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Estimation of Fructose, Glucose and Sucrose Released by Inulin Hydrolysis during Food Processing.

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Inulin, often called by the generic name of oligofructose, is a natural storage carbohydrate mostly found, in our countries, in chicory roots. It is a mixture of polysaccharides composed of fructose chains of various length terminated generally by a simple glucose unit.
Partial hydrolysis of inulin (oligofructose) occurs often in food processing on account of low pH and high temperature conditions. Consequently, significant quantities of fructose but also of glucose and sucrose are released during the process, this can finally influence organoleptic and functional properties.
In this context, our study is devoted to the development of a method for estimating the hydrolysis rate of inulin and small sugars released during food processing.

Five oligofructose samples of different average degree of polymerisation in number (DPn comprised between 3 and 22) have been envisaged. Hydrolysis reactions were generally conducted with 10% oligofructose buffered solutions and were stopped by neutralization with sodium hydroxide. Analytical determination of the small sugars was done with a Waters HPLC including a 2410 refractive index detector. Two HP87K columns from Biorad were mounted in series and used with a flow rate of 0.55 ml/min and an injection volume of 60 µl. The eluant was water brought at pH=9.2 with a few drops of 1M KOH.

Previously, Blecker *et al.* have studied acid hydrolysis of various oligofructose samples by an isothermal approach. [1] Their paper notably mentioned polynomial regressions to predict fructose release for different experimental conditions of pH (2,0 to 4,2) and temperature (7 to 130 °C).
On the basis of produced fructose for the different oligosaccharides, the present research permits to estimate the associated glucose and sucrose loss by single polynomial regressions. Results show that the amount of glucose or sucrose released is strongly dependent on the starting oligofructose composition and more particularly on the initial glucosyl unit content. An interesting feature appeared during the comparison of the released amount of the small sugars: the relative concentration of glucose continuously increases while a maximum concentration is observed for sucrose. This is due to the fact that sucrose is not an end product of the reaction.
Finally, this method has been tested under conditions similar to usual food processing including an non isothermal hydrolysis and a pH change. A good agreement has been found between predicted and measured values for fructose as well as for glucose and sucrose releases.
Note that the method has been developed to estimate the hydrolysis of oligofructose for a relatively low level of hydrolysis up to 40-50% of small sugars, it can therefore not be used above this limit (for total hydrolysis for example).

[1] BLECKER, FOUGNIES, VAN HERCK, CHEVALIER & PAQUOT, Kinetic study of the acid hydrolysis of various oligofructose samples, *J Agric. Food Chem.*, **2002**, 50 (6), 1602-1607.