Área: ORG

Chemical characterization of oil and ester from *Chrysophyllum arenarium* (Castanha Careta) for biodiesel production

Brenda Rafaela Berto de Santana (PG)[1,2], Danielle Cristina da Cruz do Nascimento (PG)[1,2], Gabriel Sampaio Fonseca (IC)[1], Francielly Julião da Silva (PG)[1], Julia Bortolusso Sampaio (PG)[1,2], Caroline Bersi dos Santos (PG)[1,2], Euclésio Simionatto (PQ)[1,2]

brendasantana678@gmail.com

[1]Laboratório de Pesquisa com Óleos e Extratos – LAPOEX, Universidade Estadual de Mato Grosso do Sul (UEMS), Unidade Universitária de Naviraí.
[2]Programa de Pós Graduação em Recursos Naturais – PGRN, Universidade Estadual de Mato Grosso do Sul (UEMS), Unidade Universitária de Dourados.

Palavras Chave: *Olechemistry, Biofuel, Oilseed, Sustainability.*

Highlights

The methyl ester of *Chrysophyllum arenarium* has a fatty acid profile suitable for a sustainable biofuel.

Abstract

This research project focuses on the chemical characterization of the oil and ester obtained from the Brazilian native species *Chrysophyllum arenarium*, known as "castanha careta". The main objective is to investigate the potential of these materials as an alternative and sustainable source for the production of biofuels, promoting technological innovation and reducing pressure on food crops. The oil was extracted from the *C. arenarium* seeds using a Soxhlet apparatus. After extraction, the oil was subjected to a homogeneous alkaline transesterification reaction to obtain the methyl ester. The oil yield from *C. arenarium* was 40%, a high result compared to oilseeds already used for industrial purposes, such as soybean (20%) and cotton (15%). To characterize the oil and ester, several analytical techniques were used: Gas Chromatography and Mass Spectrometry (GC-DIC/MS): The analysis of the *C. arenarium* methyl ester revealed that the sample is a mixture of different fatty acid esters, with the confirmed presence of three major components: methyl palmitate, methyl linoleate, and methyl oleate. The chromatographic profile indicated that the oil is predominantly composed of unsaturated fatty acids. Fourier Transform Infrared Spectroscopy (FTIR): The oil and ester spectra showed an intense absorption band at approximately 1745 cm^{-1}, confirming the presence of the carbonyl group (C=O) of esters. The absence of a prominent band in the region of 3300 – 3600 cm^{-1} (-OH bonds) in the methyl ester confirmed that the conversion was effective, without a significant presence of glycerol or free fatty acids. Nuclear Magnetic Resonance (NMR): the ^{1}H e ^{13}C NMR analyses confirmed the molecular structures of the samples. In the spectrum of the oil, peaks corresponding to the glycerol backbone protons were identified. In the ester spectrum, the absence of these signals and the appearance of a new single signal at δ≈3.67 ppm, attributed to the methyl group ($-OCH_3$), confirm the success of the transesterification reaction. The combination of Carbon-13 NMR and DEPT-135 analyses validated the structure of the methyl ester and the composition of saturated and unsaturated fatty acids. The analysis of the results from chromatography, mass spectrometry, FTIR, and proton and carbon NMR demonstrated, conclusively, that *Chrysophyllum arenarium* has a suitable fatty acid profile and a promising oil yield for the production of biodiesel.

Acknowledgments

LAPOEX, PGRN, UEMS, CAPES and FUNDECT.