BRIEF ARTICLE

Lipolytic activity in meals of pejibaye palm fruit (*Bactris gasipaes*, Palmae)

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(Rec. 9-X-1995. Rev. 24-I-1996. Acep. 21-VI-1996)

Resumen: Se determinó la actividad lipolítica en harinas del mesocarpo de tres variedades de pejibaye a 5, 24 y 38°C. No se detectó actividad en la variedad Vaupés (actividad de agua, $a_W = 0.069$, 5.8% de proteína), valores intermedios se determinaron en la variedad Utilis-Guatuso ($a_W = 0.085$, 5.9% de proteína) y actividades diez veces más altas se determinaron en las harinas de la variedad Tuira ($a_W = 0.286$, 7.0% de proteína). Las harinas integrales mostraron actividades lipolíticas más altas a 38°C, como es el caso de Utilis-Guatuso ($a_W = 0.874$) y de Tuira ($a_W = 0.932$). Los resultados sugieren que las lipasas endógenas permanecen activas a valores de a_W tan bajos como 0.08. Ya que no se encontró evidencia alguna de efecto del contenido de grasa sobre la actividad enzimática, se concluye que la rancidez hidrolítica en las harinas de pejibaye se agrava más, cuanto mayor es su a_W.

Key words: Pejibaye, lipase, hydrolytic rancidity, a_W.

An important source of energy and protein has been recognized in the fruit of pejibaye palm (peach palm, *Bactris gasipaes*, Kunth), and efforts have been directed to the use of this material as staple food for human consumption (Mora-Urpí 1983, Vietmeyer 1986, Clement and Mora-Urpí 1987, Mora-Urpí *et al.* 1991).

The meal obtained from this crop provides 15 kJ/g and around 6% protein (Murillo & Zumbado 1984, Delgado *et al.* 1988).

Pejibaye has a disadvantage, though, because it is highly perishable. Deterioration of fruits begins soon after 3 - 5 days from harvest, mainly due to fungal attack and the activity of endogenous enzymes.

Thus, in order for this product to become an all-season food -rather than seasonal- it is necessary to know as many details of its postharvest chemistry and physiology.

The use of pejibaye flour as main ingredient of dehydrated goods has some problems, the main one being hydrolytic rancidity, that is, endogenous lipolysis (R. Vega, Compañía Numar 1993 pers. comm.).

We present data concerning the residual lipolytic activity in freeze-dried pejibaye meals, kept in sealed bags under vacuum at different temperatures.

The material was obtained in March 1993, from Los Diamantes Experimental Station (Guápiles, 10.2° N, 83.8° W, Costa Rica) as fruits of the pejibaye varieties: Vaupés (No. 6528-2/3), Tuira (No. 6043-2) and Utilis-Guatuso (No. 5022-3).

The fruits were cooled after harvest and processed the next day. They were cleansed with a damped cloth, pealed and mesocarps reduced to a moist powder by using a food processor. The milled products were placed in low-density polyethylene bags, frozen to -30°C and then liophilyzed for 16 hr at 26.7 Pa and 32°C.

Whole meals were prepared likewise by milling the entire fruit.

Meals were placed in vacuum-sealed laminated bags and maintained at different temperatures in the dark.

Chemical analyses were done as indicated in the AOAC manual (1990). Water activities (a_w) were determined by use of a Novasiva Thermoconstanter isopiestic chamber. Lipolytic activities in the meals were determined by titration of free fatty acids at suitable times with NaOH/thymolphtalein, in the $CHCl_3$/MeOH (2:1) extracts of 10.00 g meal aliquots in 75.00 ml of the organic solvent. Activities are given as initial $d(RCO_2H)/dt$ values, calculated by the method of Boeker (1982) and expressed as nanokatals per gram of meal.

Chemical characteristics of the meals appear in Table 1.

The Tuira variety had a 7.0 % protein content, which explains the highest moisture and a_w values of the resulting meals ($p < 0.05$). Utilis-Guatuso variety had the highest fat content ($p < 0.05$) and a protein content similar to Vaupés.

An ANOVA of the kinetic data for the autolipolytic process indicated no significant effect on reaction rates other than of a_w, % protein and temperature. (Table 2). The heaviest effect was that of a_w.

The observed lipolytic activity was endogenous, as evidenced by the low fungal and yeast count of 10^2 CFU/g at the beginning and end of the experiment. The presence of bacterial lipases was also excluded because water activity was inappropriate for bacterial growth and development.

The absence of enzyme activity in the Vaupés variety can be understood in terms of the low a_w value of the reaction milieu. The role of water in lipolysis goes beyond acting as a mere substrate. Lipases are catalytically active when enough water is available for the enzyme molecules to become solvated and thus, locked in the proper catalytic stereochemical conformation (Zaks & Klibanov 1984, Legoy *et al*. 1991).

Another point which needs consideration is the initial amount of free fatty acids in the meals, due to their inhibitory effect on lipases (Brockman 1984). The mesocarp meals initially had 64 ± 5 μmol/g (Vaupés), 53 ± 5 μmol/g (Utilis-Guatuso) and 65 ± 5 μmol/g (Tuira). Whole meals had 250 ± 7 μmol/g (Utilis-Guatuso) and 170 ± 6 μmol/g (Tuira). The initial amount of free RCO_2H is of no importance under the conditions of this study.

TABLE 1

Chemical characteristics of the prepared meals from pejibaye mesocarp

Variety	% Fat	% Protein	% Moisture	$10^2\ a_w$
Vaupés	12 ± 1	5.8 ± 0.2	1.8 ± 0.4	6.9 ± 0.1
Tuira	14 ± 1	7.0 ± 0.3	7.7 ± 0.4	28.6 ± 0.5
Utilis-Guatuso	18 ± 1	5.9 ± 0.2	3.2 ± 0.4	8.5 ± 0.2

TABLE 2

Autolipolytic activities in the pejibaye meals

Variety	Temperature/°C	Activity/nkat g^{-1}
Vaupés, mesocarp	All temperatures	No activity
Utilis-Guatuso, mesocarp	5	0.0027 ± 0.0001
	24	0.011 ± 0.002
	38	0.020 ± 0.001
Utilis-Guatuso, whole	38	0.88 ± 0.02
Tuira, mesocarp	5	0.14 ± 0.05
	24	0.26 ± 0.02
	38	0.120 ± 0.008
Tuira, whole	38	2.9 ± 0.2

Normal pejibaye meals are expected to contain up to 10% moisture (Tracy 1987), thus inactivation of their lipolytic activity is a requisite for long shelf duration of desiccated goods based on this material.

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