



# Evaluation of Coconut Hybrids Developed for High Nut and Copra

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## Abstract

An evaluation trial conducted over 30 years on coconut hybrid combinations has resulted in identification of a superior, high yielding Tall x Tall hybrid, released as VPM 5 involving Laccadive Ordinary as female parent and Cochin China as male parent. This hybrid is better performing over other hybrids and local check with higher fruit yield (161nuts palm-1year-1), higher copra out turn (24.1kg palm-1 year-1, 4.2t ha-1 year-1) with an estimated oil recovery of 2.90 tonnes ha-1 under irrigated conditions of Tamil Nadu. The palms of the hybrid took on an average of 45 months for initiation of flowering, possess good tender nut water quality (TSS 5.5° Brix) and higher quantity (300ml per tender nut). The hybrid recorded 44 percent more nut yield, 48 percent more copra yield and 48.2 percent more oil yield over the released Tall x Dwarf hybrid 'VHC 1'. The seedlings of the hybrid are more vigorous, producing higher number of leaves within 12 months, having higher leaf area and dry weight indicating precocity in growth and development. The flowering, morphological and fruit component traits of the hybrid were compared with parental palms are found superior. The characteristics of this hybrid and its performance indicated the potential to increase the productivity and over all coconut production.

**Keywords:** Coconut hybrids; Development and evaluation; Nut; Copra yield

## Introduction

India occupies a predominant position in respect of production of coconut in the world. Coconut is grown in 1.94 million ha in 19 states and 3 Union Territories of the country producing 15730 million nuts with an average productivity of 8303 nuts per ha or 44.27 nuts/palm/year. Traditional areas of coconut in India are the states of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, Goa, West Bengal, Pondicherry, Maharashtra and Islands of Lakshadweep and Andaman and Nicobar. Non-traditional areas are the states of Assam, Gujarat, Madhya Pradesh, Bihar, Tripura, Manipur, Nagaland and Arunachal Pradesh. The four southern states put together account for more than 90% of the total production in the country (Kerala 36.88%, Tamil Nadu 34.11%, Karnataka 13.83%, Andhra Pradesh 6.16% and other states 9.0%).(www.nabard.org/english/plant\_coconut).

The discovery of hybrid vigour in coconut by Patel [1] in a cross between West Coast Tall and Chow ghat Green Dwarf made in 1932 at Coconut Research Station, Nileshtar was a significant landmark

in the history of crop improvement in coconut. This important finding paved way for the successful breeding programmes in coconut not only in India but also in other countries like Philippines, Indonesia, Sri Lanka, Cote d'Ivoire and Jamaica. Coconut research station Veppankulam was established in 1958 with mandate of evolving promoting new high yielding coconut varieties/hybrids and identification of coconut genotypes suitable for coastal region of Tamil Nadu. Over the period of research conducted, four hybrids and two varieties were released from this station so far. Those are, first coconut hybrid VHC 1 (ECT X Green dwarf) was released in 1982, VHC 2 (East Coast Tall X Malayaisan Yellow Dwarf), in 1988, VHC 3 (East Coast Tall X Malaysian orange dwarf) and tall varieties VPM 3 was selection from Andaman Ordinary Tall in 1994 and VPM 4 was selection from West Coast Tall in 2012. The latest hybrid is VPM 5 is first hybrid developed with tall parents (LCT as female parent and CCNT as male parent). The development of VPM 5 hybrid was initiated with objective of high number of nuts/palm/annum and details about the VPM 5 hybrid coconut are briefed in this article.

### Materials and Methods

The experiment was conducted at Tamil Nadu Agricultural University – Coconut Research Station, Veppankulam (TNAU–CRS, VPM), Tamil Nadu situated at latitude of 10° 29'N and longitude 79° 23'E at an altitude of 20m from the mean sea level. The average maximum temperature is 42 ° C in summer and 33 ° C in winter while the average minimum temperature is 28 ° C in summer and 23 ° C in winter. The annual rainfall varied between 800 to 1200mm.

The hybridization crossing was done with tall parents (LCT as female parent and CCNT as male parent) during 1984-85. The crossed nuts were raised in nursery separately and selection was made with superior seedlings during 1986. The 60 number of hybrid seedling were planted in B block of CRS farm maintained over a years. The stabilized yield was recorded observed in 15 years old palm on 2001. So data was recorded for nut yield, oil content and physiological traits over 10 years from 2001 to 2014 with 42 hybrid palms.

### Results and Discussion

With a aim of development of hybrid suitable for high nut and copra content, fifty crosses of highly compatible ecotypes was developed and planted in a replicated trial during 1984 at Coconut Research Station, Veppankulam with three experiments. Experiment I includes 25 crosses, experiment II includes 14 crosses and parents and experiment III includes 11 crosses and parents. From the observations in experiment I, annual nut yield was highest in hybrid CGD x ECT (178.7 nuts/palm), MYD x CC (157.0 nuts/palm), AY x ECT (205 nuts/palm) MYD x ECT (120.4 nuts/palm), CGD x CC (187 nuts/palm) MGD x ECT (233.33 nuts/ palm/year) during the year 2010-11,2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively, in which the pooled yield was recorded after the stabilized yielding period. In Experiment II, highest annual nut yield was found in AY x WCT (136.7 nuts/palm), Siam x AY (119.2 nuts/palm), AY x ECT (129 nuts/palm), Siam x AY (208.4 nuts/palm), PHOT x CCNT 154 nuts / palm and Siam x AY (243.2 nuts/palm/year) during the year 2010-11,2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively (Table 1-4).

**Table 1:** Cumulative mean performance of LCT x CCNT (VPM 5).

S.No	Character	LCT X CCNT (VPM 5)	Hybrid Check VHC-1	Local Tall Check ECT
1	Mean annual fruit yield (no s./palm)	161	112	99
	% increase over the check of nut yield	43.8	62.6	
2	Fruit yield/ha/year (in'000)	28.18	19.6	17.33
3	Copra content (g/nut)	149.8	142.8	133.1
4	Copra out turn/palm/year (kg)	24.12	16.33	13.18
	% increase over the check for copra out turn	47.7	83	
5	Copra out turn (t/ha/year)	4.22	2.86	2.31
6	Copra oil content (%)	70	69.5	68.4
7	Estimated oil yield (t/ha/year)	2.95	1.99	1.58
	% increase over the check for oil yield		48.2	86.7

**Nut Parameters:** Nut parameters were recorded for 3 hybrids LCT x CCNT, CCNT x LCT, LCT x PHOT and the checks, VHC 1, VHC 2 and VHC 3. The mean value are given below.

**Table 2:** Nut Parameters of LCT x CCNT (VPM 5) compared with released hybrids.

Hybrid	Whole Nut Wt. (G)	Dehusked Nut Wt. (G)	Kernel Thickness (Cm)	Kernel Wt (G)	Shall Wt. (G)
LCTx CCNT (VPM5)	1052	567	1.17	275	145
CCNT x LCT	1150	687	1.05	297	170
LCT x PHOT	1138	675	1.2	312	165
VHC 1	1007	548	1.1	252	135
VHC 2	978	610	1.22	327	147
VHC 3	1208	662	1.15	283	175

**Table 3:** Mean performance of nut characters of LCT x CCNT.

Sl.No.	Characters	VPM 5	Hybrid Check	Local Check
		LCTxCCNT	VHC 1	ECT
1	Whole fruit weight (g)	958.0±21.2	818.4±30.1	780.7±36.2
2	Husked fruit weight (g)	454.4±15.7	424.3±18.9	365.9±20.6
3	Kernel thickness (cm)	1.4±0.2	1.2±0.3	1.2±0.3
4	Kernel weight (g/nut)	243.7±6.7	236.1±7.2	243.6±5.1
5	Copra content (g/nut)	149.8±8.3	142.8±7.6	133.1±9.3
6	Oil content (%)	70.0±2.5	69.5±1.6	68.4±1.8
7	Oil yield (g / nut)	104.9±3.1	99.3±4.0	9 91.0±5.2

**Table 4:** Quality analysis of tender nut characters of LCT x CCNT (VPM 5).

Sl.No.	Characters	LCTxCCNT (VPM 5)	Checks	
			VHC 1	ECT
1	Quantity of water (ml)	285.5±25.5	220.7±30.1	205.5±34.3
2	Sweetness of water*	3	2	2
3	Sweetness of tender nut kernel*	3	2	2
4	TSS (°Brix)	4.8±0.42	4.4±0.51	4.1±0.48
5	Total Sugars (g/100ml)	4.8±0.38	4.4±0.43	4.1±0.39

\*Standard protocols published by Bioversity/CPCRI

1: Poor; 2: Average; 3: Good; 4:Very good

In Experiment III, highest annual nut yield was found in LCOT x CCNT (161.5, 84.2, 180, 125.3 and 198.2 nuts/palm/year during the year 2010-11, 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively. The information generated from earlier studies the fatty acid profile, reaction to environmental stresses, biochemical constituents of seedlings of hybrid combination [1-6]. Were collected and used. Among the hybrids, Hybrid LCT x CCNT showed promising yield among the years. Average stabilized yield for the hybrid is 161nuts/palm/ year. The physiological parameters of LCT X CCNT were also recorded. The results revealed that enzyme nitrate reductase was 9.3µmol/NO3/g/kg, Total chlorophyll of 3.12mg/g and protein of 12.84mg/g. The standard heterosis over ECT was 64.5 [7,8].

LCT x CCNT is a tall x tall hybrid with circular crown shape, biometric observations was recorded for the hybrid it revealed that Total number of leaves (34.7), Length of petiole (1.22m), Length of leaflet bearing portion (3.61m), Number of leaflets (right) (103.9), Number of leaflets (left) (104.3), Length of leaflet (1.28m), Breadth of leaflet (5.6 cm) and Number of leaf scars in 1m length (35.2). Nut characteristics of LCT x CCNT revealed that Whole nut wt. of (1052g), dehusked nut wt (567g), kernel thickness (1.17cm), kernel

wt. (275g), shell wt. (145g) and copra wt. (149.8g). LCT x CCNT consistently recorded the highest nut yield over the years.

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