PS13: BREEDING POPULATIONS SELECTED FOR LOW LIPASE

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The quality of palm oil is primarily determined by its content of free fatty acids (FFA) as they are easily oxidized to make the oil rancid. Sambanthamurthi *et al.* (1991) reported an increase in FFA in palm oil due to the action of an endogenous lipase. Lipases are one of the most studied groups of lipid-related enzymes because of their involvement in oil quality deterioration (Sambanthamurthi *et al.*, 2000). The endogenous enzyme is activated after abscission of the fruit although exogenous enzyme(s) also become involved when the fruit is bruised. Thus, any delay in processing the fruits will increase the FFA content in the oil produced (*Figure 1*).

The FFA can be removed by refining the oil, but this is an added cost. Palm oil from the present commercial palms showed 22% to 73% FFA after exposure to low temperature. Sambanthamurthi and Kushairi (2002) confirmed that endogenous lipase activity is genotype-dependent. Low endogenous lipase palms occur, and they can be used to develop new planting materials producing better quality palm oil.

SCREENING FOR LIPASE ACTIVITY

Screening for lipase activity was carried out on fruits from oil palm germplasm materials collected from Nigeria, Congo, Cameroon, Angola, Senegal, Guinea, Sierra Leone and Tanzania. The FFA levels were measured using the cold-induced lipase assay (Sambanthamurthi and Kushairi, 2002). This novel assay is more accurate than the traditional methods used for measuring FFA as it amplifies the FFA content in the oil by inducing lipase activity at low temperature.

The germplasm materials were from breeding trials, being evaluated for their fresh fruit bunch (FFB) yield, oil yield (OY), vegetative and physiological parameters.

SELECTION OF LOW LIPASE PALMS

A wide variation was found in the levels of FFA in the fruits. Some palms from Cameroons, Guinea, Sierra Leone, Senegal and Tanzania had <10% at 5°C, considerably lower than that in the current planting materials. Among them were four *teneras* and four *duras*, which produced a mean FFB yield of >144.08 kg palm yr^{-1} and oil-to-bunch of >11.57% (*Table 1*). They will be used in a breeding programme to produce planting materials for quality oil.

NOVELTY OF TECHNOLOGY

Some palms from the MPOB oil palm germplasm collection produced lower FFA levels in their oils

Figure 1. Any delay in processing harvested fruits will raise the FFA level in palm oil.

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TABLE 1. YIELD CHARACTERISTICS AND FFA LEVEL IN OIL OF SELECTED *Tenera* AND *Dura* PALMS WITH LOW ENDOGENOUS LIPASE

Palm No.	Fruit type	FFB (kg ha^{-1} yr^{-1})	FFB (t ha^{-1} yr^{-1})	BNO	ABW	O/B* (%)	OY (kg ha^{-1} yr^{-1})	OY (t ha^{-1} yr^{-1})	FFA at 5°C (%)
0.353/216	T	199.23	29.49	16.00	12.45	24.26	48.33	7.15	1.05
0.256/2246	T	144.08	21.32	15.67	9.19	28.84	41.55	6.15	9.90
0.219/833	T	159.18	23.56	12.00	13.26	26.99	42.96	6.36	8.20
0.353/182	T	189.27	28.01	21.83	8.67	21.88	41.41	6.13	1.52
0.256/2259	D	203.77	30.15	19.83	10.28	11.57	23.58	3.49	9.90
0.256/157	D	179.05	26.50	18.00	9.95	12.64	22.63	3.35	4.82
0.256/2243	D	179.07	26.50	15.67	11.43	18.06	32.34	4.79	2.04
0.353/188	D	176.23	26.08	23.17	7.61	15.91	28.04	4.15	3.60

Notes: FFB: fresh fruit bunches; BNO: bunch number; ABW: average bunch weight; O/B: oil-to-bunch ratio; OY: oil yield; FFA: free fatty acids.
*Number of bunches analysed: >3.

than the current planting materials. It is possible to develop low FFA planting materials from them.

BENEFITS

The FFA in palm oil can be removed by refining but this would incur a cost. With low FFA planting materials, good quality palm oil can be produced. Assuming that 1 t of the good quality low lipase palm oil generates an extra RM 30, the additional revenue will be RM 450 million a year, based on the production for 2007.

CONCLUSION

The traits from selected PS13 low FFA palms can be introgressed into advanced breeding populations to develop palms producing high quality palm oil.

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