Title Modeling the forced-air cooling process of fresh strawberry packages, Part I: Numerical model

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Abstract

A numerical analysis of the forced-air cooling process of retail packages of strawberries was performed by solving the conservation equations of mass, momentum and energy within the system. The results showed that the heterogeneity of the cooling process is largely influenced by the structure and design of the packaging system (individual clamshell packages and trays). On average 75 ± 2% of the total airflow forced through the system bypassed the clamshells, and 46 ± 5% of the flow rate forced through clamshells bypassed the strawberries. After 1 h of cooling, the average-fruit-temperature per clamshell ranged from 2.4 °C to 8.3 °C between the first and last clamshells along the main flow direction. Within these clamshells, the maximum differences in the volume-average temperature of individual fruits reached 3.5 °C and 5.1 °C, respectively. The results show the potential use of this numerical approach as a design tool to optimize the forced-air cooling process of horticultural products.