

Relative performance of coconut hybrids in Tamil Nadu

K. GANESAMURTHY, C. NATARAJAN AND S. RAJARATHINAM

Coconut Research Station, Veppankulam - 614 906, Thanjavur District, Tamil Nadu

Abstract: Fourteen coconut hybrids developed at four coconut research centres in Southern India were evaluated for their morphological, nut and yield attributes at Coconut Research Station, Veppankulam to identify superior hybrid combinations for cultivation in Tamil Nadu. Among the hybrids studied, WCT x MYD, WCT x COD, LCT x PHOT and ECT x CGD were found to be outstanding with high nut, copra and oil yield. These hybrids are found to be suitable for cultivation in Tamil Nadu.

Key words : Coconut, Hybrid, Nut yield, Copra yield.

Introduction

The coconut palm (*Cocos nucifera* L.) is one of the most versatile species providing food, refreshing drink, shelter and several products for industrial use. It ranks first among the oil yielding crops of the world in terms of geographical distribution as it is grown in more than 90 countries of tropics. Research work in the improvement of coconut by breeding was started in India as early as in 1916. Manifestation of hybrid vigour in coconut was first reported in the cross between West Coast Tall as female parent and Chowghat Green Dwarf as male parent (Patel, 1937). This finding has led to the exploitation of heterosis in coconut which has been adopted as the major programme of improvement in all the coconut growing countries in the world. The hybrids germinated early and were very vigorous characterized by increased height, collar girth and more number of leaves compared to the progeny of female parent. Heterosis breeding in Tamil Nadu was initiated in 1968 at Coconut Research Station, Veppankulam and the first coconut hybrid VHC 1, a cross between East Coast Tall x Dwarf Green was released in 1982 (Ramanathan *et al.* 1982). The tall female x dwarf male hybrids are found to be early bearing and high yielding. Detailed studies made on different combinations of palms from both tall and dwarfs have shown that certain combinations are more promising

than others. Hence, it is necessary to identify palms in both tall and dwarf varieties to obtain promising hybrids based on the combining ability of the parents.

In this study, coconut hybrids developed at different coconut breeding station in South India were studied for their relative performance to identify promising hybrids for cultivation in Tamil Nadu.

Materials and Methods

Fourteen coconut hybrids comprising of one from Central Plantation Crops Research Institute (CPCRI), Kasaragod, three from Coconut Research Station, Pilocode, four from Coconut Research Station, Ambajipet (AP) and six from Coconut Research Station, Veppankulam along with local cultivar East Coast Tall were raised in a randomized block design with three replication at Coconut Research Station, Tamil Nadu Agricultural University, Veppankulam during 1986. Four palms were planted in each hybrid combinations in each replication. All the recommended agronomic packages were adopted uniformly for all the genotypes. Observations on the morphological attributes *viz.* plant height, trunk girth, number of leaves, number of inflorescence/year, number of female flowers/inflorescence, number of nuts/bunch were recorded in all the four palms in each replications during

Table 1. Growth and reproductive attributes of coconut hybrids

| Sl. No. | Hybrid | Plant height (cm) | Girth of trunk (cm) | Total no. of leaves/palm | No. of inflorescence / year | No. of female flower/ inflorescence | No. of nuts/bunch | Setting percentage (%) |
|---------------------|--------------|-------------------|---------------------|--------------------------|-----------------------------|-------------------------------------|-------------------|------------------------|
| <i>Tall x Dwarf</i> | | | | | | | | |
| 1 | WCT x COD | 557.5 | 77.7 | 32.2 | 13.6** | 36.9 | 15.6** | 42.3* |
| 2 | WCT x MYD | 578.4 | 74.8 | 36.3* | 13.4** | 38.0 | 16.9** | 44.5** |
| 3 | WCT x GBD | 617.4 | 87.3 | 33.7 | 12.4 | 32.1 | 11.2 | 34.9 |
| 4 | ECT x CGD | 633.8 | 83.8 | 33.7 | 13.4** | 33.5 | 14.6* | 43.6** |
| 5 | ECT x COD | 640.0 | 94.4* | 28.4 | 11.7 | 32.6 | 12.5 | 38.3 |
| <i>Dwarf x Tall</i> | | | | | | | | |
| 6 | COD x WCT | 546.3 | 70.7 | 31.1 | 12.2 | 36.3 | 12.4 | 34.2 |
| 7 | GBD x LCT | 415.7 | 69.8 | 31.2 | 12.4 | 41.0 | 12.6 | 30.7 |
| 8 | GBD x PHOT | 643.6 | 83.3 | 35.5* | 13.6** | 40.4 | 11.1 | 27.5 |
| 9 | GBD x FJT | 513.1 | 78.7 | 34.9 | 12.7 | 38.6 | 10.9 | 28.2 |
| 10 | GBD x ECT | 564.0 | 92.9* | 31.5 | 12.4 | 35.7 | 10.9 | 30.5 |
| <i>Tall x Tall</i> | | | | | | | | |
| 11 | LCT x COCT | 625.8 | 84.7 | 33.1 | 12.3 | 27.7 | 10.1 | 36.5 |
| 12 | COCT x LCT | 637.8 | 92.5* | 33.7 | 12.4 | 25.6 | 8.6 | 33.6 |
| 13 | COCT x PHOT | 444.2 | 84.7 | 30.1 | 12.4 | 28.3 | 7.5 | 38.5 |
| 14 | LCT x PHOT | 601.3 | 76.9 | 29.3 | 12.0 | 33.9 | 10.6 | 31.3 |
| 15 | ECT (Tall) | 610.4 | 86.8 | 32.4 | 12.0 | 30.4 | 10.5 | 34.5 |
| | General Mean | 577.1 | 82.6 | 32.5 | 12.6 | 34.1 | 11.7 | 35.3 |
| | SE(d) | NS | 4.6 | 1.5 | 0.3 | NS | 1.4 | 2.8 |

* Significant at P : 0.05; ** Significant at P : 0.01

2001 and the mean values were worked out. For studying the nut characters, two nuts of 12 months maturity were collected from each of the four palms at harvest. Data were collected on whole nut weight, dehusked nut weight, kernel weight, copra weight and oil content of the copra separately by following standard procedures during summer months. The cumulative mean number of palms for the four years from 1999 to 2002 was taken as the annual nut, copra and oil yield of each genotype. The mean data were subjected to statistical analysis.

Results and Discussion

Growth and reproductive attributes

The statistical analysis of mean values recorded for the growth and reproductive attributes of the hybrids and the check variety East Coast Tall (Table 1) revealed that the genotypes showed significant differences among them for all the characters studied

Table 2. Nut characters of coconut hybrids

| S.No. | Hybrid | Whole nut weight (g) | Dehusked nut weight (g) | Kernel weight / nut (g) | Copra weight / nut (g) | Oil contents of copra (%) |
|---------------------|--------------|----------------------|-------------------------|-------------------------|------------------------|---------------------------|
| <i>Tall x Dwarf</i> | | | | | | |
| 1 | WCT x COD | 1099.00 | 517.50 | 292.50 | 145.61 | 68.31* |
| 2 | WCT x MYD | 1144.00 | 533.75 | 249.38 | 147.42 | 66.42 |
| 3 | WCT x GBD | 1297.00 | 666.88 | 348.13* | 179.84** | 66.53 |
| 4 | ECT x CGD | 928.00 | 496.88 | 248.12 | 135.60 | 67.64 |
| 5 | ECT x COD | | | | | |
| <i>Dwarf x Tall</i> | | | | | | |
| 6 | COD x WCT | 1076.00 | 514.38 | 293.75 | 143.20 | 68.75** |
| 7 | GBD x LCT | 1255.00 | 596.25 | 316.88 | 164.65 | 66.63 |
| 8 | GBD x PHOT | 1181.00 | 552.50 | 301.88 | 147.61 | 65.81 |
| 9 | GBD x FJT | 1126.00 | 634.38 | 335.63 | 152.05 | 65.78 |
| 10 | GBD x ECT | 1199.00 | 546.25 | 303.75 | 134.42 | 67.67 |
| <i>Tall x Tall</i> | | | | | | |
| 11 | LCT x COCT | 1034.00 | 454.38 | 239.38 | 127.80 | 67.04 |
| 12 | COCT x LCT | 1527.00 | 601.88 | 327.50 | 172.82* | 66.72 |
| 13 | COCT x PHOT | 1231.00 | 543.75 | 293.13 | 171.52 | 65.33 |
| 14 | LCT x PHOT | 1403.00 | 648.75 | 355.00** | 185.51** | 67.52 |
| 15 | ECT (Tall) | 1160.00 | 515.00 | 287.50 | 130.45 | 66.20 |
| | General Mean | 1172.00 | 550.17 | 295.58 | 151.37 | 66.94 |
| | SE(d) | NS | 95.48 | 20.97 | 10.06 | 0.61 |

* Significant at $P=0.05$; ** Significant at $P=0.01$

except for the plant height. The character girth at trunk recorded by the hybrids, ECT x COD, GBD x ECT and COCT x LCT were significantly higher than the general mean. Hybrid WCT x MYD recorded the highest total number of leaves (36.3) followed by GBD x PHOT (35.5) which were found to be significantly higher than the general mean. The reproductive attributes of the hybrids, which are considered to be the key factors for nut yield in coconut showed remarkable variation among the hybrids. The number of inflorescence per year in WCT x COD, GBD x PHOT, WCT x MYD and ECT x CGD were significantly higher than the rest of the hybrids. Though there is no significant difference for number of female flowers/inflorescence among the hybrids, the number of nuts/bunch and nut setting percentage recorded by the hybrids WCT x MYD, WCT x COD and ECT x CGD were significantly higher

than the general mean. Earlier studies on reproductive attributes like inflorescence production, female flower production and setting percentage in coconut indicates that high yielders produce regular bunches, leading to high female flower production, resulting in high yield whereas in low yielders, production of bunches, female flowers and setting percentage were poor. Correlation studies also showed positive significant correlation for number of bunches, female flowers and setting percentage with yield (Satyabalan, 1982). In the present study among the fourteen hybrids WCT x MYD, WCT x COD and ECT x CGD were found to be high yielders based on their per se performance for the reproductive attributes.

Nut characters

The mean values recorded for the nut characters by the hybrids and East Coast Tall

are presented in Table 2. The hybrids showed high level of variations for most of the nut characteristics. Among the hybrids LCT x PHOT, COCT x LCT, WCT x GBD and GBD x FJT had recorded high whole nut weight and dehusked nut weight, as compared to the East Coast tall variety. The kernel weight and copra weight of the hybrids WCT x GBD and LCT x PHOT were also significantly higher than the general mean, while COD x WCT recorded the highest oil content of 68.75 per cent followed by WCT x COD (68.31). Among the hybrids studied, LCT x PHOT, WCT x GBD and COCT x LCT were found to be superior based on nut characteristics. The superiority of WCT x GBD for dehusked nut weight, kernel and copra content was also reported by Satyabalan in 1976.

Yield and yield attributes

The annual nut, copra and oil yield of hybrids and their relative performance over local cultivar East Coast Tall are presented in Table 3. Among the different hybrid combinations studied, the performance of Tall x Dwarf hybrids for annual nut, copra and oil yield was found superior as compared to other hybrid combinations viz. Dwarf x Tall and Tall x Tall. The annual nut yield of Tall x Dwarf hybrids, WCT x MYD, ECT x CGD and WCT x COD was higher than the rest of hybrids registering 42.1, 40.4 and 39.6 per cent higher nut yield than East Coast Tall. The annual nut and copra yield of these hybrids and LCT x PHOT (Tall x Tall) was also significantly higher than the general mean yield. The yield

Table 3. Yield characters of coconut hybrids

| S.No. | Hybrid | Annual mean nut yield/palm | Percent age over ECT | Annual mean copra yield kg/palm | Percent age over ECT | Annual mean copra yield kg/palm | Percent age over ECT |
|---------------------|--------------|----------------------------|----------------------|---------------------------------|----------------------|---------------------------------|----------------------|
| <i>Tall x Dwarf</i> | | | | | | | |
| 1 | WCT x COD | 162.5 | 39.6 | 23.7** | 55.9 | 16.2** | 60.4 |
| 2 | WCT x MYD | 165.4 | 42.1 | 24.4** | 60.5 | 16.2** | 60.4 |
| 3 | WCT x GBD | 115.1 | - | 18.4 | 21.1 | 12.2 | 20.8 |
| 4 | ECT x CGD | 163.4 | 40.4 | 21.7* | 42.8 | 14.5* | 43.6 |
| 5 | ECT x COD | 135.6 | 16.5 | 17.9 | 17.8 | 12.2 | 20.8 |
| <i>Dwarf x Tall</i> | | | | | | | |
| 6 | COD x WCT | 138.7 | 19.2 | 19.9 | 30.9 | 13.7 | 35.6 |
| 7 | GBD x LCT | 135.8 | 16.7 | 19.6 | 28.9 | 13.1 | 29.7 |
| 8 | GBD x PHOT | 130.6 | 12.2 | 19.3 | 26.9 | 12.7 | 25.7 |
| 9 | GBD x FJT | 121.4 | 4.3 | 17.3 | 13.8 | 11.4 | 12.9 |
| 10 | GBD x ECT | 90.3 | - | 12.1 | - | 8.2 | - |
| <i>Tall x Tall</i> | | | | | | | |
| 11 | LCT x COCT | 117.1 | 0.6 | 15.0 | - | 10.1 | - |
| 12 | COCT x LCT | 86.7 | - | 14.9 | - | 9.9 | - |
| 13 | COCT x PHOT | 78.6 | - | 13.5 | - | 8.8 | - |
| 14 | LCT x PHOT | 120.3 | 3.4 | 22.3** | 46.7 | 15.1** | 49.5 |
| 15 | ECT (Tall) | 116.4 | - | 15.2 | - | 10.1 | - |
| | General Mean | 125.2 | - | 18.3 | - | 12.3 | - |
| | SE(d) | NS | - | 1.44 | - | 0.92 | - |

* Significant at P=0.05; ** Significant at P=0.01

Increase of copra ranged from 47.8 to 60.5 per cent for oil from 43.6 to 60.4 per cent over ECT in these hybrids. Earlier studies have shown that Tall female x Dwarf male hybrids are found to be early bearing and high yielding.

Satyabalan (1976) from his detailed studies on different combinations of palms from both the tall and dwarfs reported that certain combinations are more promising than others. Among the different types of dwarf genotypes available in India, Chowghat Orange Dwarf seemed to be a better pollen parent than others. The superiority of local and Malaysian Yellow Dwarf (MYD) as the best male parent with good combining ability with tall cultivars has also been reported from Veppankulam by Ramachandran *et al.* (1974). Hence, it is necessary to identify palms in both the tall and dwarf varieties to obtain promising hybrids based on the combining ability of the parents for the yield attributes. In the present study among the different combinations studied, the performance of WCT x MYD, WCT x COD and ECT x CGD in tall x dwarf and LCT x PHOT in tall x tall combinations was found to be outstanding for yield attributes and are found suitable for cultivation in Tamil Nadu.

It may be concluded from the study that among the fourteen coconut hybrids studied for their relative performance on morphological, reproductive and yield attributes, three tall x dwarf hybrids WCT x MYD, WCT x COD and ECT x CGD and a tall x tall hybrid LCT x PHOT were found to be superior and recorded significantly higher nut copra and oil yield than East Coast Tall. These hybrids are found to be suitable for cultivation in Tamil Nadu.

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