

Title Effect of processing on the texture and sensory attributes of raspberry (cv. Heritage) and blackberry (cv. Thornfree)

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Abstract

The effect of pre-treatments (CaCl₂, low methoxyl pectin (LMP), and combined solutions) on objective texture parameters of fresh raspberries and blackberries, as well as the effect of freezing method and thawing mode on the same objective texture parameters and sensory attributes of both berries was studied. Following, the effect of complete freezing process combining the best pre-treatments with the best freezing/thawing conditions found for each fruit was investigated. Four instrumental tests, Kramer Shear Cell (KSC), back extrusion, compression and multiple penetration were used to measure fruit texture objectively, whereas a descriptive quantitative method was used to carry out fruit sensory analysis. For calcium and LMP pre-treatments applied separately, texture parameters were significantly higher in samples treated at the highest concentrations (100 mM of CaCl₂ for both fruits and 0.3% and 3% of LMP for raspberry and blackberry, respectively), while for the combined pre-treatments, the highest texture parameters were found in the samples treated with CaCl₂ (100 mM) and LMP (0.1%) in the case of raspberries and CaCl₂ (100 mM) and LMP (3%) in the case of blackberries, compared to fresh controls. Objective texture parameters evidenced as blackberry fruit was more susceptible than raspberry fruit to the effect of pre-treatments. The maximum force of the multiple penetration tests was the parameter that best reflects the changes occurring in the turgidity and firmness of the fruits as a result of the pre-treatments. Raspberries frozen at 3.3 °C min⁻¹ and thawed at +5 °C and blackberries frozen at 2.2 °C min⁻¹ and thawed at room temperature had higher texture parameters. For the raspberry, panellists hardly distinguished between the sensory firmness of fresh control and those of raspberries frozen and thawed under the above cited conditions, corroborating the effect positive of freezing at 3.3 °C min⁻¹ in the fruit texture. For the blackberry, panellists did not detect a significant difference between the sensory firmness of frozen/thawed fruit and those of fresh control, thus confirming that the blackberry structure is more resistant to freezing process. In both fruits, over the complete process objective texture parameters were again highest in the samples treated with 100 mM CaCl₂ (applied separately or combined with LMP), suggesting that the pre-treatment with CaCl₂ (100 mM) can be sufficient to prevent loss of firmness in frozen raspberries and blackberries. Panellists did not detect the effect of firmness caused by this pre-treatment in the frozen raspberry, but panellists scored the firmness of the samples pre-treated with CaCl₂ (100 mM) higher than those of the untreated control in the frozen blackberry. For the raspberry, none of the correlations between

objective and sensory attributes of texture was significant, whereas for the blackberry firmness presented a higher and significant correlation with compression maximum force.