Free-from innovation for taste

Many bakeries use other cereals and pseudo-cereals such as amaranth, quinoa and buckwheat, looking to add new sensory experiences to their range. The gluten-free label is an added benefit, but it is not always a straightforward claim to earn.

To guarantee gluten-free products stay clear of any accidental contamination (measurable values under 20ppm), the safest way is to produce them separately from the lines running regular products. Ideally, separate raw material and packaging storage should be set up, in addition to isolated production facilities and production rooms. The safest option also represents a high investment, however, and trying to avoid it only leads to putting more effort into processes, cleaning and controls, while the contamination risk is never zero. In the production area, gluten-free products should be regarded as an independent product category. The reason stems from the characteristics of gluten-free doughs, which are different from those made with raw materials such as wheat, spelt, or rye, for example. Short and sometimes very plastic, is how gluten-free doughs can be described. This is precisely what makes production somewhat more difficult, as many manufacturers of conventional baked goods are not used to these properties. Experience is required to design or adjust the machines to these kinds of dough characteristics.

Working with pre-doughs that also need to be pumpable is even more challenging; entire machinery can break down during production if the raw materials and additives are not correctly balanced. Flours can separate during fermentation, causing the starch to sink to the bottom and block the mixing tool, the specialist illustrates.

Replacing functionalities

Gluten forms a three-dimensional network when energy is supplied. This is the essential core that must be taken into account. Wherever the gluten is pulled, stretched or compressed, gluten-free products cannot directly keep up. However, there are raw materials like fibers and additives, for example, thickeners that can build up and significantly improve the structure of gluten-free doughs. This makes gluten-free doughs very similar to wheat doughs.

In general, baked goods gaining their sensory characteristics thanks to the presence of gluten are harder to replicate technologically through processes and/or the selection of raw materials, in the absence of gluten. For example, a baguette or ciabatta with its open, partly coarse, soft and yet thin pore structure will be very difficult to imitate. Cakes and biscuits, on the other hand, are very easy to imitate, especially if gluten is a hindrance or even undesirable. In addition, the more the crust-to-crumb ratio leans towards the crust, the easier it is to handle its gluten-free production. A pizza, for example, is not technologically very challenging compared to the ciabatta described above.

By using raw materials such as fibers e.g. psyllium, additives such as thickeners e.g. guar gum, hydroxymethyl cellulose, xanthan and/or modified starches, the properties of gluten-free doughs and products can be significantly improved. The use of the Indian psyllium husk (Psylium) alone improves the quality of the doughs and baked goods enormously. Because

Comparison of CO_2 Equivalents		
Process	**Wheat products**	**Gluten-free products**
Water absorption (separated, main part)	Gluten 1.3g and starch 0.4 H_2O/g	Starch 0.4g H_2O/g
Pre-dough	A 1:1 ratio of flour to water is often used for the pre-doughs. The flour ingredients in combination with water make it a mass that flows well, which is shear-stable and pumpable. These properties remain stable during fermentation.	When using rice starches or similar materials, the starch content in the raw materials predominates. During long fermentation, the phases separate and the starch sinks to the bottom, which can destroy the pre-dough strands. Therefore, it is recommended to use propeller systems (pre-dough systems) for such applications. The mold must be controlled separately, to always keep the starch in suspension.
Mixing	Through the flour contents in protein or gluten, starch, pentosans and other components, a viscoelastic dough is produced under the influence of added mechanical energy.	It can be done without adding raw materials such as fibers. If rice flour is used, for example, the dough becomes more like a mushy mass without stability and ideally plastic.
Source properties	Depending on the type of dough or baked goods being produced, there is a high degree of swelling due to proteins, xylans and pentosans.	Alternatively, the swelling of rice flour can only be determined based on the proportion of rim husk: the darker the flour, the more water can be absorbed. This also applies to wheat, but in the case of rice flour, this is the only component.
Dough development	In a classic wheat dough, energy must be added to be able to develop a three-dimensional gluten network. However, it is not only the linkage of gliadin and glutenin that needs to be taken into account here, even though this is the largest part, but also protein-starch and protein-xylene compounds. This combination makes the viscoelastic dough, which must be intensively mixed in a mixing machine for a few minutes.	In contrast, the dough of e.g. rice flour is only mixed to form a binding mass, if necessary, which is composed of cellulose, xylans and other thickening ingredients.
Shaping the dough	The viscoelastic dough can be shaped as desired after short rests. It is for loaf bread, freely set bread or for small pastries.	Shaping the dough is only conditionally successful with 100% rice flour bread; breads have to be baked in boxes, in most cases.
Fermentation tolerance	Once the dough has been mixed out, the dough, the gluten structure, holds the gases and thus forms a loose dough structure, which can also be held well over the proofing time and beyond.	The doughs in the box have a supporting box wall, which adds to the stability. These doughs or masses are very stable, but usually cannot hold well without this supporting wall, as they would otherwise collapse. Therefore, the fermentation tolerance is good, but only possible in the box.
Gas holding	As with fermentation tolerance, mixed doughs have a good gas retention capacity, as the proteins (gluten) can hold the gas even when slightly agitated.	Due to the viscous mass, the rather compact doughs can hold the gases that are nevertheless kept, but this is also limited, as with the wheat doughs.
Furnace drive	In the oven, the yeast gives another gas boost and the gases also expand somewhat. Here, the gluten must hold the gases well before it denatures and the starch takes over water absorption and structure formation.	In gluten-free doughs, the starch generally takes over water absorption and structure formation right from the start. As a result, many gluten-free products tend to be more compact.

of this outstanding use of the raw material psylium or other fibers, they are also often used in organic products. The use of transglutaminases is also often discussed, but, compared to the fibers, it is often too expensive and the effect is rather small compared to the costs.

A patented gluten-free starter

The DIOStart rice liquid starter is a starch culture for rice application. They are special lactic acid bacteria that are adapted in the medium specific to rice. Sourdough can be produced with these starters; if this sourdough is then added to the dough, the properties of the baked product are improved in the form of freshness, aroma profile, crumb stability, crumb adherence and mold protection in the end product.

What's more, the addition of lactic acid bacteria initiates a controlled fermentation, which can then be maintained individually. Besides, depending on the amount added and the raw material used, the starter prevents the starch from separating in the matrix and sinking to the bottom. This in turn is ideal for fermenter systems.

The lactic acid bacteria likes a temperature of 30-34°C, but a temperature over 40°C should be avoided. The higher the temperature, the more yogurt-like it tastes and the baked goods will have a milder taste; temperatures under 32°C will make the sourdough stronger and somewhat more acidic in taste. The temperature should not fall below 28°C.

Fermentation is completed after 34 hours but can be extended up to 48 hours. After 48 hours, the sourdough is completely leavened, whereas at 34 hours it is still very active. If the sourdough is to be reused, a starter quantity of 30% is recommended. When preparing the first sourdough, a starter quantity of approx. 2-5% is required, depending on the raw materials used. The ratio of flour to water should be 1:1-2 depending on the recipe. This sourdough can then be added by 10-30% to the bread dough (calculated on flour).

Sourdoughs can help reduce thickening additives that can often be used in gluten-free products. It should be noted that psyllium is not a food additive, but a fiber. In general, the first studies show that lactic acid bacteria can convert fructans in flour (in combination with water), but further research is needed to ascertain whether all lactic acid bacteria can do this or only certain ones. What is clear, however, is that lactic acid bacteria and yeasts in pre-dough can contribute to the degradation of FODMAP with long fermentation.

Depending on the fermentation process, the resulting baked goods are easily digestible, present a juicy crumb, soft non-straw crumb, are slightly sour (yogurt-like) to sour (kefir-like) or even aromatic sour.

In the development of the rice starter, the difficulty of raw material diversity, applications, parameterization and machineability came into play. The newest version of the starter is organic-capable. The rice starter should also be universally applicable, always offer an individual solution so that the baker can achieve a variety of products. In addition, sourdough can always be produced with machines without much manual handling. The patent Diosna was granted is based on these concepts, including example recipes and parameters so that a rice bread can be made and baked safely. The patent is intended as a guide for gluten-free use.

The application possibilities for the rice starter and rice sourdough are manifold, including rice cakes, rice bread, rice hamburgers, or wholemeal breads; grain-on-grain breads ranging from sweet to savory can be developed with it. +++

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