PS5: BREEDING POPULATIONS SELECTED FOR THIN SHELL *TENERA*s

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Oil yield is derived from a composite of characters and is dependent on a number of components, the most important being fresh fruit bunch (FFB) and fruit composition, such as mesocarp to fruit (M/F), shell to fruit (S/F) and oil to bunch (O/B). One of the determinant factors leading to the colourful success story in oil yield improvement is the exploitation of a single gene controlling shell thickness. The discovery led to the commercial utilization of the *dura* x *pisifera* (DxP) or *tenera* planting materials with thicker oil-bearing mesocarp and reduced shell contents of the fruit.

The O/B, a prime component in oil yield, is determined by the *bunch analysis* method, which involves the determination of the oil content of a representative sample of the mesocarp from a bunch. Individual palms are selected on the basis of the M/F, S/F, oil to dry mesocarp (O/DM) and O/B. Attention is also given to other characters, such as fruit to bunch (F/B) and kernel contents, to ensure that the traits are at reasonable levels.

The oil palm fruit is a drupe, which consists of the mesocarp, shell and kernel. Within the fruit, a major component that determines a high O/B, besides M/F, is S/F. A reduction in shell content subsequently increases the mesocarp content of the fruit, while the kernel remains unchanged. Extremely thin shell *tenera*s have been selected among the germplasm collection of the Malaysian Palm Oil Board (MPOB) for breeding (Kushairi *et al.*, 2003).

SELECTION

In improvement programmes, heritability estimates and correlation among traits are emphasized. Generally, the heritability of bunch yield and its components is low, and higher estimates are obtained for bunch quality traits, such as mesocarp, shell and oil contents of the fruit.

Studies on correlation between bunch quality components indicated strong relationship for several pair of traits. For example, S/F is positively correlated with mean nut weight (MNW), F/B, kernel contents, and negatively correlated with mean fruit weight (MFW), M/F, O/DM, O/WM, O/B and oil yield (Kushairi *et al.*, 1999). When two characters are highly negatively correlated, it is very difficult to maximize for both in the same palm, except through high selection pressure over a long period of time.

Since S/F is selected-against, negative correlations with the oil-related-traits are advantages in selection for oil yield improvements. Given that the volume of fruit remains constant, selection-against S/F would also be selecting for M/F.

PS5 has low S/F, between 2.80% and 7.40% as compared with that of a typical Deli x AVROS, which is about 12%. Subsequently, PS5 is high in M/F, above 80% and O/B ranging from 26% to 29% *(Table 1)*.

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COMMERCIALIZATION POTENTIAL

The F/B of PS5 are about 60% to 65%. On average, *tenera* palms have a higher sex ratio than *dura* but a lower F/B. This is largely due to the increase in M/F failing to compensate in weight for the lower shell to bunch. However, if full advantage is to be taken of the fruit composition of the *tenera*, then the F/B must be maintained and a high account must be taken of this in the *dura* parent.

While selecting *dura* palms is straight forward, selection of the *pisifera* parent is quite troublesome due to the female sterility nature. *Pisifera*s are generated from *tenera* x *tenera* (TxT) or *tenera* x *pisifera* (TxP) crosses. Since *pisifera*s are female sterile, there is no direct evaluation of their worth. In addition, it is difficult to confidently identify *pisifera*s without examining cross-section of the fruit. Thus, it is necessary to evaluate the *tenera* sibs on the basis of actual test crosses with selected *dura*s, a procedure referred as *progeny testing*.

PS5 are *tenera* breeding populations selected for thin shell. *Pisifera* sibs of PS5 are potential candidates for use as male parents for the production of DxP planting materials of high oil yield.

Figure 1. Fresh fruit bunches of typical DxP (left) and selected tenera *with thin shell (right).*

Figure 2. Characteristics of thin shell tenera *fruits.*

TABLE 1. CHARACTERISTICS OF PS5 THIN SHELL (low S/F) *TENERA*s

No.	Palm No.	Progeny	FFB	BNO	ABW	NBA	F/B	MFW	M/F	S/F	K/F	O/DM	O/B	K/B	OY	TEP	HT	BI
1	0.256/2246	TZA 05-01	144.08	15.67	9.19	3	60.64	9.33	92.30	2.80	4.90	80.67	28.84	2.98	41.55	44.12	1.20	0.52
2	0.256/632	TZA 01-03	167.98	17.67	9.51	3	61.54	8.37	88.55	4.93	6.52	79.33	26.73	4.02	44.90	48.95	1.07	0.53
3	0.256/2204	TZA 01-02	169.08	17.50	9.66	3	64.98	10.09	83.16	7.13	9.71	80.61	29.48	6.32	49.84	56.25	1.03	0.64
4	0.256/902	TZA 12-02	103.38	7.50	13.78	2	57.34	13.78	87.24	7.23	5.52	81.70	26.53	3.37	27.43	29.52	0.64	0.48
5	0.256/270	TZA 02-01	144.67	18.33	7.89	3	59.79	10.45	86.30	7.40	6.30	81.60	28.58	3.83	41.35	44.67	0.68	0.48

Notes: S/F of a typical Deli x AVROS is about 12%.
Field planted 1990. Yield recording 1995-2000. Bunch analysis 1995-2000. Vegetative measurements 1998. NBA = number of bunch analysis. FFB = fresh fruit bunch (kg palm^{-1} yr^{-1}), MFW = mean fruit weight (g), F/B = fruit to bunch (%), M/F = mesocarp to fruit (%), S/F = shell to fruit (%), K/F = kernel to fruit (%), O/DM = oil to dry mesocarp (%), O/B = oil to bunch (%), K/B = kernel to bunch (%), OY = oil yield (kg palm^{-1} yr^{-1}), TEP = total economic product, HT = height (m), BI = bunch index.

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