PS8: HIGH VITAMIN E BREEDING POPULATION

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Vitamin E is a fat-soluble vitamin, naturally present in small amounts in vegetable oils. It consists of eight tocopherol and tocotrienol isomers, namely, α-, β-, γ-, δ-tocopherols and tocotrienols. Vitamin E acts as an antioxidant and plays an important role in the stabilization of oils and fats. Vitamin E components in palm oil especially γ- and δ-tocotrienols have excellent antioxidants which are important for the protection of unsaturated lipid peroxidation particularly in biomembranes and confer protective effects on some diseases. In addition, vitamin E has anti-cancer properties. Palm oil contains an average of about 800 ppm vitamin E, ranging between 600 ppm and 1000 ppm (Choo *et al.*, 1995). The major forms of tocopherols and tocotrienols in palm oil are α-tocopherol and γ-tocotrienols.

Oil palm breeding and selection have been focused on developing planting materials of high oil yield with emphasis on improving oil yield, oil quality, slow height increment and pest and disease-tolerance. Recently, the feasibility of commercializing palm oil-based vitamin E had been put forward (Choo *et al.*, 1995; Choo and Yusof, 1996). The variation of vitamin E in palm oil could be exploited for the development of novel planting materials.

SELECTION

The oil palm (*Elaeis guineensis*) germplasm in MPOB Genebank at Kluang Research Station

Figure 1. Twenty-nine-year-old palm 0.150/500 characterized by high vitamin E, high yield and dwarfness.

was screened for vitamin E (tocopherol and tocotrienol) using high performance liquid chromatography (HPLC). Evaluation and selection for bunch yield, oil yield, growth and physiological parameters were also carried out. Screening for vitamin E showed that total tocopherol and tocotrienols isomers varied

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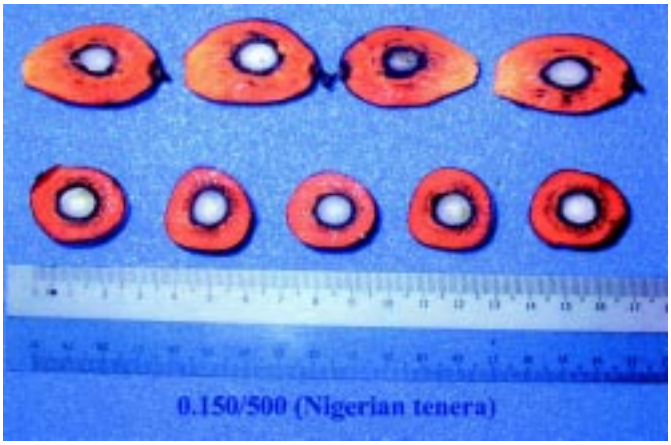
TABLE 1. PS8 PALMS SELECTED FOR HIGH VITAMIN E

No.	Palm No.	Family	Fruit type	α-Tocopherol (ppm)	α-Tocotrienol (ppm)	γ-Tocopherol/ β-tocotrienol	γ-Tocotrienol (ppm)	δ-Tocotrienol (ppm)	Total vitamin E (ppm)	FFB (kg palm^{-1} yr^{-1})	BNO (No. palm^{-1}yr^{-1})	ABW (kg palm^{-1}yr^{-1})	F/B (%)	MFW (g)	M/F (%)	S/F (%)	O/DM (%)	O/B (%)	K/B (%)	OY (kg palm^{-1}yr^{-1})	OY (t ha^{-1} yr^{-1})	KY (kg palm^{-1} yr^{-1})	KY (t ha^{-1} yr^{-1})	TEP (kg palm^{-1} yr^{-1})	TEP (t ha^{-1} yr^{-1})	HT (m)	BI
1	0.150/500	NGA1205	*Tenera*	448.90	**528.80**	181.83	**986.97**	**356.63**	**2496.57**	246.92	25.70	9.61	60.47	8.48	71.94	14.53	74.72	22.78	8.06	56.25	8.33	19.90	2.93	68.19	10.09	2.40	0.68
2	0.225/441	ZAR3801	*Tenera*	**571.80**	227.90	31.20	593.20	**259.40**	**1683.50**	143.78	16.67	8.63	56.43	10.22	71.94	16.98	79.63	21.63	6.24	31.10	4.60	8.97	1.33	36.48	5.40	1.51	0.42
3	0.150/3752	NGA2702	*Tenera*	294.20	**389.70**	37.80	**535.30**	152.20	1409.20	198.42	19.30	10.28	59.91	7.62	82.72	10.67	76.77	25.93	4.01	51.45	7.61	7.96	1.18	56.23	8.32	4.10	0.50
4	0.256/166	TZA53-12-01	*Tenera*	**569.70**	160.80	25.10	**571.40**	64.90	1391.80	189.78	20.00	9.49	71.20	10.30	79.03	10.96	76.60	23.93	7.11	45.41	6.71	13.49	2.00	53.50	7.92	1.00	0.46
5	0.311/84	AGO0801	*Tenera*	**495.90**	224.30	27.80	484.00	136.80	1368.80	152.63	21.00	7.27	64.68	7.71	62.50	23.17	79.93	20.71	9.25	31.61	4.68	14.12	2.09	40.08	5.93	1.92	0.47
6	0.150/338	NGA0817	*Tenera*	248.80	226.53	36.43	**506.90**	**346.00**	1364.67	287.42	15.70	18.31	72.85	8.03	74.69	13.69	73.20	25.89	8.46	74.41	11.01	24.32	3.60	89.00	13.17	3.80	0.55
7	0.150/4034	NGA1620	*Tenera*	**463.80**	279.40	15.20	495.60	90.30	1344.30	139.92	15.00	9.33	66.78	6.11	84.75	7.45	76.50	30.31	5.13	42.41	6.28	7.18	1.06	46.72	6.91	4.58	0.51
8	0.311/1	AGO0808	*Dura*	409.90	**310.10**	41.20	**579.70**	**271.10**	**1612.00**	105.30	11.00	9.57	66.62	12.04	68.84	19.90	80.20	23.38	7.52	24.62	3.64	7.92	1.17	29.37	4.35	2.20	0.39
9	0.311/262	AGO0310	*Dura*	**692.00**	245.40	58.50	**465.60**	101.80	**1563.20**	119.43	9.67	12.35	65.54	12.27	46.78	43.61	68.80	14.07	6.10	16.80	2.49	7.29	1.08	21.17	3.13	2.39	0.40
10	0.256/247	TZA11-02-05	*Dura*	**704.20**	274.70	36.60	403.60	131.40	**1550.50**	102.30	9.17	11.16	65.07	14.44	51.62	38.04	77.39	15.34	6.75	15.69	2.32	6.91	1.02	19.84	2.94	1.11	0.32
11	0.218/1462	CMR1601	*Dura*	**941.60**	117.40	32.70	335.00	93.20	**1519.90**	172.63	23.33	7.40	62.13	6.94	42.41	46.07	74.17	10.99	7.19	18.97	2.81	12.41	1.84	26.42	3.91	1.83	0.54
12	0.218/1292	CMR3554	*Dura*	409.10	**378.20**	20.50	**463.70**	89.40	1360.80	120.80	13.67	8.84	70.28	9.80	61.99	32.91	81.64	26.35	3.59	31.83	4.71	4.34	0.64	34.43	5.10	2.33	0.47
13	0.152/83	NGA4504	*Dura*	260.95	287.10	28.00	**549.35**	**214.55**	1339.95	155.15	10.69	14.51	57.89	5.32	49.02	35.36	74.84	13.57	9.03	27.91	4.13	18.57	2.75	39.05	5.78	4.44	0.48
14	0.311/201	AGO0403	*Dura*	**562.40**	255.50	20.60	420.30	77.90	1336.70	129.68	15.83	8.19	61.00	8.92	54.47	33.55	79.73	14.84	7.37	19.24	2.85	9.56	1.41	24.98	3.70	1.81	0.47
				Bold >450	Bold >300		Bold >450	Bold >200	Bold >1300	*Tenera* >140 *Dura* >100								*Tenera* >20 *Dura* >10		*Tenera* >30 *Dura* >19	*Tenera* >4.5 *Dura* >2.0						

Notes: FFB = fresh fruit bunch, BNO = bunch number, ABW = average bunch weight, F/B = fruit to bunch, MFW = mean fruit weight, M/F = mesocarp to fruit, S/F = shell to fruit, O/DM = oil to dry mesocarp, O/B = oil to bunch, K/B = kernel to bunch, OY = oil yield, KY = kernel yield, TEP = total economic product, HT = height, BI = bunch index.

Bunch characteristics of high vitamin E palm 0.150/500.



Fruit characteristics of high vitamin E palm 0.150/500.

Figure 2.

considerably between the germplasm accessions (Kushairi *et al*., 2000). Within the *E. guineensis* germplasm, the *tenera* has higher level of total vitamin E compared with the *dura*.

Some 35 palms with vitamin E content of 1300-2496.57 ppm were identified (Kushairi *et al*., 2003). However, only *dura* palms with oil yields of > 2 t ha^{-1} yr^{-1} and those of the *tenera* palms with more than 4.5 t ha^{-1} yr^{-1} were selected as PS8 breeding population (*Table 1*).

Among the selected palms is *tenera* 0.150/500 (*Figure 1*) with 2496.57 ppm of total vitamin E. This palm comes from Population 12, which is known for the dwarf characteristic. Other traits of interest of palm 0.150/500 are high fresh fruit bunch (36.54 t ha^{-1} yr^{-1}), oil (8.32 t ha^{-1} yr^{-1}) yield and bunch index (0.68). The *tenera* palm 0.150/338 with 1364.67 ppm of vitamin E had oil yield of 11.1 t ha^{-1} yr^{-1}.

COMMERCIALIZATION POTENTIAL

The high vitamin E breeding population is subject to progeny testing before the production of commercial *dura* x *pisifera* (DxP) planting materials. High vitamin E palm oil for specialized markets has the potential of fetching premium prices, in addition to encapsulation of the oil as a pharmaceutical product.

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