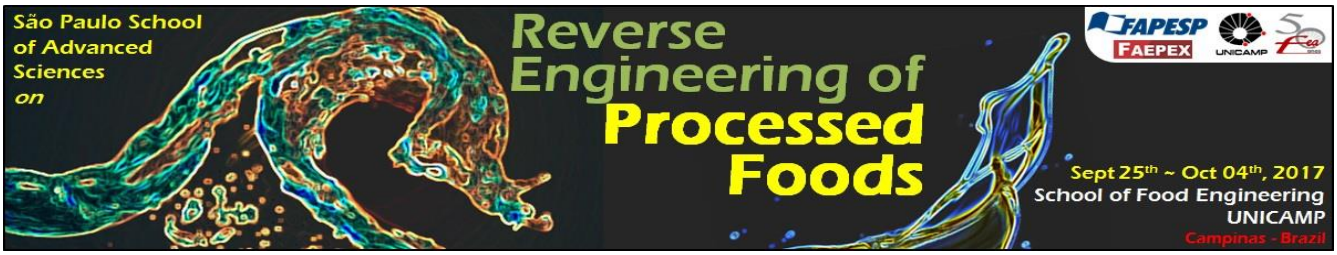


## PRODUCTION OF NATURAL NANO-GEL FROM PINEAPPLE POLYSACCHARIDES COMPLEXES FOR CONTROLLED RELEASE OF BIOACTIVE COMPOUNDS

**DÉBORA A. CAMPOS1*, LORENZO M. PASTRANA-CASTRO2, JOSÉ A. TEIXEIRA3, MARIA M. PINTADO1.** 1CBQF – Centro de Biotecnologia e Químico Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/ Porto, Portugal; 2INL - International Iberian Nanotechnology Laboratory, Braga, Portugal. 3Centro de Engenharia Biológica, Universidade do Minho, Campus Gualtar, 4710-057, Braga, Portugal. *dcampos@porto.ucp.pt

Pineapple (*Ananas cosmosus*) is the third most important tropical fruit in world production, seventy percent of the pineapple produced in the world is consumed as fresh fruit. In the agro-food sector, several materials are eliminated as waste throughout production and processing chain. These residues (skins, seed and pulp remnants) contain high content of bioactive compounds, but in generally not directly available, and for that reason is necessary to extract and characterize the feasible bioactive compounds (do Espírito Santo et al., 2012). Therefore, the study of the wastes and by-products generated during pineapple production and post-harvest processing is relevant and interesting to valorise them and reduce their environmental impact. The development of vehicles using these residues that deliveries the compounds as well promotes the maintenance of bioactivity, has been widely study, but lacks the search of new structures that could be easily used in food industry. Therefore, the focus of this research work was to developed nanocarriers using pineapple residues to extract pineapple polysaccharides for delivery of bioactive compounds. Frozen pineapple wastes were submitted to a milling and pressing processes, creating a pineapple juice and a solid semi-dried extract. Characterization was made for both parts comprised proteins, sugars, fibers, lipids and polyphenol contents. The soluble fraction was fractionated by centrifuge filter tubes with cut-off of 50 kDa and after by cut-off of 3 kDa, and three fractions were obtained: above 50 kDa, between 50 and 3 kDa and below 3 kDa. The insoluble part was submitted to hot aqueous extraction. The supernatant and the pellet of this extraction were separated and studied separately. Pineapple polysaccharides were identified and quantified by HPLC method and phenol-sulphuric method, respectively. The identified polysaccharides, were for production of a natural nano-gel that could be used as matrix of delivery. Studies on optimized process for gel formation were made. Several actions that influence the interaction polysaccharide-polysaccharide were evaluated, such as, ratio mixture between pineapple polysaccharides/xanthan gum, pH, ionic strength of solution, temperature and molecular weight of polysaccharides. Thus, was design single experiments to evaluate primary an optimum range of each influent action, for production of the most stable nano-gel. The soluble fraction with MW between 50 and 3 kDa were constituted mainly by soluble proteins (proteases), such as bromelain, ananain and comosain. The fraction with MW <3 kDa was studied for soluble small polysaccharides and oligosaccharides. To evaluate the molecular sizes of polysaccharides it was used an ultra-hydrogel column, the results showed that the both studied fractions contained two major peaks of

polysaccharides, comprising MW of 2000 and 600 Da. Also, when using an Aminex® column for simple sugars analysis, the fractions presented high concentration of two monosaccharides glucose and fructose, as expected. The polysaccharides of higher MW were identified as been galactomannan, as described elsewhere (Salunkhe & Kadam, 1995). These polysaccharides were extracted from each fraction and used to complex with xanthan gum to produce an active nano-gel. Through the studies on the best features was possible to understand the best ranges for development a higher experimental superficial design for promotion of synergetic polysaccharide-polysaccharide interaction. Through this research work was possible to evaluate and characterize the polysaccharides present in pineapple residues and apply them to a complex formation with other natural polysaccharides to produce a nano-gel for delivery of bioactive compounds.

**Financial Support:** Financial support is provided by FCT through scholarship: SFRH/BD/104074/2014.