**Structural changes of fresh-cut apples subjected to mild vacuum impregnation**

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Application of vacuum impregnation (VI) in a food porous matrix can induce cellular changes as well as modification of the internal structure of tissue and consequently its mechanical properties. Processing conditions should be adequate to avoid undesirable alterations. The aim of this work was to determine the optimum vacuum (tv) and relaxation (tr) times, necessary to minimize changes on attributes related to the sensory quality of vacuum impregnates apples. Fresh-cut apples were subjected to mild vacuum impregnation (vacuum pressure= 67.7 mbar) through the response surface methodology using a central composite design with tv= 1.14-14 min and tv= 1.14-14 min. The osmotic solution was a 30°Brix honey solution with the addition of 0,5% of ascorbic acid and 0,5% of citric acid. Changes in firmness (F) and microstructure were evaluated on day 0 and after 7 d of storage at 1.5 °C. The F was expressed as the relative percentage variation (∆%i), with respect to fresh-cut fruit without treatment, on the day of treatment (i=0) and after 7 d of storage at 1.5°C (i=7), the microstructural analysis was carried out by scanning electron microscopy. ∆%F0 and ∆%F7 resulted function of the process variables, major loss of firmness was reached with tv= 14 min and tr= 7,5 min (F0= -9,4% and F7= -30,4%). Taking into account both predictive models for optimization, the conditions that minimize the firmness loss were: tv (5,8 min) and tr (6,8 min). At these conditions, the predicted values for ∆%F0 and ∆%F7 were -6,9 and -22,7 % respectively. These results are in accordance with the scanning electron micrographs that were obtained. The micrographs revealed that VI treatment had a significant effect on the structural properties of the samples, and the organization and size of the cells changed. On day 0, treated fresh-cut apple cells sizes were greater than fresh fruit, this behavior can be attributed to OS concentration that allowed water loss and solid gain in apple tissues. The water loss from the cells would cause the cells to shrink and induced enlargement of the intercellular spaces; besides, treated samples had thinner cell walls than fresh tissue. After storage time, VI fruit presented dehydrated cells and broken cell walls and distorted cellular spaces, these observations agreed with a major loss of firmness at day 7 due to microstructural alteration.

Key words: firmness, structural propierties, , vacuum time, relaxation time