

**Title** Industrial-scale radio frequency treatments for insect control in walnuts  
II: Insect mortality and product quality

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#### **Abstract**

This paper reports on the second part of a scaling-up study investigating the technical feasibility of using radio frequency (RF) energy in commercial postharvest insect control in in-shell walnuts as an alternative to chemical fumigation. A large-scale treatment for conveyORIZED walnuts was designed based on a 25 kW, 27 MHz RF system to achieve an average walnut surface temperature of 60 °C, and minimum temperature of 52 °C, for 5 min. The treatment caused 100% mortality of fifth-instar navel orangeworm larvae, the most heat tolerant target pest, in both unwashed and air-dried walnuts, and was effective over a relatively wide range of walnut moisture contents (3–7.5%). Walnut quality was not affected by the RF treatments; kernel color, peroxide values and fatty acid values of treated walnuts were similar to untreated controls after 20 days at 35 °C simulating 2 years of storage under commercial conditions at 4 °C. The RF treatment slightly reduced the moisture content of the walnuts, especially the shells. The RF treatment developed in this study should also control codling moth, Indianmeal moth and red flour beetle in in-shell walnuts. This treatment will provide an effective and environmentally friendly phytosanitary treatment technology for the walnut industry.