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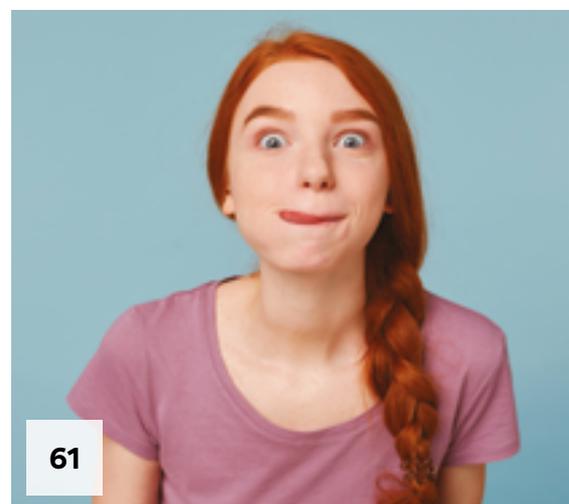
From chocolate to cola, colour has always been an important aspect of marketing. Find out how our ideas about colour can also influence our relationship with food.



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WELCOME

Welcome to the Autumn 2022 edition of *Baking Europe* journal.

A loaf of bread, pastry or cake at your local bakery has, to all intents and purposes, changed little in the past 100 years. But dig a little deeper and it soon becomes apparent that vast differences can be seen in today's products and manufacturing processes from the basic ingredients, right through to the shop shelf. Presently, the most noticeable change is the introduction, or reintroduction, of 'ancient' grain flours in addition to those being discovered from hitherto unknown sources, in order to economise on wheat use during the current shortages.

Since its launch nine years ago, *Baking Europe* has covered hundreds of research and innovation topics, but none so much as those of recent years. Driven by the pandemic and other world crises, the latest concepts and ideas are now changing the very essence of baking. Sound dramatic? Then read on, but be sure to put on your track shoes because you will need to start running to catch up; as did we:-

In this issue we have a special report on flour from acorns, thanks to Manitoba University's researchers; and these seeds are from evergreen oak trees! Hands up all who thought that all oaks were only deciduous? Mine are firmly down by my side!

Foods with health giving properties are still in vogue, so courtesy of the University of Surrey UK, we delve into the benefits of almonds which, when processed in a certain way, increase nutrient and fibre content.

In view of the energy price hikes we look at the latest on solar energy and biogas, which uses biowaste and contributes to the circular economy. From pectin to quinoa, through to a must-read report on pollination without bees, this issue has something for every professional. Topped off with two articles examining opposite ends of food product appeal – disgust and colour on the one hand and deliciousness on the other, you need only turn the page to get a better grasp on the very latest in baking!



Graham Pendred
Publisher & Editor

Where would we be without POLLINATORS?

Written by:



Szymon W. Lara

PhD student in Food Business and Nutrition Science, advocating the role of forgotten crops in food and nutrition security

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Global food and nutrition security depends on the state of world pollinators, such as birds, mammals, and many invertebrates. Several hundred insect species play a major role in global crop pollination, mainly beetles, flies, moths, butterflies, wasps, ants, thrips and the most obviously recognisable pollinators, bees. Out of approximately 369,000 species of angiosperms (flowering plants), almost 90% interact with pollinators, with the majority not being able to reproduce in their absence.¹

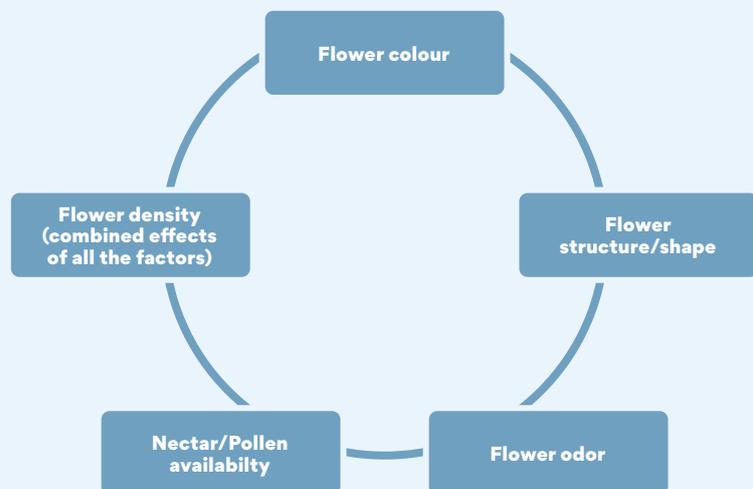
Animals, particularly bees are responsible for the gemmate transfer between one or more variety of at least 66% of the estimated 1,500 crop species cultivated around the globe.² Around 75% of the world's most abundant food crops have increased fruit or seed set when animal pollinated, this results in a further economic benefit of at least €150 billion or around 10% of the value of annual world agricultural production.¹ These figures show the human

reliance on the eco-system services provided by pollinators, whether in the form of food production, nutrition, societal implicates or economic prosperity.

Staple crops like cereals, often produce flowers which are wind

pollinated, therefore their reliance on pollinators is minimal and most other crops can yield without pollination, for example, leafy greens, bulbs, tubers and root vegetables.^{2,3} In the 20th century the development and popularisation of crops less reliant on pollinators has sparked interest in

Figure 1: Factors influencing the insect visitation to flowers. Gardeners could use this to enhance their garden attractiveness to the pollinators.





many fruits and vegetables, for example, bananas, tomatoes, citruses, many legumes and oil crops. On the other hand, most fruit plants are dependent on the gemmate shuffle, which magnifies the importance of pollination. From a food security perspective, large field agglomerations³ that pursue monocropping³ are not as pollinator dependant, as are for example, rural communities in the developing world, as these often rely on local food eco-systems, including the pollinators

(especially as the ratio of animal pollinated plants increases from around 78% in the more industrialised temperate zones to over 94% in the less wealthy tropics).^{1,3} Nevertheless, the declining wild pollinator populations could have significant implications for global food supply, as around three quarters of cultivated crops rely on pollination to some degree, sometimes indirectly through initial seed cultivation, or by fertiliser production or animal feed. The absence of pollinators could result in

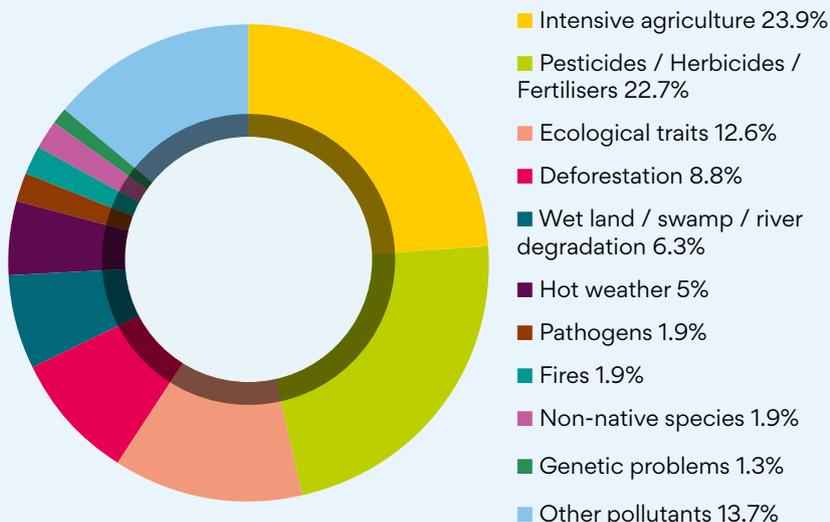
a yield reduction of 100% in some crops but only 5% in others.⁴

This pollinator shortage has been on the horizon for quite some time, despite the efforts undertaken by scientists and food systems practitioners. Wild populations of pollinators are drastically dropping around the globe, yet there is a small increase in the number of managed bee colonies, which unfortunately, often become the victim of colony collapse disorder or the Varroa mite (see foot note 2 and figure 2).^{5,6} As a result, the environmental degradation and problems with managed pollination might still be compromising the production of pollinator-dependent crops like nuts, soybean, coffee, and many fruits, contributing to food insecurity in some specific areas.^{3,4,5,6}

“The absence of pollinators could result in a yield reduction of 100% in some crops but only 5% in others.”



Figure 2: Factors contributing to the decline of wild-bee colonies and other insect species worldwide. Graph adapted from the data presented by UNEP, “Emerging Issues: Global honey-bee colony disorder and other threats to insect pollinators” (2022).



Where crops fail or end up diminished due to pollinator absence, most growers will actively manage their pollination. The problems with pollinator populations have, for example, impacted pear production in China, where every year, tens of thousands of local people are recruited for the immense task of hand pollinating pear flowers.^{5,6} Vanilla is a prime example of a premium food commodity that is purely hand pollinated. This task requires workers to physically, by hand, transfer the pollen from one flower onto another.⁶ Vine crops from the Cucurbitaceae family, like watermelons, melons and pumpkins are very often pollinated with help from managed honey-bee colonies settled around the fields. A similar



“Where crops fail or end up diminished due to pollinator absence, most growers will actively manage their pollination.”

pollution, altered light and moisture levels and as a result of that, growers must sometimes rely on hand pollination.⁵

Some efforts are being made to reintroduce insects back into towns and cities, often through the modification of local flora in parks and gardens, however this is often dominated by exotic horticultural varieties, potentially leading to an increase of foreign species of insects, which could further endanger the local environment.

Urban gardeners could also try to promote settlements of native pollinator species through the enhancement of flora, with native plants creating ecological habitats that fulfil the nesting habitats, sociality and behaviourally of the lost/declined species of pollinators. The diversity of bee species for example, has been seen to correlate with the percentage of seminatural habitats in the area.^{3,5}

Similar principles could be undertaken by the larger, often commercial orientated food growers. Science suggests that land preservation and sustainable management practices could generate a significant economic benefit to growers by promoting wild bee populations that enhance yield production.⁴ Crop-pollinating insect species are often generalist and pollinate many native plants, however, restoring pollination services to agriculture could also benefit wild

plants and thereby promote the conservation of biodiversity across the agri-natural landscape.² This could be achieved by increasing agrobiodiversity or intercropping. Furthermore, the conservation of wild insect habitats like meadows and especially the buffer strips of land separating fields from roads and fields' margins are essential to reducing insect degradation levels. Perhaps a more conscious use of pesticides as well as herbicides, for example, through the adoption of technology driven precision farming, could prove as advantageous for the local biospheres as for the farmers themselves. This has been observed at a fava bean (*Vicia faba* L.) farm in Australia, where a change in knowledge-oriented field management increased yield by 17%, purely through the maintenance of local wild bee habitats.⁴ The benefits to farmers are not only limited to the increase in yield, but also the decrease of certain running costs, as a rich bank of insects around a field can significantly reduce the need for hand pollination or hive renting.

Food and nutrition security is known to be a complex chain of interacting factors that include economic values, infrastructure, science and social inequalities. In 2020, the World Economic Forum identified the decline of pollinators in the top five long-term global risks, due to the effects of a shift in crop cultivation from nutrient-rich food crops (e.g., fruits) to energy-dense, nutrient-poor commodity crops (e.g., wheat,

approach is undertaken at cocoa-tree farms through agroforestry where permanent bee colonies are settled by humans or the bees are transported on lorries, but only for the flowering period, similar to avocado and passion fruit production in many tropical countries. This, however, could be contributing to the illusion of the lack of correlation between the declining populations of wild insects and some degradation in yields.^{4,6}

The problem of diminishing wild pollinators also impacts urban growers, allotment holders and small-scale farmers across Europe. Urbanisation is often associated with the decline of local biodiversity, this is due to habitat fragmentation, distribution and elevated levels of



soybean). Improving the state of world pollinators is an important factor in feeding populations and policymaking can be a very useful method for the ecologically orientated changes in the agricultural systems.

However, more action is needed to reverse damage already done and individuals themselves could take up the challenge of creating insect friendly habitats, whether in their local areas, by maintaining meadows, lawns, shrubs, and trees or by incorporating more native species of plants, both perennial and annuals, into their gardens.

Creating a rich biodiverse garden, with numerous species, with the combined flowering time of at least two seasons, is a stepping stone to attracting bees into gardens and providing them with a rich source of food, enabling colonies to multiply, survive winter and thrive in spring. 

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Foot notes

Foot note 1: Flower fertilisation is on average higher for wind pollinated monocrops due to the abundance of co-flowering conspecific plants.

Foot note 2: Colony collapse disorder is a natural phenomenon where the worker bees disappear from the managed beehives, leaving behind the queen, young larvae, and food. Varroa mite on the other hand, is a parasite that attacks and kills honeybees worldwide.

References

- 1 Ollerton J, Winfree R, Tarrant S. How many flowering plants are pollinated by animals?. *Oikos*. 2011 Mar;120(3):321-6.
- 2 Kremen C, Williams NM, Thorp RW. Crop pollination from native bees at risk from agricultural intensification. *Proceedings of the National Academy of Sciences*. 2002 Dec 24;99(26):16812-6.
- 3 Werrell PA, Langellotto GA, Morath SU, MATTESON K. The influence of garden size and floral cover on pollen deposition in urban community gardens. *Urban Horticulture: Ecology, Landscape, and Agriculture*. 2017 Mar 3:173.
- 6 Garibaldi LA, Aizen MA, Cunningham S, Klein AM. Pollinator shortage and global crop yield: looking at the whole spectrum of pollinator dependency. *Communicative & Integrative Biology*. 2009 Jan 1;2(1):37-9.
- 5 Matteson KC, Ascher JS, Langellotto GA. Bee richness and abundance in New York City urban gardens. *Annals of the Entomological Society of America*. 2008 Jan 1;101(1):140-50.
- 4 Cunningham SA. Human welfare and its connection to nature: What have we learned from crop pollination studies?. *Austral Ecology*. 2017 Feb;42(1):2-8.
- 7 Antonelli A, Smith RJ, Fry C, Simmonds MS, Kersey PJ, Pritchard HW, Abbo MS, Acedo C, Adams J, Ainsworth AM, Allkin B. *State of the World's Plants and Fungi* (Doctoral dissertation, Royal Botanic Gardens (Kew); Sfumato Foundation).
- 8 Morandin LA, Winston ML. Pollinators provide economic incentive to preserve natural land in agroecosystems. *Agriculture, Ecosystems & Environment*. 2006 Sep 1;116(3-4):289-92.

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TRUE COLOURS

Food colouring and disgust perception



Written by:



Dr Jeanine Ammann
Agroscope



Dr. Anne Berthold
Department of Health Sciences and
Technology, ETH Zürich

As humans we can use different senses to interact with food and the first interaction we usually have, is to visually inspect it. We check for flaws, signs of decay or pathogen presence and if we are satisfied they are absent, we may use another sense (e.g., smelling or tasting) to then hopefully conclude that the food is safe to consume. Disgust, as a basic human emotion, helps humans differ between suitable and unsuitable food.¹ In our previous research, we found that product colour significantly influences flavour perception.² Now, in this article, we highlight two studies investigating the effects of visual appearance, that is to say, food colour, on individuals' disgust perception. The findings of our research highlight the complexity of food-colour interactions and how this new knowledge about the antecedents of disgust perception are important for researchers, as well as product developers, as this can be used to increase product acceptance and liking.

Two colours of juice

In 2017, we conducted a virtual reality experiment to investigate the effect of juice colour on participants' disgust perception.² A total of 99 participants (68 female, 31 male) took part in this study wearing a head-mounted virtual reality system (see Figure 1) while trying two different banana juices,

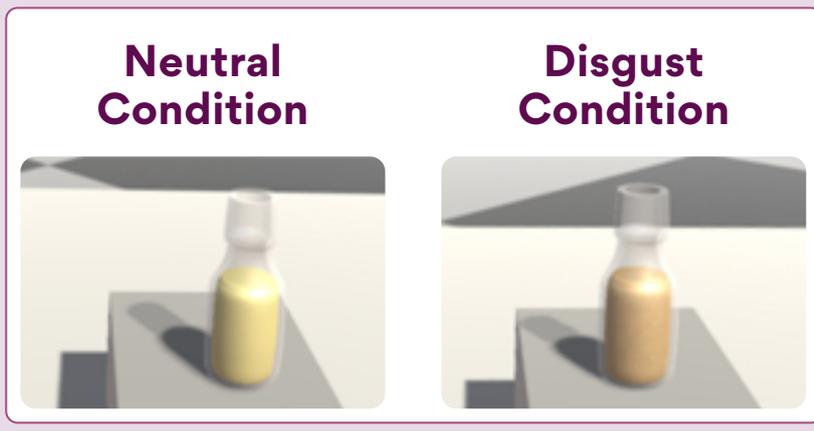
one yellow, the other brown. The yellow version of the juice aimed to mirror the juice's real appearance, while with the brown version, we aimed to induce disgust by making the juice symbolise the ageing of bananas (see Figure 2). Wearing the head-mounted virtual reality system, participants were able to drink the juice while seeing its virtual reality image, but they did not see its real appearance, which enabled us to give them the same juice twice, while modifying its colour in the virtual reality environment. Both juices were rated by participants for their visual appearance and for disgust evoked. All participants tried both juices, but the order of presentation was randomised to control for possible order effects.

“Disgust, as a basic human emotion, helps humans differ between suitable and unsuitable food.”

Figure 1: Participant trying the juice while wearing a head-mounted virtual reality device



Figure 2: The two colours of juice in the virtual reality environment.



Acceptance of natural browning

We found that participants liked the appearance of the yellow juice significantly more than the brown juice ($t(98) = 6.93, p < .001$). Against our hypothesis, results further showed that participants did not perceive the brown colour as more disgusting than the yellow one. The disgust ratings for both juices were virtually the same and participants rated both juices as not disgusting ($t(98) = 0.18, p = .85$).

Instead, they may have thought that the brown juice looked natural (as opposed to artificial), as it shows the natural browning of bananas. Furthermore, they were well aware that they were seeing a virtual image of the juice and not its real appearance, which might also have influenced the results. In addition, there was no difference in liking of the juices ($t(98) = 0.30, p = .77$), which indicates that participants were not

significantly influenced by the visual appearance of the juices when rating their taste.

Shades of red and green

In a separate study, we tested how specific colours, in this case, red and green, can influence disgust perception, by inviting 234 individuals (176 female, 52 male, 4 other) to an online experiment, where we showed them four food items either in their natural appearance or in a red or green coloured version. Additionally, two of the four food items were taken from the Food Disgust Picture Scale³ and looked potentially disgusting, whereas the other two looked perfectly fine to eat. Participants were assigned to either the red or the green condition, which meant that two of the four pictures were coloured in red or green, respectively, while two were presented in their original appearance. Participants rated all four pictures for disgust and attractiveness.

Colour and disgust

We found that the naturally coloured food items were perceived as most attractive. Furthermore, the green and red coloured items differed significantly in the levels of disgust evoked ($F = 64.0, p < 0.01$). Specifically, the green coloured pictures were perceived as significantly more disgusting than the red coloured pictures. In addition, disgust ratings of the green coloured pictures were significantly positively correlated with the 8-item Food Disgust Scale⁴, whereas the ratings of the red coloured pictures were not.

“From an evolutionary perspective, it is not surprising that green foods are intuitively judged as more disgusting than red foods.”

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This implies that individuals with higher food disgust sensitivity rated the green food items as more disgusting than those individuals with lower food disgust sensitivity. In nature, red colours can symbolise the ripening of vegetables (e.g.,

tomatoes) or fruit (e.g., apples), whereas green can serve as a proxy for sourness or bitterness and so from an evolutionary perspective, it is not surprising that green foods are intuitively judged as more disgusting than red foods.

Conclusion

Colour had a significant influence on the participants in our two studies. By investigating the effect of colour on disgust perception, we found that interactions were complex. A brown colouring does not automatically induce disgust, it probably depends on the strength of the browning and the type of food in question. For red and green, we found that red coloured foods were perceived as more attractive, whereas green coloured foods tended to be perceived on a level that leaned more towards being considered disgusting. Clearly, more research is needed to follow up on these findings and to discover more on the interesting relationships between food, colour and disgust interactions. 

About the authors

Dr Jeanine Ammann studied food science at ETH Zurich in Switzerland and worked in the food industry. After completing a PhD on food disgust sensitivity and a few years of research and teaching in the university environment, she joined Agroscope, where she currently investigates consumer behaviour, along the food value chain.

Dr Anne Berthold studied psychology at the University Leipzig in Germany and completed her PhD at the Friedrich Schiller University in Jena. After several years of research at the University of Zurich, she is currently working at the ETH Zurich in Switzerland where she investigates how people's consumer behaviour is shaped by different contextual factors.

References

1. Rozin, P., Haidt, J., & McCauley, C. R. (2008). Disgust (M. Lewis, J. M. Haviland-Jones, & L. F. Barrett Eds.): The Guilford Press.
2. Ammann, J., Hartmann, C., & Siegrist, M. (2020). Virtual reality (VR) as a new tool for nutrition and behaviour research. A review of four studies. *Proceedings of the Nutrition Society*, 79(OCE2), E273. doi:10.1017/S0029665120002219
3. Ammann, J., Hartmann, C., & Siegrist, M. (2018). Development and validation of the Food Disgust Picture Scale. *Appetite*, 125, 367-379. doi:10.1016/j.appet.2018.02.020
4. Hartmann, C., & Siegrist, M. (2018). Development and validation of the Food Disgust Scale. *Food Quality and Preference*, 63, 38-50. doi:10.1016/j.foodqual.2017.07.013

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PROGRESSA BREAD

The new compact bread line from FRITSCH

The trend towards breads made from soft doughs with long pre-proofing times of up to 24 hours, and often a high rye content, poses major production challenges especially for medium-sized retail bakers. To be able to produce as many different products as possible at consistently high quality, a production line simply has to be uncomplicated to retool, easy to clean and ready to expand if necessary. To meet this demand, FRITSCH has launched a completely new bread line - the PROGRESSA bread. Depending on product size, the PROGRESSA bread can process between 800 kilograms and 1.8 tons of dough per hour. The new line combines a sophisticated hygienic design with highest product quality on a small footprint.

Hygienic Design

“The design of a system decides how quickly and easily employees can

remove or clean individual elements or parts,” says Michael Gier, the Manager of the FRITSCH World of Bakery. The principle is to achieve as many functions as few parts as possible. During the development, great importance was, therefore, given to ensuring that all parts are easily accessible and easy to remove. “There are no motors or other electrical parts, such as sensors, in the drive compartment of the line,” explains Michael Gier. “This means the machine can be dismantled quickly and, for the most part, cleaned quickly and thoroughly with the steam jet.”

Another big plus of the PROGRESSA bread is that the amount of oil needed for processing the dough sheet has been reduced to a minimum. “The advantage of our soft dough sheeter SDS nano is that it flours the dough sheet from all sides. To flour the sides of the dough sheet, we use fold-up

“The advantage of our soft dough sheeter SDS nano is that it flours the dough sheet from all sides.”



belts”, explains Michael Gier. This flour-dusting on all sides means there is no need to use oil at all for the sheeting process. This lowers the cost of oil consumption and reduces the effort of cleaning enormously. On top of that, this prevents oil inclusions in the dough, which in turn guarantees excellent baking results of the finished breads.

Product quality

“With our SDS nano and the Soft Dough Roller (SDR) we get a uniform dough sheet which is processed very gently to preserve the structure of the dough. This is the basis for the high-quality products on our line”, Michael Gier describes.

The fact that FRITSCH had been part



of the MULTIVAC Group for two years benefited the developers regarding the weight accuracy of the products. As a packaging manufacturer, MULTIVAC has a great deal of experience with precise weighing systems. FRITSCH were able to benefit from this know-how due to a strong cooperation within this project. The weighing system of the new bread line is equipped with two weighing units. The dough sheet is first weighed before the guillotine. Once the desired weight is reached, the guillotine is released and the dough sheet is cut into individual pieces for further processing. The second weighing is done behind the guillotine. If the weight of the dough pieces deviate from the target weight, the cutting process is corrected

accordingly. This ensures an outstanding weight accuracy of the products.

Once the dough pieces have been cut to precision by the guillotine, there are different options available. Manual processing also possible, for example, by using a baguette wrapping table. In addition, FRITSCH offers a feeding system specially tailored to the line. With this lift tipper, customers can refill a maximum amount of 250 liters to ensure a fast process.

“With the PROGRESSA bread, bakers can process pre-proofed doughs as well as doughs with a high rye or water content with the same quality as on a large-scale line,” Gier

emphasises. This makes the new system attractive not only for medium-sized businesses but also for industrial customers: being only five metres in length, it can be integrated effortlessly into almost any existing production hall. 

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ALMOND HEALTH BENEFITS

Health effects of almonds in baked goods

Almonds are a traditional baking ingredient, but can their health benefits be optimised?

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Almonds were originally native to Iran and surrounding countries, containing lipids (around 50%), proteins (20-25%) and carbohydrates (~20%). They are recognized as a healthy snack, with a recommended daily intake of 30–50 g per day, as part of a healthy diet. The beneficial effects related to almond consumption are thought to be associated with the presence of protein, monounsaturated fatty acids (~32%), dietary fibre (~14%), riboflavin, vitamin E, niacin and essential minerals (manganese, 1.1 mg/100 g; magnesium, 275 mg/100 g; copper, 1.1 mg/100 g; and phosphorus, 486 mg/100 g)². Furthermore, almond polyphenols in the form of tannins, lignans,

Figure 1: Almonds at three different scales. The nut within its shell and hull. A section through the seedcoat and cotyledon cells. An individual parenchyma cell, from the cotyledon, with the cell wall, oil bodies and protein bodies depicted¹.

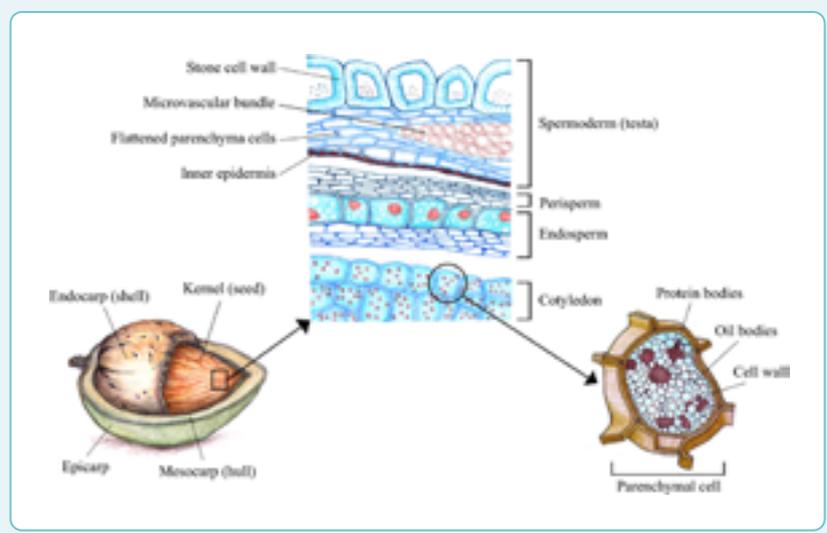
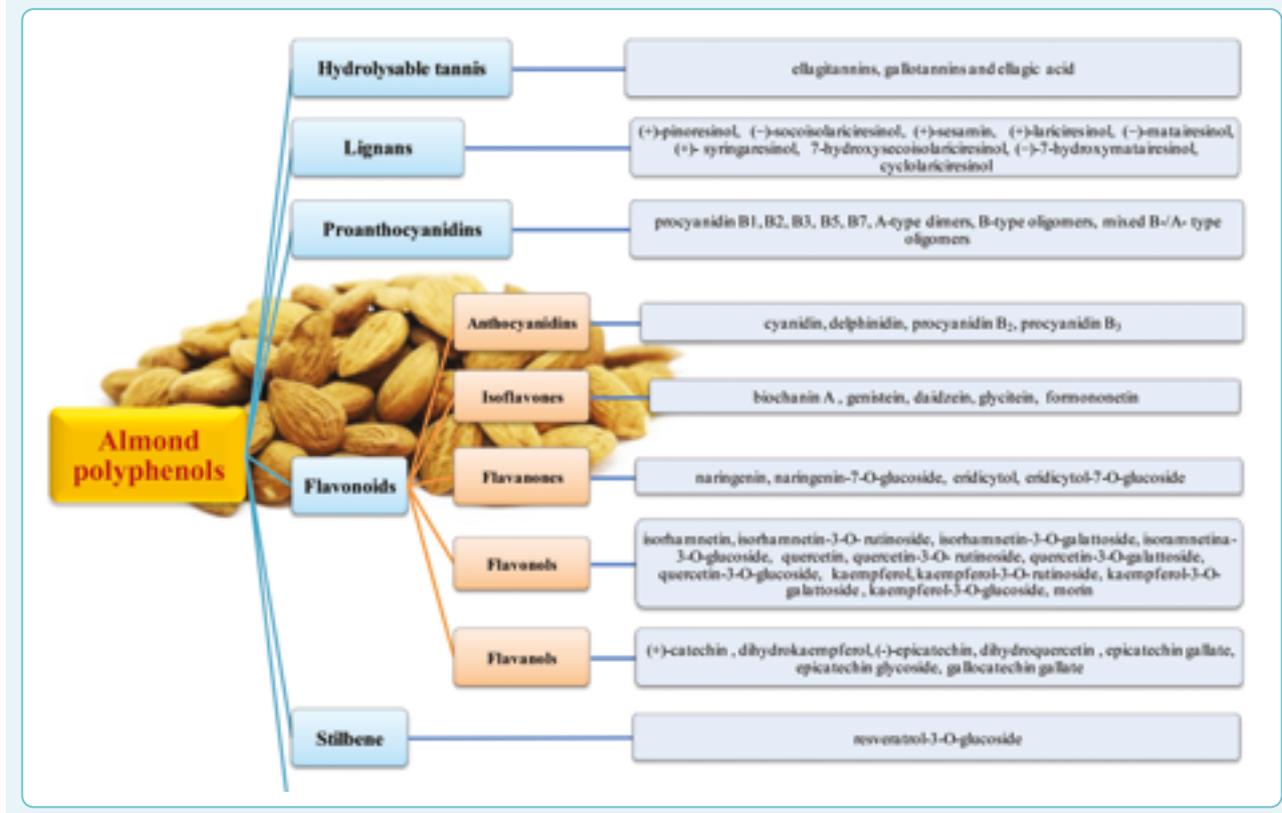


Figure 2. Main Polyphenols in Almonds (Figure taken from Barreca et al.)³.



proanthocyanidins, stilbene, flavonoids and phenolic acids, are associated with both almond quality and benefits for human health (Figure 2).³

There are more than 50 cultivated almond varieties which have been bred to have specific characteristics (size, shape, skin texture and blanchability), they display different chemical and nutritional profiles due to genetic and environmental factors, as well as processing conditions⁴.

Almonds are produced worldwide in hot-arid Mediterranean climate regions and the USA, particularly California, is currently the largest almond producer, followed by Spain and Australia. Traditionally, both

blanched and unblanched almonds have been used in baking, for example as marzipan.

EU regulations

The key EU regulations that govern the use of almonds in food are given in Table 1. They cover potential toxins, either those that occur naturally, such as aflatoxins or pesticides and other residues. American producers are permitted to use pre-export checks

by a competent authority (the United States Department of Agriculture – USDA) to reduce the frequency of checks when importing to the EU.

As almonds are harvested by shaking the tree and collecting the fallen almonds from the ground, they can be contaminated with microbes such as *Salmonella spp.* and *E. coli*, so they may need to be pasteurised. Pasteurisation may occur as part of

“One recent innovation is the use of seed coat as a way of increasing the fibre and phytonutrient content of foods.”



another process (oil roasting, dry roasting, blanching) or can be done separately (steam pasteurisation, and propylene oxide fumigation). As with other foods, almonds and almond products are also subject to the Food Information for Consumers regulation, which covers the nutritional composition and allergen information that must appear on the packaging.

Tree nuts, including almonds, are one of the main causes of allergic reactions worldwide. The “exposure” to food allergens can be by ingestion,

skin contact, or via airborne particles. Tree nuts can cause severe reactions, characterized by multi-systemic and respiratory symptoms. Data from the literature suggests that the prevalence of tree nut allergy is in the order of 1% in the general population,⁵ though allergy to almonds alone is quite rare, with cross-reactivity to other tree nuts occurring more frequently.

Novel uses of almonds in baking

Almond flour is often used in gluten-free baking, but the crumb will often

be denser than for wheat-based baked goods. One recent innovation is the use of ground seed coat as a way of increasing the fibre and phytonutrient content of foods. Having blanched the almonds to remove the seed coat, the seed coat can be dried (rotary air drier, 60°C for 30 min), milled to a powder (<0.6 mm) and then added to biscuits as a partial replacement for wheat flour at 10 or 20%. This increases the fibre content of biscuits to permit “source of fibre” or “high in fibre” claims, respectively, and slightly increases the fat content, but with no effect on

Table 1: EU regulations relevant to using almonds in food products

Regulation	Key component	Details
1169/2011	Nutrition and allergens	Nutrition must be presented in the prescribed format and be accurate within specified limits. Almonds are included within the nut definition for allergens and therefore should be highlighted.
1881/2006	Aflatoxin	For almonds that will undergo further sorting, permitted aflatoxin levels are 12.0 µg/kg (B ₁) and 15.0 µg/kg (sum of B ₁ , B ₂ , G ₁ , G ₂), whereas those that will be directly consumed/used have permitted levels of 8.0 µg/kg and 12.0 µg/kg, respectively.
	Cadmium	0.2 mg/kg fresh weight.
396/2005	Pesticides	Can search the EU pesticide database for specific thresholds.



calorific value. The colour is significantly affected by the inclusion of the seed coat powder, with both formulations being darker brown than is usual. The odour and flavour are largely unaffected, apart from a slight “leafy” odour. The biscuits also become more friable, probably due to reduced gluten content and better expansion.⁶

Bioaccessibility of nutrients and metabolisable energy based on processing

Recent research has shown that the processing method used can affect the bioaccessibility of nutrients and therefore the metabolisable energy provided by the almonds. Bioaccessibility is the availability of nutrients to digestive enzymes prior to absorption and metabolism by the body. Almond cells are ~36 µm in diameter, and the usual particle size of almond flour is 250-400 µm, so there will be some intact cells within each almond particle.⁷ Therefore, digestive enzymes need to pass through the cell walls to digest the nutrients within.

Cell walls are a complex network of polysaccharides, proteins and phenolics that may be somewhat porous, while still slowing down or completely preventing some enzymes accessing the cell interior. Hence, some of the nutrients are not digested in the stomach or duodenum and may reach the colon, where they are either fermented by gut bacteria or simply excreted.

The excreted nutrients cannot be metabolised to produce energy, therefore the metabolisable energy is lower than the energy measured using a bomb calorimeter (complete combustion) or calculated using Atwater factors (which are reliant on very poorly conducted experiments).⁸ When more representative methods of measuring metabolisable energy

“Almond skins are a waste product of the blanching process, so finding a use for them makes the process more sustainable.”

were used by Novotny *et al* at the USDA, whole natural almonds were shown to have 25% lower metabolisable energy than calculated using the Atwater specific factors.⁹ This finding was replicated by the same group during a second study focused on the effects of processing on metabolisable energy from almonds. It also showed whole roasted almonds have 19% less energy and roasted chopped almonds have 17% less, whereas almond butter has similar amounts of metabolisable energy compared to those that the Atwater specific factors produce. The study appears to show an increase for almond butter, but it was not statistically significant.¹⁰

Beneficial nutrients, particularly fat-soluble vitamin E, are also likely to be affected by poor bioaccessibility from almonds that have not been ground to a fine paste.

Gebauer *et al* have done similar experiments with other whole nuts (pistachios, cashews, walnuts) which showed 5%, 16% and 21% reductions in metabolisable energy, respectively.¹⁰ Our own research suggests that this is not related to cell size or the particle size after mastication, suggesting that something more fundamental is having the effect, perhaps cell wall composition, thickness and porosity, or the stability of the membranes surrounding the oil bodies within the cell (Figure 1).

Microbiome

As the undigested nutrients, as well as the cell walls (dietary fibre) and phytonutrients, are delivered to the colon, it is expected that there would be some effect on the microbiome (i.e., prebiotic). One study feeding 0 g, 42 g or 84 g per day for 18 days showed no effect on lactic acid bacteria or bifidobacteria, two potentially beneficial microbial groups, although there was a suggestion that butyrate-producing bacteria may be favoured (butyrate is a short-chain fatty acid that is



beneficial to gut health).¹¹ A second study that fed 42 g of whole natural almonds, whole roasted almonds, chopped roasted almonds, or almond butter for 21 days showed only a few changes compared to the control diet.¹² Almond skins are a waste product of the blanching process, so finding a use for them makes the process more sustainable. A study that included almond skins or whole almonds in the diet for 6 weeks showed that almond skins were generally better and quicker than almonds at significantly increasing the beneficial *Bifidobacterium* and *Lactobacillus* species, and reducing *Clostridium perfringens*, although *C.*

perfringens numbers rebounded two weeks after the test diets concluded.¹³

Satiety/snacking and body weight management

Evidence from clinical trials has demonstrated the health promoting factors related to almond consumption. One of the main effects of regular almond consumption is the control of blood lipid levels, with a reduction in total cholesterol, and glucose levels in the blood.^{14,15} The role of impaired glucose and/or lipid homeostasis and obesity as cardiovascular risk factors has been established and almonds could help contribute to a reduced

cardiovascular risk.¹⁶ Almond snacking has also been related to increased satiety and improvement of body weight management. Finally, several secondary metabolites, mainly represented by the polyphenols found in the skin, could act as potential functional foods and prebiotics. Polyphenols present in the skin could also be used for their antimicrobial and antiviral potential.

In summary, the health benefits of almonds in baked goods can be optimised, taking into account the consumers' specific needs, such as weight management and nutrient intake. 

References

1. Grundy, M.M.-L., *et al.* (2016) A review of the impact of processing on nutrient bioaccessibility and digestion of almonds. *Int J Food Sci Technol* 51:1937-1946.
2. Almond Board of California. (2021) Nutrient comparison chart for tree nuts. https://www.almonds.com/sites/default/files/2021-07/Tree%20Nut%20Nutrient%20Comparison%20Chart_28g_2021.pdf
3. Barreca, D., *et al.* (2020) Almonds (*Prunus Dulcis* Mill. D. A. Webb): A source of nutrients and health-promoting compounds. *Nutrients* 12:672.
4. Almond Board of California. (2015) California almonds technical information. https://www.almonds.com/sites/default/files/2020-05/abc_technical_kit_2015.pdf
5. Mandalari, G., *et al.* (2018) Almond allergy: an overview on prevalence, thresholds, regulations and allergen detection. *Nutrients* 10:1706.
6. Pasqualone, A., *et al.* (2020) Use of almond skins to improve nutritional and functional properties of biscuits: an example of upcycling. *Foods* 9:1705.
7. Grassby, T., *et al.* (2014) Modelling of nutrient bioaccessibility in almond seeds based on the fracture properties of their cell walls. *Food Funct* 5:3096-106.
8. Sanchez-Pena, M.J., *et al.* (2017) Calculating the metabolizable energy of macronutrients: a critical review of Atwater's results. *Nutr Rev* 75:37-48.
9. Novotny, J.A., *et al.* (2012) Discrepancy between the Atwater factor predicted and empirically measured energy values of almonds in human diets. *Am J Clin Nutr* 96:296-301.
10. Gebauer, S.K., *et al.* (2016) Food processing and structure impact the metabolizable energy of almonds. *Food Funct* 7:4231-4238.
11. Ukhanova, M., *et al.* (2014) Effects of almond and pistachio consumption on gut microbiota composition in a randomised cross-over human feeding study. *Br J Nutr* 111:2146-2152.
12. Holscher, H.D., *et al.* (2018) Almond consumption and processing affects the composition of the gastrointestinal microbiota of healthy adult men and women: a randomized controlled trial. *Nutrients* 10:126.
13. Liu, Z., *et al.* (2014) Prebiotic effects of almonds and almond skins on intestinal microbiota in healthy adult humans. *Anaerobe* 26:1-6.
14. Jenkins, D.J., *et al.* (2006) Almonds decrease postprandial glycemia, insulinemia, and oxidative damage in healthy individuals. *J Nutr* 136:2987-2992.
15. Sabate, J., *et al.* (2003) Serum lipid response to the graduated enrichment of a Step I diet with almonds: A randomized feeding trial. *Am J Clin Nutr* 77:1379-1384.
16. Dhillon, J., *et al.* (2016) Almond consumption during energy restriction lowers truncal fat and blood pressure in compliant overweight or obese adults. *J Nutr* 146:2513-2519.

ACORN AND CAROB BEAN FLOURS

Yesterday's ingredients could play a valuable role in tomorrow's bakery

Written by:



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Meeting the expected growth in food demand by 2050 has been one of the biggest challenges for agri-food sector stakeholders, further complicated by the scarcity of global resources and climate change. Additionally, the political climate has been under enormous pressure with the world seeing more than two years of pandemic and the resurgence of war in Europe. Cereals, in particular, as basic commodities of the human diet, are expected to suffer tighter constraints due to the effects of climate change and their relatively

high consumption worldwide. As a consequence, there is now an urgent need to find alternative flours that could be used for bakery products and in particular those that decrease our dependence on traditional cereals. Looking back into days gone by, during the Roman Era, the scarcity of cereals gave rise to the development of bread with alternative flours such as those derived from acorn, carob, rye, herbs, legume seeds, straw and even dried animal's blood. Similarly, the present-day grain crisis and food security concerns are driving a burgeoning interest in these

previously underexploited crops, some of which potentially may contain excellent health benefits. Other raw materials, such as fruit and vegetables have been recognised for their health benefits due to their rich nutritional profiles, high bioactive compound content and potential antioxidant capacity. Underexploited raw materials like this, not only have the advantage of adding value to otherwise wasted resources, but also allow the rediscovery of innovative ingredients with functional properties. Finally, alternative commodities such as these are naturally gluten free (GF)



sources, which is yet another advantage of their use in specific circumstances.

Food trends

In recent years and up to the present day, general concerns over the environment, sustainability and CO₂ emissions, have grown considerably resulting in a heightened consumer awareness about their food's nutritional and health-giving benefits. A growing trend in this regard is that

of the consumption of bread enriched with nutrient-dense ingredients which is considered a good source of functional ingredients, one that is now becoming a staple food that is largely eaten every day.

Acorn and carob flours: underexploited resources as innovative and sustainable ingredients

Despite being consumed in Roman times, the regular consumption of

acorn in this form has been lost to the history books. Currently, acorns have been identified as a sustainable underexploited ingredient † that can be used for human nutrition and consumption, but in reality acorns are mainly eaten by grazing animals: a substantial amount being left in fields and going to waste. Acorn is the fruit of the holm oak (*Quercus ilex* and *Quercus rotundifolia*), a surprisingly evergreen oak tree from the *Quercus* genus, which is one of the most

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important trees in the Mediterranean agroforestry ecosystem. Since holm oak is an indigenous resource in the Mediterranean area, producing fruits even under extreme adverse climatic conditions, and has always been available as an important alternative resource during years of scarcity, thanks to its ability to adapt to climatic change.

Acorn flour presents a good nutritional and functional profile, because it is rich in unsaturated fat, fibre, vitamin E, chlorophylls, carotenoids, total phenolics and rich in antioxidants, an ingredient with the potential to improve both gluten-containing and gluten-free (GF) bread's nutritional characteristics. In relation to fatty acids, acorn has

about 60% oleic acid ($\omega 9$)* and about 16% linoleic acid ($\omega 6$), which is of benefit, since fat develops an important role in food texture, although being unsaturated.

Carob flour from *Ceratonia siliqua* L. also represents an underexploited fruit, that is enjoying a rapid recovery in fortunes. This tree is native to the Mediterranean coastal regions and southwest Asia. Its main use is currently for locust bean extraction, but in the previous century it was also exploited as a cacao substitute owing to its flavour and sweet taste. Carobs are low in proteins and fat, but rich in sugars and minerals as well as dietary fibre and phenolic compounds, specifically pinitol, useful for its antidiabetic properties. At a scientific

level, numerous preventive and therapeutic applications have been identified (antitussive, antidiarrhoeal, antibacterial, diuretic, antiulcer, anti-inflammatory and antidiabetic) as well as the treatment of gastrointestinal disorders such as gastroesophageal reflux, irritable bowel, diarrhoea and ulcerative colitis. Presumably, these characteristics are responsible for the increasing presence of either carob flour or locust bean gum, in the composition of baby foods (A veritable panacea?) Ed.

Acorn and carob flour in bakery applications

With bakery innovators now searching for alternative flour sources, it will come as no surprise that acorn and

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carob flours have excellent potential. In fact, many bakeries in Portugal and Spain are already developing bread formulations containing these flours or a blend of both, replacing in part, the cereal flour content and they are getting very good results. The quantities of the alternative flours being used in wheat and rye formulations could vary from 8% to 20%, depending on the other mixed flours (rye, wheat, spelt, etc), in the recipes and of course, the type of bread being baked.

An important point to note is that acorn flour used on its own introduces a bitter taste but thankfully is counterbalanced by the cocoa and sweet flavour of carob flour, producing a balanced bread presenting technological and nutritional characteristics. A further benefit to their use is that both flours are rich in unsaturated fatty acids and fibre, providing a particular texture to the bread, creating potential nutritional benefits as well. Consumers appreciate the inclusion of these flours blended with rye and/or wheat, leading to bread with a dark colour and exquisite and innovative flavour. Even the production of sourdough for bakery applications

can provide opportunities for carob flour, considering its high sugar content. Likewise, the cacao taste of the carob flour is very much suited to making bakery sweets, pastries and cookies.

In conclusion, these flours can be considered as 'go to' ingredients when looking for innovative flavour and appearance in bakery items such as bread, but they can also be useful when there is a need to substitute wheat flour in non-wheat producing countries.

Acorn and carob flours in GF bread

Another important bakery application for alternative flours is the production of gluten free breads. Acorn and carob flour both have a significant impact on the rheology of the dough or batter and consequently in GF

bread. However, these positive effects have been shown to be limited by a particular threshold which needs to be observed to obtain optimal results for the bread product being made and is determined by the correct ratio of the flours used in the formulation[†].

Typical ratios of carob flour to use when making gluten free breads are: replacing 15% rice flour for carob flour which allows for a bread with darker colour, better crumb structure, less hardness and slower firming time during storage. Furthermore, by applying jet-milling and further fractionation, a range of different carob flours with varying particle size distribution and chemical composition can be included. Fractionated carob flours have led to gluten free breads with a different appearance but also with a greater potential for reducing their glycemic index.

Acorn flour and debittered acorn flour have also been recognised as being suitable for making gluten free breads when used in combination with rice and corn flours[†]. Up to 25% acorn flour could be added to a GF bread recipe, improving the sensory experience when compared to rice-based breads; although its addition does decrease bread volume and increase crumb hardness, though this can be countered by adding the appropriate amount of water during breadmaking. Likewise, acorn flour significantly improves the total

“Acorn flour used on its own introduces a bitter taste but thankfully is counterbalanced by the cocoa and sweet flavour of carob flour.”

Biographies

Rita Beltrão Martins has finished the PhD with the research topic of Sustainability and Innovation applied to Agrifood Chain, in University of Trás-os-Montes e Alto Douro (UTAD, Portugal). She is also co-founder of Terrius (<https://terrius.pt/en/home-en/>), a company located in the South of Portugal, focused in developing ingredients with circular economy fundamentals. Terrius has the objective of recovering old foods that were traditionally present in the Mediterranean diet and were lost, like acorn flour and smoked chestnut.

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phenolic content of bread. The inclusion of up to 35% acorn flour has been incorporated into gluten free blends, whilst observing the acidification of the dough. This ratio can create breads with darker crumbs and with a significant increase in bioactive compounds and antioxidant properties, however, in light of rheological properties and bread features, a maximum of 23% of the dough's formulation is recommended[†].

Improving on the many positive attributes of sourdough, the use of acorn flour has been shown to add to that effect. Sourdough facilitates the technological characteristics of acorn flour when used to make GF bread, increasing the amount of acorn flour that can be included in GF recipes. This, in turn, leads to an increase in protein, unsaturated fatty acids, minerals and polyphenol content.

Gluten-free bread formulations with acorn and flour/starch blends, such as: corn and potato starch, rice and corn flour or buckwheat, rice flour and potato starch offer very promising alternatives. In particular, as mentioned before, acorn flour has also been tested in combination with sourdough, showing a positive synergetic effect.

In short, acorn and carob flours show good nutritional and functional properties, demonstrating the importance of rediscovering their use as ingredients in our diets which is not only particularly relevant to the baking of GF bread, but also, due to their unique characteristics, they present great potential for their inclusion in other bakery products, or different starch-based foodstuffs. Various European research teams have conducted excellent research on this subject for extending the use

of such flours in bakery applications, for both 'with gluten' or gluten free breads. It only remains for this newly acquired knowledge to be integrated into innovative and dynamic, large-scale bakery businesses. 🇪🇺



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References

[†]Beltrão Martins, R.; Gouvinhas, I.; Nunes, M.C.; Alcides Peres, J.; Raymundo, A.; Barros, A.I.R.N.A. Acorn Flour as a Source of Bioactive Compounds in Gluten-Free Bread. *Molecules* 2020, 25.

Suggested Reading:

Beltrão Martins, R.; Garzón, R.; Peres, J.A.; Barros, A.I.R.N.A.; Raymundo, A.; Rosell, C.M. Acorn Flour and Sourdough: An Innovative Combination to Improve Gluten Free Bread Characteristics. *Eur. Food Res. Technol.* 2022, 248, 1691–1702, doi:10.1007/s00217-022-03996-y.

Rtibia, K., Selmia, S., Grami, D., Amri, M., Eto, B., El-Benna, J., ... & Marzouki, L. (2017). Chemical constituents and pharmacological actions of carob pods and leaves (*Ceratonia siliqua* L.) on the gastrointestinal tract: A review. *Biomedicine & Pharmacotherapy*, 93, 522-528.

Tsatsaragkou, K., Kara, T., Ritzoulis, C., Mandala, I., & Rosell, C. M. (2017). Improving carob flour performance for making gluten-free breads by particle size fractionation and jet milling. *Food and Bioprocess Technology*, 10(5), 831-841.

INSPECTIN' PECTIN

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Most people's first encounter with pectin is as the gelling agent in jam, be it on their

breakfast toast or croissant or perhaps in a jam tart. If you have ever tried making your own jam, you are maybe aware of a liquid pectin, added to jam to ensure good gelling or perhaps jam makers sugar which contains dry pectin. Home jam makers' 'tricks', to ensure a decent set to their jams, involve adding lemons or apples (in our case the rather green, under-ripe ones) to the soft fruit. It appears that pectin is present in a lot of fruit and vegetables, but in varying quantities

and most importantly, quality, especially with respect to the gelling properties.

Citrus and apple pectin are widely accepted as having the best gelling qualities, but there is now a desire for other functionalities from pectin, like non-gelling thickening, emulsification and protein reactivity/protection. As a result, new sources which have those different properties are emerging, for example sugar beet and sunflower heads. Also, new processes, that do not separate pectin from its raw material source are now producing functional, clean label alternatives.

“There is now a desire for other functionalities from pectin, like non-gelling thickening, emulsification and protein reactivity/protection.”







One factor in common with all these sources is that the pectin, or pectin containing product, is obtained from food parts previously wasted e.g., peel and pomace in citrus fruits, sugar beets and apples, heads and stalks in sunflowers. I am going to presume here that, at some point in the future, many other sources of pectin will be offered from waste streams as farmers and manufacturers attempt to produce food more sustainably and more profitably.

So, what do we have at the moment?

Currently, there are three basic types of pectin and a composite of pectin, fibre and protein which is being promoted as a clean label product, labelled as citrus fibre. The pectins themselves may be labelled as pectin or by their E number (E440i, E440ii).

As the chemistry of pectin itself varies according to its source and how it is extracted, there are, of course, many potential variations in grading, based on how it performs in a food. There are side chains, 'hairy' and smooth areas and different levels of methoxy content, or degree of esterification.

All of these are naturally present in the raw pectin and may be manipulated during extraction to lower or modify their ratios. There is a different naming system in manufacturing companies and the literature, so HE and HM may be used to refer to the same product under the name of high ester (HE) or high methoxy (HM) pectin, similarly LE and LM for low levels. I was originally introduced to pectin using HM and LM, so I will use that form here.

The word manipulated in the above paragraph will have alerted you to the changes that occur during the processing of peel or pomace to extract the pectin. I am not going to discuss the chemistry and processing of gums here, as I don't think it's helpful, however, I think it useful to consider the processing results in three basic types of pectin: high methoxyl, low methoxyl and amidated low methoxyl.

The main use for pectin is in setting jams and this is dependent on the degree of methoxylation. Very high levels lead to rapid setting as the mix

cools, useful for jam containing particulates e.g., strawberry, to avoid the fruit floating to the top of the jam in the jars. Slightly lower levels of methoxylation lead to slower setting, which makes filling easier as the type typically used, HM pectin, will set in the jar not in the filling head. This is especially important as the gel is not tolerant to stirring after it has set, as it breaks up and synereses. In order for HM pectin to set satisfactorily, apart from a good source for high gel strength pectin (apple pomace or citrus pith and peel), the mix needs to be quite acidic and high in sugar; as in a typical jam. The pH must be 3.1 to 3.5, the sugar content (degree Brix) in the 65 area. Naturally, this level of acidity and sugar content helps with preservation as well as setting the jam and it is worth noting that the gel formed by HM pectin under acidic pH at high sugar levels is not reversible on heating.

Conversely, LM, or low methoxy, pectin needs some sugar, but is not dependent on low pH: it gels in the presence of calcium ions. This is both a positive and a negative. Fruit

“For those bakers looking for healthier products, there is the potential for reducing fat and sugar and increasing fibre content using pectins.”

naturally contains calcium, though of course, never in consistent amounts; every crop will vary. This means that you need to either pre-dissolve the powdered LM pectin in de-ionised water (to avoid calcium salts in the water causing it to either precipitate or pre-gel) or you need a chelating agent to take up the calcium and then, preferably, release it slowly to allow setting.

The advantage of using added LM pectin, for example, in fruit preparations, is that you can use lower quantities of sugar. The fruit preparation (not a jam) does, on the whole, taste much fresher and unusual fruits with little natural pectin may be used e.g., kiwi. My first development project involving pectin used LM pectin to make a beautiful milk-based dessert; this involved making a fruit preparation (strawberry) which was added to milk. The calcium in the milk gelled the LM pectin – it was light and delicious.

Amidated LM pectin is, I sense, falling a bit out of favour because of the chemistry involved. It has the E number E440ii and the process of amidating it, chemistry aside, makes it a lot more tolerant to calcium, so less fiddly to work with. Though I have not seen it myself, I have read that the gels are self-healing – they will reform after stirring, which would be useful.

As mentioned earlier, the major bakery applications for pectin have historically been in jams. However, the LM types in particular have been used for a range of other bakery goods and ingredients, including

glazes, flavour emulsions, confectionery (especially pate de fruits), puddings and pudding-based desserts and whipping creams. There is also some discussion about the use of either HM or LM as viscosifiers in bread, especially sandwich bread. Pectin will interact with protein, both types are sometimes used in plant based ‘milks’ to viscosify and stabilise the protein against calcium addition and acid. In bread, they are thought to improve freezer tolerance of unbaked dough, increase the softness of the baked doughs and increase moisture retention over shelf life.

For those bakers looking for healthier products, there is the potential for reducing fat and sugar and increasing fibre content using pectins, plus some health claims approvals. Sugar beet pectin has been shown to be an effective emulsifier, at least as effective as gum acacia is for limonene in soft drinks. It will have a much weaker gel structure and lower viscosity, so may be used at higher levels to produce minimal thickening but allow a high soluble fibre content. Regarding health claims, the EFSA / EC have approved those concerning reduction of post prandial glycaemic response and its positive effect on blood cholesterol level; this could be a good selling point.

And so, we move on to citrus fibre.

I must be honest here, for years I have disliked citrus fibre, mainly because I could never get it to work in the way the manufacturers claimed it would. I also felt it was a bit like cheating, as the gelling properties are dependent on calcium salts and chelating agent

addition – so a clean label claim for the citrus fibre, but it only works if you add other non-clean label ingredients. However, that was for its use in plant-based meat alternatives. When conducting research for this article, mainly on the manufacturers’ web pages, I began to suspect that citrus fibre has its place in bakery goods.

Citrus fibre contains insoluble fibre, soluble fibre (basically unrefined pectin) and some protein. The insoluble fibre will absorb water quickly and provide a structure to hold the water in. The soluble fibre pectin can make up about 40% of the product and provides both viscosity, water binding ability and in the correct gelling conditions, gelation. The protein provides fat and oil binding, which helps to stabilize emulsions.

All of this is good for yield, reducing calories and clean label development. I think you will need to judge for yourself whether the claims for a similar sensory experience to full fat products are true and be especially careful about the neutral taste claims; anything that comes from citrus peel, without any refinement, may have citrus oils carrying over and so a bitter background taste. In other words, get samples, check them out for yourself and never believe the marketing until you have experienced it with your own taste buds! 🍊

FOR MORE INFORMATION →

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BIOGAS SOLUTIONS

for a more circular economy

How the baking industry can contribute to more sustainable food and energy systems.

Written by:



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Swedish Biogas Solutions Research Center (BSRC), Linköping University



Madeleine Larsson
Assistant professor

Across the planet we are facing a wide range of sustainability challenges such as climate changes: air pollution; water availability and pollution; noise; and waste management. There are many problems related to how we manage natural resources, including the non-cyclic practices within agriculture.

Too many industrial systems are linear – although we urgently need to economise scarce resources - a wide range of essential resources are landfilled or incinerated. The baking industry is both influencing and

influenced by these factors, therefore, meaning it can also contribute towards improvements.

Significant contributions to sustainability require well-designed sociotechnical systems or business models, that are multifunctional and can provide key products and services, such as food, energy, mobility and other essential services, based on the sustainable management of natural resources. A shift is needed towards a more biobased and circular economy. In this context, biogas solutions could play an essential role within the baking industry.

Biogas is produced in facilities that utilise anaerobic digestion (AD), where wet biomass is degraded by microorganisms and converted into valuable products. One great advantage is that biogas can be produced from most wet organic wastes or by-products, such as food waste, industrial biowaste and agricultural residues. A biogas plant can deliver raw biogas, biofertilizers and carbon dioxide. Furthermore, raw biogas can be used, as it is, for the production of heat and electricity. Alternatively, the raw gas can be upgraded to biomethane and used for transportation, as an industrial gas or for other purposes (biomethane is commonly referred to as renewable natural gas). The nutrients in the feedstock end up in the biofertilizers and can be returned to agriculture. Furthermore, there





are several options for making use of the carbon dioxide.

Biogas is produced in many countries across the globe, in various amounts and ways. Variables include different feedstocks and technologies employed and in the scale of production: ranging from small-scale (household to farm) to larger facilities (delivering more than 100 GWh/year). Many factors shape how biogas solutions are designed in different countries, where either policy,

infrastructure or types of industry may have greater influence. Industrial food bio-waste is generally a good source of biogas: bakeries, the beverage industry, potato processing, dairies, slaughterhouses, fishing industry and breweries are considered promising sectors for expanding biogas production.

The feedstock may have varying content of carbohydrates (starch, sugar, fiber) fats and proteins and still be suitable. Commonly, producers

are looking for the right mix of feedstocks that are co-digested.

There are many examples of biogas systems used to treat sludge and wastewater from the food and beverage industry. Around the globe, biogas is commonly used to generate heat (including that used for cooking) and electricity, while there is a growing interest in its use for transport and regarding industrial applications. In countries with natural gas grids, upgraded biogas

“A shift is needed towards a more biobased and circular economy. In this context, biogas solutions could play an essential role within the baking industry.”

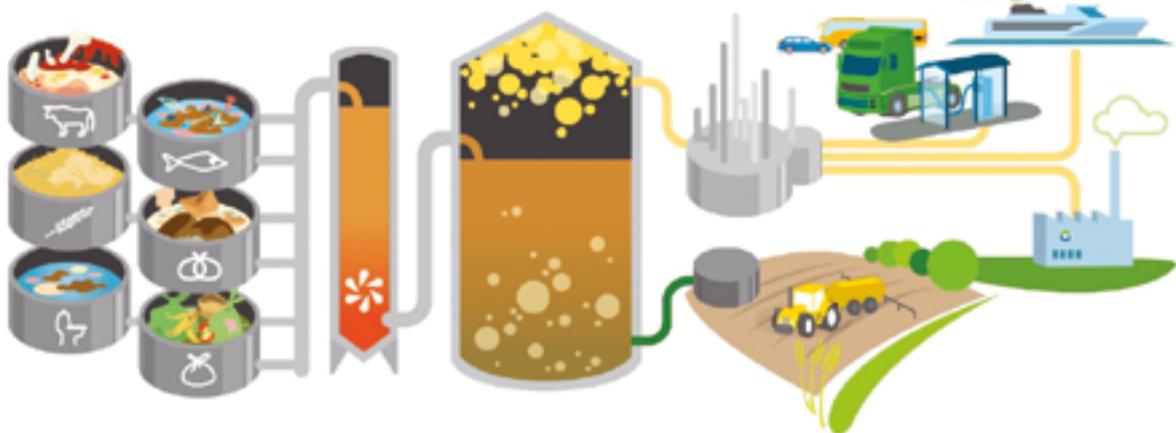


(biomethane) can be injected into the grid. Thus, natural gas systems facilitate biogas use, but at the same time, an association with a fossil fuel can also have a negative connotation for biogas development.

Biogas solutions can contribute to a wide range of societal benefits, depending on the context, for example, the many positive links to the UN Sustainable Development Goals. In addition to energy/fuel services, biogas solutions may

contribute to waste management functions: water management functions and improved water quality; more sustainable agriculture and land use; reduced emissions of greenhouse gases (GHG), particles and nitrogen

Figure 1. A schematic illustration of biogas solutions, where different types of feedstocks are converted in AD plants to biomethane fuel and biofertilizers for use in agriculture. In addition, carbon dioxide is separated and may be used for different purposes. Illustration: Mattias Schläger.





“A biogas plant can be a strategic component in food industrial production.”

solutions show very competitive sustainability performance, which makes it possible for the players involved to strengthen their green marketing. For example, well-designed biogas solutions may provide energy and transport solutions with very competitive climate performance, where production based on manure and ley crops stands out with the possibility for negative emissions. A biogas plant can be a strategic component in food industrial production, including biorefineries, to improve their resource efficiency (for example to reduce the costs for wastewater treatment), though this does require a substantial and long-term commitment.

Biogas solutions tend to have a local character, meaning that they are part of local systems providing food and energy. Thus, they may contribute to important, improved food and energy security/supply, which is needed in many contexts and most recently has been cited in connection with the war in Ukraine. The common dominating focus on supply chains, may also be complemented by a more local orientation, involving industrial symbiosis.

There is great potential to significantly expand the production of biogas and biofertilizers in Europe and worldwide, even in countries which already have large-scale production, without negative competition with food or fodder. Of course, biogas solutions cannot alone solve the whole energy or transport puzzle, but the potential contribution it can make

is considerable: they should be smartly combined with other renewable technologies. However, more companies and decision makers need to account for biogas solutions contributions to solving several additional sustainability challenges. For example, the potential to recycle nutrients, such as phosphorus, is critical for future food and feed provision – very relevant to the baking industry. To reduce the needs of mineral fertilizers is of further benefit from a climate perspective. 

oxides and positive effects regarding biodiversity.

The baking industry can play several important roles in relation to biogas solutions. It may supply biowaste to external biogas producers and thus contribute to energy and nutrient recovery and ecological farming in society. Whether this is feasible and a preferable option for biowaste is context specific – it needs to be compared to other alternatives. However, byproducts from the whole value chain can be suitable for biogas production – from agriculture and raw material processing (e.g., mills) to the bakeries and end consumers. In the future, biogas solutions may enable the use of green heat, electricity, gas and/or transport. Today, many organisations experience increased pressure from a range of stakeholders to reduce their environmental impact and the use of biogas (and biofertilizers) may be a favourable way in which to respond. Broad sustainability assessments that grasp the multifunctionality of biogas

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The ripening of GREEN ENERGY

Solar power is underutilised by bakeries even though it is as important to the farmer as wind to the miller and has the potential to cut costs just when energy is at a premium.

Written by:



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The sun is central to almost every part of the early journey from seed to loaf. Through warmth, light, germination and photosynthesis the grain is grown, ripens and is then harvested. Curiously, however, the sun's generous abundance is often unused when it could continue to benefit the process, not just in baking, but providing energy for heating and lighting in the bakery or the transportation of the product as well as in drying ingredients, such as fruit.

An installation of 171 solar panels on a 914.4m bakery roof, for example, would be capable of generating about 273,600kWh of energy

annually depending on local climate. The number of solar panels that can be positioned at a facility is the only limit to the amount of power that can be generated.

Advantages of installing solar energy to provide day-to-day electric power in a facility can include increased cash flow as it brings down consumption, reduces operating costs and offsets the expense of installation and maintenance. Furthermore, the value of a building, so equipped, can be enhanced as an asset.

Employing sustainable technologies not only reduces environmental impact, which has its own planetary,



“The number of solar panels that can be positioned at a facility is the only limit to the amount of power that can be generated.”

“Solar energy is a practical and cost-effective option made more so by wars, plagues and transport disruption.”

commercial and public relations benefits, but can provide some measure of energy security as well.

The good news is that solar panels are around 70% cheaper than they were in 2010 and consequently their inclusion is a lot more appealing to any business plan than it was formerly.

Sunny side up

Photovoltaic technology is continuing to advance, which can only make it less expensive, more efficient and more versatile. Backed up with energy storage it can improve local as well as regional energy security.

We are used to seeing rigid freestanding or roof-installed structures, but flexible, lightweight and even semi-transparent panels are appearing. The technology that can be installed into the fabric of infrastructure and on roofs, walls and other surfaces.

For example, the PV companies are starting to produce, thin, lightweight, black panels that can be applied to roofs and facades.

Also, transparent see-through Cadmium Telluride (CdTe) thin-film Photovoltaic technology is being produced, which can be manufactured into insulated double-glazed units.

The crust of the building

“Building applications and BIPV products are more and more

considered as construction elements, aiming to be aesthetically pleasant, multi-functional and cost-effective.”¹

Increasingly, the skin of new buildings is becoming photovoltaic. This represents an architectural revolution that integrates energy with form, made possible by building-integrated photovoltaics (BIPV). The cladding of a building can look like its traditional equivalent and a solar tile look much like a traditional one, but the very outer structure of the building becomes part of its integrated energy system. The walls do not only keep in the warmth, but produce it, and provide electricity for the functions within.

For example, a Multi-Functional Centre, built by the City of Lugano, Switzerland in 2017, which included rainscreen facades covered by a light colour Fibre Reinforced Cement (FRC), were replaced in 2019 by integrated glass photovoltaic modules with a surface of about 1.678m and a nominal power of 173kWp with a calculated energy production of about 76.500 kWh/yr.

Professor David Fermin of Bristol university says solar technology is not even restricted to the façade, but can become the windows: “You can retrofit this kind of structure on buildings without compromising integrity or safety. If you have the cladding and windows as part of your active system, that can actually provide most of your power.”



Fermin says that 95% of commercially-available solar models are made of silicon. This is comprised of relatively thick Crystal suitable for large scale utility scale electricity production. However, where very thin, very light semi-transparent devices are required to be adapted to a roof or the facade of a building, other technologies are preferable.

The alternatives include perovskite and organic photovoltaics, which are thin film solar cells that use organic semiconducting materials instead of silicon.

All systems go

Although multiple energy use can dissipate supply, solar can answer a lot of need, especially in the sunny South of Europe. A recent Fraunhofer report reveals that the energy payback of PV systems in Northern Europe needs around 1.2 years to balance the input energy, while PV systems in the South only require one year or less depending on the technology installed and the grid ².



Even in Northern regions the careful application of the technology can maximise solar capture over and around a building using lightweight flexible panels.

Solar and wind are already the least expensive energy sources. Over the coming years they will become even less expensive and by 2030 provide 30,000 jobs in the EU. Gas and coal were 6-10 UK pence per kWh in 2015 whereas PV was 5-7 pence per kWh and in 2050 is expected to be just 1-3 pence per kWh.

Installation has a price, but the payback is considerable and long-lasting. China dominates the market with its modules but shipping heavy and bulky modules is starting to make reshoring of solar panel manufacture

an appealing option that will drive costs down further.

In 2020 China had a 67% share of total global photovoltaic module production, total count from Asia was 95%, whereas Europe only contributed 3% and USA/Canada 2%³. Shorter supply chains, enhanced technology and flexible materials manufactured in Europe may make all the difference.

Proving the point

The sun has been contributing to our food supply and preparation since earliest times. Even baking, itself, and the drying process, can be powered by solar energy as proved by such projects as a bakery in Petaluma, California, which uses 1,722 solar panels on its 1.5 acre-roof to help bake its

sprouted breads.

The first house to directly convert sunlight into heat and electricity for domestic use, was built in the year of the oil crisis, 1973, at the University of Delaware and proved that solar technology was a practical energy option.

Since then, environmental and climate concerns have become even more of a driver, but energy security equates to material costs as well as planetary care.

Solar energy is a practical and cost-effective option made more so by wars, plagues and transport disruption. So, it is in the interest of bakeries and suppliers to seriously consider its application in their operations. **BE**

References

1. Corti, Paolo; Bonomo, Pierluigi; and Frontini, Francesco, *Building Integrated Photovoltaics: A practical handbook for solar buildings' stakeholders*, Status Report 2020, SUPSI – Swiss BIPV Competence Centre.
2. *Photovoltaics Report*, Fraunhofer Institute for Solar Energy Systems, February 2022
3. Ibid.

INDUSTRY RESEARCH

Carefully selected research and science papers from company research departments.

In this issue:

SolarBakery

A new innovative concept - Using renewable energy on a portable bakery.

Unsold bread

Bread waste is often seen as scandalous. Enter the “Crumbler” to refashion the waste into new edible bakery ingredient.

Labelling technology

Verification of label accuracy is paramount so the input data must be reliable. A leading manufacturer shows you how.

New interest in SOLAR POWER

The current energy crisis is having a profound effect on businesses across Europe and the world and in particular the bakery business, due mainly to the energy hungry baking process itself. Solar energy is by no means new, but interest and take-up in the business are, finally, on the rise (no pun intended) in an effort to reduce energy costs and retain some semblance of affordability for the increasingly hard-pressed consumer faced with ever rising living costs.

The lightbulb moment that I experienced saw the eventual birth of a mobile bakery in a during an impromptu conversation with a young man I met from the Democratic Republic of Congo (DRC) who wanted to make a

difference in his country. After travelling to The Congo together in 2010, the mobile bakery was established; which in short, comprises a bakery in a converted shipping container designed to operate with minimal resources.

The business model was well received locally, we were able to create employment for more than a hundred women and finance a school with the income from the bakery. However, the power supply was initially a problem for us since we suffered many power outages and a diesel generator that was very expensive to buy and run.

Since the mobile bakeries were sited in hot (African) countries with sunny climates, we decided to convert the

energy source to solar, from which Solarbakery was born in 2020.

The SOLARBAKERY comprises a mobile, containerised bakery that can be transported by ship to any location in the world. The fundamental principle of the invention is of course that it is 100% powered by a photovoltaic system on the roof of the container. The construction of roof based solar panel system was cleverly designed for this purpose and is stored inside the container during transport, it being easily reattached to the roof by hand at the place of use without the need of heavy equipment or specialist technicians.

The entire baking process and the equipment of the bakery were



CEO of Solarbakery
Simon Zimmermann in
front of prototype

“We can provide fresh bread in the morning, just like ordinary bakeries. This not only makes it possible to bake at night, but can also keep the operation going during bad weather.”



designed for operation entirely by solar power thereby optimising efficiency.

The purpose of SOLARBAKERY is to use renewable energy to meet the high demand for baked goods in regions where bakeries could not be established until now due to a lack of infrastructure.

Further developments include the integration of a storage battery room so that we can provide fresh bread in the morning, just like ordinary bakeries. This not only makes it possible to bake at night, but can also keep the operation going during bad weather.



Since batteries are one of the biggest cost drivers at Solarbakery, we have developed a 70/30 baking process with our master baker Daniel Petruccelli to keep the battery size as small as possible. In this process, 70% of the bread is pre-baked during the day in order to use as much solar energy as possible directly and then 30% is baked during the night.

As the space in the container is very limited, we have designed expandable, extra rooms, which can be quickly pulled out on site. In one of these extra rooms there is a fermentation room and in the other an electric mill. In this way it is also possible to collaborate with local agricultural organisations and increase the local value chain.

Co-operation and strengthening of the local community in general is very important to us. For this reason, we will



build and operate our second container in Senegal. We also take great care to ensure that our locations are always integrative and not disruptive to the community. For this reason, we also talked to local politicians such as mayors for our first location in Senegal beforehand and had them confirm their interest in our invention.

Designing the Solarbakery was not an easy or straight-forward task since it posed many challenges of a multi-dimensional nature in order to cater for the special needs of a bakery craftsman. For example, it was essential to provide sufficient space for all the disparate equipment and, in particular, that for dough fermentation. More importantly, the limited work space available for employees in a converted shipping container, needed to be planned very carefully in order to produce to high quality bread in an efficient and safe manner.

Space needed to be allocated for the various electrical apparatus, cabling and the photo-voltaic panels themselves in addition to the inverters

and storage batteries (the latter of which, can be very large indeed). Finally, the design of the mechanical aspects of the solar panel assembly had its own to allow quick and easy assembly by hand of the solar bakery.

Background summary

After more than a year of designing the Solarbakery, we were ready in the summer (2022) to build our first prototype and it was a proud moment for the whole team to see the fruits of our hard work.

Assembly of the bakery was carried out by ourselves in order to retain full control over the construction from which we were able to learn, identify any difficulties and recommend improvements as necessary. This was particularly useful whilst assembling the roof which, at the time, posed a

number of construction difficulties, but have been resolved and are now being redesigned.

Supply Chain

Like many companies we are, alas, struggling with supply chain problems and have not thus far at the time of writing been able to complete our battery room. We did, however, manage to encourage our Master Baker Daniel Petrucelli and our Senegalese partner Mamadou Tounkara to test the prototype with grid power and try out both Senegalese and German recipes. We are currently incorporating our experiences from the prototype into the design of the next version and will soon launch our crowdfunding to finance the implementation of a whole bakery chain which we will be operating in Senegal. 

If you would like to know more about the project/campaign, you are welcome to register under <https://mailchi.mp/solarbakery/i-want-to-crowdfund>

Contact: www.solarbakery.com

UNSOLD BREAD

A valuable untapped resource

Written by:



Franck Wallet

Fondateur Explicicat / Crumbler

“Overproduction”, “old bread”, “breakage”, there are many words that describe bread that is produced but not sold, often we just don’t know what do to with it all. Throwing away bread represents a significant problem for professionals, both economically, ecologically and morally. But what if surplus bread were actually a valuable untapped resource?

Of course, there are many recipes such as “French Toast”, that can help to reduce the amount of wasted bread. But this type of recipe can hardly be thought of as a solution, considering the amount of bread in question. However, a less common use for this bread: transforming it into breadcrumbs, creates circular economies as it can then be used to replace some, if not all the flour in many bread and pastry recipes.

It should be noted that breadcrumbs are not flour and do not have exactly the same properties. In particular, it would not be able to recreate the

glutenous structure needed for bread making if replaced 100%. However, for other applications, breadcrumbs are a viable flour substitute.

It is the lightly salted raw material (the salt from bread) that allows for interesting, high-quality recipes. As long as this material is kept dry, it has the advantage of being preserved, which offers real flexibility for use in bakeries and by biscuit manufacturers.

We have identified three variables which can be adjusted to allow the use of breadcrumb material and which permit an almost infinite number of possibilities. These variables are:

- the type of bread used, which affects the flavour of the breadcrumbs and therefore the products made. White breads will be more neutral, while special breads (seeds, corn, nuts, etc.) will bring their own particular flavours.
- the percentage of breadcrumbs incorporated into the recipe as a replacement for flour. Very low percentages (<10%) will not significantly change the finished product, while higher percentages may have an impact on the flavour, texture and colouring. For example, it is quite possible to start from a cookie base, and (by slightly adapting the dosages of butter and egg), to replace all the flour with

“Throwing away bread represents a significant problem for professionals, both economically, ecologically and morally.”



breadcrumbs. The result will be a tasty shortbread biscuit, rather than a cookie.

- the texture of the ground bread: still soft, naturally dried, toasted in the oven – this aspect will affect the texture of the finished product.

In 2016, after observing and analysing the potential of this simple concept, I set myself the challenge of disseminating these ideas among bakery professionals (artisanal and

“The idea of promoting the use of breadcrumbs in new recipes, above all, means less waste.”

industrial bakeries, supermarkets, restaurateurs, etc.). The idea of promoting the use of breadcrumbs in new recipes, above all, means less waste (sustainability being one of the biggest challenges of our time), but also allows professionals to make

substantial savings in raw materials and waste treatment costs.

The very first recipes that included breadcrumbs for cookies and muffins, made by hand using a simple blender were welcomed by many bakers, but,





in terms of sustainability one major hurdle remained: how to enable the baker to quickly transform his unsold products into breadcrumbs, with the cost and availability of labour also needing to be considered.

It was this problem that resulted in the creation of the Crumbler. Very simple in design, it is a machine with a two-sided sieve, large holes make possible the grinding of bread that is still soft (or even brioches and pastries), offering very soft powders and the small holes allow for fine artisan breadcrumbs.

Beyond the machine itself, it was evident that professionals would need support regarding recipe and hygiene control. For this reason, we worked with chefs to develop innovative recipes and also conducted a hygiene control study with the AGIR laboratory and the Departmental Analysis Laboratory of Dordogne (France). This was completed thanks to financial support from Ademe, checking aspects such as correct storage conditions and duration for the different types of breadcrumbs used. Thus, we now have the fully functioning Crumbler, accompanied by new, regularly published recipes and hygiene information sheets, making the process safe and quick to set up.

With nearly 300 sites equipped to date, in France, including those of renowned chefs such as Christophe Michalak and Rodolphe Landemaine, it is of great interest to see how each professional, from the basic recipes that we provide, innovates and develops his own recipe ideas incorporating breadcrumbs, ranging from bread to pizza dough or from financier to brownie.

Each bakery becomes its own recovery point, which greatly

simplifies traceability issues and there is no collection cost. The result is simply a new, unique raw material available to each equipped site and with an average saving of one to two tonnes of recycled material per site, per year.

On the consumer side, our innovation has been welcomed. When we set up blind tests, stating that there was a “mystery ingredient” in the bakery product, not many participants were able to figure out that the recipes included breadcrumbs: guesses included “coconut” and “semolina”. When the secret of the recipe was revealed, participants were surprised and the reception they gave was generally very positive, perhaps as bread is a symbolic food that no one

likes to see go to waste.

If the practice of incorporating breadcrumbs is as old as the world and if some have used it through trial and error, it still remains to this day very little known and this is what we want to change. The ecological crisis and the soaring price of raw materials has led us to believe that for ecological and economic reasons this approach will continue to develop. Furthermore, as the issue of bread waste is global, recipes can be developed endlessly and adapted to the properties of the bread of any given country or culture. There are many economies to be made and we look forward to helping the bakery sector adapt to a more sustainable future. 

FOR MORE INFORMATION →



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IT'S ALL ABOUT THE

Label verification in the food industry

Written by:



Dr Russell Sion

Managing Director, Jenton Dimaco

There are several powerful reasons to ensure that the labelling of food products is correct; some obvious and some less so, but within this article the focus will be from the perspective of the food processor and producer. Broadly they fit in to three categories – improved production efficiency, waste reduction and regulatory compliance. These will be considered in turn followed by a plan for a completely integrated label verification solution.

Label verification and production efficiency

Automated label verification has a huge part to play in increasing production line efficiency in food factories. In the UK, Brexit has caused a dramatic reduction of production line workers whilst across

the developed world, Covid-19 has affected working practices. In many cases this has created a greater appetite for production line automation. Many applications which were previously deemed uneconomic to automate (based on simplistic calculations of worker cost compared with that of automation) are now being automated based solely on the unavailability of a skilled workforce.

Having decided to automate, the two main questions are first “How to go about it?” and secondly “what’s the risk?”. Most automation tasks should be achievable and contacting organisations such as BARA (British Automation & Robotics Association www.ppma.co.uk/bar.html) will help guide the project. There are, of course, many risks to automation, but in our industry one of the most

significant is that by removing the last person on the line prior to the product being boxed, the final visual check is also removed. This, however, can be mitigated in many ways.

When checking that the product identification and presentation is correct, some machine vision solutions available can virtually replicate, and in many cases outdo, a human operative. Where the checking of label accuracy is required, the case for using automation is much stronger since the label not only identifies the product but also contains some critical variable information such as “use by” dates and pricing. A well designed label verification system should be able to verify 100% of the data on 100% of the products against validated source data.

“Where the checking and correct identification of product is presented properly, some machine vision solutions available can virtually replicate, and in many cases outdo, a human operative.”

DATA

Label verification and waste reduction

A study carried out in 2016 by WRAP; a climate action NGO www.wrap.org.uk, entitled “Quantification of food surplus, waste and related materials in the UK grocery supply chain” (ISBN: 978-1-84405-473-2) calculated that approximately 1.7 million tonnes of food were wasted in the UK prior to it reaching the consumer, of which almost half was preventable. Although bakery products represented only 10% of this, it was by percentage the largest sector where this waste could most likely be reduced.

A further study by Rentokil (www.rentokil.com) which looked at the common causes of food product recalls determined that mislabelling was the second most common cause of recalls in the US, and the third most common in the UK (<https://www.rentokil-pestcontrolindia.com/food-safety/cost-of-a-product-recall-infographic/>)

Again, a well-designed label verification system would be able to detect not only that the incorrect label was being used and hence the increased likelihood of undeclared allergens, but also that any incorrect data which would necessitate a recall, would be prevented.

Food labelling errors fall in to two categories, systematic errors and random errors. A systematic error is where the label and/or data is manifestly incorrect.

Random errors are generally a problem relating to the vagaries of the production process such as a

foreign body becoming temporarily attached to a printer. For the purposes of reducing waste at the point of production an automatic label verification system should be able to reduce systematic errors to zero by ensuring that the label and associated data is checked against a known standard.

Label verification and compliance

Almost all food production is subject to strict legal and customer compliance regulations. Manufacturers that are not fully on board with compliance often see it as a problem, even a threat to the business.

When it comes to food labelling there are many parameters that must be checked to ensure accuracy of the data, from the fundamentals establishing the use of the correct packaging through to the more complex aspects of accurately determined weights, prices and country of origin. Typically, this information is recorded at intervals of between 30 and 60 minutes during

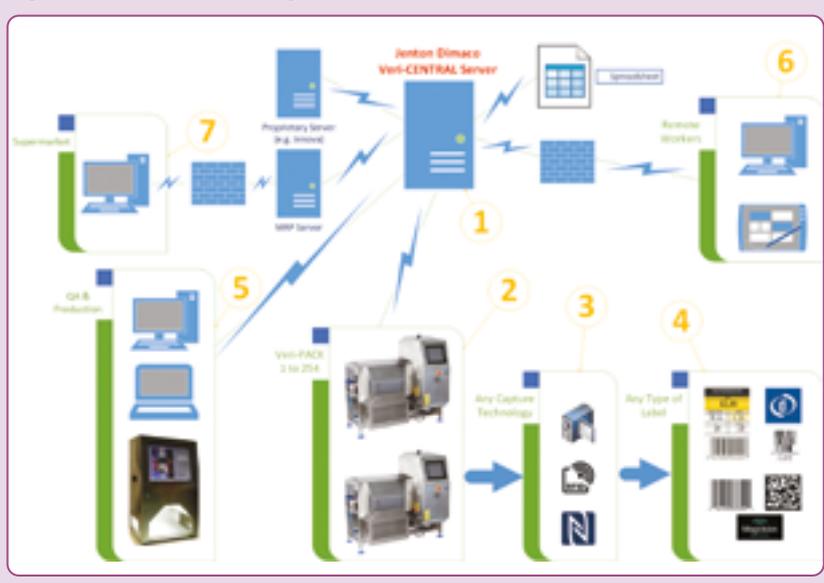
line stoppage, on paper check sheets with labels then affixed as proof. As an example, if a factory with 10 production lines runs 2 shifts, 6 days a week, it is likely to generate 120 label verification sheets each week that must be archived for future inspection.

Companies that have stuck with such a manual approach to label verification would fall into the trap of being tethered to a system that generates little, if any, benefit to themselves over and above meeting their compliance obligations.

A fully automated label verification system should, therefore, offer several fundamental benefits over a manual system first;

- 100% of label data verification
- 100% of pack/product verification
- Label data is verified against a known correct standard
- Capturing of both systematic

Figure 1: Jenton Dimaco integrated label verification solution



(incorrect data) and random errors e.g., misplaced or missing label, print head contamination

And secondly:

- Proof of compliance
- Facilitation of fast audit responses
- Tracking of manual overrides against individual user and time/ date
- Easily allowance of the data feedback as part of continuous improvement programs.

An automatic label verification system should provide the data not only for compliance but to help guide the business.



Designing a label verification system

Creating a suitable system that meets the requirements of the three specific cases outlined above requires careful consideration; the following is a brief overview – to be read in conjunction with Figure 1.

- 1.** The diagram shows the label verification server linking to an MRP server, a proprietary server and spreadsheets. All the data would ideally emanate from an MRP server, but in the real world it is usually a combination of some or all of them. From wherever the data is sourced, it is important that

the following rules are observed:

- The data should not be duplicated across multiple sources

- The data must be the latest version available
 - The data source must be secure and traceable
- 2. The hardware.** This should be designed so it is able to read the label concerned. The use of “smart” cameras can present many compromises. Different packaging solutions may necessitate multiple cameras located in different locations.
 - 3. The label technology.** Currently almost 100% of label verification systems are camera based for use on printed labels but to be “future-proofed” systems should be able to use alternative media

such as RFID and NFC.

- 4. The label.** The ability to read many forms of label is important. Ideally, a system should have a good OCR to read text and printed characters, as well as 1D, 2D and data embedded codes. The ability to read encrypted codes also aids future proofing.
- 5. The QA / Technical team.** The employees in these teams generally have primary and secondary needs that can be helped by automating label verification. The primary need is to ensure compliance is maintained throughout production. From a central location, QA/technical team managers must have a

“An automatic label verification system should provide the data not only for compliance but to help guide the business.”



complete overview of what's happening whilst being fed key process information such as pass/fail percentages.

The secondary facility that should be made available that of having the ability to check labels offline to the same standard as the online system. Having an offline label verification system utilising the same data allows new products / labels to be verified prior to them going into production thereby reducing future downtime.

6. Remote access. The capability to allow authorised remote access is critical for three principal activities. Firstly, it allows remote technical support to quickly assess any problems that arise and help lineside operators diagnose reasons for repeat rejections on seemingly correct labels (in our experience over 85% of all remote access requests due to continuous rejection is that the lineside

operators are working from obsolete data sources such as printed spreadsheets). Secondly it allows senior technical personnel to monitor different production sites remotely. Thirdly, it facilitates quick and easy on the job training.

7. The Supermarket (or customer).

This really isn't a function of the label verification, but more of a capability of how the whole system responds to changing requirements. In many applications it is possible and usual, for pricing to change during a production run. If this happens then it is essential that the label verification is automatically updated.

Conclusions

This article set out to show that automated label verification can deliver many benefits to the food producer. It can increase efficiency, reduce staff count, reduce waste, and improve compliance, however, in order to achieve significant benefits such as these, care and attention must be taken when designing and implementing the automated label verification system.

Simply attaching a smart camera and entering data into a local terminal will not deliver the benefits. As a final example, if a lineside operator was able to set a printer up to print a use-by date of "Feb 30" and set a smart camera up to verify "Feb 30", this would make nonsense of the so called, "verification system" that would allow all the packs pass through regardless.

In label verification there are no shortcuts to success, but for those companies prepared to make the investment there is a guarantee of numerous benefits, just remember – **It's All About the Data.** *

About the author

Since obtaining his PhD from the University of Southampton in 1993, Russ Sion has worked for the Jenton Group primarily in food factory automation. Russ became the Managing Director of Jenton Dimaco when it was acquired by the Jenton Group in 2016, since when its turnover has grown by a factor of 6.

*

Many readers will no doubt be aware of the old adage "Garbage in Garbage out" [Ed] 

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IDDBA

The International Dairy Deli Bakery Association (IDDBA) is a nonprofit trade association for food retailers, manufacturers, wholesalers, brokers, distributors, and other industry professionals. Our membership includes more than 1,500 companies ranging from small independents to the world's largest corporations. IDDBA helps its members enhance their economic position by providing opportunities for professional dialogue, education, exchange of industry data and selling opportunities.

IDDBA 2023 | June 4-6 | Anaheim

The IDDBA show is the largest industry-only show for the dairy, deli, bakery, and foodservice industries. Spend June 4-6 in beautiful Anaheim California growing your business by meeting decision makers from around the globe face-to-face and building relationships.

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PPMA

Total Show 2022 – Review

Industry celebrates another successful PPMA Total Show – bringing manufacturers, suppliers and customers together.

Visitors and exhibitors have hailed the 2022 PPMA Total Show as a resounding success. Since the completion of the show, which ran from 27-29 September at the NEC Birmingham, UK, the processing and packaging industry have provided very positive feedback, calling the exhibition “a great networking event that has everything you need in the processing and packaging arena.”

A winning combination of expert exhibitors, representing the full production line, carried out live demonstrations of machines for high-calibre visitors. This created a fantastic atmosphere filled with invaluable opportunities, which Yamato’s National Sales Manager Paul Webster described as, “A one-stop shop for our customers. Every solution in the world is here.”

This year’s show hosted over 350 stands representing 2,000 brands and featured a significant number of new product launches and ‘first showings’ of the latest technologies, automated solutions, robotics and vision systems. One visitor from Pepsi Co, Project Manager Nicole Carr said, “It was good to see what other technologies are out in the market and what opportunities there are.”

Building and maintaining relationships with colleagues and suppliers

continued in the evenings after the show, including at the PPMA Gala Dinner, which was highlighted by a performance from stand-up comedian Jason Manford in front of hundreds of exhibitors and VIPs.

The highly sought-after PPMA Industry Awards were also handed out during the course of the exhibition to winners including Markem-Imaje, Fortress Technology, Pace Machine Handling, Crest Solutions, and Epson (UK). The winners were praised by judges for their creativity, smart technologies and innovative solutions, focused on increasing productivity and efficiency, reducing costs as well as delivering excellence in customer service.

Show visitors were also rewarded with a three-day seminar programme of informative and educational presentations and opinion-led industry insights. Centred around the theme ‘The Future Of...’ the seminars were compiled specifically to address the many opportunities and challenges facing the UK industry.

Seminars also emphasised the efforts that are being made to make the manufacturing industry more sustainable and environmentally friendly as we work towards Net Zero.

Summing up the benefits of this year’s show and events, Stuart Colton



from Omron described it as, “An absolutely fantastic opportunity to engage with the most important market sector in the UK.”

Richard Little, PPMA Show Director



said, "It is both overwhelming and gratifying to receive such positive and encouraging feedback from visitors and exhibitors alike and we are delighted that once again, in its 34th year, PPMA Total Show has

delivered an event that reaches into the very heart of our industry, addressing the needs of our members as well as delivering on the aspirations and expectations of our visitors." 



Contact details

The PPMA Show returns to the NEC in 2023 and will run from 26-28th September. Exhibitors interested in booking a stand should contact Natalie Charlton 020 8773 5520. Potential visitors seeking information, can find out more at www.ppmashow.co.uk

SÜDBACK 2022

proves that the industry is ready to take off again

Südback 2022 came to an end after four days with some 35,384 visitors and 600 exhibitors ensuring that the trade fair once again matched the level at the previous event in 2019. The positive aspects of südback included, in particular, the investment intentions of the trade visitors despite the challenges facing the industry.

The 29th Südback emitted that wonderful bakery aroma that we all love and filled five exhibition halls over a period of four days at Messe Stuttgart, where it also provided a platform for the bakery and confectionery trades to be able to discuss innovations and trends. The trade fair representing bakery and confectionery trades again presented everything relating to baking; from working and operating technology, raw materials and merchandise through to shop fixtures and fittings. The new gelato area powered by GELATISSIMO, which was held as a one-off event during südback 2022, featured a varied programme, trends and ideas relating to the artisan production of gelato.

“südback more than affirmed its role in the bakery and confectionery trades and clearly indicated its importance. In spite of many challenges now facing the industry, the trade visitors came to südback with the intention of making investments. The trade fair, therefore, set its sights on the future and

provided guidance,” said Stefan Lohnert, President of Messe Stuttgart, at the end of the fair.

Close co-operation with the südback partners

The professional and promotional supporters of südback also drew positive conclusions at the end of the trade fair. Gunter Hahn, Managing Director of the BÄKO Head Office, said that the industry was very keen to present its innovations at südback: “Saturday, the first day of the trade fair, was fantastic. We noticed that the visitors possessed a great deal of expertise. The exhibitors brought along numerous innovations which had a long time to mature. südback is an encouraging signal for the industry and has the positive effect which the bakery trade needs.”

Martin Reinhardt, Regional Guild Master of the Regional Association of Guilds of Württemberg Bakers, was also impressed by the positive mood in the exhibition halls: “We saw exhibitors and visitors laughing on every day of the trade fair and did not feel we were in the middle of a crisis. It is great to see that südback has a positive effect on the industry: we are now ready to take off.” Klaus Vollmer, Regional Guild Master of the Baden-Württemberg Regional Association of Confectioners' Guilds, not only looked back with satisfaction at südback, but is also looking forward to the next event: “As the Regional Association of Confectioners' Guilds, we are

delighted to have matched the success from 2019. We would therefore like to thank everyone involved. The following now applies: after the trade fair is before the trade fair.”

Propensity to invest among trade visitors – südback is a trade fair for decision-makers

In spite of the complex challenges now facing the industry, the trade visitors, 18% of whom were from abroad, came to südback with the intention of investing. Firstly, 69% of the visitors said that they were involved in purchasing and procurement decisions in their company with 23% saying that they were actually responsible for these decisions. Secondly, around one third of the visitors were definitely intending to make purchases or investments. 46% said they may make purchases or investments in the near future. Around 50% of those visitors were actually planning to make investments in the next six months. 30% of the visitors also mentioned higher investment volumes upwards of €50,000.

Extensive accompanying programme with the presentation of the südback Trend Award

The Bakers' Trend Forum, the Confectioners' Trend Forum and the südback Trend Award proved to be very popular. The high quality nature of the forum talks and baking demonstrations attracted many



visitors. Innovative product developments in relation to technology, design and concept were honoured again with the südback Trend Award. The Award was also presented for the first time in the “Public favourite” category. The visitors were able to vote online for their favourite innovations from 20 nominated ideas, concepts and technical innovations which the first-class jury previously selected as worthy of winning. The winner in the “Public favourite” category was the company AMG Reichenbach GmbH, which took the Award for its CO₂ monitoring with AMG MasterKonzept 4.0. This innovation helps to regulate excessive CO₂ concentrations in productions to optimum values during fermentation, baking, cooling and storage processes.

The winner in the “Marketing, sales and organisation” category was Keil Konzepte with its “Mini Bäckle – the world’s smallest and fully functioning bakery branch”. This is a transportable, sustainable and flexible sales unit with everything belonging to a superbly equipped shop in miniature, including a store room and sanitary facilities.

The French manufacturer Boiron Frères came out on top in the “Raw materials & convenience” category with its new “AMBIENT FRUIT PURÉES”. These fruit purées do not contain any added sugar, aroma additives or preservatives. The trick, however, is that the fruit purées do not have to be cooled making their processing much easier.

The winner in the “Technology” category was Va-Q-tec AG with its “va-Q-tray – A va-Q-tec TempChain Solution”, a reusable thermal system box. Thanks to their special insulation with high temperature stability, the innovative tray design ensures



temperature-controlled transport of dough products or other baked goods.

EXHIBITORS SATISFACTION

Kerstin Schmidt, Chief Commercial Officer Central Europe/UK & Bread, CSM Deutschland GmbH: “We went all-in during our presence at südback and had an exciting mixture in the portfolio. That was only right and proper, we had over 25,000 sample tastings alone. The diversity of the industry can be experienced at südback. It is simply possible to do more when a trade fair is staged as an attended event. The visitors were primarily looking for solutions.”

Lisa Affenberger, Marketing, König Maschinen Gesellschaft m.b.H.: “Our company has had a connection

with südback for many decades. The trade fair is a focal point for us to a certain extent. We were positively surprised by this year's event. We are very satisfied as we welcomed large numbers of visitors to our stand. We were able, in particular, to target craft enterprises and industry. We were also able to finally perform our demonstrations again in a live setting and answer a large number of questions on the spot.”

Roland Knorr, Sales, RONDO GmbH & Co. KG: “We looked forward very much to südback during the run-up to the event. The trade fair exceeded our expectations. We saw that the visitors were very interested. Some follow-up orders and discussions hold out the promise of good business for



our company after the event. Face-to-face meetings were our main objective, but customers also came with a specific interest in making investments. In our opinion, südback is a European trade fair.”

Daniel Petricevic, Head of Sales Southern Germany, WMF GmbH:

“südback is the most important sales channel for our company in regard to bakeries. We met more visitors here than expected and were very impressed by the mood in the exhibition halls.”

Pascal Hautecouverture, VP Global Sales and Marketing, WIESHEU GmbH:

“We were very positively surprised by the large numbers of visitors. In particular, there was great demand for our latest E3 shop baking oven with its high energy efficiency level. After all, the subject of energy is affecting the entire industry. We, therefore, also focused on this topic at südback and held a large number of interesting discussions on our exhibition stand.”

Simone Nücken, Marketing & Event Manager, WACHTEL GmbH:

We had both regular customers and new customers on our stand, and held good discussions from the first day of the trade fair. We also welcomed

international customers.”

Annemarie Renner, Digital Marketing Manager, Zeelandia GmbH & Co. KG:

“südback is an important event for us to meet and hold discussions with customers. Firstly, we were often asked about vegan products and secondly, focusing on processes played a relevant role.”

Other awards at südback

In addition to the südback Trend Award, the Carlo Wildt Cup was also presented at the trade fair.

Apprentices in their second or third apprenticeship year demonstrated their skills here under this year’s motto

“Contrasts”. This competition for young confectioners is an inherent part of südback and is an impressive example of high-quality training.

The Grand Prix GELATISSIMO was also held this year at südback 2022. The best gelatieri competed against one another in this gelato competition in the pistachio, yoghurt and strawberry flavours. The three day winners – Matteo Caldata from the Big Bang gelateria (pistachio), Giuseppe Floris from the Dolomiti ice cream café (yoghurt) and Alfiero Conte from the Gelati Conte ice cream parlour (strawberry) won through their victory a brand-new Vespa and qualified for the Grand Final during which they provided a live demonstration of their skill when creating coconut sorbet. At the end of the Grand Final the jury presented the coveted trophy, the “Coppa GELATISSIMO”, to the winner Alfiero Conte. 🏆

The next südback will take place from 26 to 29 October 2024.

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BAKINGEUROPE

Editor’s comment

Having been to several südback shows since *Baking Europe*’s launch in 2013, I only have memories of fondness for the show which includes the 2022 fair just finished. The show is well laid out, the website works well and transport links enable easy access. In addition, the staff are all exceptional in their professionalism and courtesy to a highly commendable level and bend over backwards to assist, a quality that is all too often rare which doubtless leads to happy exhibitors and visitors. It is always a pleasure to be at südback and as such I look forward to the next show.

Graham Pendred
Publisher *Baking Europe*

ON THE SEARCH FOR DELICIOUSNESS

Written by:



Professor Charles Spence

Head of the Crossmodal Research Laboratory, University of Oxford

The search for deliciousness, at least according to the North American biologists Rob Dunn and Monica Sanchez, can be linked to the evolution of flavour and is a key part of what makes us human. As they put it, “In short, our human evolutionary story is a story of flavour and deliciousness, and the story of flavour and deliciousness is a story of physics, chemistry, neuroscience, psychology, farming, art, ecology, and evolution.”^a Indeed, noted gastronomes such as Anton Brillat-Savarin (1835) have long been on the trail of exactly what it takes to make certain foods taste delicious.^b Although Dunn and Sanchez do not

specifically talk about bread in their book, Dunn has written elsewhere about the science behind delicious sourdough bread. He starts one article by posing the following question: “how does flour, water, bacteria and wild yeast from the air result in something as delicious and as unique as a loaf of sourdough?”^c He suggests that the bacteria found on the hands of bakers (not to mention in the spaces that they inhabit) are crucially important in this regard.

According to a number of influential food science commentators, such as Harold McGee, molecular gastronomy may hold the answer.

McGee describes this as, “the scientific study of deliciousness”.^d Peter Barham, a physicist from the University of Bristol, together with colleagues from the Department of Food Science at the University of Copenhagen also consider molecular gastronomy as lying at the heart of the search for deliciousness, stating that, “We take a broad view of Molecular Gastronomy and argue it should be considered as the scientific study of why some food tastes terrible, some is mediocre, some good, and occasionally some absolutely delicious. We want to understand what it is that makes one dish delicious and another not,

“Some of the most creative individuals of the kitchen have been suggesting that chefs should be striving to deliver more than simply just deliciousness in the food/dishes that they deliver to their customers.”



whether it be the choice of ingredients and how they were grown, the manner in which the food was cooked and presented, or the environment in which it was served.”^e Naturally, it follows that chefs should endeavour to be students of this science and as such the authors behind the *10 Principles of Modernist Cuisine* are also keen to stress the fundamental need for chefs to “always strive to produce the most delicious, technically exquisite food”.^f But is deliciousness in bread, or any other food product for that matter, something that can be assessed and/or promoted by means of an analytic scientific approach?

On the analytic versus holistic approach to deliciousness

Specifically with regard to the world of wine, North American, Clark R. Smith, of *Vinovation Inc.*, thinks not. The controversial vinologist created something of a stir a few years ago when, in an issue of *Vineyard and Winery Management*, he complained about the analytical approach to winemaking that was apparently advocated by the UC Davis wine programme. In a commentary provocatively titled, *Does UC-Davis have a theory of deliciousness?*, Clark suggested that a scientific analytic

approach was often responsible for making clean but dull wines. Instead, Clark argued for a fusion of the analytic approach to wine-making with an “older, visceral, holistic method of assessment”, in order, hopefully, to produce an integrated view of what makes wine “delicious.”^g Translating the debate to the world of bread, one might perhaps want to contrast the approaches that have been championed, on the one hand, by holistic-style bakers such as Chad Robertson of *Tartine Bakery* in California,^h with the much more rigorously scientific approach to bread making epitomised by the likes of Nathan Myhrvold and Francisco Migoya in their five-volume *Modernist Bread*, on the other.ⁱ

One of the replies to Clark’s broadside on the art and science of wine-making by Jim Lapsley argued that quality (or deliciousness in Clark’s terminology) should not be considered as an objective absolute property of a food, but rather as depending on the taster’s viewpoint. As Lapsley notes: “A concept of deliciousness is not coded somewhere in the genes. Rather it is an individual judgment that involves likes and dislikes and generally requires a social and personal context

that is most often learned. Ask yourself: Did you like your first taste of beer or did you find it unpleasantly bitter? Do you like it now? Well, your frame of reference has changed (and perhaps your taste buds too). Although we can recognize wine styles, the assessment of relative quality between wines of two different styles or within one particular style is ultimately a personal or hedonic judgment.”^j Interestingly, while various commentators have been debating the concept of deliciousness and how best to achieve it in the world of wine, some of the most creative individuals of the kitchen have been suggesting that chefs should be striving to deliver more than simply just deliciousness in the food/dishes that they deliver to their customers.

What lies beyond deliciousness?

In their 2006 ‘*Statement on the new cooking*’, top chefs Ferran Adria, Heston Blumenthal and Thomas Keller, together with Harold McGee took great pains to emphasize the importance of deliciousness to modern(ist) cooking. At the same time, however, they also stressed that what they are striving for goes beyond merely delicious food to include those dishes that the diner will find ‘stimulating’. At one point, writing that: “We do not pursue novelty for its own sake. We may use modern thickeners, sugar substitutes, enzymes, liquid nitrogen, sous-vide, dehydration, and other non-traditional means, but these do not define our cooking. They are a few of the many tools that we are fortunate to have available as we strive to make

“What they are striving for goes beyond merely delicious food to include those dishes that the diner will find ‘stimulating’.”

delicious and stimulating dishes.”^k The Michelin-starred Spanish chef Andoni Luis Aduriz, of Mugaritz, near San Sebastian, has been pursuing the latter position in some of his dishes. A decade ago, Andoni had the following to say in one interview: “You know, I went to cooking school decades ago, and there they taught me how to make delicious food. It’s not my goal to make delicious food anymore. I want to make interesting food.”^l Indeed, this chef is famous for, amongst many other things, serving the occasional dish that he knows many of his guests will not like the taste of, because they help to illustrate a particular narrative function within the fabulous multi-

course meals served in the restaurant.

Ultimately, as one of the most symbolic and historic of our fermented foods, not to mention one that took on such a special role in the home during the early stages of the Covid pandemic,^m it is presumably unlikely that a purely analytic, scientific strategy is ever going to provide a definitive answer to the question of what, exactly, makes bread, or at least some of it, so delicious.ⁿ Instead, a more holistic, artistic approach is also likely to be needed: one that allows the consumer to literally taste the idiosyncratic hand of the maker.^o Should bread – that seemingly

magical mixture of flour, water, bacteria and wild yeast – be interesting and more than simply delicious? That is a question that for now at least, I better leave unanswered. 

FOR MORE INFORMATION 



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References

- a. Dunn, R., & Sanchez, M. (2021, p. xvi). *Delicious: The evolution of flavour and how it made us human*. Oxford, UK: Princeton University Press.
- b. Brillat-Savarin, J. A. (1835). *Physiologie du goût [The philosopher in the kitchen / The physiology of taste]*. J. P. Meline: Bruxelles. Translated by A. Lalauze (1884), *A handbook of gastronomy*. London, UK: Nimmo & Bain.
- c. Dunn, R. (2018). Inside the fascinating (and delicious!) science of sourdough bread. *Ideas TED*, December 19th. <https://ideas.ted.com/inside-the-fascinating-and-delicious-science-of-sourdough-bread/>; Dunn, R. (2018). Never home alone: From microbes to millipedes, camel crickets, and honeybees, the natural history of where we live. New York, NY: *Basic Books*.
- d. McGee, H. (1984/2004). *On food and cooking: The science and lore of the kitchen* (Rev. Ed.). New York, NY: *Scribner*.
- e. Barham, P., Skibsted, L. H., Bredie, W. L. P., Bom Frøst, M., Møller, P., Risbo, J., Snitkjær, P., & Mortensen, L. M. (2010, p. 2315). Molecular gastronomy: A new emerging scientific discipline. *Chemical Reviews*, 110, 2313-2365.
- f. Spence, C., & Youssef, J. (2018). Assessing the long-term impact of the molecular gastronomy movement on haute cuisine. *International Journal of Gastronomy & Food Science*, 14, 35-44. <https://doi.org/10.1016/j.ijgfs.2018.10.001>.
- g. Smith, C. (1995). Does Davis have a theory of deliciousness? *Vineyard and Winery Management*, July/August, 8-10.
- h. Robertson, C. (2010). *Tartine bread*. San Francisco, CA: *Chronicle Books*.
- i. Myhrvold, N., & Migoya, F. (2017). *Modernist bread*. The Cooking Lab.
- j. Lapsley, J. (1995). Tastes great! No, less filling! *Vineyard & Winery Management*, November/December, 56-62.
- k. Adria, F., Blumenthal, H., Keller, T., & McGee, H. (2006). Statement on the ‘new cookery’. *The Observer*, December 10th. <http://www.guardian.co.uk/uk/2006/dec/10/foodanddrink.obsfoodmonthly>.
- l. Ulla, G. (2012). Chef Andoni Luis Aduriz on Mugaritz and deliciousness. *Eater*, May 15th. <https://www.eater.com/2012/5/15/6586849/chef-andoni-luis-aduriz-on-mugaritz-and-deliciousness>.
- m. Ammann, J., & Ritzel, C. (2021). The soothing effect of bread in the Covid-19 pandemic. *Baking Europe*, Autumn, 6-9.
- n. Geissler, L. (2018). *Time works*. *The Ingredient*, April, 64-67.
- o. Hayward, T. (2014). The cult of inconsistency. *FT Weekend Magazine*, October 10th. <http://www.ft.com/intl/cms/s/0/41cb3e4c-4e66-11e4-bfda-00144feab7de.html>.

About the author

Professor Charles Spence is a world-famous experimental psychologist with a specialization in neuroscience-inspired multisensory design. He has worked with many of the world’s largest food and drink companies across the globe since establishing the Crossmodal Research Laboratory (CRL) at Oxford University in 1997. Prof. Spence has published more than 1,000 academic articles and edited or authored, 15 books including the Prose prize-winning “The perfect meal” (2014, with Betina Piqueras-Fiszman), and the international bestseller “Gastrophysics: The new science of eating” (2017; Penguin Viking) – winner of the 2019 Le Grand Prix de la Culture Gastronomique from Académie Internationale de la Gastronomie. His latest book, Sensehacking, was published in January 2021.

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