



TOTAL VALORIZATION OF PINEAPPLE (*ANANAS COSMOSUS*) BYPRODUCTS AND PRELIMINARY CHARACTERIZATION OF ADDED VALUE FRACTIONS

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The demand for natural products with functional activities has been the subject of many recent studies. In the agro-food sector, several materials are eliminated (such as skins, seeds and pulp remnants) as waste throughout production and processing chain. These residues 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 (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 in order to valorize them and reduce their environmental impact.

Pineapple (*Ananas cosmosus*) is a popular fruit, which grows in the tropics and sub-tropics and belongs to the *Bromeliaceae* family. The fruit can be marketed to be natural or industrially processed, generating waste such as peels, stems, crowns and cylinder, which correspond to 35% of raw material processed (Erukainure *et al.*, 2011).

Frozen pineapple wastes were submitted to a milling and pressing processes, creating a pineapple juice and a solid semi-dried extract. Characterization of both parts comprised proteins, sugars, fibers, lipids and polyphenol contents. Additionally the total extraction yields were calculated.

The soluble fraction was fractionated by centrifuge 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. Besides compositional analysis the fractions were also evaluated concerning antioxidant activity assessed through ABTS colorimetric assay and by ORAC fluorometric assay. The fraction with MW between 50 and 3 KDa were constituted mainly by soluble proteins (proteases), such as bromelain, ananain and comosain and characterized by Urea – gel electrophoresis. On the other hand, the proteolytic activity of bromelain and the others was accessed by a modified *in vitro* microplate assay using a model with different types of substrates (Hale *et al.*, 2005).

The insoluble part was submitted to hot aqueous extraction during 1 hour at 80 °C with uniform stirring (100 rpm), promoting a hot solubilisation; the mixture was cooled and centrifuged (12000 g for 20 min). In the supernatant were present the soluble polysaccharides and in the pellet pineapple ligninocellulosic material. The soluble fraction was precipitated with 3 volumes of ethanol and evaluated the presence of the different polysaccharides. The solid fraction was re-dissolved and treated with commercial enzymes (cellulases, pectinases and hemicellulases). The solution was centrifuged and separated by membranes with cut-off of 50 and 3 KDa, and the fractions were evaluated by SDS-PAGE, FPLC and HPLC method.

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References:

1. Erukainure, O. L., Ajiboye, J. A., Adejobi, R. O., Okafor, O. Y., Adenekan, S. O. (2011). Protective effect of pineapple (*Ananas cosmosus*) peels extract on alcohol-induced oxidative stress in brain tissues of male albino rats. *Asian Pacific Journal of Tropical Disease* 1(1):5-9.
2. Santo, A. P. E., Cartolano, N. S., Silva, T. F., Soares, F. A. S. M., Gioielli, L. A., Perego, P., Converti, A., Oliveira, M. N. (2012). Fibers from fruit by-products enhance probiotic viability and fatty acid profile and increase CLA content in yoghurts. *International Journal Food Microbiology* 154(3):135-44.
3. Hale, L. P., Greer, P. K., Trinh, C. T., James, C. L. (2005). Proteinase activity and stability of natural bromelain preparations. *International Immunopharmacology* 5: 783-793.