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Comparative performance of different oil palm hybrid combinations in Cauvery delta region of Tamil Nadu

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Oil palm plays a significant role to meet the vegetable oil requirements in India, which is the largest consumer of palm oil in the world, consuming around 18 per cent of total world consumption (Rao, 2013). Increasing demand and low production of oil seeds in the country has necessitated the import of vegetable oil, so as to meet the demands of ever growing population. India is the largest importer of palm oil amounting to 45 per cent of world imports. Palm oil is grown in about 40 countries of the world constituting 32 per cent of the global production of edible oils. Indonesia and Malaysia are the leading oil palm producers contributing 46 and 40 per cent of the world production, respectively, followed by Nigeria, Thailand and Colombia. Palm oil alone contributes 55.9 per cent of market share of global oils. An oil palm tree produces 40 kg of oil a year, almost 5720 kg of oil per hectare. The Government of India has been supporting oil palm through subsidies (planting, fertilizers and micro irrigation) and various state governments also provide assistance for oil palm development. Even though the government has been trying to expand the area under palm oil cultivation, factors like low productivity, price fluctuations, insufficient processing facilities and lack of suitable technologies for mechanical harvesting, result in sluggish expansion of oil palm cultivation.

Tenera hybrids play a pivotal role in oil palm productivity. In order to evaluate the performance of hybrids, a trial was initiated to study the productivity of ten tenera hybrids and to select the most suitable oil palm hybrid for Cauvery Delta Zone in Tamil Nadu. Ten hybrid combinations *viz.*, 49 x 66 (NRCOP 11), 25 x 214 (NRCOP 12), 25 x 66 (NRCOP 13), 68 x 36 (NRCOP 14), 21 x 214 (NRCOP 15), 131 x 66 (NRCOP 16), 350 x 66 (NRCOP 17), 107 x 214 (NRCOP 18), 61 x 66 (NRCOP 19) and 28 x 68 (NRCOP 20) were planted in Randomized Block Design with three replications (six palms per replication) in the farmer's holding located in Peraiyur Village, Thiruvarur district of Tamil Nadu during 2006. Drip irrigation was followed and the fertilizers were applied in four equal split doses (as per the recommendation of ICAR-IIOPR, Pedavegi) during June, September, December and March by uniformly spreading them within a three metre circle around the base of the palm and forking to incorporate them into the soil. Mg deficiency was corrected by the application of 500 g of $MgSO_4$ palm^{-1} year^{-1} and boron deficiency was corrected by the application of Borax @ 100 g palm^{-1} year^{-1}.

Regular biometric and yield observations like palm height, girth, number of leaves produced palm^{-1} year^{-1}, number of female inflorescence, number of male inflorescence and fresh fruit bunch (FFB) yield were recorded and the data were statistically analyzed. Individual bunch weight was measured in kilograms to arrive FFB yield.

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The palm height was measured from the ground level upto the base of the 25th leaf and palm girth was measured 60 cm from the ground level and the sex ratio was calculated by following formula:

$$\text{Sex ratio} = \frac{\text{Number of female inflorescence}}{\text{Total number of inflorescence}} \times 100$$

Significant differences were observed for palm height (m), palm girth (m), number of leaves palm^{-1} year^{-1} number of female inflorescence, number of male inflorescence and FFB yield among the hybrids studied. The growth and yield performance of the oil palm hybrid combinations are furnished in Table 1.

Table 1. Growth performance of oil palm hybrids (10 years old)

Hybrids	Palm height (m)	Palm girth (m)	No. of leaves produced palm^{-1} year^{-1}
NRCOP 11	3.3	3.4	25.7
NRCOP 12	2.4	2.6	23.2
NRCOP 13	3.2	2.7	26.3
NRCOP 14	3.1	2.8	26.8
NRCOP 15	2.5	2.9	26.4
NRCOP 16	2.3	2.4	24.2
NRCOP 17	2.5	2.7	25.9
NRCOP 18	2.5	2.6	24.4
NRCOP 19	3.0	2.7	24.3
NRCOP 20	3.2	2.9	25.5
SE	0.39	0.27	1.17
CD (P=0.05)	0.80	0.60	2.36

The palm height ranged from 2.3 to 3.3 m between hybrids at the age of 10 years. The lowest palm height (2.3 m) was recorded in NRCOP 16 and it was the highest in NRCOP 11 (3.3 m). The hybrid NRCOP 11 recorded significantly the highest palm girth (3.4 m) and it was the lowest in NRCOP 16 (2.4 m). Number of leaves produced per year (26.8) was the highest in NRCOP 14 and the highest number of female inflorescence (13.7) was recorded in NRCOP 17, while the highest number of male inflorescence was recorded in NRCOP 13. Data on yield attributes (Table 2) revealed that the highest FFB productivity (152.1 kg palm^{-1} and 21.7 t ha^{-1}) were registered in the hybrid NRCOP 17 and was on par with NRCOP 20 (21.5 t ha^{-1}) NRCOP 18 (17.3 t ha^{-1}) and NRCOP 11 (16.6 t ha^{-1}). The lowest FFB yield was recorded in NRCOP 13 (12.5 t ha^{-1}). Higher yield in the above hybrids was attributed to more number of female inflorescence production with higher sex ratio.

Under favourable growing conditions, an inflorescence is initiated in the axil of each leaf of the palm. The rate of leaf production varies with age and on an average three leaves are produced per month in young palms and two per month in the case of older palms (Verheye, 2010). The development of an oil palm inflorescence between the stages of initiation and flower maturity lasts

Table 2. Yield performance of 10 year old oil palm hybrids

Hybrids	Male inflorescence (No. palm^{-1})	Female inflorescence (No. palm^{-1})	Total inflorescence (No. palm^{-1})	Sex ratio (%)	FFB productivity (kg palm^{-1})	FFB yield (t ha^{-1})
NRCOP 11	6.0	12.3	18.3	67.2	115.9	16.6
NRCOP 12	5.1	12.0	17.1	70.2	92.9	13.3
NRCOP 13	6.9	12.1	19.0	63.8	87.6	12.5
NRCOP 14	5.9	13.2	19.0	69.3	119.8	17.1
NRCOP 15	6.2	11.7	17.9	65.4	95.8	13.7
NRCOP 16	6.4	13.0	19.4	67.0	100.5	14.4
NRCOP 17	5.0	13.7	18.7	73.3	152.1	21.7
NRCOP 18	6.3	11.6	17.9	64.8	121.1	17.3
NRCOP 19	5.6	12.7	18.3	69.4	95.8	13.7
NRCOP 20	6.3	11.0	17.3	63.6	150.1	21.5
SE	0.6	0.3	0.7	3.1	24.7	3.5
CD (P=0.05)	1.2	0.8	1.5	6.3	50.4	7.1

two to three years for both sexes, the process being initiated soon after seedling establishment. In tropical humid climates with regular rainfall, inflorescence and fruit production is spread evenly throughout the year. Typically, a mature palm will alternate between male and female inflorescence production during its lifetime. In regions with high and regular rainfall, oil palm sex ratios tend to vary little throughout the year, in contrast to areas experiencing a marked dry season, where the sex ratio undergoes extensive fluctuations. This illustrates the well-established observation that oil palm sex determination is strongly influenced by climatic factors, with male inflorescence production being promoted by water deficit (Adam *et al.*, 2005). Water supply is the main yield-limiting factor in oil palm (Kallarackal *et al*., 2004). The oil palm industry is focusing on yields mainly in terms of FFBs, relegating the critical parameters of bunch oil extraction rate and kernel extraction rate (Ng *et al*.,1998). From the present study with four years data, it is observed that the hybrid NRCOP 17 recorded significantly the highest FFB productivity under Cauvery Delta region in Tamil Nadu and further the yield stability of different hybrids needs to be studied for few more years.

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