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Effects of ascorbic acid and light on reactions in fresh-cut apples by microcalorimetry

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Abstract:

During the manufacturing of fresh-cut apples, a number of biochemical events, overall exothermic, contribute to increasing the reaction rate of the fruit and the browning of its wounded surface. This work applied isothermal microcalorimetry to compare the overall effect of such complex events before and after treatments with ascorbic acid solutions, pulsed lights or UV-C lights. Briefly, apple samples were cut into cylinders and dipped in solutions containing ascorbic acid (0 – 2.5 %) or exposed to high energy doses of light (from 6 to 175 kJ/m^2). In general, the heat-flow signal recorded by microcalorimetry was inversely proportional to the intensity of the applied treatment. In case of treatments with ascorbic acid, the heat-flow signal was empirically deconvoluted in three distinctive signals, respectively, (I) and exponential decay, (II) a Gaussian central curve and (III) a final logistical function. The first and the third functions were constant regardless of the concentration of ascorbic acid used. Only the second Gaussian function was correlated with the concentration of ascorbic acid and the area was used to evaluate the efficacy of the process. Overall, this work contributes to the understanding of the heat produced by fruit after wounding and, from a practical standpoint, can help compare the effects of different treatments on fresh cut fruits.

Keywords: microcalorimetry, fresh-cut fruit, ascorbic acid, UV-C light, pulsed light