Title Effect of postharvest silicon application on 'Hass' avocado fruit physiology

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Citation ISHS Acta Horticulturae 911:565-571.2011.

Keywords avocado (*Persea Americana* Mill.); silicon; firmness; carbon dioxide; ethylene

Abstract

Avocado fruit are prone to post-harvest pathological and physiological disorders such as anthracnose and mesocarp discolouration. Silicon has been used to minimize the adverse effects of biotic and abiotic stress on fruit quality. This study investigated the effect of silicon application on fruit firmness, carbon dioxide (CO_2) production and ethylene evolution of 'Hass' avocado fruit. Four different sources of silicon (potassium silicate (KSil), Nontox-Silica® (NTS), calcium silicate (Ca_2SiO_4) and sodium metasilicate pentahydrate ($SiO_3Na_2.5H_2O$)) were used as postharvest applications. Fruit were dipped into the Si sources at 80 to 1470 ppm Si and subsequently stored at either -0.5, 1, 5°C or 25°C (room temperature). Firmness, CO_2 and ethylene measurements were taken every two days as the fruits ripened. Fruit stored at 5°C were firmer than fruit stored at other temperatures. With respect to net CO_2 production, there were significant differences in temperature means. Fruit stored at -0.5°C produced the highest amount of CO_2 whereas fruit stored at 5°C produced the lowest. There were no significant differences between the treatment means. Results of ethylene evolution showed significant differences between temperature means but no differences between treatment means. Further ultra-structural analysis (EDAX) was conducted to determine the extent of Si infiltration within each treatment. Silicon passed through the exocarp into the mesocarp tissue in fruits treated with high concentrations of silicon, i.e., KSil 1470 ppm. Fruit dipped into dilute Si solutions (80 and 160 ppm) showed Si presence in the exocarp and infiltration of small amounts of Si into the mesocarp. Treatments with NTS showed the lowest Si infiltration. Postharvest application of 1470 ppm Si in the form of KSil seems to be most beneficial, probably as respiration was most suppressed in the KSil 1470 ppm at 5°C treatment.