BREEDING FOR HIGH KERNEL PLANTING MATERIAL: PORIM SERIES 3 (PS3)

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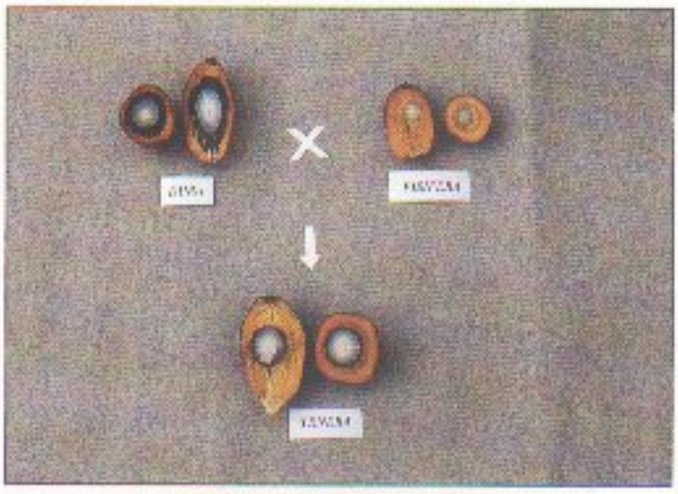
INTRODUCTION

There is an increasing demand for lauric acid (C12) by the oleochemical industry. Lauric acid is an important raw material in the manufacture of detergents. Coconut (*Cocos nucifera*) copra and oil palm (*Elaeis guineensis*) kernel are traditional sources of lauric oils. These are cultivated in the tropical regions of the world.

PORIM has initiated a breeding programme to develop oil palm planting materials with high kernel content. This material is known as PS3 and its background information is outlined in this pamphlet.



PORIM Series 3 – High content kernel.

OIL PALM GENETIC RESOURCES AND VARIATION FOR PALM KERNEL

The Palm Oil Research Institute of Malaysia (PORIM) has assembled a large collection of oil palm germplasm for the past 20 years. Collections were made in West Africa and Central-South America (Rajanaidu and Rao, 1988). The first collection, made in Nigeria in 1973, was screened for kernel/bunch (K/B) (fruit/bunch x kernel/fruit). The distribution of variation for K/B in oil palm populations collected in Nigeria is shown in *Figure 1*. For individual palms, the K/B ranged from 2.6%-15.3%. The palms with high K/B can be multiplied with tissue culture technique to fix the trait or bred by selfing and sib mating.

KERNEL CONTENT AND ECONOMIC RETURNS

It was indicated previously that breeders have been emphasizing high levels of mesocarp oil in breeding programmes. Hartley (1988) indicated that oil palm breeders should attempt to increase the kernel content in oil palm bunches. After the introduction of weevils in Malaysia (Basri *et al.*, 1983) the K/B, on average, has increased from 5% to 7%. The long-term forecasts by economists indicate that the crude palm oil (CPO) price will be around US$600 per tonnes and palm kernel about US$360. It is estimated that every 100 tonnes of fresh fruit bunches (FFB) will draw an income of US$17 850 at 5% K/B and US$18 150 at 10%K/B. There is a net gain of US$300 for every 100 tonnes of FFB (*Table 1*). Hence, it is profitable to develop oil palm planting material with higher kernel content.

BREEDING FOR HIGHER LEVELS OF KERNEL CONTENT IN OIL PALM PLANTING MATERIAL (PS3)

The oil palm planting material, DxP (*tenera*), is produced by crossing *dura* (female) with *pisifera* (male). The kernel content in oil palm fruits is maternally inherited. The *dura* mother palms with more than 20% K/F and 13% K/B are crossed with *pisiferas* which are known

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TABLE 1. ECONOMIC RETURNS FROM HIGH KERNEL PLANTING MATERIALS (PS3) BASED ON 100 TONNES FFB

1. Current planting material

	Volume of kernel or CPO (tonnes)	Price/tonne (US$)	Total Value (US$)
5% (kernel/bunch)	5	360	1800
26.75% (oil/bunch)	26.75	600	16 050
Income			17 850

2. PS3

	Volume of kernel or CPO (tonnes)	Price/tonne (US$)	Total Value (US$)
10% (kernel/bunch)	10	360	3600
24.75% (oil/bunch)	24.75	600	14 550
Income			18 150

Net gain by planting PS3 (US$18150 – US$17850) = **US$300/100 tonnes FFB**

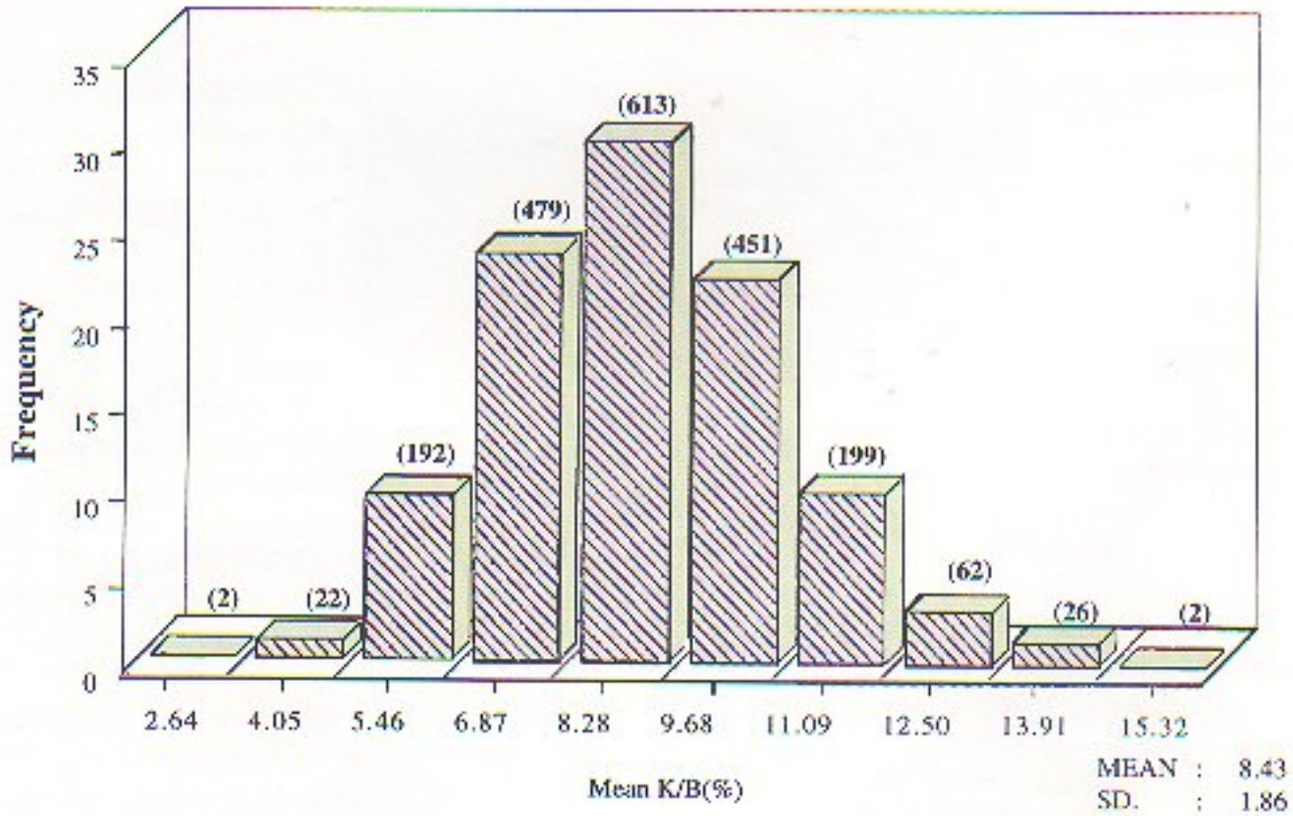

Figure 1. Variation of palm level for kernel/bunch (%).

Figures in parentheses represent the total number of palms.

TABLE 2. CHARACTERISTICS OF *DURA* MOTHER PALMS WITH HIGH KERNEL CONTENT

Palm Number	FFB (kg/p/yr)	BNO (no/p/yr)	AB WT (kg/p/yr)	K/F (%)	K/B (%)	O/B (%)	O/P/Y (kg)
0.149/7021	168.9	24	7.4	17.6	11.44	13.1	22.13
0.149/3077	171.2	19	10.0	19.3	12.56	14.3	24.48
0.149/14376	197.7	17	11.6	17.5	11.38	16.8	33.21
0.149/1094	162.2	8	22.8	16.2	10.53	13.5	21.90
0.149/3231	174.8	13	14.6	20.4	13.26	13.9	24.30
0.149/10702	167.1	17	11.0	17.0	11.05	13.5	22.56
0.149/10426	189.5	12	13.6	20.0	13.00	16.8	31.84

FFB = fresh fruit bunch
BNO = bunch number
ABWT = average bunch weight
K/F = kernel-to-fruit
K/B = kernel-to-bunch
O/B = oil-to-bunch
O/P/Y = oil per palm per year

Individual palm selection: K/F > 16%
FFB > 160 kg/p/yr
O/P/Y>20kg

for their general combining ability, such as, Avros *pisifera* (Rajanaidu *et al.*, 1990). The inheritance of kernel size in the oil palm is illustrated in *Figure 2*. A number of studies have shown that the heritability estimates for K/B and K/F are high in oil palm (Hardon *et al.*, 1985) and these traits are maternally inherited.

The selfs, and sibs of promising high kernel *dura* mother palms have been distributed to the industry. The characteristics of high kernel *duras* are given in *Table 2*. In addition, these *duras* have been progeny-tested with AVROS and other sources of *pisiferas* which are known for their general combining abilities (*Figure 3*).

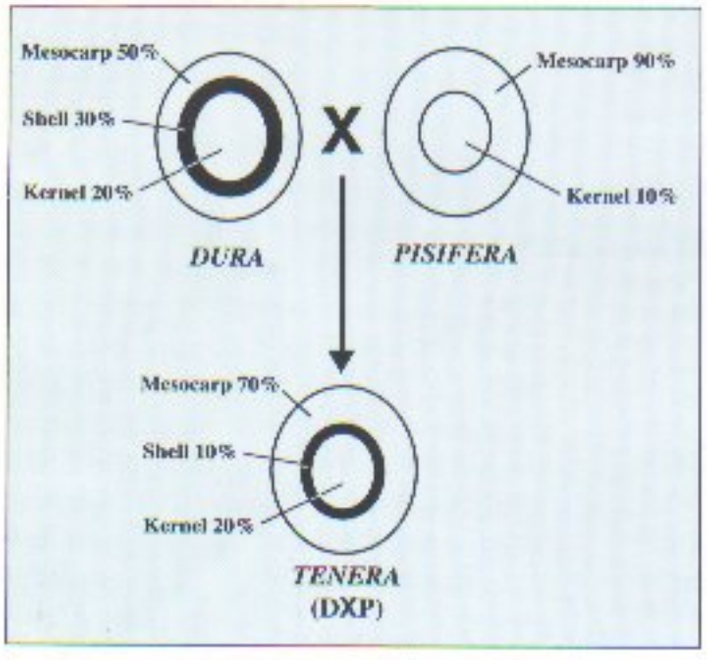

Figure 2. Inheritance of kernel in oil palm

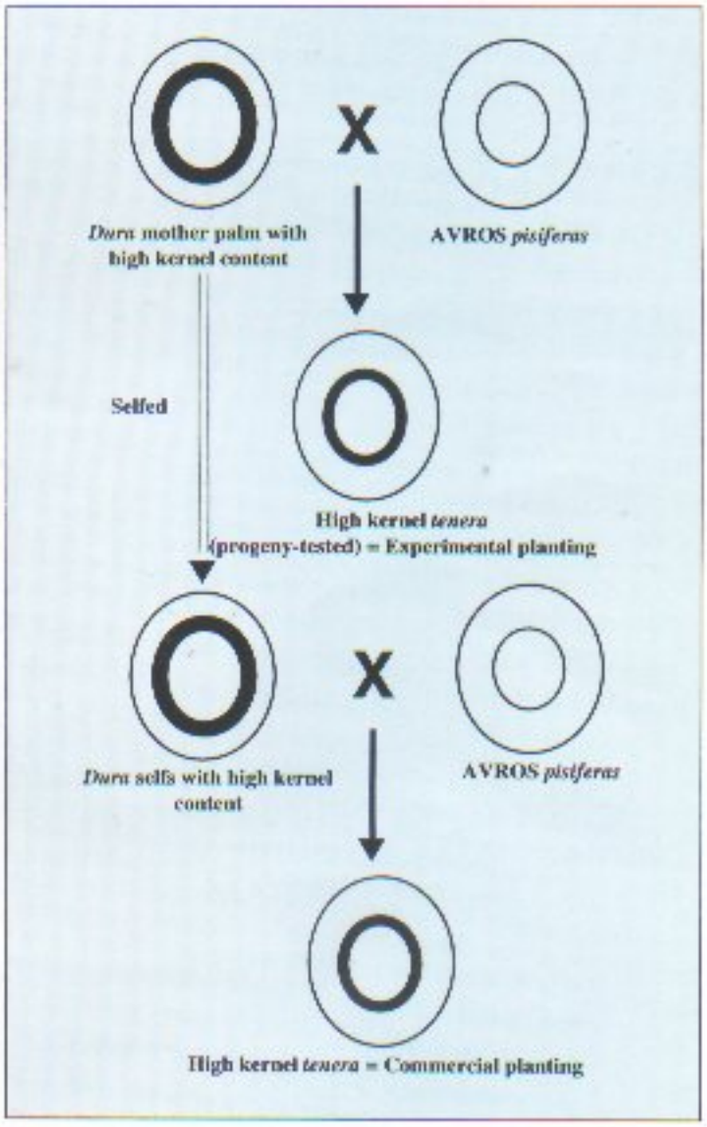

Figure 3. Utilization of high kernel duras to produce PORIM SERIES 3 planting material.

CONCLUSIONS

It is known that the kernel content in an oil palm bunch can be increased from 5% to >10%. There are oil palm families with >10% K/B in our oil palm germplasm collections. The K/B can be fixed readily in oil palm planting material since this characteristic is maternally inherited. It is also possible to multiply outstanding palms with high K/B by using tissue culture methods (Jones, 1974). If there is an indication for strong, long-term demand for lauric oils from users, it is possible for the oil palm breeders to embark aggressively on the production of planting materials with high kernel content, PS3.

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