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Evaluation of Promising Hybrids and Varieties of Coconut in East Coast Region of Andhra Pradesh

G. Ramanandam*, E. Padma, M. Kalpana, K. Ravindra Kumar, N.B.V.C. Rao and H.P. Maheswarappa

AICRP on Palms, Horticultural Research Station, Ambajipeta

Dr. Y.S.R. Horticultural University, Andhra Pradesh

*Corresponding Author E-mail: drramanandam@gmail.com

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ABSTRACT

An experiment was conducted under All India Coordinated Research Project on palms at Horticultural Research Station, Ambajipeta to evaluate the yield performance of released coconut hybrids viz., Chandrasankara (COD x WCT), Lakshaganga (LCOT x GBGD), Keraganga (WCT x GBGD), Chandralaksha (LCOT x COD), VHC-I (ECT x MGD),VHC-II (ECT x MYD), Godavari Ganga (ECT x GBGD) and two varieties namely Chandrakalpa and Double Century. The experimental palms were planted during 2002 spaced at 7.5 x 7.5 m. in RBD with 3 replications maintaining 6 palms per replication and evaluated for 15 years. The results revealed that the coconut hybrid Godavari Ganga was found precocious, and comes to flowering within 45 months after planting followed by Lakshaganga and Chandralaksha (47 months). Significantly the highest nut yield of 135.1/palm/year and copra out put (26.5 kg/palm/year) was recorded with Godavari Ganga which was followed by Kera Ganga (120.6 nuts/palm/year) and Lakshaganga (118.3 nuts/palm/year). Significantly the highest oil content of 70.3% was recorded with VHC – II which was on par with Godavari Ganga (66%). However, the highest estimated oil yield (17.5 kg/ palm) was recorded with Godavari Ganga followed by VHC-II(16.0kg/palm)., Based on its superior performance with respect to higher nut yield, copra out put and oil yield, the coconut hybrid Godavari Ganga was found most suitable for cultivation in East coast region of Andhra Pradesh.

Key words: *Coconut, Hybrid, Nut yield, Copra out turn, Tender nut water.*

INTRODUCTION

Coconut (*Cocos nucifera* L.) is a varsatile palm with multiple uses grown widely in the humid tropics and is known as Tree of heaven or Kalpavriksha. Coconut provides nutritious food and refreshing drink, oil for edible and non-edible uses, fiber of commercial value, shell for fuel and industrial uses, timber and a variety of miscellaneous products for domestic and industrial use.

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Perennial nature of palms, higher level of heterozygosity, long gestation phase, need for larger area and longer time for experimentation and lack of technologies for mass propagation of palms with targeted traits are the major constraints in successful breeding efforts.

Andhra Pradesh is one of the important coconut growing states in India with an area of 1.15 lakh ha with production of 1377.53 million nuts and productivity of 11957 nuts per ha. (CDB 2016-17)[4]. The predominant variety under cultivation in the state is East Coast Tall which is tall type with an average yield potential of 80 nuts/palm/year. In general Tall cultivars are grown for copra and oil production while dwarfs are preferred for tender nut water. Hence, introduction/development of high yielding varieties/hybrids and their evaluation in a particular conditions are very important to achieve higher production and productivity in coconut. Hybrids, usually express hybrid vigour in growth, precocity and higher yields as reported for the first from India in 1937[6].

The coconut hybrid Godavari Ganga was developed by crossing East Coast Tall (ECT) as female parent with Gangabondam green dwarf (GBGD) as male parent and released from Horticultural Research Station, Ambajipeta in 1991 based on its superior performance over its parents for commercial cultivation in Andhra Pradesh state and has become popular among the farmers. Different tall and dwarf cultivars were selected and inter-varietal hybridization was done between Dwarf x Tall and Tall x Dwarf types to explore more heterosis. Parental varieties were selected to produce superior hybrids over existing varieties and hybrids for early bearing, higher nut yield, copra output and oil yield and tender nut water content. A good number of hybrid combinations of Tall x Dwarf (T x D), Dwarf x Tall (D x T) and Tall x Tall (T x T) have been developed and evaluated over years in different locations. The expression of hybrid vigour is influenced by the environment[3] and hence the evaluation of hybrids/varieties is necessary to ascertain their suitability to a particular locality. With this back ground, a field experiment was designed with the objective to study the performance of different hybrids under East coast of Andhra Pradesh.

MATERIAL AND METHODS

Evaluation of selected hybrids and varieties carried out at All India Co-ordinate Research Project on Palms, Horticultural Research Station, Ambajipeta centre, which is situated at 16.4^0 N latitude and 81.5^0 E longitudes and at an altitude of 34 m above mean sea level. The soils are coastal alluvial type with pH 7.8 with impeded drainage. The mean maximum temperature ranges from 26.7 to 36.8°C and the minimum temperature ranges from 22.7 to 42.5°C. The average rainfall and relative humidity during experimentation was varied between 1000 to 1250 mm and 65 to 87 %, respectively.

A total of nine entries which includes seven hybrids and two varieties *viz.*, Chandrasankara (COD x WCT), Lakshaganga (LCT x GBGD), Keraganga (WCT x GBGD), Chandralaksha (LCT x COD), VHC-I (ECT x MGD), VHC-II (ECT x MYD), Godavari Ganga (ECT x GBGD), Chandrakalpa and Double Century were evaluated for 15 years. The experiment was laid out in randomized block design with three replications maintaining 6 palms per replication. The seed nuts received from ICAR-CPCRI and SAU's were sown in poly pots and healthy seedlings of one year old from each entry were selected and planted during 2002 at a spacing of 7.5 x 7.5 m with a density of 175 palms per hectare under irrigated conditions duly adopting the standard package of practices as recommended by Dr. YSR Horticultural University. The growth parameters like palm height, girth, number of functional leaves on the crown, leaf length and petiole length were recorded during 2017-18 at the age of 15 years. The nut yield per palm was recorded periodically at each harvest from July to June and pooled to get nut yield per palm per year. Copra content per nut was recorded by drawing random sample of

six nuts per each entry in each replication at each harvest. Copra out put per palm was calculated based on the copra content per nut in each treatment. The oil content in copra was estimated using Soxhlet apparatus by drawing pooled samples of each hybrid/variety over replications and oil yield per palm was computed. The yield data, copra output and oil yield were pooled for seven years from 2011-12 to 2017-18 ,while the fruit component characters were recorded during 2017-18 to draw the conclusions. The data was analyzed statistically as per the procedure given by Gomez and Gomez [5].

RESULTS AND DISCUSSION

Growth characters

Growth parameters recorded at the age of 15 years is presented in Table 1. Among the growth parameters, palm height, functional leaves and leaf characters did not differ significantly among the hybrids. However, palm girth at 1 m height and length of 10 internodes were significantly varied among the entries evaluated. The variety Double Century was recorded significantly the highest girth at one metre height (115.4 cm), while the lowest was with Godavari Ganga (90.9 cm). With respect to length of 10 internodes, VHC- I has recorded the maximum values (101.9 cm) and the lowest with Godavari Ganga (75.6 cm). The lower values for palm girth and length of 10 internodes in hybrid Godavari Ganga which was the cross between ECT (Tall) x GBGD (Dwarf) could be attributed to the involvement of dwarf cultivar as one of its parent.

The age at first flowering was significantly varied among the hybrids/varieties evaluated (Table 2). The coconut hybrid Godavari Ganga was the earliest to flower (45 months after planting) and it was on par with VHC-II. The earliest flowering in Godavari Ganga could be attributed to involvement of Dwarf cultivar (GBGD) as one of the parent (male parent) as it comes to flowering within 36 months after planting under agro-climatic conditions of Andhra Pradesh

Yield and tender nut quality parameters

Significant variation was observed for nut yield among coconut hybrids and varieties and yield varied from a minimum of 106.6 nut/palm/year (Double century) to the maximum of 135.1 nut/palm/year. Significantly higher mean nut yield (Average of 7 years) was recorded in coconut hybrid Godavari Ganga (135.1 nuts/palm/year) followed by Keraganga (120.6 nuts/palm/year). The yield data revealed that the coconut hybrids gave higher nut yields compared to varieties could be attributed to their hybrid vigour and higher yield potential. The Indian coconut cultivars population is comprised of enormous variability due to continued cultivation since so many years. It is well established that the performance of the cultivar in a locality is a function of its genotype and environment. Therefore, the performance will vary under different agro-climatic conditions.

The tender nut water content was significantly higher in VHC II (367.3 ml) and was on par with Double Century (343.3 ml), Lakshaganga (342.6 ml) and Godavari Ganga (327.3 ml with the high TSS 7.5^0 Brix). No significant variations were observed for potassium content of tender nut water. However, sodium content was differed significantly among the entries evaluated. The sodium content varied between the minimum of 22.9 ppm (Chandralaksha) and the maximum of 38.0 ppm (Double century). The quality and acceptability of tender coconut water is governed by the maturity of the nuts, variety, agro-climatic conditions and agronomic practices. Apshara *et al.*[1] observed that COD x WCT and LCOT x COD were better performing hybrids for tender nut purpose as they recorded higher amounts of water, TSS and optimal levels of sodium and potassium.

Fruit component characters

The coconut hybrids and varieties have shown significant variation for fruit weight, copra output and oil yield (Table 3). Significantly the highest fruit weight was recorded with Chandralaksha (1464.7 g) and it was on par

with Godavari Ganga (1389.3 g) and Chandrakalpa (1356.5 g). However, fruit component traits found non- significant among coconut hybrids and varieties.

The hybrid Chandralaksha recorded significantly the highest copra content (212.5 g/nut) which was on par with Double Century (205.9 g), VHC-II (200.9 g) and Godavari Ganga (195.8 g). With regard to copra output and oil yield, the hybrid Godavari Ganga recorded the highest values (26.5 kg/palm and 17.5 kg/ palm) followed by Chandralaksha (23.1 kg/palm and 16.0 Kg/palm) respectively. However, significantly higher oil content was recorded in VHC- II (70.3 %) and it was on par with Godavari Ganga (66.0 %). The higher copra out put in Godavari Ganga can be ascribed to higher nut yield and copra content compared to other hybrids and varieties. Similar results of higher yield were earlier reported by Rao *et al*[7] and Ramanandam *et al* [9] in Andhra Pradesh and in Tamil Nadu[2] and in Assam by Nath *et al*[8] .

It can be concluded from this experiment that among the coconut hybrids/varieties evaluated, the hybrid Godavari Ganga was found superior in terms of nut yield, copra output and oil yield and tender nut water over other cross combinations and varieties. Hence, the hybrid Godavari Ganga was considered to be the most suitable for cultivation in east coastal districts of Andhra Pradesh.Identification of high yielding varieties/hybrids suitable to a particular area is very important to achieve higher production and productivity in coconut.

Table 1: Performance of coconut hybrids and varieties for growth parameters (at 15th year age)

Coconut Hybrid/ Varieties	Plant height (m)	Girth at 1 metre height (cm)	Functional leaves on crown(no.)	Leaf length (m)	Petiole length (cm)	Length of 10 internodes (cm)
Chandrasankara	7.9	108.0	33.2	415.0	137.0	98.2
Lakshaganga	7.5	108.1	33.0	428.0	135.0	96.2
Keraganga	7.7	95.0	33.2	428.0	134.0	97.0
Chandralaksha	8.2	99.7	33.4	425.0	136.0	97.3
VHC – I	8.1	105.0	33.2	437.0	137.0	101.9
VHC - II	8.6	109.3	35.1	402.0	131.0	86.1
Chandrakalpa	8.0	104.4	34.3	426.0	139.0	85.2
Double century	7.8	115.4	32.9	445.0	136.0	96.1
Godavari Ganga	7.1	90.9	35.9	409.0	131.0	75.6
S Em $\pm$	0.3	3.6	0.9	0.1	0.03	4.41
CD at 5%	N.S	11.0	N.S	N.S	N.S	13.34

Table 2: Performance of coconut hybrids and varieties for yield and tender nut quality parameters

Coconut Hybrid/ Variety	Age at first flowering (months)	No of bunches per annum	Mean nut yield (Av. 7 years/ Palm)	Tender nut water content (ml)	TSS (^{0} Brix)	Sodium content (ppm)	Potassium content (ppm)
Chandrasankara	57.0	12.1	114.2	300.0	6.9	23.5	2112.0
Lakshaganga	47.0	12.3	118.3	342.6	6.7	30.5	2434.0
Keraganga	60.0	12.4	120.6	299.6	7.1	26.5	2614.0
Chandralaksha	47.0	12.0	109.3	324.0	6.3	22.9	2218.0
VHC – I	70.0	11.2	110.9	286.0	6.9	24.8	2412.0
VHC – II	67.0	12.8	113.3	367.3	6.4	26.0	2528.0
Chandrakalpa	72.0	12.3	110.3	251.3	6.8	34.0	2362.0
Double century	57.0	11.8	106.6	343.3	6.6	38.0	2595.0
Godavari Ganga	45.0	12.5	135.1	327.3	7.5	32.0	2628.0
S Em $\pm$	6.8	0.38	4.13	19.48	0.2	1.8	161.9
CD at 5%	20.4	N.S	12.5	58.92	0.6	5.7	NS

Table 3: Performance of coconut hybrids and varieties for Fruit component characters

Coconut Hybrid/ Variety	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)	Dehusked fruit weight (g)	Copra content (g/nut)	Copra Output (kg/palm)	Oil content (%)	Estimated oil yield (kg/palm)
Chandrasankara	22.4	16.3	1290.2	569.2	180.7	20.7	65.0	13.4
Lakshaganga	21.4	13.8	912.0	560.78	191.2	22.6	62.3	14.1
Keraganga	18.7	13.7	971.8	414.48	144.1	17.3	64.3	11.1
Chandralaksha	24.0	16.7	1464.7	607.84	212.5	23.1	65.0	15.0
VHC - I	22.2	13.8	1022.4	513.63	180.8	20.1	61.6	12.4
VHC - II	23.2	14.7	1056.2	357.85	200.9	22.7	70.3	16.0
Chandrakalpa	19.1	18.1	1356.5	560.98	174.1	19.2	63.0	12.0
Double century	22.3	15.3	1033.7	538.79	205.9	22.1	61.3	13.5
Godavari Ganga	23.7	14.7	1389.3	555.74	195.8	26.5	66.0	17.5
S Em ±	1.1	0.9	36.6	88.68	7.3	1.02	1.6	0.7
CD at 5%	NS	NS	110.8	NS	22.1	3.1	5.1	2.4

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