Characterization of natural hepatoprotectors and added foods by photoacoustic spectroscopy and colorimetry

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The pandemic and crisis of metabolic diseases necessitates the development and consumption of foods with a higher nutrient content that have a better impact in the quality health. The improvement of mixtures daily foods by adding nutraceutical materials by bioactive substances has a favorable effect on products and consumers [1-2]. This kind of materials and mixtures is possible to characterize them by photothermal techniques using some of distinct configurations like photoacoustic spectroscopy (PAS) open cell (OC) and closed cell, photoacoustic microscopy (PAM) and photopyroelectric (PPE), etc. Through use of these techniques diversity thermal and optical parameters have been obtained such as the optical absorption coefficient (β), the diffusivity, effusivity and thermal images [3-5]. Also, using the colorimetric techniques in the materials in the variables (CIEL*a*b*) can be used for the analysis of foods. In the present study were characterized optically by PAS and colorimetry the natural hepatoprotective food and with the mixtures of commercial cornmeal were made tortillas adding 2, 4,6 and 8% of black radish powder. The PA spectra of the natural hepatoprotectors and the tortillas were obtained to analyze their differences. In the Figure 1 showed spectra PA of natural hepatoprotectors, it can be observed that the behavior of the FA signal in the range of 250 to 400 nm has the maximum signal amplitude on the study samples. The PAS technique and colometry permit the study of naturals hepatoprotectors and blends of cornmeal added with black radish.

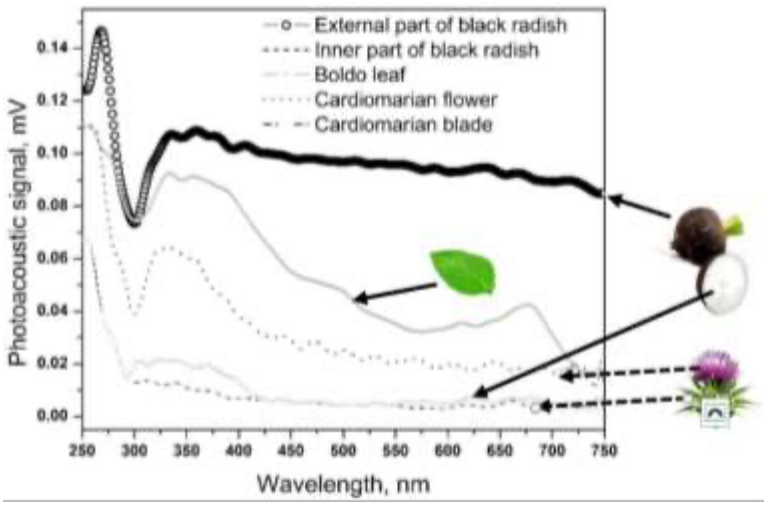

Fig 1. Photoacoustic spectra of black radish, Silybum marianum and boldo (Peumus boldus).

References

[1] C. Hernandez-Aguilar, A. Dominguez-Pacheco, C. Valderrama-Bravo, A. Cruz-Orea, E. Martínez Ortiz, J. Ordonez-Miranda, Photoacoustic spectroscopy in the characterization of bread with turmeric addition. Food Bioproc. Tech. 13 (2020) 2104-2119.

[2] C. Hernandez-Aguilar, A. Dominguez-Pacheco, M. Palma Tenango, C. Valderrama-Bravo, M. Soto Hernández, A. Cruz-Orea, J. Ordonez-Miranda, Lentil sprouts: a nutraceutical alternative for the elaboration of bread. J. Food Sci. Technol., 57 (2020) 1817-1829.

[3] M. Kovács, O. Dóka, D. Bicanic, Z. Ajtony, Application of laser-based photoacoustic spectroscopy and colorimetry for quantification of anthocyanin in hard boiled candy. Microchem. J. 135 (2017) 100-104.

[4] P. Tavakolian, A. Mandelis, Perspective: Principles and specifications of photothermal imaging methodologies and their applications to non-invasive biomedical and non-destructive materials imaging. Int. J. Appl. Phys. 124 (2018) 160903.

[5] O. Delgado-Vasallo, A.C. Valdes, E. Marin, J.A.P. Lima, M.G. Da Silva, M. Sthel, H. Vargas, S.L. Cardoso, Optical and thermal properties of liquids measured by means of an open photoacoustic cell. Meas. Sci. Technol.11 (2000) 412.

[6] E. Cuevas, D. Zaldivar, M. Perez, procesamiento digital de imágenes usando Matlab & Simulink. Alfaomega, 479 (2010).

[7] H. Lawless, H. Heymann, Color and Appearance. In: Sensory Evaluation of Food. Food Science Text Series. Springer, New York, NY. (2010) 295-297.