

Ad hoc support

Characterisation of associations between condensed tannins and plant cell walls

ABSTRACT

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Year : 2012

Project number : 1200-015

Type of funding : PP

Project type : PC

Research units in the network :

Start date : 2013-06-30

End date : 2014-08-15

Flagship project : no

Project leader : Carine Le Bourvellec

Project leader's institution : INRA-INRAE

Project leader's RU : SQPOV

Budget allocated : 0 €

Total budget allocated (including co-financing) : 12500 €

Funding : Labex

GOAL

The objectives are to find new information pertinent to the nutritional value of fruits and vegetables. In this framework, we have investigated binding of tannins (procyanidins) to the plant cell walls polysaccharides in fruits. This is related to the nutritional quality of fruits and vegetables because common processes (freezing, but also cooking, pressing or mastication) realize a destructuration of the plant tissues that bring in contact the (initially separated) tannins and cell walls. Subsequently, tannins bind to cell walls. The neoformed complex is further stabilized during cooking to form covalent bonds, probably through cleavage of condensed tannins in acidic conditions, with formation of highly reactive carbocations. The cell walls - tannins complex is ingested and reaches intact the lower gut. In the lower gut, bacteria from the colon ferment the tannins, generating metabolites that are responsible for the health-beneficial effects of these molecules.

ACTION

Cell wall materials were extracted from undisrupted cells and from distinctive pear cells that are parenchymatous and stones cells. Procyanidines from cider apple were extracted, purified and characterized.

In order to investigate non-covalent and covalent interactions between cell walls and procyanidins we artificially created complexes at 25 °C and 95 °C and then quantified them by UV-visible spectrometry and isothermal titration calorimetry (ITC at 25°C and 45°C).

Covalent adducts were attempted to be traced by successive solvent extraction and enzymatic digestion in crude boiled pear and artificial complexes generated between procyanidines and the different cell wall materials

RESULTS

Concentration of bound procyanidins varied between the distinctive cell walls (stone cellsInteractions

between cell walls and procyanidins induced by heat treatment could lead to the occurrence of newly formed structures resulting from the implementation of physicochemical interactions. We propose that the cell wall structure plays a critical role in the nature of these interactions. These phenomena could affect the organoleptic characteristics and alter the nutritional quality of processed foods predominantly affecting the level of their bioavailability

PERSPECTIVES

Development of a method to isolate covalent adducts.

Study of the impact of non-covalent and covalent complexes between procyanidins and cell walls on colonic fermentations of procyanidins.