academicJournals

Vol. 13(15), pp. 803-805, 12 April, 2018
DOI: 10.5897/AJAR2018.13027
Article Number: BCC26FC56638
ISSN 1991-637X
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http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Short Communication

Bacaba-de-leque (*Oenocarpus distichus*): A new wet tropics' nutritional source

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Received 31 January, 2018; Accepted 20 March, 2018

The present study aims to determine the nutritional composition of soluble and insoluble fibers, vitamins and minerals in the fruit of bacaba-de-leque (*Oenocarpus distichus* Mart.) a native Central Amazonian tropical fruit. Results show the fiber contents to be 3.95 g 100 g^{-1}, 100% of which shows to be insoluble fibers. Potassium stood out among the minerals, with 173.85 mg 100 g^{-1}. High vitamin E concentration (6.65 mg 100 g^{-1}) was observed as well. Considering the fruit's nutritional potential, we suggest its incorporation into the Amazonian population diet as an essential nutrient and health improving compounds source, to be more frequent.

Key words: Fiber, vitamins, minerals, nutrition.

INTRODUCTION

The palm tree family (Arecaceae) occurs throughout the world's tropical and sub-tropical regions. Palms trees hold high ecological and economic importance, and display complex, spatial species distributions and diversity patterns (Wolf et al., 2011). It holds 187 genera and nearly 2,466 species. Palms are well-known in warm climates. Most of them are single-stemmed with large fan leaves on top. The Amazonian region harbors many fruit species, including bacaba-de-leque (*Oenocarpus distichus* Mart.), also known as oil bacaba, which presents unique size of palm stem and distichous leaves and, stands out on account of yielding fruits bearing nutritional and economic potential to be taken advantage of by the Amazonian populations. Despite its many uses, just as for making jelly, mousse, candy, ice cream and juice or wine, very little is known regarding its nutritional composition, as of yet. Therefore, further research on its chemical composition, mainly vitamins, minerals and dietary fiber, are needed in order to contribute for improving its marketing and social inclusion programs. Even though there no published data addressing bacaba-de-leque juice chemical composition, one may still find a lot of it being published regarding another bacaba species (*Oenocarpus bacaba*) (Yuyama et al., 2013). Hence, the purpose of the present work is to provide information on health promoting phytochemicals, mainly vitamins E, C, β-carotene and complexes of vitamins B, thiamine (B1), riboflavin (B2), niacinamide (B3), pyridoxine (B6) and lipids, proteins, minerals and fiber chemical composition in the fruit bacaba-de-leque.

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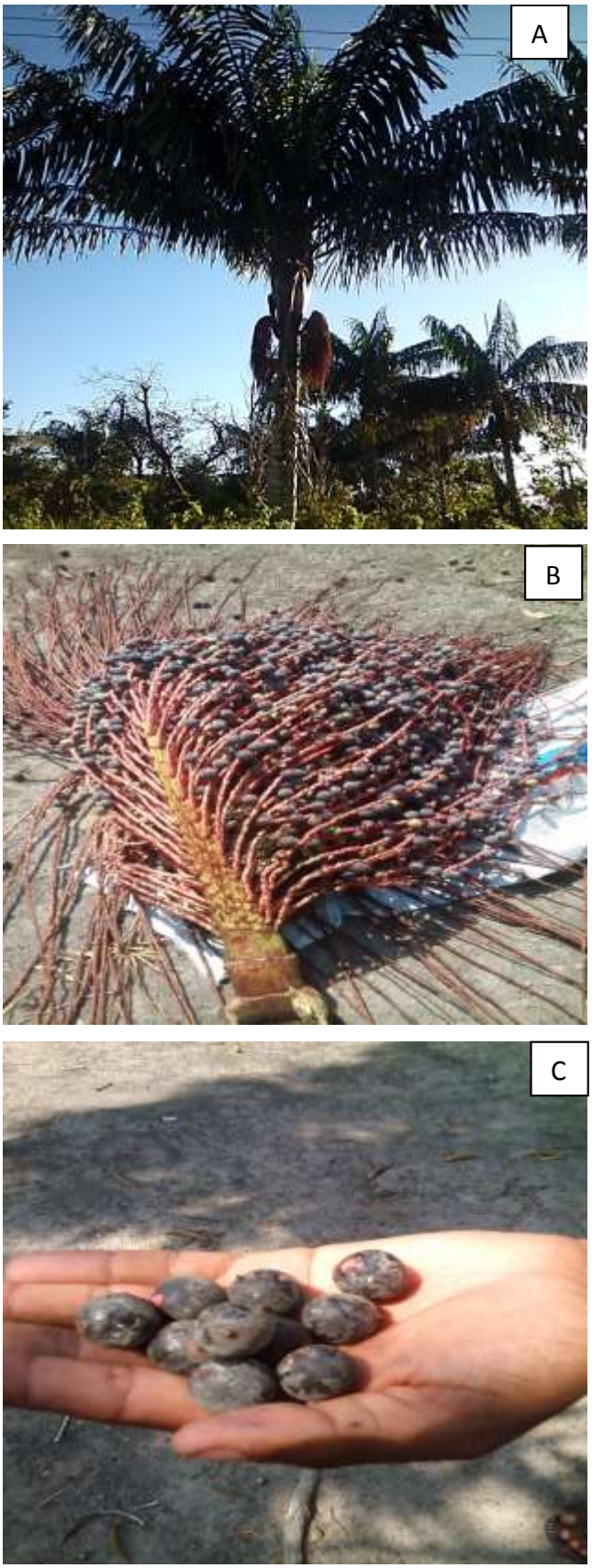


Figure 1. Bacaba of leque (*Oenocarpus distichus* Mart.) (A) tree (B) bunch and (C) fruits.

MATERIALS AND METHODS

The fruit of Bacaba-de-Leque (*O. distichus* Mart.) was harvested by hand during its ripening stage in the region of the city of Santarém, Pará, Brazil (S 02º20´57.5´´ W 054º48´0.38´´) in February 2016 (Figure 1). The sample consisted of three, 10 kg lots. They were stored into a sealed Styrofoam box and transported to the Food Physicochemical Laboratory (LFQA) of the Environment and Health Society Coordination (COSAS) at the National Research Institute of Amazonia (INPA) so as to be analyzed. Pulps were extracted with an automatic pulp remover (Itametal, 1.5 mm mesh) and homogenized in a blender prior to being analyzed in order to quantify their mineral, lipids, vitamins and fiber contents. Moisture, ash and protein contents were determined according to the method proposed by Association Analytical Chemists (AOAC) (2010) using 6.25 factor to convert the nitrogen percentage into protein content. Total lipids were extracted and determined according to Bligh and Dyer (1995). Total carbohydrates were calculated through their difference, according to equation:

c = 100 - (Moisture + Lipid+ Protein + Ash)

Caloric value was determined by using the indirect method, which is based on the application of the main product nutrients (carbohydrates, protein and lipids) conversion factors. Results are expressed in food kcal g^{-1}. Fiber contents were determined by the method proposed by Asp et al. (1983). Vitamin C content was measured three times by high-performance liquid chromatography (HPLC) following the method proposed by Maeda et al. (1989). β-carotene and Vitamin E content was measured three times by high-performance liquid chromatography (HPLC) following the method proposed by AOAC (2016). The methodology of analysis of vitamins from complex B was based on the procedures described by Albalá–Hurtado et al. (1997).

Determinations of the mineral content were obtained in triplicate by the atomic absorption spectrophotometry method recommended by the Adolfo Lutz Institute (IAL) (2008), and according to the Varian (2000) manual. Sample digestion was carried out in a MD-2591 MARS-Xpress brand CEM Corporation, microwave-oven. Nitric acid concentration was used to mineralize organic matter, which was then cooled and diluted with deionized water. The sample reading was performed directly on atomic absorption spectrophotometer (Spectra AA, model 220 FS, Varian, 2000), with specific lamps according to the manufacturer's manual. Ca, K, Na, Mg, Fe, Zn, Mn, Cu were the quantified mineral elements. Standard tomato leaf certified material (SRM 1573a) was employed to control the analyses according to Trahey (1992). Results are expressed in the sample's mg 100 g^{-1} fresh weight (FW).

RESULTS AND DISCUSSION

Bacaba-de-leque wine nutritional constituents showed low protein concentration and high energy level, mainly due to the presence of lipids. Compared to the other bacaba type (*Oenocarpus mapora*), the oil content of which was 6.53 g 100 g^{-1} (Yuyama, et al., 2013), that of bacaba-de-leque was shown to be much higher (7.28 g 100 g^{-1}) (Table 1). Therefore, energy supply comes to be its greatest contribution. Another attribute detected on bacaba-de-leque has shown to be the high and low content of potassium, calcium and magnesium, as well as of minor elements, such as copper and iron (Table 1), respectively. Its dietary fiber content is also very high, making it good natural source of these nutrients (3.95 g 100 g^{-1}), since in other bacaba species the fiber content

Table 1. Nutritional composition of Bacaba-de-Leque (*Oenocarpus distichus)* nutrients unit per 100 g.

Moisture (g 100 g^{-1})	**85.86**
Ash (g 100 g^{-1})	0.25
Protein (g 100 g^{-1})	1.15
Lipids (g 100 g^{-1})	7.28
Carbohydrates (g 100 g^{-1})	5.46
Soluble fiber (g 100 g^{-1})	0.0
Insoluble fiber (g 100 g^{-1})	3.95
Energy (kcal 100 g^{-1})	91.96
Vitamin C (mg 100 g^{-1})	8.10
β-Carotene (mg 100 g^{-1})	0.29
Vitamin E (mg 100 g^{-1})	6.65
Tiamin (mg 100 g^{-1})	0.01
Riboflavin (mg 100 g^{-1})	0.03
Niacin (mg 100 g^{-1})	0.01
Piridoxina (mg 100 g^{-1})	0.0
Minerals (mg 100 g^{-1})	
Calcium (Ca)	3.80
Copper (Cu)	0.20
Iron (Fe)	0.28
Manganese (Mn)	0.67
Zinc (Zn)	0.35
Potassium (K)	173.85
Sodium (Na)	1.9
Magnesium (Mg)	7.80

is very low (2.10 g 100 g-^{1}) (Yuyama et al., 2013). Studies have shown that high-fiber diets have great therapeutic potential against dyslipidemia, cardiovascular diseases and some types of cancer (World Health Organization (WHO), 2015), with the consequent reduction of glucose and blood cholesterol. Bacaba-de-leque shows a high concentration of Vitamin E 6.65 mg 100 g-^{1} as compared to the other bacaba type (*O. bacaba*) with 2.15 mg 100 g-^{1}. As to iron, bacaba-de-leque showed not to be iron-rich (0.28 mg 100g^{-1}). It should be noted that not all the iron present in food, especially vegetables, comes to be absorbed and used by the body. Therefore, further studies on the iron bioavailability are required. Bacaba-de-leque has shown to be a powerful source of antioxidants, which help to reduce the effects of premature aging caused by free radicals and prevent other diseases such as cancer and diabetes. Further studies are needed to elucidate the full potential of this fruit, which is yet to be studied.

Conclusions

Bacaba-de-leque has shown to be an excellent source of vitamin E, riboflavin, insoluble fiber, energy, minerals, especially potassium and calcium, essential for human nutrition as well as the development of different applications. Further research is paramount to exploit other palm characteristics, which may be useful for human nutrition.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors thank BFN/FAO (Biodiversity for Food and Nutrition) and INPA (National Research Institute of Amazonia), and FAPEAM processes 062.00682 / 2015 and 062.00796 / 2015, for their financial support.

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