



**DIOSNA**  
**Trend Report**  
*Forecasts & solutions  
for the Bakery  
Industry 2024*

# Trends + needs in dough production

**Strategies** for achieving **success** in 2024





## 2024 trends shaping the dough and bakery industry

**As in recent years, the trend among end consumers continues:** back to flavorsome bread and rolls, quality and organic products are in demand, healthy eating and sustainability in consumption, and the resources used are more important than ever. Less salt, no sugar, Clean Label. In the past, less flavor and a less optimal haptic experience were accepted in return, and consumers spend more money on sustainably produced organic products. So if you manage to present consumers not only with feel-good, i.e. healthier and more sustainable, but also tasty products, you can count on strong demand. There's a growing appreciation for premium products in Eat-Out-At-Home quality, where both the haptic and the flavor experience can correspond to a restaurant visit. Variety is also in demand. Discovering something new more often, tasting something new that feels good. Enjoyment without a guilty conscience - or rather: with a clean conscience in the best quality.

Trends that will shape 2024:

- ➔ **Feel-good baked goods & slow baking**
- ➔ **Eat-Out-At-Home: premium quality food**
- ➔ **Sustainability**
- ➔ **More product variety - but keeping efficiency and reliability high**

Read the DIOSNA trend report for the baking industry to find out how consumer trends are influencing the baked goods industry and what challenges and opportunities this presents for manufacturing companies.

## Feel-good baked goods & **slow baking**

Today and tomorrow, you can score points with feel-good and healthy products that contribute more to a healthier diet and also help the end consumer to feel good. Be it through the types of flour and grains (spelt, rye, quinoa; whole grain) chosen for the baked goods, the addition of grains and sourdough, the reduction of fat, salt and sugar, or the declaration as slow food.

Incorporating combinations of flavor technology and sourdough, such as wheat sourdough or rye sourdough, into the recipes makes it possible to reduce or even eliminate baking agents and additives such as sugar and salt and thus achieve a Clean Label product - with taste, haptics and freshness. But not everyone has the production capacity for Clean Label production. But even without the stamp, these combinations can be used to produce fresh baked goods with reduced use of baking agents, salt and sugar.



## Less salt

Cereal products, especially bread, are the main source of salt in the human diet. Worldwide, an estimated 1.28 billion adults aged 30-79 suffer from high blood pressure. One of the global targets in the area of non-communicable diseases is to reduce the prevalence of high blood pressure by 33% between 2010 and 2030 (WHO). The Association of German Industrial Bakeries has also announced that it will reduce the salt content of packaged bread and baked goods to 1.1 g of salt per 100 g of finished product by 2025.

Salt is an important ingredient in bread production, and reducing it can have a negative effect on bread quality.

One way to reduce salt is to add a yeast starter, provided it has enough time to develop - overnight. Over this long period of time, 'wild' sourdough microorganisms can also develop and form flavor components allowing a reduction in salt without any loss in taste. An ideal gluten network despite salt reduction can be achieved with the right kneading process. This is optimal if it supports improved water absorption and the formation of an optimal gluten network. The process is perfected by the gradual change in kneading which is made possible by frequency control like DIOSNA mixers do.

One Clean Label solution for reducing salt is the targeted use of sourdoughs strengthening the gluten network. Just as known from ascorbic acid. The use of sourdough can compensate for this and thus reduce the amount of salt required, as sourdough in combination

with NaCl improves the perception of the salty flavor and aroma. In their review 'Strategies for Reducing Sodium Intake in Bakery Products', Codină et al.\* write that the use of sourdough in low-salt products for the production of healthier foods is a promising strategy and that sourdough counteracts the effects of salt reduction on bread flavor leading to good sensory properties of the end product, such as the crumb structure.

It was also reported that the addition of sourdough fermented with *Lactobacillus amylovorus* during bread production to produce a low-salt bread would extend the shelf life compared to a control sample. Bread containing lactic acid bacteria (LAB) from fermented wheat germ tasted saltier compared to a control bread. It is assumed that the salty flavor is based on a combined effect of souring and proteolysis.

By adding a sourdough made from rye malt fermented with glutamate, in which bacteria of the species *Lactobacillus reuteri* have accumulated, the salt content of the bread could possibly be reduced from 1.5% to 1% (compared to flour), with the flavor and other characteristics of a consistent bread quality. Sourdough improves the perception of the salty flavor and provides additional aromatic compounds. This makes sourdough a useful functional ingredient for bread with low salt content. In addition, sourdough can be used not only in bread, but also in pastries or croissants to improve their flavor, texture and therefore aroma.



\* Codină, G.G.; Voinea, A.; Dabija, A. Strategies for Reducing Sodium Intake in Bakery Products, a Review. Appl. Sci. 2021, 11, 3093. <https://doi.org/10.3390/app11073093>



### Less sugar & fat

Alongside high blood pressure, diabetes is one of the most common diseases worldwide. Together with hyperlipidaemia, i.e. high fat and cholesterol levels, these diseases form the metabolic syndrome. Metabolic syndrome is one of the most important risk factors for cardiovascular diseases, which are particularly favored by the Western lifestyle consuming a lot of salt, sugar and fat alongside too little exercise. Sugar and fat can also be reduced in baked goods without sacrificing flavor.

Industrial sugar can be reduced by using a thermal pre-dough. The DIOSNA AromaStück®, for example, is a thermally produced pre-dough. By adding flour, groats, or seeds together with a special pre-dough starter (DIOStart® Aroma) and water into a respective plant (e.g. DIOSNA Aroma Ecoline) after a defined development time, a large number of aroma components and natural maltose form for an unmistakable taste profile. Maltose is formed from starch during the swelling process when flours, groats and seeds are broken down enzymatically.

The addition of both sugar and fat can be drastically reduced by this process. The AromaStück® can also be combined with microorganism-driven sourdoughs and produced in DIOSNA pre-dough systems.

## Keep it slow: FODMAPs

The term FODMAP („Fermentable Oligo-, Di-, Monosaccharides And Polyols), has repeatedly found its way into the media in recent years and has often been associated by health experts with fermentation and the bread-making processes.

FODMAPs include carbohydrates and sugar alcohols such as fructose, lactose, sorbitol, xylitol and many more. These substances are not absorbed into the bloodstream in the small intestine, but are fermented by bacteria in the large intestine. This is particularly important for people with irritable bowel syndrome. This is because bacterial metabolism can cause flatulence and bloating (discomfort) but also severe abdominal pain/cramps, including diarrhea. Around 6-15% of the world's population currently suffer from irritable bowel syndrome (IBS). Today, health insurance companies and doctors recommend a FODMAP diet (under medical supervision).

FODMAPs are found in many foods. Oligosaccharides such as fructans and galactans are found in the husks of cereals, garlic and artichokes (fructans). Galactans are increasingly found in pulses such as beans, lentils and chickpeas. Cereals contain disaccharides such as maltose, whereas fruit and sweet foods in particular contain sucrose. Also lactose is included in the row of IBS supporting substances and is found in milk and products made from it, such as yoghurt, ice cream, pudding, quark, etc. Honey, asparagus, watermelon, onions and many more contain monosaccharides, which are also FODMAPs. Despite this long list, the list of polyols is shorter. Sorbitol and mannitol are the most common sugar substitutes, although xylitol has also become very common on the market in recent years. Sorbitol and mannitol are also found in apples, blueberries and some edible mushrooms, for example.

There are different ways to follow a FODMAP diet. The consumption of foods with a low FODMAP content and the consumption of already fermented foods. Studies show that yeasts and lactic acid bacteria, for example, metabolize FODMAPs and form gases, acids and other metabolic products. This applies, for example, to sauerkraut,

dairy products such as yoghurt and cheese produced with lactic acid bacteria, as well as beer and wine. The German Federal Centre for Nutrition reports that longer dough proofing as well as the use of alternative yeasts, and the use of sourdough in the production process could be levers for reducing FODMAPs.

With regard to FODMAPs, sourdough fermentation facilitates the breakdown of fructans, but can in turn lead to the release of mannitol. The use of sourdough could therefore only lead to a change in the FODMAP profile, but not to a sufficient reduction in the compounds belonging to the FODMAPs. Previous studies have shown that extending the dough proofing time or using sourdough in whole meal wheat and rye breads reduces the FODMAP content. However, the reduction is not sufficient to make them digestible for patients with irritable bowel syndrome.

However, studies by the University of Hohenheim show in a more differentiated way that both the choice of wheat variety and the selection of the chosen process are decisive for the amount of FODMAPs.

The group also found that the fructan content of the flours analyzed correlated with the average FODMAP content, meaning that the average expected FODMAP or excess fructose content of a baked good could be roughly estimated from the fructan content of the flour: the less fructan in the flour, the fewer FODMAPs and excess fructose in the bread. Therefore, it is interesting choosing raw materials with a low fructan content to obtain a low FODMAP bread. The use of sourdough and yeast also appears to further reduce FODMAPs. Overall, this increases the wholesomeness of the breads.





## **Eat-Out-At-Home:** better flavor & feeling

### **Optimization of water adsorption**

Eating at home in restaurant quality - in terms of baked goods: in artisan or craft quality - is one of the growing consumer demands. Haptic, flavor and freshness are not only determined by the raw materials, but also by the water content. Water plays an important role in each individual recipe. Water ensures the formation of gluten, the protein structure that is responsible for the volume of the bread, for the gelatinization of the starch and controls the consistency of the dough. Water also helps to control the temperature of the dough, which is crucial for good quality products. The right amount of water also ensures that baked goods stay fresh and edible for longer. For example, less water absorption affects the consistency of the dough in terms of dryness and hardness, as well as the hydration and dispersion of the ingredients. A lack of volume and a drier and denser crumb are some of the expected results.

Optimum water absorption in the dough can also be achieved by the amount added and the process. This makes it possible to achieve doughs with a 3-5% higher water content. The increased water absorption of dough improves the quality and flavor of the end product. Water absorption can be increased by making adjustments during the process. It is therefore particularly important to keep an eye on the kneading process.

An optimal kneading time leads to an optimum stretching of the gluten, which makes the dough smooth and elastic and produces a baked good with the desired size and crumb structure if needed. In addition, a shorter kneading time ensures a lower dough temperature. Various types of mixers are available to achieve optimum mixing and dough development, such as spiral, horizontal, high-speed or wendel mixers.

To illustrate the differences, only the aspect of the dough temperature at the end of the kneading process will be briefly discussed here. This in turn has an influence on water absorption. With a DIOSNA spiral mixer, around 2% more water can be added to the dough. The wendel mixer compresses and stretches the dough between its two wendel tools and then presses it against the bowl wall. This achieves a water absorption of 3-5% for most doughs, especially for flours with a medium protein content. In addition, the kneading time is considerably shorter compared to spiral mixers, which results in less dough heating and the production of more dough batches per hour. Every dough has different requirements depending on the target product. To find out which process is best suited, we therefore recommend on-site tests at the manufacturer's premises.



### Pre-dough: more flavor, more freshness, longer shelf life

In the context of Eat-Out-At-Home quality, the use of pre-dough or sourdough is almost a must, especially because of its positive influence on the baked goods. In addition to the advantages already described regarding the reduction of salt, sugar and fat as well as the improved shelf life, the following points contribute to a premium experience:

- ➔ More aroma
- ➔ More freshness
- ➔ Better crumb
- ➔ More naturalness
- ➔ Better stability for the freezing process

By using specific sourdough starter cultures, acidity levels can be achieved that are not perceived as sour. For example, the DIOSNA starter for a mild wheat sourdough can be used to produce croissants. In addition to optimized relaxation behavior of the dough and a dry dough surface, the croissant has a more intense, buttery aroma and tastes fresher.

Another option for more flavor and a better haptic experience accompanied by the feeling of eating healthier is to add swelling, scalding or cooking pieces. Grains and seeds can be pre-soaked and then added to the main dough.

The swelling piece achieves softer grain components that make the baked goods more enjoyable to eat. The scalding piece achieves starch gelatinization, which contributes to both improved water binding capacity and improved aroma. This also includes the DIOSNA AromaStück®. It can be used to achieve an aromatically rounded taste, which is based on the neutralization of acid peaks. This results in an aromatic, malty bread taste, for example. A juicy crumb can be achieved with the cooked piece. This method is implemented in appropriate systems (e.g. DIOSNA aroma systems).

The following table shows further advantages of using starter and sourdough for various products.

**Bakery products, with world-wide significance,** and the technological and product advantages achieved by the use of pre-doughs/sourdoughs

| Pre-dough/Sourdough              | Bakery product  | Advantage                                                                                                                                                                                             |
|----------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wheat sourdough                  | Flat bread      | <ul style="list-style-type: none"> <li>• Gluten strengthening</li> <li>• Storage improvement</li> </ul>                                                                                               |
|                                  | Hamburger bun   | <ul style="list-style-type: none"> <li>• Gluten strengthening freezing stability</li> <li>• Clean label option</li> </ul>                                                                             |
|                                  | Hot dog bun     | <ul style="list-style-type: none"> <li>• Crum elasticity</li> <li>• Deep freezing storage stability</li> <li>• Clean label option</li> </ul>                                                          |
|                                  | Pretzel         | <ul style="list-style-type: none"> <li>• Gluten strengthening</li> <li>• Stress stability</li> <li>• Improved dough relaxation</li> <li>• Suitability for automatic lines</li> <li>• Aroma</li> </ul> |
|                                  | Sandwich bread  | Crumb structure, softening                                                                                                                                                                            |
|                                  | Croissant       | <ul style="list-style-type: none"> <li>• Optimized relaxation behavior of the dough</li> <li>• Dry dough surface</li> <li>• Suitability for automatic lines</li> <li>• Aroma</li> </ul>               |
| Wheat sourdough (mild)           | Pastry (Danish) | <ul style="list-style-type: none"> <li>• Optimized relaxation behavior of the dough</li> <li>• Dry dough surface</li> <li>• Suitability for automatic lines</li> <li>• Aroma</li> </ul>               |
|                                  | Toast bread     | <ul style="list-style-type: none"> <li>• Crumb stability</li> <li>• Aroma</li> <li>• Clean label option</li> </ul>                                                                                    |
| Wheat sourdough (strong)         | Pizza           | <ul style="list-style-type: none"> <li>• Improved dough relaxation</li> <li>• Suitability for automatic lines</li> <li>• Aroma</li> <li>• Re-integration of rest dough</li> </ul>                     |
| Wheat sourdough (mild or strong) | Wheat bread     | <ul style="list-style-type: none"> <li>• Gluten strengthening</li> <li>• Storage improvement</li> <li>• Aroma</li> </ul>                                                                              |

## Sustainability

### Pre-dough: reuse leftover dough & bread in production

Requirements for a more sustainable production in dough production can be met by returning leftover baked goods and dough to the process. Here too, sourdough is the solution. Using wheat or rye bread fermentation with special starter cultures and systems, bread and dough residues can be fully fermented and developed into a flavorful sourdough. Products that are cut from dough, such as pizza or croissants, produce a large amount of dough scraps. Based on bread fermentation, dough scraps can be mixed with the main sourdough and fermented for a short time.

This is how 20 to 25% of the total dough weight can consist of fermented dough scraps. However, the reuse of bread and dough scraps is not only sustainable, but also contributes to the quality of the dough and the baked product. Aroma, haptics, freshness, shelf life and the pre-requisites for freezing are influenced positively.

The use of fermented dough in products such as croissants is being used by more and more bakeries with a proportion of around 7% mild sourdough to noticeably enrich the buttery taste of croissants.



## More **product variety**, more **efficiency**

### AGV and smart room concepts for more flexibility

Until now, industrial production on a large scale has mostly been based on mono lines. Many manufacturers on this scale have so far relied neither on dough resting nor on the integration of sourdoughs. Today, many bakers and manufacturers are expanding and developing their product portfolios. Pre- and sourdoughs are increasingly being integrated into production. In addition, dough resting is playing an increasingly important role, even in very busy companies.

However, the subsequent integration of dough resting systems or sourdoughs into existing systems poses a major challenge. But how can one move away from the mono line, at least for the premium segment, so that the product range can be adapted to the ever more flexible market requirements?

- Integration of smart transport vehicles with lifting function: automated guided vehicles (AGVs) operating driverless and recipe-controlled move bowls away from and to different pick-up and destination stations. The lifting function enables lifting into and out of racks.
- Smart space-saving concepts: The dissolution of rigid structures and production lines can be made possible by AGVs, as these can operate freely in space. They enable for the implementation of bowl storages - e.g. for dough resting - instead of area increasing storage, for example.
- The dissolution of rigid production structures in combination with space-saving room concepts also enables the implementation of smaller production lines.
- As dough processing via an automated linear system does not allow to access the system during ongoing production e.g. for cleaning in preparation for a batch size change the combination of independent working plants, dosing stations etc., with agile transport vehicles results in an immense reduction in downtimes as there are no access restrictions. A mixer can easily be taken out of the AGV supply chain for cleaning and to be reintegrated after again.

### Interested in AGV supported systems?

[www.diosna.com/landingpages/agv-e-guide-en-download](http://www.diosna.com/landingpages/agv-e-guide-en-download)



### Choosing the right mixer is essential

Last but not least, efficiency in dough production is determined by the choice of the right mixer. The choice of the right system depends on its range of use, the desired batch output, quality and efficiency. Cleaning should also be easy, as this is decisive for downtimes. In addition, simple operating and an intuitive control systems make operation easier. Simple and comprehensive monitoring of kneading curves, dough temperature, frequency, and recipe status, for example, is very important for an optimum in quality management.

Choosing the right type of mixer depends on the respective end product and therefore increases the success rate for precise conversion. Kneading type, frequency, force, type and temperature are the decisive factors for differentiation. A frequency inverter enables kneading at different frequency levels and therefore the processing of different types of dough.

The type of kneading, e.g. vertical spiral kneading or kneading with wendel tools, determines the energy and water input, the mixing of the ingredients, the temperature, etc. But also, the distance between the kneading tool and the bowl wall (in the case of wendel mixer also the distance between the tools) is decisive for quality, as this determines the force and surface with which the dough is pulled apart, pressed together or pressed against the bowl wall. All this - and more - must be considered when selecting an efficient kneading system.



## Conclusion

The 2024 trends for the bakery industry are diverse and can be found on the part of both end consumers and manufacturers.

A healthier diet plays a major role for consumers, particularly in the context of various illnesses such as high blood pressure, diabetes, cholesterol, intolerances, and intestinal health. But also, many healthy people feel the need to feel fitter and to support an appropriate lifestyle. The reduction of salt, fat, and sugar in baked goods as well as the use of whole meal flours and seeds support this lifestyle and nutritional requirement. Sustainability and naturalness also play an important role in the choice of baked goods.

For the bakery industry, high quality, an individual, aromatic taste, suitability for freezing and freshness, in addition to responding to trends, continue to be of crucial importance for remaining stable in the market. In this context, staff shortages represent a challenge for efficiency that needs to be compensated for or counteracted. This is not always possible due to the availability of staff on the labor market, but also due to illness and vacation.

If manufacturers in the dough and bakery industry want to meet these demands the following topics can be solutions for a viable future:

- ➔ the integration of pre- and sourdoughs
- ➔ the reintegration of leftover dough and bread
- ➔ the digital management of production and its logistics (e.g. recipe, process-dependent bowl management)
- ➔ the automation of production logistics (e.g. with automated guided vehicles - AGVs)
- ➔ the use of durable high-performance mixers that have a positive impact on dough quality and are highly flexible in terms of frequency (e.g. wendel mixers and spiral mixers with frequency converters from DIOSNA)
- ➔ the integration of Wellness or feel-good premium products in smaller batches
- ➔ the production of baked goods that either have a longer shelf life or can be frozen easily and retain their quality after defrosting or baking

About us

## DIOSNA - Quality Made in Germany

**All under one roof:** DIOSNA machine engineering and technology are used worldwide in the processing and production of solids for the pharmaceutical and food industries. The product portfolio includes mixers, granulators, dryers, coating systems, fermentation systems and kneading machines for research, pilot and industrial production. It also offers a wide range of solutions for the most important processes in dough production, from dosing to pre-dough preparation and kneading through to transfer logistics - for research, pilot and industrial production.

Product development with the customer, process planning and optimization, project management, after-sales and value added services are continuously optimized yesterday, today and tomorrow with a focus on our customers.

This is why DIOSNA customers have valued quality, performance, expertise and philosophy for over 135 years.

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