

Frozen strawberry quality enhancement using high hydrostatic pressure and vacuum infusion with pectin methylesterase and calcium chloride solution

Abstract.

Fresh strawberry (*Fragaria x ananassa*) is a delicious fruit that is an excellent source of micronutrients and an array of beneficial phytochemicals. Emerging technologies like high pressure freezing and thawing have gained interest recently due to their ability to preserve the structure of the food during storage, albeit the possible shortcomings of degradation of texture and sensory quality. In this study, the effects of high hydrostatic pressure freezing and thawing on the physical quality attributes (texture, drip loss and Degree of Methylation (DM)) of strawberry were investigated. Strawberry samples were infused in a vacuum using pectin methyl esterase (PME) and CaCl₂ solution at 170 hPa pressure for 5 min at room temperature to improve textural integrity; infused with distilled water; and another group of samples further incubated at 40°C for 20 min. Fresh samples and non-pretreated samples were also studied. All the samples were subjected to high pressure freezing and thawing processes at 200 MPa and the effect of the processing conditions on texture were evaluated. The high pressure processed samples were compared with conventionally frozen and thawed samples. Pectin methyl esterase, CaCl₂ infusion and incubation gave a relative hardness of 1.5 pretreatment compared to water only infused at 0.5. The CaCl₂ and PME-infused samples had a higher relative hardness after one day of storage at -18°C compared to non-pretreated and water-infused samples at 0.3 compared to 0.1, respectively. Pretreated, water-infused, and PME with CaCl₂-infused samples showed no significant difference in hardness when measured immediately after conventional thawing and high pressure induced thawing HPIT but are the former are a third less hard compared to the latter upon storage after 3 hours and three months. Galacturonic acid per mg of Alcohol insoluble residues AIR sample for the fresh strawberry was 0.002±2.699E-05 and 0.002±1.070E-05 moles for the one-day vs. three months storage, respectively, for samples conventionally frozen and thawed in duplicate experiments. Therefore, a combination of high-pressure shift freezing (HPSF) with PME and CaCl₂ infusion improved the texture of the strawberry compared to those that were not pretreated, and gained weight by 15%. The PME and CaCl₂-infused strawberry showed less degradation than the non-pretreated and water-infused during both long- and short-time frozen storage. Conventional freezing processes caused more degradation compared to HPSF. Degradation of 3 months conventional freezing was comparable to 1-day storage. For frozen storage, enzyme pretreatment combined with high pressure freezing can be used to enhance the quality of strawberry.

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