Sociedade Brasileira de Química (SBQ)

PHYSICOCHEMICAL CHARACTERIZATION OF OZONATED SUNFLOWER OIL OBTAINED BY DIFFERENT PROCEDURES

Maritza F. Díaz[*1] (PQ), Dayana Gil[1] (PG), Bárbara Manet[1](TC), Magali Gómez[1] (PG), Eliane T. Sousa[2] (TC), Márcia C. da C. Veloso[5] (PQ), Pedro A. de P. Pereira[2](PQ), Solange Pizzolatto[4] (PQ), Antonio S. Mangrich[4] (PQ), Ângelo C. Pinto[3] (PQ), Jailson B. de Andrade[2] (PQ) [*]maritza.diaz@cnic.edu.cu

[1]Ozone Research Center, Havana,Cuba. [2] Instituto de Química - Universidade Federal da Bahia, [3]Instituto de Química - Universidade Federal do Rio de Janeiro, [4] Instituto de Química - Universidade Federal do Paraná, [5] Centro Federal de Educação Tecnológica da Bahia, CEFET-BA.

Palavras Chave: *sunflower oil, ozonolysis, biological activity*

Introdução

The characterization of vegetable oils has been subject of academic study and commercial interest for many years. The vegetable oils show a wide variety in fatty acids composition, which is associated with characteristics and properties of the oils[1]. The reaction of ozone with vegetable oil occurs with the carbon-carbon double bonds present in unsaturated fatty acids[1]. This reaction produces several products such as hydroperoxides, peroxides and aldehydes, which could be responsible for the wide biological activity of ozonized vegetable oils[2]. The yield of oxygenated compounds from unsaturated oils depends on reaction conditions, as the reaction temperature, the applied ozone doses, etc. In this work, sunflower oil, which average composition is rich in linoleic (48-74%) and oleic acids (14-39%), was ozonized at different ozone dosages and reaction conditions. Their physicochemical properties and antimicrobial activity were then determined.

Resultados e Discussão

The ozone was generated by passing oxygen or air through an ozonator OZONECIC-60g at a fixed voltage (150V) and a constant flow rate of 2.5m^3/h. The O_3 initial concentrations were determined by an Anseros Ozomat equipment (Germany). Edible sunflower oil (10 L) was introduced into a stainless steel reactor where the reaction took place at 25^{0}C. The ozone dosages applied (air: 5.7; 11.4; 17.1; 22.8 mg/g; O_2: 4.9; 9.8; 14.7; 19.6; 24.4 mg/g) were obtained, respectively, through different bubbling times (air: 2, 4, 6, 8 h ; O_2: 1, 2, 3, 4, 5 h)

During the ozonation, it was observed an increase of the peroxide values, determined by iodometric assay (BP 2000 Apendix XF,IA,IB), along with a decrease in the iodine values (BP 2000 Apendix XE, IA, IB).

The reaction products were identified using ^{1}H Nuclear Magnetic Ressonance, NMR (AVANCE 400 MHz, Bruker, $CDCl_3$ as a solvent and TMS as a external reference). The intensities of olefinic proton signals decreased with the gradual increase in O_3 concentration applied, although without a complete disappearing. The aldehyde protons were observed as a weak intensity signal in all the spectra. The signals belonging to olefinic protons from hydroperoxides presented a small increase with the increase in O_3 dosages. The ozonation effects on the fatty acids composition of these samples were analyzed using gas chromatograph – mass spectrometer system, model GCMS-QP2010 with autosampler AOC-20i (Shimadzu, Japan), a GC column Elite5MS (30 m x 0.25 mm dia. x 0.25 µm film thickness), showing a gradual decrease in the unsaturated fatty acids (C18:1, C18:2) with the gradual increase in the ozone dosages. The technique of Electron Paramagnetic Ressonance at liquid nitrogen temperature (77 K) in the Bruker ESP 300E EPR spectrometer, having a modulation of 100 kHz and operating at X-band frequency (9.5 GHz) was used to measure the free radicals, with the intensity values of the principal signals used for monitoring the reaction development between ozone and sunflower oil.

The antimicrobial activities were determined in three bacterial strains: *Staphylococcus aureus ATCC 25923; Pseudomonas aeruginosas ATCC 27853* and *Escherichia coli ATCC 25922*. The highest spectrum of antimicrobial activity was obtained with the sample presenting the highest peroxide index.

Conclusões

In the ozonation of sunflower oil, the final conditions were attained more quickly when oxygen was used as the ozone source, thus presenting an advantage over the air. The samples of ozonized oil didn't present free radicals, which is a very important issue if these oils will be used as drugs. It was concluded that as highest the applied ozone dosages, the highest the potential antimicrobial activity of the ozonized sunflower oil.

Agradecimentos

CNPq, CITMA (Cuba), FAPESB, FINEP, PRONEX, ANEEL, RECOMBIO.

[1] Bailey, P.; Ozonolysis of Olefins Academic Press: New York,. **1978**.

[2] Diaz, M.; Hernandez, R.; Martinez, G.; Gómez, M; Vidal, G.; Fernandez, H.; Garcés, R.. *J. Braz. Chem. Soc.*. **2006**, *17*, 403.

.