

Title Changes in texture, cellular structure and cell wall composition in apple tissue as a result of freezing

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Abstract

Apple texture is one of the critical quality features for the consumer. Texture depends on several factors that are difficult to control and which change with freezing. To better understand the mechanisms involved in the texture degradation of apple tissues following freezing/thawing, our approach was to combine mechanical properties, cellular structure and cell wall composition measurements on fresh and thawed apples (Granny Smith) after three different freezing protocols (at -20 °C, -80 °C and -196 °C). This work highlighted the interest of applying macrovision and image texture analysis to quantify the freezing effects on cellular structure and ice crystal size. Freezing at -20 °C and after immersion into liquid nitrogen were the protocols affecting the most fruit texture leading to cell membrane breakage resulting in cell wall collapse and tissue breakage, respectively, which accounted for the mechanical behaviour of the samples. All freezing protocols induced vacuole burst showing that the turgor pressure preservation remains critical during the freezing process.