Scientists develop protein, skin care and biopesticide products from fish filleting residue and rapeseed press cakes

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Food industry co-streams which could be upgraded to more valuable products than the original ones ending up as animal feed. Scientists developed feasible and gentle methods to make good use of fish filleting residues and rapeseed press cakes. The APROPOS project succeeded in creating new technologies for SME's for the production of items such as dietary supplements and skin care products.

"Superb final results can be achieved by applying fairly simple production methods. The idea of the project was to develop technologies based on which all parts of a raw material can be used, without leaving any waste. In this project, the aim was not to produce fractions of high purity, but to develop methods for achieving practical results beneficial to both the producer and the final product. Several technologies, product prototypes and ideas were developed for use by companies," says Raija Lantto, Head of Research Area at VTT Technical Research Centre of Finland Ltd and coordinator of the EU-financed APROPOS project.

The international project involved the development of production processes which could provide business opportunities for SMEs operating in Europe, America, Africa and Asia.

Valuable products from rapeseed press cakes

Press cakes based on rapeseed oil production are currently used as feed

components for production animals. In the future, this side-stream, which contains protein and other valuable substances, could even become the primary product.

It has been estimated that, when used as a food ingredient, the commercial value of rapeseed protein products made of press cakes could be as high as EUR 5,000/tonne. The market price of press cakes used as fodder is EUR 150 - 300/tonne and the price of rapeseed oil is EUR 400 - 800/tonne. Annually, 15 million tonnes of rapeseed press cakes are produced in Europe and 50,000 tonnes in Finland.

As part of the APROPOS project, gentle rapeseed processing methods were developed, enabling the recovery of one-half of the protein of the seeds. The project did not aim at achieving the highest possible protein content. Instead, it succeeded in generating a fraction rich in protein and fibre, with much higher stability in drinks, for example, than can be achieved using a very pure rapeseed protein product produced commercially in Canada.

The Polytechnic University of Catalonia (UPC) was tasked with defining the bioactive characteristics of rapeseed press cake fractions. In peptide-phenol extracts made by VTT, for instance, the UPC discovered anti-inflammatory, anti-ageing, bacteriostatic, antioxidant and antimicrobial properties. Peptide-phenol extract has been successfully tested by two Catalonian companies producing skin care creams and medicinal wound dressings. By using an ultrasound-based encapsulation method developed by UPC, the peptide-phenol extract could be modified to a form in which the brownish-yellow colour of the extract was avoided. The resulting white emulsion could be suitable for cold creams, medical nappies for chronic care patients, and compresses for enhancing the antimicrobial qualities of the product and skin condition.

VTT developed bio-mechanical methods to produce proteins and

phenols from rapeseed press cakes for food and cosmetics industry applications. The enzymatic treatment helped to improve the extraction of proteins from rapeseed oil press cakes. The most cost-efficient production method is the water-saving enzyme-assisted process, which helps to avoid the expensive drying phase of the material.

Sinapine and sinapic acid are the key phenolic compounds found in the kernel of rapeseeds. VTT manipulated the extraction efficiency, solubility and antioxidativity of these compounds, and tested the characteristics of the products with Norwegian SINTEF. It is known that the liposoluble phenol extract processed from sinapine effectively prevents problems such as the oxidation of emulsions and oils.

Protein supplement for East-African population from Nile perch

The Nile perch is an East-African export product. Today, its filleting residues are already used for extracting oil for use as fuel for cooking, for example. It is estimated that more than 90 per cent of the East-African population lives without a sufficient daily amount of protein. In the project, the Norwegian research centre SINTEF developed a manufacturing process designed all the way up to pilot scale, by which fish filleting residue is used to manufacture protein-rich dietary supplements meeting African taste preferences and packaged in portion-size packets.

The protein and oil enrichment method SINTEF had developed for filleting the residue of Norwegian salmon was found to be profitable. As a result, a Norwegian SME specialising in the up-grading of salmon residue is expanding its plant with the intention of applying the method in production.

An agricultural pesticide made from glucosinolate, for India

In India, mustard seeds, close relatives to rapeseed, contain considerable amount of glucosinolates, which taste bitter and are anti-nutritional to humans. As part of the APROPOS project, a technology has been developed to isolate glucosinolates and protein from mustard press cakes. Glucosinolates are compounds which can serve as an effective natural ingredient in pesticides, for agricultural use in India's arable areas in particular. In the project, this work was performed by the Energy Research Institute, which demonstrated a water extraction method for glucosinolate on pilot scale alongside an SME from New Delhi. This particular SME is currently planning the commercialisation of the production method.

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