Title Intense light pulses decontamination of minimally processed vegetables and their shelf-life

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Abstract

Intense light pulses (ILP) is a new method intended for decontamination of food surfaces by killing microorganisms using short time high frequency pulses of an intense broad spectrum, rich in UV-C light. This work studied in a first step the effect of food components on the killing efficiency of ILP. In a second step, the decontamination of eight minimally processed (MP) vegetables by ILP was evaluated, and thirdly, the effect of this treatment on the shelf-life of MP cabbage and lettuce stored at 7 °C in equilibrium modified atmosphere packages was assessed by monitoring headspace gas concentrations, microbial populations and sensory attributes. Proteins and oil decreased the decontamination effect of ILP, whilst carbohydrates and water showed variable results depending on the microorganism. For this reason, high protein and fat containing food products have little potential to be efficiently treated by ILP. Vegetables, on the other hand, do not contain high concentrations of both compounds and could therefore be suitable for ILP treatment. For the eight tested MP vegetables, log reductions up to 2.04 were achieved on aerobic mesophilic counts. For the shelf-life studies, respiration rates at 3% O_2 and 7 °C were 14.63, 17.89, 9.17 and 16.83 ml O_2/h kg produce for control and treated cabbage, and control and treated lettuce respectively; used packaging configurations prevented anoxic conditions during the storage times. Log reductions of 0.54 and 0.46 for aerobic psychrothrophic count (APC) were achieved after flashing MP cabbage and lettuce respectively. APC of treated cabbage became equal than that from control at day 2, and higher at day 7, when the tolerance limit (8 log) was reached and the panel detected the presence of unacceptable levels of off-odours. Control never reached 8 log in APC and were sensory acceptable until the end of the experiment (9 days). In MP lettuce, APC of controls reached rejectable levels at day 2, whilst that of treated samples did after 3 days. Both samples were sensory unacceptable at day 3, controls because of bad overall visual quality (OVQ), off-odour and leaf edge browning and treated samples due to bad OVQ; browning inhibitors might be proposed to preserve OVQ. Yeasts and lactic acid bacteria counts were low in all the samples. It seems that ILP treatment alone under the conditions used in this work does not increase MP vegetables shelf-life in spite of the reduction in the initial microbial load.