Study of Physical-chemical Properties of Different Palm Oil Varietals using GC-FID and NMR to Evaluate the Impact in Food and Biofuel Industries

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Palm oil, extracted from the fruits of the Guinean Elaeis, is the most produced and used vegetable oil in the world with applications mainly in the food and biofuels industry and it is the main source of solid vegetable fat after trans-fat banishment. Several varieties of palm are developed in Latin America to improve productivity and adapt to resist some diseases like lethal yellowing (LY), disease that is vanishing regular palm in Latin America. However, these varietals of palm produce fruit with variety and oil with different fatty acid compositions and physicochemical properties, which implies in challenges for extraction, esterification, refinery, fractioning, and final product production like chocolates, margarine etc.

The objective of this work was to evaluate palm oil from different varieties cultivated in Brazil using NMR and GC-FID in a way to understand the impact of the new species in the industry and develop fast and low-cost methods for quality and process control. The major identified and quantified fatty acids using the GC-FID were palmitic acid (28.7% - 46.8%), stearic acid (1.8 - 5.5%), oleic acid (35.0 - 56.4%), and linoleic acid (8.9 - 14.3%). The considerable variation in the fatty acid content results in a large variability in the iodine value (52.7 – 76.1 g I2 100g-1) and different SFC curves, impacting directly the products from these oils. The results show the importance of characterizing the palm oil before the esterification and fractioning reaction due to the higher variability of fatty acid composition. The TD-NMR could predict some characteristics of palm oil and can be used as a low-cost, less time-consuming, and no-reagents methodology to analyze palm oil, which is essential for process and quality control.

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