

Effect of Temperature on Optical Properties of Vegetable Oils Using UV-Vis and Laser Fluorescence Spectroscopy

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Abstract

UV-Vis absorption and fluorescence spectroscopy are used to test the quality and changes in the composition of extra virgin olive oil (EVOO) and canola oil (CO) with temperature. The increase of temperature caused a change in the molecular structures of both types of oils seen as a gradual decrease of intensity amplitudes of absorption and fluorescence signals. A significant alteration occurred at $\approx 200^\circ\text{C}$ where almost the main spectra of pheophytin-a, b, carotenoids, lutein and vitamin E in EVOO and linoleic acid and oleic acid in CO disappeared. An independent experiment showed the output of laser changes linearly with the input in oil at constant temperature (*i.e.*, room temperature) where the transmission values of $\approx 33\%$ and $\approx 75\%$ are determined for EVOO and CO respectively. However, the transmission through a heated oil exhibited a non-linear behaviour which indicates the molecular optical response to thermal changes. The effect of storage time and adulteration of oils were also evaluated.

Keywords

Extra Virgin Oil, Canola, Temperature, Optical Properties, UV-Vis Absorption, Fluorescence Spectroscopy, Laser

1. Introduction

There is a wide range of vegetable oils which are used for variety of daily applications such as cooking, cosmetics and pharmaceuticals. For example, olive and canola oils are considered mostly monounsaturated fat, while corn and soybean oils contain mainly polyunsaturated fat (*i.e.*, more than one double bond) and