Maximiliana maripa Drude Mesocarp and Kernel Oils: Fatty Acid and Total Tocopherol Compositions

Sir:

For several decades, Amazonian palms have been very coveted. In French Guiana, even if some species are well-known, we have especially turned our attention to the maripa palm (*Maximiliana maripa* Drude).

The genus *Maximiliana* belongs to the subfamily Arecoideae. One species, *M. maripa,* has been reported in French Guiana and may have originated from there. The maripa palm, also called "inaja" in Brazil, is generally found in open areas and secondary forests. It grows mainly on dry sandy sites. It is a large-stemmed palm about 18 m high and 20 cm in diameter with long leaves.

The fruit bunch contains ovoid drupaceous fruits. These are composed of a fibrous outer shell and a mesocarp pulp which is somewhat viscous when the fruit is immature. The yellowish-brown seed, which is woody, is 3–4 cm long and 2 cm in diameter. The fruits appear between January and June and occasionally also appear from October to December.

This species is well-known by natives through nutritional uses (1,2). The fruits provide a pulp and a kernel which can be eaten uncooked, and an edible oil can be extracted from mesocarp and kernel. Besides, the maripa palm tree heart is particularly appreciated although it remains hard to extract. The fatty acid composition and the unsaponifiable value for the *M. maripa* mesocarp and kernel oils are reported in several works (3,4). In the present study, they have been completed by the determination of the total tocopherol content. Fruits were harvested during the ripening season. They were stored at low temperature (−18°C) to avoid the degradation of the triglycerides by enzymatic hydrolysis.

Mesocarp and kernel oil extraction. After shelling the seeds, the pulp and the kernels were ground in a mixer, and 40 g of each sample was placed in an extraction thimble. The oil extraction was performed in a Soxhlet apparatus for 2 h using 200 mL hexane as solvent. The crude oil obtained was dried and weighed. The oil yields are 8.9% for the pulp and 31.3% for the kernel.

The ratios oil/pulp (13.3%) and oil/kernel (8%) are rather average in comparison with other palm oils (4). The unsaponifiable values are common for these types of oils (pulp: 0.6; kernel: 1.7).

Determination of fatty acid composition. The fatty acid composition was determined by analysis of their methyl esters. The methyl esters of the fatty acids were prepared from the oil by esterification with methanol in the presence of potassium hydroxide and BF_3 according to AFNOR NF T 60-233 method (5). The methyl esters were analyzed by gas chromatography using a Carlo Erba GC 6000 (Vega Series; Milan, Italy) chromatograph fitted with flame-ionization detector and equipped with a 30 m × 0.32 mm, 0.25 µm film thickness capillary column (DB-5-MS; J&W Scientific, Folsom, CA). Helium was used as the carrier gas at a flow rate of 40 kPa. The analysis was performed in the following conditions: oven temperature 80°C for 2 min, with a rise of 15°C/min to 160°C and a rise of 5°C/min to 200°C. The temperature was maintained at 200°C for 20 min. Quantitation was performed using the internal standard method.

The fatty acid composition shown in Table 1 emphasizes the predominance of oleic acid in pulp oil and lauric acid in kernel oil (about 40% for each oil). Also the presence of polyunsaturated fatty acids (2 to 6%) is revealed. The ratio of saturated/unsaturated acids is about 50:50 in the pulp oil. Meanwhile, for the kernel oil it is about 87:13 because of the high content of middle-chain-length fatty acids C_{12} and C_{14}. The *M. maripa* pulp and kernel oils have a composition close to those of *Elaeis guineensis* palm (6). They represent a potential source for both food and nonfood applications. Nevertheless, industrial exploitation still remains a problem because of the fruit structure. Indeed, the maripa fruit has a hard shell; the other palm species are favored.

Tocopherol and tocotrienol analysis by high-performance liquid chromatography. The unsaponifiable matter was

TABLE I
Fatty Acid Composition of the Pericarp and Kernel Oils for *Maximiliana maripa* and *Elaeis guineensis*[a]

	M. maripa		*E. guineensis*	
Fatty acid	Pulp oil	Kernel oil	Pulp oil	Kernel oil
Caproic	—	trace	—	0.8 ± 0.2
Caprylic	—	3.8 ± 0.9	—	3 ± 1.5
Capric	—	4 ± 0.7	—	3 ± 1.0
Lauric	13 ± 0.3	40.5 ± 8.2	trace	48 ± 3.5
Myristic	18.7 ± 0.8	25.4 ± 0.8	2 ± 1	16 ± 1
Palmitic	18.6 ± 0.7	9.0 ± 0.4	44 ± 1.5	8 ± 2.0
Palmitoleic	trace	trace	trace	trace
Stearic	1.8 ± 0.8	2.4 ± 0.5	5 ± 1	2 ± 1
Oleic	41.5 ± 1.5	10.8 ± 2.0	39 ± 2.0	15 ± 3.0
Linoleic	5.8 ± 0.2	2.4 ± 2.3	10 ± 1.5	2 ± 2.5
Linolenic	trace	—	trace	—

[a]Results are mean values of three determinations ± standard deviation.
[b]From Reference 6.

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TABLE 2
Tocopherol (T) and Tocotrienol (T3) Contents of the *M. maripa* Pulp and Kernel Oils[a]

Tocopherol/tocotrienol (ppm)	Pulp oil	Kernel oil
% α-T	92	2
% β-T	25	1
% γ-T	—	1
% δ-T	—	Trace
% α-T3	36	7
% β-T	12	2
% γ-T3	10	2
% δ-T3	10	Trace
Total	185	15

[a]Traces (<0.5%). See Table 1 for abbreviation.

recovered from 5 g of kernel oil according to AFNOR NF T 60-233 procedure (5). This unsaponifiable fraction was then diluted in 2 mL of hexane and injected onto a Lichrosorb® (Waters Corporation; Milford, MA) 60 Å column (25 cm, 5 µm thickness). The sample was analyzed according to the following conditions: a Waters™ 486 tunable absorbance detector with a excitation of 292 nm was used. The pump and autosampler module were a PerkinElmer (Norwalk, CT) isocratic LC Pump 250. Injection was performed using a Rheodyne 7725i (Rohnert Park, CA) with 20 µL loop. The mobile phase was hexane/2-propanol (99:1, vol/vol).

The total tocopherol content is rather average for the pulp oil (185 ppm), whereas it is very low for the kernel oil (15 ppm) (Table 2). We can notice the interesting predominance of α-tocopherol in pulp oil (9.2 ppm), which is not the case for *E. guineensis* pulp oil (7). Compared to palm kernel and coconut oils, the high content in tocotrienols for the *M. maripa* kernel oil is usual.

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