

Abstract

Non-uniform heating of fresh fruit caused by variations in radio frequency (RF) fields is a major obstacle in developing postharvest insect control treatments based on RF energy. A fruit mover was developed to evaluate possibilities to improve RF heating uniformity of large fruit, such as oranges and apples, in a 12 kW batch type RF system. This fruit mover provided a means to rotate and move fruit in water when subjected to RF heating. Parameters for moving and rotating fruit in the mover were selected based on consideration of vortex formation, foaming, damage to the fruit, and volume occupied by the fruit in water. RF heating uniformity of oranges and apples in the mover was assessed using an infrared imaging technique and direct temperature measurement with fiber-optic sensors and thermocouples. The results showed that, with rotation and movement of fruit, temperature uniformity in oranges and apples was significantly improved with less than 2.8 and 3.1 °C standard deviations, respectively, after an average temperature rise of about 30 °C in 7.8 min. The fruit mover can be used to develop a treatment protocol for disinfecting fresh fruit and to simulate industrial scale and continuous treatment systems.