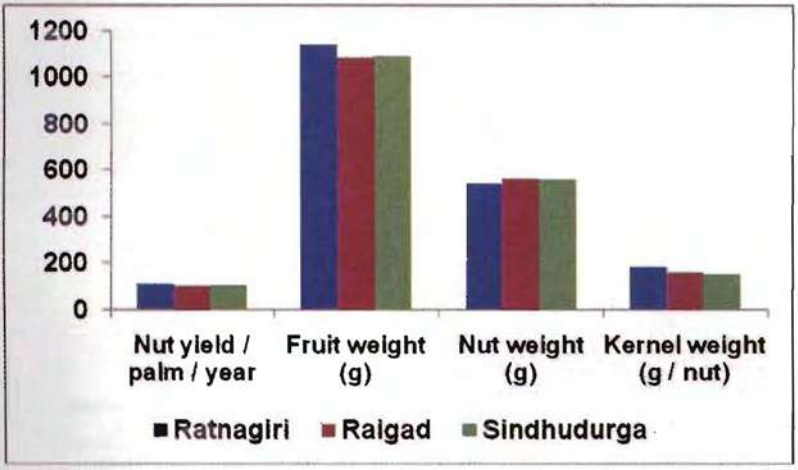


**Fig.4. Nut Yield and fruit characters of elite palms in Maharashtra**

## 4.5. Tamil Nadu

In Tamil Nadu, the survey identified the elite mother palms of the varieties WCT and ECT. Among the WCT palms, the average age ranged from 20 to 30 years. Among the three districts with WCT, the maximum palm height was recorded in Erode district (Average 1448 cm) and maximum number of functional leaves in Coimbatore district (Average 38.0) For yield and nut parameters, palms of Erode district were found to be better, with an average nut yield of 120 nuts, fruit weight of 1585 g, nut weight of 760 g and kernel weight of 268 g (Table 7) (Fig. 5).

Among the districts where in ECT mother palms were observed, the average age of the palms were 25 to 28 years and average palm height ranged from 805 to 988 cm. For all the characters studied, the mother palms surveyed in Thanjavur district was found to be superior to the palms of other districts. Hence these could be exploited as seed nut source for production and distribution of quality coconut seedlings (Table 7)(Fig. 6).

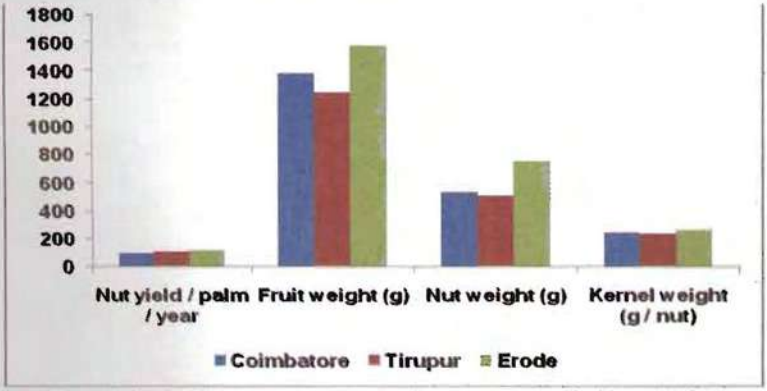


**Fig. 5. Nut Yield and fruit characters of elite WCT palms in Tamil Nadu**

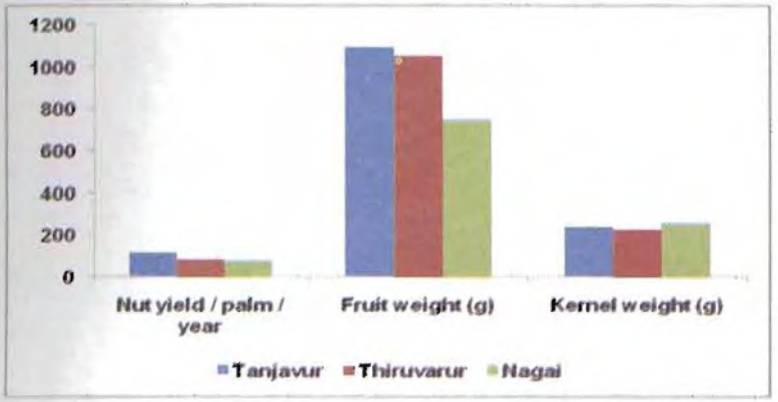


**Fig.6. Nut Yield and fruit characters of elite ECT palms in Tamil Nadu**

**Table 7. Summary of growth and yield contributing traits in mother palms of different regions**

| State / District | Cultivar | No. of palms observed | Average Age | Height (cm) | No. of leaves | No. of harvested bunches / palm / year | Nut yield / palm / year | Fruit weight (g) | Husked fruit weight (g) | Kernel weight (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Andhra Pradesh** | | | | | | | | | | |
| East Godavari | ECT | 1000 | 29 | 1489.4 ± 310.4 | 35 ± 0.85 | 12.1 ± 1.4 | 104.6 ± 29.9 | 929.9 ± 91.5 | 500.4 ± 37.2 | 300.9 ± 39.4 |
| West Godavari | ECT | 1000 | 28 | 1307.5 ± 123.9 | 34.9 ± 1.4 | 14.4 ± 2.3 | 110.6 ± 17.7 | 944.4 ± 92.4 | 550.9 ± 53.3 | 268.3 ± 59.7 |
| Vishaka patnam | ECT | 1000 | 24 | 1060.4 ± 116.7 | 33.6 ± 9.9 | 12.6 ± 0.5 | 102.7 ± 16.2 | 951.3 ± 115.9 | 600.3 ± 71.8 | 341.9 ± 113.2 |
| **Assam** | | | | | | | | | | |
| Kamrup | Kamaru-pa | 120 | 33 | 1363 ±160.1 | 30.5 ± 1.9 | 9.2 ± 0.61 | 167.4 ± 47.8 | 1069.1 ± 86.1 | 718.2 ± 62.6 | 309.4 ±14.5 |
| Nalbari | Kamaru-pa | 40 | 30 | 1503.8 ± 171.3 | 30.8 ± 1.4 | 8.8 ± 0.5 | 146.9 ± 18.1 | 1056.7 ± 66.0 | 703.3 ± 65.1 | 309.3 ± 20.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Morigaon | Kamarupa | 20 | 30 | 1400.5 ± 156.7 | 31.9 ± 2.3 | 8.7 ± 0.57 | 151.6 ± 18.8 | 1154.5 ± 143.5 | 716.2 ± 58.6 | 315.8 ±18.6 |
| Nagaon | Kamarupa | 20 | 28 | 1430.0 ± 184.0 | 31.4 ± 1.9 | 9.2 ± 0.8 | 156.0 ± 19.9 | 1081.6 ± 52.3 | 709.1 ± 33.0 | 308.9 ± 9.0 |
| **Chhattisgarh** | | | | | | | | | | |
| Jagdalpur | ECT | 30 | 22 | 1148 ± 195.0 | 20.4 ± 3.1 | 6.03 ± 1.6 | 148.5 ± 26.9 | 1469 ± 236.4 | NA | 204.5 ± 60.3 |
| Narayanpur | ECT | 4 | 23 | 1088 ± 165.0 | 21.0 ± 1.2 | 5.8 ± 0.9 | 145.0 ± 40.4 | 1423 ± 227.9 | NA | 240.0 ± 84.4 |
| Sukma | ECT | 7 | 18 | 1069 ± 290.0 | 22.9 ± 5.5 | 8.29 ± 1.5 | 125.7 ± 17.4 | 1472 ± 262.0 | NA | 195.6 ± 59.9 |
| Mahasa mund | ECT | 6 | 20 | 1408 ± 270.0 | 23.7 ± 1.2 | 7.5 ± 0.6 | 164.0 ± 8.9 | 1442 ± 35.5 | NA | 192.3 ± 16.2 |
| Bijapur | ECT | 2 | 19 | 1300 ± 280.0 | 19.0 ± 4.2 | 6.0 ± 1.4 | 125.5 ± 13.4 | 1551 ± 114.6 | NA | 268.0 ± 82.0 |
| Dantewada | ECT | 24 | 20 | 1217 ± 73.0 | 19.0 ± 3.4 | 5.9 ± 1.1 | 145.7 ± 23.6 | 1463 ± 250.8 | NA | 227.5 ± 73.7 |
| **Maharashtra** | | | | | | | | | | |
| Ratnagiri | Banawali | 1000 | 37 | 1224.5 ± 280.1 | 31.2 ± 2.7 | 11.5 ± 2.0 | 114.6 ± 34.4 | 1142.4 ± 399.9 | 541.7 ± 176.1 | 183.7 ± 57.9 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Raigad | Banawali | 1000 | 29 | 1257.6 ± 263.8 | 30.6 ± 3.6 | 11.6 ± 1.5 | 106.0 ± 19.0 | 1088 ± 299.5 | 564.2 ± 134.4 | 160.6 ± 31.4 |
| Sindhu durga | Banawali | 1000 | 30 | 1244.0 ± 239.9 | 31 ± 2.7 | 11.5 ± 1.5 | 106 ± 19.3 | 1094.2 ± 334.6 | 561.8 ± 150.5 | 155.0 ± 28.6 |
| **Tamil Nadu** | | | | | | | | | | |
| Coimbatore | WCT | 1010 | 20 | 1184.0 ± 139 | 38 ± 2 | 12.3 ± 0.6 | 99.0 ± 8.0 | 1386.0 ± 218.0 | 538.0 ± 72.0 | 247.0 ± 35.0 |
| Tirupur | WCT | 1040 | 30 | 1181.0± 176 | 36 ± 2 | 11.7 ± 0.2 | 107.0 ± 19.0 | 1249.0 ± 223.0 | 507.0 ± 85.0 | 237.0 ± 50.0 |
| Erode | WCT | 659 | 25 | 1448.0 ± 449 | 31 ± 3 | 10 ± 0.9 | 120.0 ± 12.0 | 1585.0 ± 244.0 | 760.0 ± 128.0 | 268.0 ± 42.0 |
| Thanjavur | ECT | 1000 | 26 | 918 | 36 | 11.2 | 111.3 | 1092 | NA | 237.9 |
| Thiruvarur | ECT | 1000 | 25 | 988 | 34 | 10 | 88.3 | 1055 | NA | 228.1 |
| Naga pattinam | ECT | 1000 | 28 | 805 | 26 | 10.2 | 80.5 | 747 | NA | 257.5 |
| NA: Not available | | | | | | | | | | |

# Documentation of Coconut Mother Palms in Andhra Pradesh

## Elite Palms of East Godavari District


## Elite Palms of West Godavari District


## Elite Palms of Vishakhapatnam District


Elite Palm of Kamrup, Assam

Elite Palm of Nalbari, Assam

Elite Palm of Nalbari, Assam

Elite Palm of Morigaon, Assam

## Elite Palm of Raigad, Maharashtra

## Elite Palm of Ratnagiri, Maharashtra

# Documentation of Mother Palms in Tamil Nadu

## Elite Palm of Coimbatore District

## Elite Palm of Tiruppur District

## Elite Palm of Thanjavur District

## Elite Palm of Thiruvarur District

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