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Flavonoid enrichment of fresh-cut apple through osmotic dehydration

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The demand for healthier food products has been increasing recently and the popularity of functional foods is gaining much interest among consumers. Flavonoids, such as quercetin and fisetin, are bioactive compounds that provide numerous health benefits, such as antioxidant and senolytic activity [1]. Low-calorie sugars may be used as an alternative to sucrose in order to reduce the risk of chronic diseases [2]. The objective of this study was to determine the feasibility of incorporating flavonoids and low-calorie sugar substitutes in fresh-cut apple via osmosis. Osmotic dehydration (OD) is a minimal processing technology that promotes mass transfer in fruits, while retaining its fresh-like sensory qualities [3].

In the present work, the osmosis-driven infusions of quercetin and fisetin into apple cubes were performed. The effects of different osmotic agents, sucrose and sorbitol and mannose, (mass ratio sample:osmotic solution of 1:4) on the OD mass transfer kinetics in apple cubes were studied at 25 °C and 40 °C for 8 hours. The colour and quercetin and fisetin contents were also analysed. Sorbitol and mannose were quantified during the OD process as well.

The results showed an increase in the kinetics of water loss (WL) and solute gain (SG) at 40 °C, as well as an increase in quercetin concentration at the end of the OD process with sucrose. However, this effect of the temperature was observed only for the SG in the OD with sorbitol-mannose. Moreover, the use of these solutes resulted in a higher WL, but a lower SG, in relation to sucrose. While samples treated at 40 °C tends to present a lower lightness (L* value) and a higher yellowness (b* value) than at 25 °C, there were no significant differences in the total colour differences (TCD) between both temperatures regardless the solute used. The use of sorbitol-mannose, on the other hand, contributed to lower decreases in lightness and higher increases in yellowness than sucrose, the latter most likely due to the solute gain, which included quercetin. There was a lower TCD in samples treated with sorbitol-mannose, which goes along with the results of the kinetics.

The results of the present work suggest that OD using alternative low-calorie and health promoting solutes is also an effective treatment to simultaneously enrich fresh-cut apple with senolytic flavonoids, resulting, therefore, in a great potential for a novel functional food.

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