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Vegan diet

Tasty, Airy Baked Goods with Culinary Foam made from Peas

Culinary foam made from the whites of chicken eggs makes baked goods light and airy. In the LeguFoam project, Fraunhofer researchers are working on a plant-based alternative made from legumes.

“More and more people are consciously maintaining a healthy diet and also looking for ethical unproblematic vegan products. We are addressing this need with the LeguFoam project,” explains Dr. Maïke Föste, senior research scientist in the Food Process Development department at the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising, near Munich. The initiative is funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK).

Föste and her team are using fine pea flour to make their foam. “When processed the right way, peas are very neutral in flavor, which makes them a great option,” she explains.

First, protein concentrate is produced from the pea flour. Therefore, a suspension of water and flour is produced. By adding alkaline solution, the pH-value increases and soluble proteins go into solution. The suspension is centrifuged, after which membranes are used to separate and further concentrate the proteins. The next step is to analyze and characterize the protein concentrate. The researchers are especially interested in the protein’s foaming capabilities and the long-term stability of the foam.

Proteins stabilize gas bubbles

Foam forms when a liquid mixture is beaten or whipped, incorporating tiny bubbles of air. The proteins form a film around the bubbles, stabilizing their surface. The more effective the functional groups of proteins are in attaching to the bubbles, the more foamy mass can be created and the longer it will remain stable. To improve the pea protein concentrate’s foaming properties, the team of researchers at Fraunhofer IVV is using high pressure homogenization. This makes it possible to functionalize the protein structure on a targeted basis, tailoring its foaming capabilities. The researchers were able to draw on years of experience working with legumes and plant-based proteins when characterizing and functionalizing the protein concentrates.

They are also investigating how long the foamy mass retains its consistency. After the protein concentrate is whipped into foam, the foam is kept inside a container of a defined size for a specified period of time. Afterward, the researchers check to see how much foam is left.

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“At this point, our legume-based processing approaches are getting us very close to the quality of animal-derived protein foams,” Föste says, pleased with their results. As the next step, the team plans to work on further improving long-term stability.

The Fraunhofer researchers also performed an initial sensory evaluation to test the taste and mouthfeel of their legume-based baked goods. They found that people with refined palates and lovers of bakery-quality pastry and baked goods could still tell the difference, but the plant-based alternative was still considered tasty.

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Fig. 1 Egg-based protein foam is often used to make delicate baked goods like sponge cake and meringue light and airy.

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Fig. 2 Researchers working in the lab at Fraunhofer IVV have succeeded in crafting protein foam from legumes such as peas and lentils.

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