**Production of low viscous pectin-rich carrot dietary fibre by enzymatic hydrolysis and high-pressure homogenisation**

R. Morales-Medina1, R. Pérez-Gálvez2, J. Steffan3, R. Schmidt3, M Bunzel3 and S. Drusch1*.*

*1Technische Universität Berlin, Institute of Food Technology and Food Chemistry, Department of Food Technology and Food Material Science, Berlin, Germany*

*2University of Granada. Department of Chemical Engineering, Granada, Spain*

*3Karlsruher Institut für Technologie, Institut für Angewandte Biowissenschaften, Abteilung für Lebensmittelchemie und Phytochemie, Karlsruhe*

Dietary fibre (DF) has a high nutritional value since it can prevent several cardiovascular diseases and diabetes type 2 when the daily intake exceeds 25 g. However, in most countries, dietary fibre consumption is much lower; consequently, in the last decades, the fortification of food matrixes with DF has gained interest. While DF-fortified solid matrixes (such as baked goods) are broadly accepted by consumers, incorporating DF into liquid matrixes (*i.e.* beverages or yoghurt) is still under development since the sensorial properties of liquid matrixes are highly sensitive. Hence, tailor-made dietary fibre has to be produced with adequate solubility, low viscosity, small particle size and physical stability, among other properties. In this context, a combination of enzymatic hydrolysis and high-pressure homogenisation (microfluidization) has been proposed as a powerful tool to tune the functional properties of high cellulosic dietary fibre. Nevertheless, this processing approach has not yet been applied to pectin-rich dietary fibre sources (commonly produced in the fruit and vegetable derivates industry). Due to the complex chemical structure of pectin, selecting adequate enzymes is a critical step to be studied.

This work aimed to produce stable and low viscous pectin-rich dietary fibre-based suspensions. To that end, suspensions were prepared through enzymatic hydrolysis (30–240 min and 5% enzyme/substrate ratio) using a ternary mixture of enzymes (polygalacturonase, a 1:1 arabinanase-galactanase blend and cellulase; enzyme percentages within the mixture ranging from 5 to 90%) followed by high-pressure homogenisation (*i.e.* microfluidization). The hydrolysed and microfluidized suspensions were characterised in terms of stability against sedimentation, viscosity, particle size distribution and content of insoluble, alcohol-insoluble, and soluble fractions. Additionally, the mono- and disaccharide content of a selected subset of samples was determined.

Results showed that combining enzymatic and mechanical treatment reduces the particle size and insoluble mass, leading to stable low viscous suspensions (5 to 18 mPa·s, 1wt%). No stable suspensions were produced for a viscosity lower than 5 mPa·s. As a general trend, the longer the hydrolysis time, the lower the viscosity of the suspensions due to a decrease in the insoluble mass content and a decrease in the molecular weight of the soluble dietary fibre. Regarding the composition of the enzymatic mixture, a high percentage of cellulase and/or polygalacturonase reduced viscosity considerably. Presumably, the hydrolysis of the cellulosic network followed by microfluidization, apart from decreasing the insoluble mass, may result in a more open structure that facilitated the hydrolysis of pectin by decreasing the sterical hindrance. At a high content of polygalacturonase, the homogalacturonan regions of pectin were hydrolysed, potentially resulting in a severe reduction of the molecular weight. On the contrary, intense hydrolysis of the galactan- and arabinan- chains had a minor impact on the functional properties. In this case, the reduction of molecular weight may be too low.

The results of this work broaden the application of enzymatic hydrolysis and high-pressure homogenization to produce low viscous pectic-rich dietary fibres with the potential of being ingredients to fortify liquid food matrices that can be applied to up-grade fruit and vegetable industrial by-products.

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