

Pejibaye Palm Fruit Contribution to Human Nutrition

A. BLANCO METZLER, M. MONTERO CAMPOS, M. FERNÁNDEZ PIEDRA AND J. MORA-URPÍ*

*Costa Rican Institute of Research and Education of Health and Nutrition,
Box 4, Tres Ríos, Costa Rica and*

**School of Biology, University of Costa Rica, San José, Costa Rica*

Many tropical fruits and vegetables are not well known in the temperate countries, nor do they receive the attention they deserve in their native countries. Among them—and one with a great potential—is the pejibaye palm (*Bactris gasipaes* Kunth), also known as peach palm. The fruit of this palm can be used as a cereal for human consumption and has high food values for some nutrients.

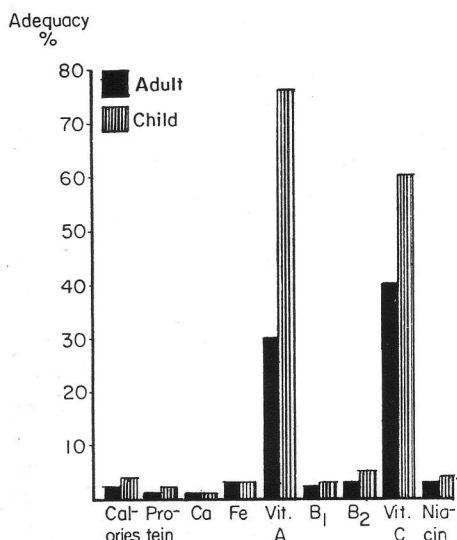
The pejibaye palm has been cultivated and its fruit prepared for food in different ways since pre-Columbian times in some regions of Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guayanas, Honduras, Nicaragua, Panamá, Perú, Trinidad, and Venezuela. There is evidence that during some historical periods it was the main dietary staple of a number of indian tribes. At present, the first class fruit is popular and highly acceptable as a between-meal snack and the lower quality—which represents around one third of the production in Costa Rica—is used as animal feed.

Although there is great variability in the chemical composition of the fruits among and within the many landraces known (Vega 1986, Mora-Urpí and Clement 1988) the average result of three native Costa Rican pejibaye populations (Tucurrique, San Carlos and Guápiles) (Fernández 1988) indicates that $58.5 \pm 0.5\%$ of the edible portion (mesocarp) is water, $34.2 \pm 0.6\%$ is ash. Carbohydrate composition is variable, as starch and “dietary fiber” content ranges between 19.2–30.2% and 5.3–

9.7%, respectively. The fat is semisolid at room temperature, since 36% of the fatty acids are saturated and 64% unsaturated (49% monounsaturated and 15% polyunsaturated). A polyunsaturated index (P/S) between 1.0 and 2.2 and a high monounsaturated fatty acid content are factors that reduce the risk of cardiovascular disease (Ernest and Cleeman 1988, Krist-Etherton 1988); even though pejibaye fruit pulp has a low P/S (0.43) half of its fat is monounsaturated.

One third of the pejibaye pulp ash is composed of potassium ($229 \pm 4 \text{ mg}\%$). Other minerals of nutritional value, such as calcium, magnesium, and iron have values of $15.3 \pm 3.9 \text{ mg}\%$, $16.6 \pm 4.1 \text{ mg}\%$ and $0.8 \pm 0.0 \text{ mg}\%$ respectively in the fresh fruit. Sodium content is very low ($3.7 \pm 0.2 \text{ mg}\%$). Chemical analyses of these nutrients were done on cooked fruit pulp and the methodology used was of the Association of Official Analytical Chemists 1975 for proximal constituents, minerals and fatty acids. “Dietary fiber” analysis was estimated as neutral detergent fiber by the Van Soest method modified by Mongeau (1982). The starch was estimated colorimetrically by the Nielsen method (1943). Details of the preparation and analysis can be found in Fernández (1988).

Vitamin content in pejibaye pulp is less than 1% of its dry weight, but this does not mean that its contribution is unimportant. This fruit is famous because of the amount of vitamin A precursors present,



1. Nutrient adequacy percentage of the nutrients provided by the daily consumption of one medium fruit (approx. 34 g edible) for adults and preschool children.

although values vary considerably according to genotype. Blanco et al. (1990a) evaluated four of them, two from Costa Rica and two from Colombia, for biological availability of carotenoids in retinol by the depletion-repletion method. The results demonstrated that the consumption of just one fruit from three of those genotypes satisfies the recommended adult daily allowance of vitamin A. As for the remaining genotype, seven fruits were required.

Another vitamin that is present in significant quantities in pejibaye is ascorbic acid. The average value in raw fruits is 35 mg% (Wu Leung and Flores 1961). But the estimation of vitamin C in cooked and stored fruit still has to be made since cooking of pejibaye is indispensable and this is a water soluble thermolabile compound.

Based on the uncooked pejibaye analysis (later adjustments according to complete results on cooked material have to be done) and the recommended dietary allowances (RDA) (Menchú 1973, Asp 1988) where for adult men and pre-school children, the nutrient adequacy percent-

Table 1. Energy and retinol content per unit of pejibaye fruit, corn tortilla, white wheat bread and raw carrot.

Edible food unit	Energy (Kcal)	Retinol (μ g)
Pejibaye, medium (34 g)	66	228
Corn tortilla (18 g)	41	0.9
White wheat bread (32 g)	91	zero
Carrot, medium (74 g)	30	2,368

age was estimated. Figure 1 indicates that the consumption of just one medium size fruit 50 g total or 34 g edible contributes 30% and 76% of their respective retinol's RDA, 40% and 60% of their vitamin C's RDA.

The consumption of more than one fruit—four, for example, which is common in adults—contributes 8% of their calories, 4% of the protein, 4% of the calcium, 12% iron, 120% of the retinol, 8% of vitamin B1, 24% of the B2, 160% of the vitamin C and 12% of the niacin's RDA.

Because the pejibaye fruit is rich in starch it can be used as a cereal. A well known food practice in Costa Rica is to substitute bread or corn "tortilla" for pejibaye fruit, when in season to accompany meals. A comparison of the caloric content of these three staples (see Table 1) indicates that it is superior to tortillas, and carrots, but lower than wheat white bread. However, varieties of pejibaye rich in oil will have a higher caloric value than bread. The significance of these data is that they stress the value of pejibaye as a common source of energy.

Although in the tropics retinol precursors are abundant, there is a high frequency of diets deficient in vitamin A. The substitution of cereals with pejibaye would benefit the populations that show this problem. For example, in Costa Rica vitamin A is the most deficient nutrient in the average diet (Ministerio de Salud 1986). Table 1 compares the retinol contents in pejibaye and white corn tortilla with that of white

Table 2. Chemical composition of pejibaye flour* (fresh basis of 100 g).

Energy, cal	413.5	Vitamin B2, mg	0.3
Humidity, g	12.0	Vitamin C, mg	62.2
Protein, g	3.8	Niacin, mg	2.5
Fat, g	8.9	Iron, mg	6.1
Ash, g	1.3	Calcium, mg	10.9
Crude fiber, g	2.1	Sodium, mg	2.7
Carbohydrates, g**	72.1	Potassium, mg	162.8
Vitamin A, μ g eq	1.2	Magnesium, mg	11.7
Vitamin B1, g	0.1	Zinc, mg	2.1

* Values calculated from fresh pejibaye.

** Carbohydrates by difference.

bread and carrot, the last being a well known source of vitamin A precursors.

Pejibaye fruit mesocarp can be made into a flour for human and animal feeding. Flour has a lower water content than raw material, 10–12% against 58% respectively, consequently nutrient density almost doubles. Estimated flour chemical composition is shown in Table 2.

In order to promote the use of the pejibaye fruit as a regular component of the diet in Costa Rica and other tropical Latin American countries, a booklet (Blanco et al. 1990b) was written containing a number of recipes that were developed taking into consideration feeding habits, cost, nutritional value, organoleptic aspects and rural food availability. The nutritional con-

tribution of a portion of a pejibaye recipe is shown in Table 3.

Obviously pejibaye fruit is not a complete food. Mineral and protein content represent limiting factors at the present time. The protein amount can be improved considerably in future cultivars, since there are genotypes that produce up to 18% protein of the dry weight of the fruit (Vega 1986).

In conclusion the nutritional advantages of the pejibaye fruit could be summarized in the following points:

1. Rich energy source.
2. Rich in vitamin A precursors.
3. A source of "dietary fiber."
4. Rich in vitamin C.
5. Medium monounsaturated fatty acids source.
6. Poor in sodium (when salt not added) and rich in potassium.
7. Rich in complex carbohydrates, therefore low in simple sugars.
8. Forms part of the feeding habits of many areas from Honduras to Bolivia.

Table 3. Daily nutrient adequacy percentage¹ per portion² of tuna-pejibaye "Picadillo."

Nutritional component	Nutrient adequacy (%)
Energy	4.3
Protein	5.2
Calcium	2.9
Iron	3.2
Retinol	18.5
Thiamin	4.5
Riboflavin	6.2
Niacin	8.6
Vitamin C	90.9

¹ % Daily nutrient adequacy = $\frac{\text{amount of nutrient/portion}}{18 \text{ year man RDA}} \times 100.$

² Portion size = 98 grams.

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