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Modification of cell walls of apple, red beet and kiwifruit by heating in acid conditions: common and specific responses.

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Abstract

Most fruit- and vegetable-based products are commonly processed before being consumed. It is known that cooking and processing induce significant changes in chemical composition and physical properties of cell wall polysaccharides. In this study, cell walls were isolated from three species: apple, red beet and kiwifruit using the alcohol-insoluble solids (AIS) procedure. The composition of the cell wall polysaccharides were compared before and after modification by boiling (100 °C, 20 minutes) at different pH values (2.0, 3.5 and 6.0) to explore the impact of acid hydrolysis and β -elimination. Native apple cell walls were mainly composed of cellulose, highly methylated pectins relatively rich in arabinan and galactan side chains and fucogalactoxyloglucan; red beet cell walls were rich in cellulose, highly methylated pectins relatively rich in arabinan and ferulic acid, kiwi fruit cell walls were mostly composed of cellulose, highly methylated pectins with low side chain contents and xyloglucans. After modification, the galacturonic acid contents of whole cell walls decreased the most at pH 6.0 indicating prevalence of β -elimination. Galacturonic acid contents decreased for all the cell walls whereas the degree of methylation (DM) decreased mostly in apple and red beet cell walls (from 82% to 60% and from 65% to 42%, respectively). At pH 2.0, acid hydrolysis decreased the content of neutral sugar side chains, especially arabinan from apple and red beet cell walls. Due to the much lower proportion of arabinose in kiwifruit cell walls, no obvious changes were recorded for kiwifruits at pH 2. Heating at pH 3.5 was as expected the least disruptive condition. Infrared spectra differentiated the samples by species and treatment as the composition done, the work is under progress in order to identified related peaks to the principal cell wall components.

Keywords: Polysaccharide, FT-IR, Processing, Side chain, Pectin, Methylation