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The use of dry Jerusalem artichoke as a functional nutrient in developing extruded food with low glycaemic index

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ABSTRACT

This study considers the use of dry Jerusalem artichoke (JA) as a functional nutrient in developing food products with enhanced nutritional characteristics and low glycaemic index (GI). Three different formulations based on buckwheat and JA were developed and processed using extrusion technology. Nutritional properties including the levels of total dietary fibre (TDF), protein, inulin, total carbohydrates and lipids were analysed. A clinical study was performed on ten healthy volunteers (aged between 21 and 56) to determine the level of GI and glycaemic load (GL).

The results revealed that JA significantly ($P < 0.05$) increased the levels of TDF and inulin whilst decreasing carbohydrates, lipids and proteins. The resulting products had a significant ($P < 0.05$) effect on IAUC between reference food and extruded products, GI and GL. Samples containing 80% of Jerusalem artichoke were considered as a low GI food whilst samples containing 30% and 60% of Jerusalem artichoke as a medium GI food. A similar trend was seen in terms of GL.

1. Introduction

Over the last decades, consumer demands for functional foods as an opportunity to improve food product quality has increased enormously. The main characterisation of functional food is fortification with dietary fibre, micronutrients, antioxidants, vitamins or minerals that contributes health benefit effects in certain disorders.

One of the promising functional constituents that could be used for developing a functional food is inulin. It has a great potential to be considered as a low glycaemic index (GI) ingredient that could provide a number of health benefits such as managing increased risk of chronic diseases (diabetes, cardiovascular diseases, obesity, stroke and cancer), improving digestive health (prevents constipation), reducing cholesterol and lipids (decrease cardiovascular disease) and enhancing mineral absorption from colon with its prebiotic role (prevents osteoporosis) (Barclay et al., 2008; Brand-Miller, Holt, Pawlak, & McMillan, 2002; Knudsen & Hessova, 1995; Watzl, Girrbach, & Roller, 2005).

The main sources of inulin are Jerusalem artichoke (JA) (*Helianthus tuberosus L. Heliathus, Asteraceae*) and chicory root (*Cichorium intybus var. sativum*). JA is also a good source of minerals (calcium, iron, selenium, potassium, phosphorus) and vitamins (vitamin B complex, vitamin C and β-carotene) (Kays & Nottingham, 2007). Inulin from JA is a non-starch carbohydrate known as a fructan which is considered as a functional ingredient with similar characteristics to dietary fibre. Because of its desirable textural and nutritional properties inulin from JA has been used as a prebiotic (Rubel, Pérez, Genovese, & Manrique, 2014), a source of low GI food (Radovanovic, Cupara, Stojceska, & Plunkett, 2012) and a fat/sugar replacer and texturizer (Choque Delgado, Tamashiro, & Pastore, 2010).

The present work investigated the possibility of the use of dry JA as a source of inulin in developing low GI extrudates. In order to develop a low GI food it is also essential to consider the type of food processing, moisture content and degree of starch gelatinization (Bjorck, Liljeberg, & Ostman, 2000; Foster-Powell, Holt, & Brand-Miller, 2002). Extrusion technology is increasingly used in the food industry for producing different types of food products such as breakfast cereals and ready-to-eat snacks. It is a high temperature, high pressure, short time and continuous processing technique that enable manufacturers to produce highly nutritious

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