



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



CHARACTERIZATION OF LOW UVT LIQUID FOODS AND INGREDIENTS FOR ULTRAVIOLET PRESERVATION

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CSBE100748 – Presented at Section VI: Postharvest Technology, Food and Process Engineering Conference

ABSTRACT Ultraviolet (UV) processing holds promise as a low cost non-thermal alternative to heat pasteurization of liquid foods, drinks and ingredients. The application of UV technology for foods is still limited due to their low UV transmittance (UVT). In addition, low UVT foods have a diverse range of chemical (pH, Brix, Aw), physical and optical properties that are critical for optimal systems and process design. Food optics is the major impact on UV transmission and consequently microbial inactivation. Physical properties (viscosity, density) influence momentum transfer and flow pattern in the reactor. This paper aims to discuss properties of selected fresh juices, milk and protein ingredients that are critical for the design of a UV pasteurization process. Differences in regulatory pasteurization requirements will be presented. Three approaches including dilutions in standard cuvettes, micro-path cuvettes and integrated sphere (IS) were evaluated. The absorbance spectrums in UVC range of 200-400 nm, absorbance at 254 nm were measured and absorption coefficients (α_{10}) were determined. Tested juices (apple, carrot and orange), milk and liquid whey proteins represented different groups of UVT, pH, Brix and viscosities. For example, apple juices belong to the group of high acid semi-transparent UVT. The apparent α_{10} of four brands of apple juice varied from 39.1 cm⁻¹ to 7.1 cm⁻¹ and correlation with vitamin C was observed. Carrot juice and milk were close to opaque low acid liquids. The observed differences showed the importance of full characterization of low UVT foods to design model liquids, preservation process and as input data for modelling UV process using CFD.

Keywords: low UV transmittance, liquid foods and ingredients, optics