Title Textural and structural changes in potato tissue as affected by calcium impregnation at high temperature

Author M.M. Indaco, D.M. Salvatori, M.A. Castro and S.M. Alzamora

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Abstract

Porous vegetables have been recently proposed as matrices in development of new functional products. Impregnation at high temperature (HTI) would be a very suitable technique for the incorporation of a specific compound in tissues of low porosity, as heat can facilitate mass transfer by acting on cell membranes and / or wall permeability. Somehow, changes in structure can affect mechanical and impregnation responses of the material. Our objective was to evaluate potato tissue behavior upon calcium impregnation at high temperature and to correlate these structural changes with mechanical properties and calcium content. HTI treatments were conducted at atmospheric pressure under conditions of internal control by immersing potato slices in agitated isotonic calcium solutions (5.88% p/p calcium gluconate and lactate salts). Experiments were carried out at 50 °C for 15, 40 and 60 min and at 80 °C for 2, 7 and 12 min. Then samples were cooled and analyzed for calcium content, texture and structure (light microscopy). Potato slices heated in water (HW) upon the same experimental conditions were used as control to analyze calcium-plant tissue interaction. The results indicated that HTI increased the calcium content of the tissue satisfying about 8-40% of the Adequate Intake. HW at 50 °C had a firming effect on the tissue, mainly after long periods of time, while at 80 °C a decrease in the rupture force was observed. HTI at 80 °C lead to a firmer potato tissue. Microscopic analysis revealed tissue compactness and folding of cell walls which appeared darkly stained, when potato was treated at 50 °C, specially in presence of calcium. Heating at 80 °C induced plasmolysis, starch granules gelatinization and thinner cell walls in samples with and without calcium, partially explaining the mechanical behavior observed. The results suggest that HTI may be used to enhance impregnation capabilities of potato tissue.