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PHYSICOCHEMICAL CHARACTERIZATION OF PULP OF *Musa acuminata*, GROWN IN THE NORTH OF BOLIVAR (COLOMBIA)

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Abstract

The pulp of banana, *Musa acuminata* (Musaceae) was characterized. Green bananas were purchased at a local market in the city of Cartagena, Bolívar. Moisture, ash, fat, protein, crude fibre, carbohydrate, vitamin C and minerals were determined. Ash 1.3 g/100 g, moisture 67g/100 g, protein 1.3 g/100 g, fat 0.25 g/100 g, crude fiber 2,3 g/100 g, carbohydrates 35.85 g/100 g and vitamin C 9.3 mg ascorbic acid were determined for the fruit pulp. The most abundant mineral present in the pulp is potassium with a value of 365 mg. The pulp of green banana (*M. acuminata*) is considered as promising or designing functional foods due to its high fiber content.

Key words: feeding, fiber, functional properties, nutrition, pulp.

Introduction

The banana *Musa acuminata* Colla (Musaceae) is a tropical fruit from the tree that receives the same name. It has an elongated or slightly curved shape, weighing 100-200 g [1].

The skin is thick, the pulp is white or yellowish and fleshy. For its cultivation it is necessary that the soil and climate have certain conditions; the ideal climate is humid tropical and should have a temperature around 18 ° C so that its growth is not impacted. It is considered a sweet fruit that is eaten raw, although in many countries it is eaten fried, roasted, dried, in juice or flakes, alcoholic beverages or flours are also made[1,2].

This fruit is the fourth staple food product in the world, especially in Africa, the Caribbean, Central and South America and Southeast Asia, is rich in carbohydrates and contains little fat, also helps provide essential vitamins such as vitamin C, B_1, B_2, B_6 and contains large amounts of potassium and magnesium, therefore, have considerable nutritional value [3]. Potassium can be found in a variety of fruits, vegetables or even meats, however, a single banana can provide up to the 23% potassium needed per day [2]. Potassium is found in large quantities in this food, it is an important mineral to control the electrolyte balance of the body, it is also essential for muscle function, the transmission of nerve impulses and the proper functioning of the heart and kidneys [1,4].

Among the properties of bananas are that it helps neutralize, dissolve and eliminate the acids retained in the body, such as uric, phosphoric, sulfuric acid, which give rise to the so-called arthritic and rheumatic diseases, gout, sciatica, ulcers, kidney stones, etc.

Colombia is a large producer of fruits and its quality is highly recognized in Europe and the USA [5]. Being the banana one of the most relevant with 1498.4 thousand tons produced per year, being grown mainly in the Urabá of Antioquia, the departments of Magdalena and La Guajira. Therefore, in this work the pulp of green bananas grown in northern Bolivar, Colombia, was characterized physicochemically.

Methods

The banana fruits were purchased in the city of Cartagena, located in the north of the department of Bolívar.

Bananas were selected taking into account that they were free of external damage and presented a green status; were washed and scalded at 90 °C for 5 minutes [6].

Chemical Analysis

Pulp samples were homogenized and tested for vitamin C (ascorbic acid) content and the crude fibre content [7,8].

Moisture: Moisture content was determined by gravimetric method as described in AOAC, 1990 925.10 at 105°C until constant weight. Results were expressed as %[9].

Ashes: The amount of ashes was quantified by gravimetric method as described in AOAC (1990) 923.03 based in completed incineration of organic Matter at 550°C. Results were expressed as %[9].

Fat: Total fat content was quantified by soxhlet extraction with petroleum ether as described in AOAC (1990) 945.16. Results were expressed as %[9].

Total protein: Content of total protein was determinated by Kjeldahl acid digestion method as described in (AOAC, 1990) 955.04. A conversion factor of 6.25 was used to calculate proteins content. Results were expressed as %[9].

Carbohydrate Content: The carbohydrate content was estimated by difference[9].

Determination of minerals

The dry and calcined samples (ash) were treated with HCl according to the method recommended by the AOAC. The Potassium, Magnesium, Phosphorus, Iron and Sodium minerals were determined by the atomic absorption spectrophotometry [10].

Statistical Analysis.

All trials were performed by sextupled. The results were expressed as the mean ± SD (standard deviation). Significant differences were determined by ANOVA analysis followed by Dunnett's or Tukey's test or as deemed appropriate.

Results

In the results (table 1) it can be seen that the banana pulp evaluated has a high moisture content, obtaining a value of 67±0.10 g/100 g.

Foods have various components within which are minerals, some essential for the body, so it is necessary to know the amounts contained in banana fruits. It was observed that the banana presented a high content of minerals with an ash value of 1.3 ± 0.05 g/100 g probably belonging to minerals such as potassium, magnesium and phosphorus.

Fiber is a component present in fruits that is difficult to degradable due to its components such as lignin, cellulose and hemicellulose. Crude fiber percentage values of 2.3 g/100 g of fresh banana were observed.

The order of importance of the minerals found in banana pulp was as follows: Potassium > Magnesium > Phosphorus > Iron > Sodium (Table 1).

Discussion

The results obtained in the chemical analyses carried out on banana pulp are similar to those included in the ICBF food composition table and those reported by Casallas *et al.* [1].

Although fruits are not rich in minerals, the most abundant in them is potassium, which coincides with the results obtained in this research (Table 1). Although fruits are not rich in minerals, they play a very important role in the balance of the human diet, especially since the composition of fruits differs from that of other foods, of animal or vegetable origin [11].

The intake of resistant starch (RA) if consumed before foods with a high glycemic index may be able to decrease the amount of circulating glucose, green bananas have important levels of RA, being considered an alternative source for the ingestion of this substance [12].

It should be noted that the consumption of green bananas (cooked in the shell and processed) increases the hydration of the intestinal contents, improving intestinal function, and the fermentation process of resistant starch in the final part of the intestinal colon collaborates to eliminate harmful intestinal health products for undesirable reabsorption of bile acids [13].

López et al. [14] described the care practices performed by traditional healers in an Afro-Colombian community in Guapi, Cauca, Colombia, identifying that green banana has medicinal properties for gastritis when it is liquefied and ingested on an empty stomach.

Likewise, the American Diabetes Association (ADA) establishes that the treatment of DM includes preferably the use of complex carbohydrates, foods with high fiber content and low in fat and a moderate consumption of sodium [15].

Torres-Zapata et al. [16], evaluated the glycemic and insulin response of patients with type 2 diabetes to the consumption of Creole pumpkin soup (*Cucurbita pepo* L.) enriched with banana starch, demonstrating that this food could help prevent the onset of type 2 diabetes in people at high risk and reduce complications in diabetic patients. It is considered that the pulp of the fruit can be mixed into food and beverages to increase the consumption of fiber by the Colombian population which is very low.

The pulp of green banana (*M. acuminata*), is considered promising to design functional foods for its high fiber content.

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Tabla 1. Physicochemical characterization of banana

Analysis	Results
Phosphorus	25 ± 0.05 mg
Potassium	365 ± 0.03 mg
Sodium	0.1 ± 0.05 mg
Magnesium	32 ± 0.01 mg
Iron	0.32 ± 0.05 mg
Vitamin C	9.3 ± 0.01 mg
Protein	1.3 ± 0.05 g/100 g
Ash	1.3 ± 0.05 g/100 g
Fat	0.25 ± 0.33 g/100 g
Moisture	67 ± 0.10 g/100 g
Carbohydrates	35.85 ± 0.10 g/100 g
Fiber	2.3 ± 0.33 g/100 g