

## Evaluation of Inter-specific Oil Palm Hybrids (*E. guineensis* x *E. oleifera*) for Selection of High Yielding Dwarf Palms

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### ABSTRACT

In cultivated oil palm varieties, harvesting poses a serious problem in mature plantations due to higher stem height increment. With a view to develop slow growing oil palm varieties with less annual height increment, a study was conducted for selection of high yielding dwarf palms from the inter-specific hybrids (*E. guineensis* x *E. oleifera*) of oil palm. Two inter-specific crosses (ISC) developed at Directorate of Oil Palm Research (DOPR) were evaluated through 44 selected ISC palms during 2007-2010. Individual palm data were recorded on annual height increment and yield parameters viz., bunch number, fresh fruit bunch (FFB) yield and average bunch weight. Maximum average FFB yield and average bunch weight were recorded in ISC-2 whereas highest number of bunches were recorded in ISC-1. The highest yielding palm was identified in ISC-2, whereas, the annual height increment was least in ISC-1. Promising palms have been identified in both inter specific crosses [five in ISC-1 and four in ISC-2] for further utilization in breeding programmes.

**Key words :** Oil palm, dwarf, inter-specific hybrids

### INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq.) is the highest oil yielding crop in the humid tropics and most important source of edible oil. The cultivated variety of oil palm in India is *E. guineensis* which is of African origin, while the American oil palm, *E. oleifera* is native to Central and South America. The tall growing *E. guineensis* palms with higher height increment reduce the economic life of a commercial oil palm plantation, since it is difficult to harvest the bunches from tall palms, whereas, *E. oleifera* is dwarf in nature. The potential solution could be the development of slow growing varieties and prolong the commercial cultivation. Selection of dwarf and productive palms with potential commercial value is an intensive task, and only a few examples of such palms have been documented till now. Jagoe (1952) discovered the 'Dumpy' palm, which had large girth and slow height increase, and this constituted the first effort of genetic introgression of dwarf genes into other oil palm populations. By backcrossing *E. oleifera* x *E. guineensis* (OxG) hybrids to *guineensis* parents, Obasola *et al.* (1976) illustrated

the possibility of maintaining the slow trunk growth characteristics of the *oleifera* parent in the resulting recombinants. More recently, Adon *et al.* (2001) demonstrated that Dumpy (Serdang) and Pobe origins definitely transmitted slow vertical growth to their descendants in combination with other origins. Also, Rajanaidu *et al.* (1999) identified the PS1 lines out of population 12 derived from prospectations in Africa. In Costa Rica, considerable effort has been devoted to fixing 'compact' genes, originating from a special palm identified in a backcross progeny of an OxG hybrid open-pollinated with *guineensis*, which not only transmits slow trunk growth but also short leaf characteristics. With a view to develop the slow growing oil palm varieties with less annual height increment, the present study was conducted for selecting high yielding dwarf palms from oil palm inter-specific hybrids.

### MATERIALS AND METHODS

The present study was carried out at Directorate of Oil Palm Research (DOPR), Pedavegi Andhra Pradesh in India. The experimental site is located at

16°43' N and 81°09' E with a mean sea level 13.41 m. The soil is sandy loam with a pH of 6.8. The climate is characterized with hot summer and an average annual rainfall of 1221 mm. Two inter-specific hybrids (*E. guineensis* x *E. oleifera*) ISC-1 and ISC-2 were developed at DOPR Regional Station, Palode (Kerala) and seedlings were planted at DOPR, Pedavegi Research Farm during 1998 in a triangular system at 9 x 9 x 9 distance. Ablation (removal of inflorescences from palm) was done during the initial three years of the planting. Regular irrigation was given through drips and evaluation was carried out after eight years of yield stabilization. The observations were recorded during 2007-10 on 44 selected ISC palms. Individual palm data were recorded on annual height increment and yield parameters which included bunch number, fresh fruit bunch (FFB) yield and average bunch weight. The annual observations were pooled and statistical analysis was done.

## RESULTS AND DISCUSSION

The results of the study (Table 1) revealed that in the inter-specific hybrid - 1 (ISC-1), the average number of bunches varied between 2.0 to 8.7 and more number of bunches were found in palm nos. 20 and 25, while, less number of bunches were recorded in palm no. 69. Maximum FFB yield (165.7 kg) was recorded in palm no. 27 followed by palm no. 25 (156.3 kg) and palm no. 28 (146.7 kg). The lowest FFB yield (29.67 kg) was found in the palm no. 82. Maximum average bunch weight (25.3 kg) was recorded in palm no. 16 followed by palm no. 77 and palm no. 3. The height increment was found to be lowest in palm no. 28 followed by palm nos. 24 and 15. The results of inter-specific hybrid - 2 (ISC-2) (Table 2) revealed that the average bunch number was 4.5. Maximum number of bunches (7.3) were found in palm no. 34 followed by palm no. 38 (5.7) and palm nos. 36, 37, 40 and 57

**Table 1 : Yield and height increment in palms belonging to inter specific hybrid-1 for the period 2007-10 (pooled).**

Palm number	Number of bunches	Total bunch weight (kg)	Average bunch weight (kg)	Height increment (cm)
1	2.3	36.3	15.6	70.0
2	5.0	95.0	19.0	45.0
3	2.7	65.7	24.6	61.0
7	5.0	77.3	15.5	76.0
8	4.7	75.7	16.2	98.0
12	8.0	133.0	16.6	66.0
13	5.3	80.7	15.1	48.0
15	7.0	125.3	17.9	36.0
16	5.7	143.3	25.3	63.0
17	8.3	130.7	15.7	78.0
19	8.0	115.3	14.4	76.0
20	8.7	109.0	12.6	52.0
21	6.7	95.7	14.4	73.0
23	4.3	34.0	7.8	61.0
24	6.3	137.0	21.6	28.0
25	8.7	156.3	18.0	57.0
27	8.3	165.7	19.9	61.0
28	7.0	146.7	21.0	14.0
67	4.0	83.3	20.8	78.0
69	2.0	33.7	16.8	50.0
77	2.3	58.0	24.6	58.0
80	4.7	82.7	17.7	63.0
82	3.3	29.7	8.9	80.0
<b>SD</b>	<b>2.1</b>	<b>42.7</b>	<b>4.8</b>	

(5.3). Maximum FFB yield was recorded in palm no. 41 (206.5 kg) followed by 57 (149.7 kg) and 34 (143.7 kg). Lowest FFB yield (67.3 kg) was found in the palm no. 42. The average bunch weight in the ISC-2 was 24.5 kg. Maximum average bunch weight (34.4 kg) was recorded in palm no. 41 followed by palm nos. 38, 32, 35 and 57. The average height increment in the ISC - 2 was 70.4 cm. Lowest height increment was observed in the palm nos. 42 followed by 39, 31 and 34. Hardon (1969) reported that yield of the hybrids in terms of total fruit weight was promising and height increment of the hybrids is substantially lower than of *E. guineensis*, but annual frond production was approximately the same.

## CONCLUSION

The highest FFB yielding palm (206.5 kg) was found in ISC-2, whereas, the annual height increment was the lowest in ISC-1. Promising palms have been identified in both the inter-specific hybrids (five in ISC-1 and four in ISC-2) which will be further utilized in breeding programmes.

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**Table 2: Yield and height increment in palms belonging to inter specific hybrid - 2 for the period 2007-10 (pooled)**

Palm number	Number of bunches	Total bunch weight (kg)	Average bunch weight (kg)	Height increment (cm)
29	4.0	98.0	24.5	81.0
30	3.7	81.0	22.1	59.0
31	3.0	75.0	25.0	44.0
32	3.0	87.3	29.1	80.0
33	5.0	108.3	21.7	81.0
34	7.3	143.7	19.6	67.0
35	3.0	84.3	28.1	75.0
36	5.3	119.3	22.4	94.0
37	5.3	91.0	17.1	71.0
38	5.7	181.0	31.9	89.0
39	4.5	102.5	22.8	41.0
40	5.3	141.0	26.4	74.0
41	6.0	206.5	34.4	43.0
42	3.3	67.3	20.2	40.0
44	4.7	120.7	25.9	55.0
51	3.3	85.0	25.5	116.0
54	4.7	96.0	20.6	63.0
55	3.0	69.3	23.1	127.0
57	5.3	149.7	28.1	104.0
59	3.0	74.0	24.7	78.0
63	3.0	68.0	22.7	79.0
<b>SD</b>	1.3	38.2	4.1	

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