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## VALORIZATION OF CITRUS PROCESSING BY-PRODUCTS AS A POTENTIAL PREBIOTIC INGREDIENT AND CREAMY PRODUCTS

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Citrus cultivation is one of the most important agricultural sectors in the world and the main uses of these products are the market of fresh produce and the production of juices, pulps, purees, jams and ready-to-eat salads. Industrial citrus processing results in three main products: juice (30-45 %), essential oil (0.2-0.5 %) and the by-products (55-65 %). The latter is composed by peel, pulp and seeds from processing residues and it is considered a low value by-product or waste which is mainly used in animal feed.

The citrus processing by-product (CB) mainly contains water (75-85 %), mono- and disaccharides (e.g. glucose and fructose, 6-8 %), polysaccharides, essentially pectin, proto-pectin, cellulose and hemicellulose (1.5-3 %), organic acids (e.g. citric and malic acid, 0.5-1.5 %), and other compounds which can have remarkable biological properties, such as vitamins, flavonoids, amino acids and minerals. Due to its composition, CB can therefore be considered as a source of high value substances (pectin, flavonoids, vitamins) and more specifically as a source of fiber and antioxidants. In this context, the purpose of this work was to valorise CB through the production of creamy fillers for bakery industry being CB the main ingredient with functional properties. In this view, its possible prebiotic activity was also evaluated *in vitro*.

CB was subjected to freeze-drying, finely powdered and then used for the formulation of creamy products which were stabilized and texturized through high pressure homogenization (HPH) treatments. Different citrus-based creamy products were prepared by modulating their composition and HPH conditions. A challenge test using *Saccharomyces cerevisiae* as a spoilage agent was carried out to test their microbiological stability. The effects of HPH on some chemical-physical parameter such as pH, colour and antioxidant activity were also evaluated. To test the possible prebiotic activity of CB, faecal media containing the CB powder in place of carbon sources were used and inoculated with some lactic acid bacteria (i.e. *Lactobacillus plantarum*, *Pediococcus pentosaceus*, *Enterococcus faecalis*) or faecal microbiota of healthy individuals. The viability of these bacteria was evaluated during 48 h of fermentation and the accumulation of some microbial metabolites with biological relevance was monitored by SPME-GC/MS.

Results obtained in both experiments were very promising. Proper combinations of HPH conditions and formulations with low  $a_w$  values resulting in significant reductions of *S. cerevisiae* viability were determined. Moreover HPH treatments caused an enhancement of the texture and the colour parameters making the creamy products highly attractive. On the other hand a slight reduction of antioxidant activity was observed following processing.

Concerning CB prebiotic activity, CB powder supported the growth of all the tested LAB species and the main microbial groups of the gut microbiota considered in this experiment including bifidobacteria whose involvement in the maintenance of human wellness and the prevention from several diseases is well known. Moreover, a significant increase in short chain fatty acids, i.e. acetic, propionic and butanoic acids, which are reported to be involved in several beneficial effects for humans, was observed.

**Key words:** citrus by-products, citrus creamy products, HPH, prebiotic activity