

Sparklingly refreshing and rich in protein - researchers are working on new methods for plant-based drinks

Whether made from rice, almonds or oats: There are now a wide variety of protein sources being tested for use in plant-based milk alternatives. But they are also promising for use in soft drinks - provided that the solubility of the proteins can be increased, thereby preventing them from being left behind as sediment. Dr Isabel Muranyi from the Fraunhofer Institute for Process Engineering and Packaging (IVV - Institut für Verfahrenstechnik und Verpackung) provided information on how this can be achieved at a webinar organised by the Society of German Food Technologists (GDL - Gesellschaft Deutscher Lebensmitteltechnologen) on the topic of new plant-based raw materials.



Without sediment, please: To produce stable, protein-rich soft drinks, scientists at the Fraunhofer IVV combine pre-germinated lupine seeds with enzyme-rich vegetable and fruit juices. (Photo: © Mareike Bähnisch)

Plant proteins tend to aggregate

Milk alternatives are in high demand. Numerous new products are being launched. "However, the market is highly saturated and there is cut-throat competition, which is why the pressure on developers to introduce innovative drinks is increasing," explained Dr Isabel Muranyi. What is definitely still missing, in her view, are "plant-based protein-rich drinks with a refreshing character – in line with the veggie trend and consumers' interest in naturalness and health".

However, vegetable raw materials often contain anti-nutritional ingredients "which can reduce the utilisation of the valuable proteins", Muranyi continued. In addition: Plant proteins are very large and tend to aggregate in an acidic environment. For the scientist, this poses a problem for use in acidic soft drinks. "As they then remain undissolved in the form of a sediment in the

container." This is one of the main reasons why there is still a gap in the market for protein-rich plant-based soft drinks.

Increased solubility of plant proteins

In a previous research project at the Fraunhofer IVV, Muranyi and her team, in collaboration with the Department of Brewing and Beverage Technology at the Technical University of Munich, have already shown that the acid-soluble globulin fraction of lupines can be used to produce a protein-rich beverage base with excellent solubility. However, one hurdle for the technical implementation in practice was the low proportion of acid-soluble protein from the lupine seed.

Although the necessary processes for concentrating the protein fractions are available, they represent a considerable cost factor in the overall process. Conventional methods for isolating the proteins are based, for example, on alkaline extraction followed by isoelectric precipitation. "This process is very costly and energy intensive and the yields are very low," Muranyi explained.

Using enzymes from fruit juices

A remedy is to be found in reducing the molecular weight size of the plant proteins: "By dividing them into peptides, we can stabilise the solubility over the entire pH range," Muranyi said. Either through germination of the seed: Endogenous enzymes are released here. Or by adding external proteases, for example by using enzyme-rich fruit and vegetable juices.

At the Fraunhofer Institute, Muranyi and her team use pre-germinated lupine seeds. "Seed processing activates endogenous enzymes that contribute to proteolysis, breaking down cell membranes and thereby degrading anti-nutritional substances such as phytic acid and oligo-saccharides," Muranyi explained. "In a second step, the fruit and vegetable juices, which still contain a certain amount of active enzymes, are then added for protein hydrolysis."

Subsequently, a microbial fermentation of the lupine seeds takes place through the addition of lactic acid bacteria in order to neutralise undesirable accompanying and bitter substances and to optimise the taste towards a fruity-fresh character. In this way, after concentration and drying, a beverage base material with a high proportion of soluble proteins is created that is appealing to the senses.

Reducing process costs

The knowledge gained from the lupine example could be transferred to a large number of other representatives of the legumes, such as peas or soybeans. "This can especially succeed if the courage for innovative processes exists on the part of the beverage producers," as Muranyi explained. "Especially when juice producers and breweries work together." The principle: The enzyme-rich juices produced when making juice are then used to hydrolyse protein from the lupins or other legumes germinated in the brewery and then fermented and dried.

Muranyi is convinced: "For beverage production, the product range of sensorially appealing protein-rich soft drinks can therefore be expanded enormously." In addition, the scientist wants to use her innovative approach to significantly reduce the costs of the process so that small and medium-sized companies are also able to produce protein-enriched soft drinks.

Additional information and contact

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