Influence of the Addition of Sucrose Behenate on the Crystallization Behavior and Microstructure of Palm Oil

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The crystallization behavior of palm oil is extremely important from a commercial standpoint. However, crystallization of the palm oil is a slow process, which is an inappropriate factor from the industrial perspective. This crystallization behavior is related to diacylglycerols (DAGs) naturally present in palm oil and its fractions. DAGs have detrimental effects on the crystallization of palm oil, associated to the low rate of nucleation of triacylglycerols (TAGs) in the presence of these compounds. In addition, stability of palm oil is compromised due to the undesirable growth of the crystals size. In attempt to propose effective solutions to these problems, recent research uses emulsifiers as potential modifiers or controllers of crystallization properties of oils and fats. Accordingly, this paper aims to study the influence of the addition of sucrose behenate on the crystallization behavior and microstructural development of palm oil with high concentrations of DAGs. For this purpose, sucrose behenate was added to palm oil in concentrations of 1%, 3% and 5% (w/w), and polarized light microscopy analysis of crystal lattice was performed. The prepared glass slides were conditioned at 20°C for 120 minutes and visualized by employing an Olympus microscope. The generated images were analyzed by using Image-Pro Plus software version 7.0, where the number of crystals, the mean diameter and the percentage of crystallized area were determined. The fractal dimension of samples was computed by means of box counting method by using MatLab software. To correlate the data was also considered the solid fat content (SFC) and crystallization isotherms at 20°C obtained by N MR to characterize the solid profiles and the crystallization kinetics. The results obtained show that the addition of sucrose behenate modifies crystal lattice of palm oil. The mean diameter of samples was of 11.06, 13.90, 12.32 e 11.74 μm for pure palm oil and sucrose behenate concentrations of 1%, 3% and 5%, respectively. Similarly that SFC, percentage of crystallized area increases with the sucrose behenate concentrations. The computed fractal dimension was 1.95±0.004 for pure palm oil and 1.98±0.003, 1.98±0.003 and 1.99±0.014 for the sucrose behenate concentrations of 1%, 3% and 5%, respectively. Changes were observed in the crystallization kinetics. The constant (k) and Avrami exponent (n) showed that addition of sucrose behenate accelerates the crystallization process by altering the crystal lattice surface and the nucleation mechanism. All results showed a good linear correlation.