Research Summary Sheet

Summary of Deliverable 4.1 /4

Biotechnological and physical-chemical optimized strategies to extract and convert biomolecules from agro-wastes:

Potato starch processing waste

Context and Challenges

Potato is commonly used in starch processing, which results in a large quantity of waste water and residues. In China, one thousand kilogram of potatoes releases 5-12 m^3 of waste water. The waste water contains 2-5% dry matter, of which one third is protein, peptides and amino acids/amines. To recover protein from the waste water without affecting their functional properties is challenging because of the aqueous nature and complex composition. The most common system of protein recovery from the waste water includes heat coagulation and acid precipitation. Although thermal/acidic precipitation results in a high yield of protein recovery, it often leads to complete loss of the protein functionality, which limits their application only to animal feed and low-quality fertilizer. In addition, approximately 4.5 to 5 tonnes of fresh potato residues are generated for every tonne of starch produced. However, while a small amount of the potato residue is used as low-value animal feed, most of it is disposed of, which means it is a major contributor to environmental pollution. Previous studies also have indicated that potato residue is rich in pectin which can be used as a good raw material for pectin extraction. The acid extraction method is often used to extract pectin in the food industry because of its convenient and easy operation. Several studies have indicated that the use of different acids can have different effects on pectin yield, structure, and physicochemical properties. As far as we know, few studies have reported the effects of different types of acids on the yield, structure, and emulsifying properties of potato pectin.

IAPPST aims to use two different traditional methods (isoelectric precipi-tation (IEP) and ammonium sulfate precipitation (ASP)) to recover proteins from potato starch processing waste water and to improve the limited information available on the comparative results. Moreover, IAPPST aims to provide a theoretical basis for the industrial extraction of pectin from potato residue and to evaluate the potential of potato pectin as a natural emulsifier in the food industry.

The project leading to this application has funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 688338.

Potato protein concentrates were extracted from potato fruit juice using ASP and IEP and characterized. Effects of HCl, H_2SO_4, HNO_3, citric acid, and acetic acid on the yield, structure, and emulsifying properties of potato pectins were investigated.

Results and Applications

Two approaches (ASP and IEP) were used to extract protein concentrates from potato waste water: effects of NaCl and pH on physico-chemical and func-tional properties were investigated. The amino acid composition of potato protein extracted by the two different methods were determined. The results will contribute to improve the extraction of minimally-modified proteins and, then, will favor the applications of potato protein.

In terms of pectin extraction, results showed that the highest yield (14.34%) was obtained using citric acid. The emulsifying activity and emulsion stability of the pectins were influenced by acid types, and were higher than those of commercial citrus and apple pectin.

Breakthroughs, benefits and added value

The results suggest that potato pectin may be useful as a potential emulsifier in emulsified food products. The solid residues obtained will be valorized as potential reinforcing agents in polymeric matrixes. Therefore, the achieved results demonstrate that potato processing waste can be fully valorized, without residues.

Further information on NoAW project: http://noaw2020.eu

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