

Valorization of the Hydroalcoholic Extract of the Raw Wax of Cuban Sugar Cane

Rilton Gonçalves Bonfim Primo^{1*}, Eva Sánchez-Hernández², Jesus Martín-Gil², Pablo Martín-Ramos², Manuel Díaz de los Ríos³ and Ricardo de Araújo Kalid⁴

¹Federal University of Bahia (UFBA), Doctoral Program in Industrial Engineering (PEI), Brazil

²University of Valladolid (UVA), Department of Agricultural and Forestry Engineering, Spain

³Instituto Cubano de Investigaciones de los Derivados de la Caña de Azúcar (ICIDCA), Cuba

⁴Federal University of Southern Bahia (UFSB) and Federal University of Bahia (UFBA), Doctoral Program in Industrial Engineering (PEI), Brazil

***Corresponding author:** Rilton Gonçalves Bonfim Primo, Federal University of Bahia (UFBA), Doctoral Program in Industrial Engineering (PEI), Salvador, Brazil

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ABSTRACT

In the present work, the phytochemical composition of a stable lyophilized extract of raw sugar cane wax is described, in which the presence of palmitic and linoleic acids, among other components, stands out. The raw wax was treated in a hydromethanolic medium and sonicated between 15 and 30 kHz, for 5 periods of 1 min, to favor its dissolution. The composition of the phases was analyzed by gas chromatography-mass spectrometry (GC-MS). The results obtained show that 70% of the phytochemical components of the hydromethanolic extract of the wax were palmitic or hexadecanoic acid (24.3%); linoleic or 9,12-octadecadienoic acid (18.8%); and others.

Keywords: Pharmacological Items; Phytochemicals of the Hydromethanolic Extract; Ultrasonic Biorefining; Raw Sugar Cane Wax

Abbreviations: GC-MS: Gas Chromatography-Mass Spectrometry; FAMES: Fatty Acids and their Esters; PEI: Post-Graduation Program in Industrial Engineering; DAFE: Department of Agricultural and Forestry Engineering; UVA: University of Valladolid; TECLIM: Clean Technologies Network; UFSB: Federal University of Southern Bahia

Introduction

Sugarcane wax, also called raw wax, has a complex composition, where both saturated and unsaturated fatty acids, high-molecular-weight fatty alcohols, aldehydes, sterols, and esters predominate as main components, so the refining process is directly associated with the use to which the extracted fraction will be directed. Several methods have been tested and used in industry for sugarcane wax

extraction and fractionation. Solvent extraction methods are the most extended, although different alternatives of this method are usually used, as accelerated solvent extraction and supercritical extraction with CO₂ [1]. Sonic extraction method is recently extended in many processes for natural products obtaining (Table 1). The objective of this work is to characterize the hydroalcoholic sugarcane extract with the aid of the Sonic method in order to recommend possible uses for this fraction [2].

Table 1: Composition of main products obtained.

Bioproducts	%
Palmitic or Hexadecanoic acid	24,3
Linoleic or 9,12-octadecadienoic acid	18,8
Oleic acid	6,6
Glycerin acid	6,0
2-hydroxy-1-hydroxymethylethyl	4,0
Glycerol 1-palmitate	3,2
Dodecanoic acid	2,7
Octadecanoic acid	2,4
Tetradecanoic acid	1,2
Pentadecanoic acid	1,0

Materials and Methods

Materials

Raw Cuban sugarcane wax was used for the research.

Characteristics

There is presence of palmitic and linoleic acids between other components.

Methods

The raw wax was treated in a hydromethanolic medium and sonicated between 15 and 30 kHz, for 5 periods of 1 min, to favor its dissolution. The resulting dispersion was greenish to brown in color and the precipitate, after settling, abundant (Figure 1a). The solution was separated by decantation, and the upper phase was subjected to freezing and lyophilization. The composition of the phase was analyzed by gas chromatography-mass spectrometry (GC-MS) [3].

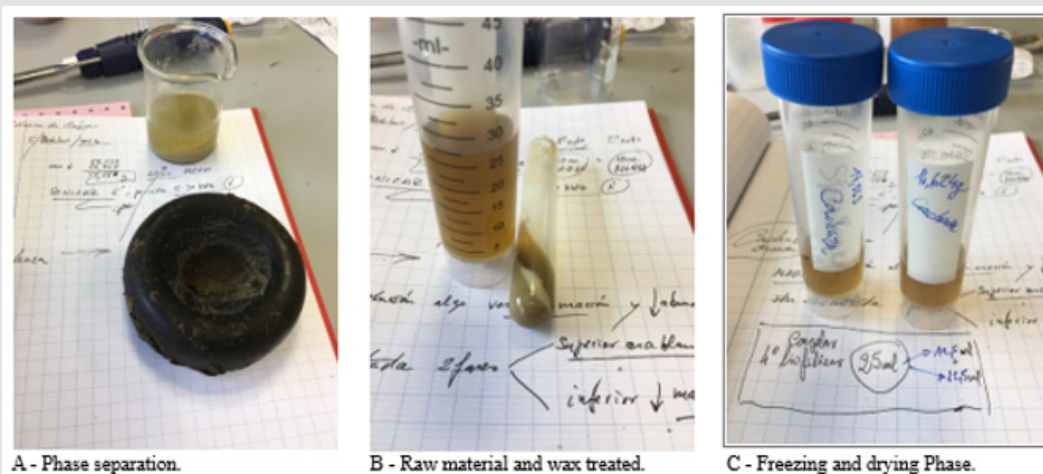


Figure 1: Samples obtained in the different steps.

Discussion

The results obtained show that 70% of the phytochemicals of the hydromethanolic extract of the wax were palmitic or hexadecanoic acid (24.3%); linoleic or 9,12-octadecadienoic acid (18.8%); oleic acid (6.6%); glycerin (6.0%); 2-hydroxy-1-(hydroxymethyl)ethyl (4.0%); glycerol 1-palmitate (3.2%); dodecanoic acid (2.7%); octadecanoic acid (2.4%); tetradecanoic acid (1.2%) and pentadecanoic acid (1.0%) (Figure 1b). The high percentage of fatty acids and their esters

(FAMES) in the lyophilized hydromethanolic extract of Cuban wax allows us to consider this product as a bio-fuel, although in the particular case of linoleic acid, its applications extend to the creation of products cleaning, chemical and pharmacological items (Figure 1c). Regarding the two main components, palmitic and linoleic acid, today their mixtures are being marketed as an adjuvant for herbicides, fungicides, acaricides and insecticides for foliar application of fruit trees and hydroponic crops [4] (Figure 2).

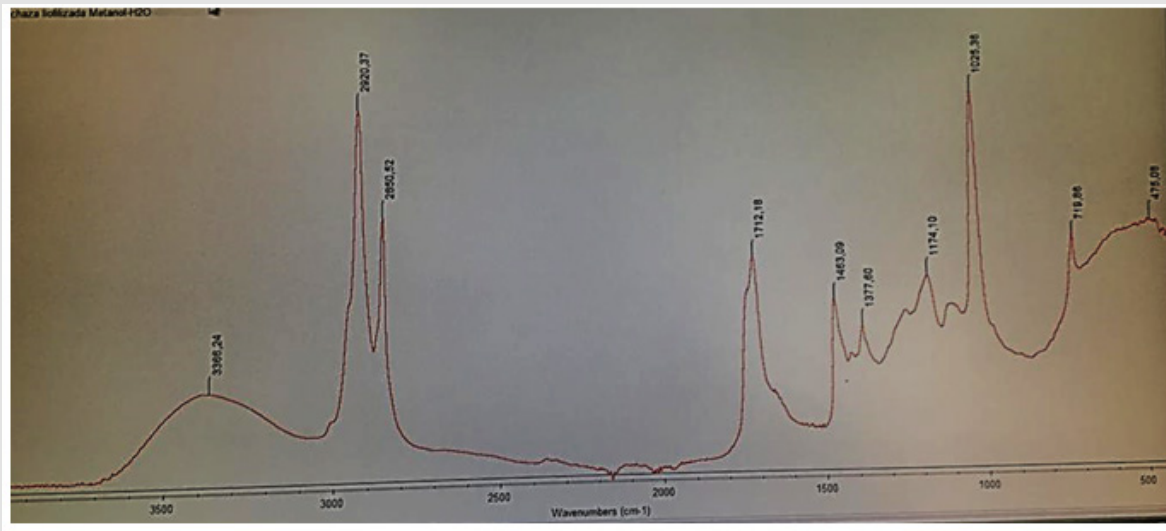


Figure 2: ATR-FTIR spectrum of the hydro methanolic extract of Cuban wax showing the characteristic absorption bands of their composition (palmitic and linoleic acids).

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Rilton Gonçalves Bonfim Primo. *Biomed J Sci & Tech Res*



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