Title Characterization of High-Hydrostatic-Pressure Effects on Fresh Produce Using Chlorophyll Fluorescence Image Analysis

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Abstract

High hydrostatic pressure has the potential to affect food-related enzymes and microorganisms while retaining the produce's characteristic properties. Although many studies on effects of high pressure on quality attributes of fruit and vegetables have been published, experimental results on the impact of high-pressure treatment on the physiological activity of products are rare. To characterize changes of the samples fast and noninvasive methods as well as a sensitive biological model system are required for this purpose. In this study, fresh lamb's lettuce (*Valerianella olitoria* Poll.) was used as a model produce. For each treatment, two leaves were carefully inserted to small plastic pouches, sealed and then subjected to pressure (up to 7.5 min at 200 MPa) or thermal treatment (up to 1 min at 50°C). Chlorophyll fluorescence imaging was applied to measure the local and temporal dynamics of the physiological postprocessing effects. Measurements of the maximum photochemical efficiency F_v/F_m allows the immediate evaluation of photosynthetic activity as an indicator for cell and tissue vitality. Thermal treatment at pressure below 125 MPa and temperatures lower than 45°C showed minor fully reversible effects but a pronounced decline in the maximum photochemical efficiency was obtained after pressure treatment of 150 MPa and temperatures of 45°C or higher values. These changes were irreversible within 24 h of recovery time. Above these thresholds, high pressure and heat treatment may not be applicable for mild processing of highly perishable fresh produce. Chlorophyll fluorescence analysis has been proven to be a valuable tool for the rapid and comprehensive evaluation of postharvest processing of green perishables.