UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales

DEVELOPMENT AND THERMOCHEMICAL CHARACTERIZATION OF AN ANTIOXIDANT MATERIAL BASED ON POLYHYDROXYBUTYRATE ELECTROSPUN MICROFIBERS

DOCTORAL THESIS IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF SCIENCES IN NATURAL RESOURCES

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“Development and thermochemical characterization of an antioxidant material based on polyhydroxybutyrate electrospun microfibers”

Esta tesis fue realizada bajo la supervisión del director de tesis, Dr. Rodrigo Navia del Departamento de Agroindustria de la Universidad de la Frontera y ha sido aprobada por los miembros de la comisión examinadora.

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Thesis summary

The use of electrospun polyhydroxybutyrate (PHB) fibers is presented as an appropriate option to encapsulate curcumin and quercetin. The electrospun fibers were obtained by dissolving PHB and adding two different concentrations of curcumin or quercetin. The obtained fibers were characterized by scanning electron microscopy (SEM), thermogravimetric analysis (TGA), and infrared spectroscopy (FT-IR). Curcumin and quercetin release profiles were measured by spectrophotometry. Antioxidant activities were determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. The fibers obtained with different formulations presented a chemical composition in agreement with that of PHB according to the FTIR spectrum, the diameters fluctuated between 0.761 and 1.803 μm, presenting a good morphological quality. The melting temperature was close to 178°C in correspondence with the literature. The crystallinity of the fibers decreased when including and increasing the concentration of curcumin or quercetin in the studied range. The antioxidant activity of curcumin was maintained after being encapsulated in PHB fibers while that of quercetin decreased after being released from the fibers. The proposed material is suitable to be used in biotechnological applications considering to perform biological analysis and release studies in other media.