

Abstract

This work presents a new methodology for increasing shelf-life of packaged fresh produce. The methodology consists in storing the packaged products in a water solution whose specific heat, thermal conductivity, density, and viscosity make it a good medium for temperature control. This hypothesis was evaluated using identical volumes (55.3 liters) to compare the traditional air-cooled method and the hydro-conservation tank. For both methods (air-cooled chamber and hydro-conservation tank), we determined the highest temperature variations at a selected point (FT), the highest temperature difference between eight points in the chamber (TD), occupation-rate effect on TD, heating and cooling rate, and external perturbation effects. Hydro-conservation methodology allows choosing a setting temperature much closer to the freezing-point value, thus reducing metabolism and increasing fresh-produce shelf life. Results show that hydro-conservation allows storage at close to 0.4 °C above the freezing point, while a conventional chamber requires at least 2.0° C. Besides, this new methodology saves energy at set point temperature value, is very resistant to external perturbations, and has a slow heating rate, which is very useful when the refrigerating system fails or is disconnected for some hours or in cases where the electric energy supply is not constant. An occupation rate of up to 12.5% does not affect the TD_{max} value.