Purification of vegetable peptides from sunflower waste after lipid extraction.
LIFE97 ENV/E/000238

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Project description:

Background

The high volume of organic waste generated from agro-industrial processes constitutes both an under-used resource and an environmental threat. This waste shares several common features which make its reuse an interesting prospect: The byproducts offer one of the principal new sources of protein due to their high protein and carbohydrate content, both in the food industry or in the cosmetic and pharmaceutical industries. At the moment, however, the presence of pigments, anti-nutritional and low-digestibility factors or, as in the case of sunflower flour, their insolubility has led to chronic under-use. Moreover, the highly concentrated location of these agro-industry sites has caused significant environmental problems because of the large accumulations of organic waste. The two main sources of such waste are the Agro-food industry, which in Spain produced 800.000 tons/year (1999) mainly from the extraction of fats in sunflower, marc, rapeseed oil, corn etc and the crustacean transformation industry and the biotechnological industry which produces 500.000 tons/year mainly from bio-alcohol production from cereal wastes such as wheat, barley etc. Conventional methods of producing vegetable protein hydrolysate have tended to rely on chemical methods which alter the structure of the amino-acids and create risks of contamination. So the focus of the current project is to explore the viability of their production through enzymatic hydrolysis, thus offering greater food security and higher nutritional quality whilst avoiding the pollution impact of chemical versions.
Objectives

The overall purpose of the project was to develop environmentally-friendly methods of recycling organic waste from agro-industrial products. The specific focus was on developing a process for obtaining protein hydrolysates from plants (sunflower) using an enzymatic process of separation, with the objective of producing key benefits: Environmental: leading to the elimination of polluting organic waste stores, nutritional: improving the nutritional component of base proteins and peptides and economic: creating a new environmentally-clean industry producing organic products for the nutritional, pharmaceutical and bio-fertilizer industries. The project proposed to achieve these goals by firstly, developing the necessary methodologies and technology to allow for the extraction and modification of the organic waste in question. Secondly, scaling up the experiment through a demonstration Industrial Plant (1/10 model) which would follow through all the biological and physical processes used in the manufacture of the products. Thirdly, the project proposed carrying out a study of all the possible fields of application for the final products.

Results

The project demonstrated that the enzymatic process of purifying vegetable peptides from sunflower waster after lipid extraction offered an innovative and environmentally friendly method for obtaining proteins of vegetable origin as an alternative to current chemical methods. The process would consist of splitting the sunflower husk, extracting the proteins, enzymatic hydrolysis and a final drying phase and would offer a way of reducing the high volume of waste currently generated by this product and transforming it into a nutritious source of protein for human or animal consumption. Economic viability of the process was seen to be ensured by making full use of the primary material, both through using the top layer or lignocellulosite layer produced during the first stage of the enzymatic separation in the packaging industry, or by compressing it for combustion or by using its fibrous components in the animal feeding industry. This would result in a reuse of 40% of the initial primary material, covering 10-15% of the direct cost. The first steps of the project were fully developed. The enzymatic process for recycling organic wastes was developed at laboratory level and was the subject of 2 patent applications registered in Europe, USA and Japan: Patent P-09602526/3 “Process for Obtaining Plant Peptones with a High Hydrolisis Degree and Applications theref” and Patent P-200002392 “Process for direct Continuum Enzymatic Protein Solubilization of Industrial Residues”, ensuring the avoidance of contaminating elements in the process or in the waste products. The project also completed the phases of scaling up in a demonstration plant and an R/D laboratory developed in close collaboration with the Instituto de la Grasa del C.S.I.C and the Pharmaceutical and Biochemical departments of the University in Seville. The processing line was made identical in its scaling to the Industrial line with an evenly-distributed control system to regulate, visualize and register the complete process loop: PH, temperature, reactant addition, enzymes etc. The project also carried out a detailed study of the application of final products. Apart from the better known uses in the nutrition field, the project focused on the potential use of peptones as a nitrogen source in fermentation processes and as biofertilizers to key horticultural crops.
However the completion of the industrial production site was delayed beyond the end date of the project through problems with obtaining permissions and in the construction process. The beneficiaries predicted the start of industrial production in October/November 2001. Significant interest was shown in the product and process by distributors in Finland, Germany, France, US, Corea and Spain which the company hoped to concretize in October.

Environmental issues addressed:

Themes

Industry-Production - Food and Beverages
Waste - Waste use

Keywords

waste use, pharmaceutical industry, edible fat, organic waste

Target EU Legislation

- Waste
- Land & Soil
- Regulation 2078/92 - Agricultural production methods compatible with the requirements of the prot ...
- Industry and Product Policy

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator PEVESA, Peptonas Vegetales, S.L.
Type of organisation SME Small and medium sized enterprise
PEVESA is a small company manufacturing high quality enzymatic peptones using organic raw materials, committed to extensive quality control systems in its production processes. It works with microbial proteases (food grade preparation) to ensure non-toxic products free from antibiotics and bacterial contamination. It currently has one production factory divided in two plants: a Protein Substrate Production Plant which obtains Protein concentrates and isolates, being the suitable substrates for Peptone production. The second plant, the Protein Hydrolyzed Production plant is dedicated to the production of peptone from the substrates.

Partners

PROTEUS is a research and development company associated to PEVESA El Instituto de la Grasa del C.S.I.C Dpto. De Bioquímima, Bromatología y Toxicología de la Universidad de Sevilla.

Administrative data:

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