

Genetic Resources of Oil Palm

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1. INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq.) is now generally regarded having originated in Africa (Chevalier, 1943; Zeven, 1967) and is endemic to west and central Africa (Rajanaidu, 1985). The south American oil palm, *Elaeis oleifera* (HBK) Cortes, previously referred to as *Corozo oleifera* and *Elaeis melanococca* was first described by Jacquin (1763) as growing in Colombia. It is characterised by short thick set trunk with a tendency for procumbancy. It is considered more primitive than *E. guineensis* since it shows dominance for several characters. Wessels Boer (1965) added a third species *Elaeis odora*, otherwise known as *Barcella odora*. These have bisexual flowers unlike the other two species. Unfortunately, no detailed studies are available on this species.

2. GERMPLASM COLLECTION

2.1 World Collection

In the 15th century, oil palms were introduced to Brazil and other tropical countries by the Portuguese. But it did not flourish in these countries till 19th century. During 1848, the Dutch imported oil palm seeds from West Africa via Amsterdam and four seedlings were planted in Bogor, Indonesia. The progenies of these palms were planted as ornamental palms in Deli and were later known as *Deli dura*. Commercial planting of oil palm started in Malaysia during 1917. Until the early 1960s, *Deli dura* formed the sole planting material. With the discovery of inheritance of shell thickness, *tenera* began to be introduced as commercial planting material. *Deli dura* material continues to be used as a female source. Even on the male side, only a limited number of *pisifera/tenera* palms are involved in the oil palm seed production programme. Hence, the genetic base of oil palm breeding and planting material is extremely narrow (breeding population of restricted origin). This restricts both the extent and rate of genetic progress that may be achieved through breeding. The introduction of new genetic material into the gene pool is expected to enhance the scope of future breeding and selection, especially in oil palm which has a long generation interval (Dato Leong Khee Seong, 1985).

Assemblage of germplasm is an important part of any breeding programme, especially in crops like oil palm which has a narrow genetic base. After the Second

World War, Institut National Pour l'Etud Agronomique du Congo Belge (INEAC) started prospection for new oil palm genetic material from commercial plantations. Between 1961 and 1964, Nigerian Institute for Oil Palm Research (NIFOR) made occasional collections at local markets and through village chiefs, and established the collection at Nigerian Institute for Oil Palm Research. Collections were also made from Bamenda hills of Camerouns. In Ivory Coast, prospection was initiated by Institut de Recherches pour les et Oleagineux (IRHO). In 1973, a large scale prospection for genetic material was carried out in the oil palm area of Nigeria jointly by NIFOR and MARDI (now Palm Oil Research Institute of Malaysia, PORIM). In Republic of Zaire, the collection of oil palm material was carried out in 1984. Belgian workers had prospected for oil palm germplasm in the early 20s and 50s in Congo (Rajanaidu, 1985).

A number of expeditions were organised by PORIM to collect *E. oleifera* germplasm from Colombia, Panama and Costa Rica in 1967, 1969 and 1980 respectively. In 1967, the United Brands Company in central America initiated a programme to collect *E. oleifera* in the natural groups found in Costa Rica, Panama, Colombia, Surinam, Honduras, Nicaragua and Brazil. In 1981, a joint effort was made by PORIM and International Board for Plant Genetic Resources (IBPGR) to collect *E. oleifera*, from central and south America. Collections were made from Surinam, Colombia, Panama, Costa Rica, Nicaragua and Honduras.

2.2 Indian Collection

Oil palm was introduced to India towards the end of 19th century as a botanical collection at National Botanic Gardens, Calcutta. Maharashtra Association for Cultivation of Science (MACS) introduced African oil palm (*dura*) in Pune during 1947-1959. The Association also used to supply seeds of these palms to various developmental departments in the state of Maharashtra. Irrigation Department of Maharashtra planted oil palm along the Neeral irrigation canal. Isolated oil palm trees are found in various states of the country probably planted as botanical curiosity.

In India, systematic collection of oil palm materials was initiated during 1960s by the Department of Agriculture, Kerala. *Dura* and *tenera* collections were made from Malaysia and Nigeria, and planted at the Oil Palm Station, Thodupuzha, Kerala. Systematic collection of oil palm accessions was taken up by the Indian Council of Agricultural Research during 1979 at Central Plantation Crops Research Institute, Research Centre, Palode, Kerala. Since many countries are reluctant to spare oil palm planting materials, the collection comprised mainly of random samples of *teneras* introduced by various agencies in the country from time to time for commercial purposes. The collection also include *E. oleifera* introduced from Malaysia (Fig. 1) and Costa Rica, which is important in the context of introgression of desirable traits into *E. guineensis*. The germplasm bank at Palode comprises 22 accessions (Table 1).

The germplasm materials are being evaluated for yield and yield attributes under uniform conditions. Comparative early performance of the collections planted in 1981 and 1982 is given in Table 2.

Table 1 : Germplasm introductions at Palode

				<i>Exotic</i>			
SI No.	Source	Year of collection	No. of palms available	Remarks			
1.	NIFOR (Nigeria)	1979	119	<i>Tenera</i>			
2.	Ivory Coast	1981	48	<i>Tenera</i>			
3.	Republic of Zaire	1982	48	<i>Tenera</i>			
4.	Indonesia	1986	48	<i>Deli dura</i> × <i>Pisifera</i>			
5.	Indonesia	1986	48	<i>Dumpy dura</i> × <i>Pisifera</i>			
6.	Malaysia	1987	20	<i>Tenera</i>			
7.	Cameroon	1988	48	<i>Tenera</i>			
8.	Malaysia	1988	20	<i>Tenera</i>			
9.	Malaysia	1988	2	<i>Tenera</i> × <i>Pisifera</i>			
10.	Malaysia	1988	4	Surinam × Avros			
11.	Costa Rica	1989	4	<i>E. oleifera</i> × <i>E. guineensis</i>			
12.	Costa Rica	1989	6	Clone			
13.	Malaysia	1990	26	<i>E. oleifera</i>			
14.	Costa Rica	1990	12	46787			
15.	Costa Rica	1990	12	46264			
16.	Costa Rica	1990	12	46695			
17.	Costa Rica	1990	12	45272			
18.	Costa Rica	1992	1	<i>E. oleifera</i>			
				<i>Indigenous</i>			
1.	India (CPCRI)	1982	48	<i>Tenera</i>			
2.	India (Sampaje)	1986	4	<i>Dura</i>			
3.	India (Kodungalloor)	1989	7	<i>Dura</i>			
4.	India (CPCRI)	1990	48	<i>Dura</i> × <i>Pisifera</i>			

Table 2 : Performance of oil palm introductions (1992)

SI No.	Accessions	Year of planting	No. of palms	No. of leaves	No. of male inflorescences	No. of female inflorescences	No. of bunches (kg)	Wt. of bunches
1.	NIFOR	1981	47	24.9	6.6	4.3	3.8	69.4
2.	Ivory Coast	1981	45	23.9	5.9	3.9	6.4	116.6
3.	CPCRI	1982	34	23.6	7.5	3.5	3.9	47.2
4.	Republic of Zaire	1982	43	24.5	8.2	3.1	3.6	41.9

Note: Values are for average/palm/year.

Table 3 : Suggested oil palm introductions

Name of the country and source	Materials required	Type of planting materials	Qualitative characters of materials
Nigeria (NIFOR)	i) d x p crosses 34 lines	Seeds i) Tissue-cultured plantlets	Best <i>pisifera</i> source for production for <i>tenera</i>
	ii) 30.103 p	i) Pollen, seeds	For improving <i>dura</i> lines
	iii) Avros		
	iv) <i>Dura avros</i>		
	v) <i>Tenera</i> material of known percentage	Crossed Hybrid seeds	High yield and oil out-turn
	Ivory Coast	i) <i>Duras</i> d.115.d d.5.d d.10.d L.2.T	Seeds and tissue-cultured plantlets
ii) <i>Pisifera</i>		Tissue cultured plantlets	Proven male parents
iii) <i>tenera</i> 14 high yielding combinations of second cycle of breeding.		Seeds	High-yielding early-bearing, drought-tolerant, vascular- wilt resistant, semi-tall <i>tenera</i> hybrids
iv) d x t and t x t involving above <i>dura</i> lines		Seeds	To identify suitable parent
v) <i>Elaeis oleifera</i> x <i>E. guineensis</i>		Seeds	Introgression
Malaysia (PORIM)		i) Collections from PORIM) germplasm	Seeds
	ii) Malayan dumpy	Seeds	Reduced height
	iii) Malayan Deli <i>duras</i> <i>tenera</i>	Seeds	High-yielding and high oil out-turn
Indonesia	<i>tenera</i>	Seeds	High-yielding and high oil out-turn
Central America and West Africa (Angola, Tanganyika, Brazil, Zambia, Guinea, Liberia, Senegal, Ivory Coast, Sierra Leone, Madagascar)	<i>E. guineensis</i>	Seeds	Widening genetic base
Central America and South America (Honduras, Nicaragua, Venezuela, Brazil Costa Rica, Panama, Columbia, Surinam)	<i>E. oleifera</i>	Seeds	Dwarfness, oil quality



Fig. 1 : *Elaeis oleifera* introduced from Malaysia.

Tenera palms of Ivory Coast have shown their superiority over NIFOR palms and the indigenous material (CPCRI) out yielded the Republic of Zaire palms.

3. FUTURE COLLECTIONS

The direct usefulness of *teneras* available in the germplasm collections is very limited. It is necessary to collect *dura* parents which have proved to produce high yielding hybrids. Serious effort has to be made for a systematic collection of oil palm germplasm materials by prospection in the original habitat of *E. guineensis* and *E. oleifera*. It would also be worthwhile to obtain seed materials of proven performance for augmenting the breeding programme. A list of materials suggested for introduction is given Table 3.

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