By-products from agriculture - how researchers intend to harness proteins from unused sources

The world's population is growing, and at the same time, resources are becoming scarcer and climate change is advancing. How can a growing population still be adequately fed in times of scarce resources? Scientists at the Technical University of Munich (TUM) are participating in the TRIBOTEC project, which is researching how an innovative dry fractionation technique can be used to obtain highly functional proteins from previously little-used sources.

Rapeseed products obtained from the triboelectric belt separation process.
(Photo: © Luise Wockenfuss)

New technologies for gentle extraction of protein

"The quality and supply of plant proteins is a crucial factor for global food safety, nutrition and the environment. New technologies for the gentle extraction of protein are therefore essential," emphasises Petra Först, Professor at the Department of Systems Process Engineering at the TUM School of Life Sciences in Weihenstephan, Germany.

Scientists from Freising are therefore participating in the TRIBOTEC project led by the German Institute of Food Technologies (DIL), which is researching protein enrichment and fractionation of agricultural by-products using dry triboelectrostatic separation technology.

Electrostatic separation of the material to be ground

"Electrostatic separation is an environmentally friendly technology. In the process, the ground materials are first electrostatically charged. With the help of air currents, the ground material is swirled and electrostatically charged," explains Dr Javier Perez Vaquero, scientist at the TUM Department of Systems Process Engineering.

These physical forces separate the fine fraction enriched with protein from the coarse fractions enriched with fibres and starch. The fine fraction then has a significantly higher protein content than the initial sample. The advantages compared to conventional methods are that the water and solvent-free process reduces energy consumption and operating costs while retaining the original functionality of the protein. In addition, the process is suitable for a wide range of materials.

Javier Perez-Vaquero is studying the meal of seeds of plant origin at the Department of Systems Process Engineering at the TUM School of Life Sciences. (Photo: © Luise Wockenfuss)

Studies with rapeseed and lupines

In their experiments, Perez Vaquero and his team examined the meal of seeds of plant origin - in this case rapeseed and lupines. The total increase in protein was between five percent for rapeseed meal and 20 percent for lupine meal. "Our research has shown that higher masses can be handled than found in previous studies. This allows us to achieve mass processing of up to several kilograms per hour, which is a tenfold increase. We have therefore taken a step forward in achieving a protein value that is high enough to be used in industry," explains Vaquero.

"The ongoing research opens up enormous potential for the use of alternative protein sources that have not been sufficiently exploited so far," praises Prof. Petra Först. By-products that regularly occur in the food industry, for example sunflower or rapeseed press cake as residues from oil production, can be processed further in the laboratory or in industry with the help of this process if a source of highly functional protein is required. This is conceivable, for example,

for animal and fish feed or as protein for the production of meat substitutes. The process also makes it possible to tap into new plant protein sources.

The TRIBOTEC project is being carried out by a research consortium involving partners along the entire feed chain from raw material to product application, led by the German Institute of Food Technologies (DIL), with the participation of Napiferyn Biotech (NFB), ProLupin (PL) and Matis. The project is financially supported by the European unit EIT Food.

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