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SPECIAL "PLANT BASED ALTERNATIVES"

magazine

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Plant-based dairy alternatives – an IDM International Dairy Magazine special focus

The plant-based dairy alternatives sector is growing in developed countries at an astonishing rate. Granted, starting from zero, the sale of the first product represents 100% growth. But the plant-based category has long since developed into main-stream markets and even those who enjoy original milk and meat are becoming, in the face of ever increasing choice, more and more willing to give plant-based a try. Of those who've tried, a great number are taking plant-based analogues into their everyday diet, spurring the flexitarian movement all over the world. A prerequisite is, however, that such products really stand up to the expectations of consumers regarding texture, colour, taste and nutritional values. This special issue of IDM International Dairy Magazine explores the ways of improving plant-based alternatives. Readers will find a number of solutions and proposals for how to manufacture better plant-based products.

Manufacturers should not see the plant-based category as cannibalising dairy. Still, margins delivered by plant-based products are good and often significantly higher than what the

original dairy business generates. And, most important, dairies basically know how to process and package the analogues. They have control over the cold chain and they know the consumers. All in all, this is a huge advantage over the so many start-ups that may have good ideas and concepts but lack the market insights and connections necessary for success.

As the market for plant-based matures, we will surely see a decline in margins given increasing competition. It should be a major task for manufacturers and retailers alike to prevent the same erosion of margins that has happened in the dairy category over the past decades. Anyway, a dairy company that has its footholds both in original and alternative fields will be fit for surviving the changes that lie ahead for the food industry.

We think that we have compiled interesting information in this special issue that will help dairies to tackle some of the challenges in making plant-based alternative products.

Roland Sossna, Editor





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FOODITIVE

"First ever" vegan casein

Dutch plant-based ingredient manufacturer, Fooditive Group, aims to change the opinion toward GMO foods through its innovative ingredients. After success with its upcycled natural sweetener, the company is now expanding to animal-free dairy proteins.

The key to producing Fooditive's vegan casein was to first understand the milk formula. This helped the team to re-create an animal-free version of milk casein, by using fermentation and ensuring that the process will be scalable for the food industry.

Fooditive believes this ingredient will be a game-changer in the food industry because it supports the next generation of milk while simultaneously delivering great taste. The ingredient is also versatile as it is suitable for a variety of applications from dairy milk formulations to yoghurt, crèmes, and cheeses to get the melting characteristics.

The ingredient will be the first vegan casein available for applications in the food industry, and there is already an extensive list of food developers and food companies – some of them are big players in the dairy industry – subscribed to test the ingredient in their products. Fooditive plans to debut the vegan casein in 2022 in the market.



Fooditive Group has introduced the industry's first vegan casein (photo: Fooditive)



Want to produce oat-based drinks?

Here's what you need to know

Research suggests the market for healthy oat-based beverages will continue to grow. But as a new category of drinks, it lacks ready-made production solutions. We've identified three key processing challenges – and how to meet them with the right technology and expertise. Download our whitepaper and learn how we can help you succeed in the oat-based market.

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Functional ingredient innovation

Unlocking the full potential of plant-based dairy products



*Author: Ben Rutten, Global Business Manager
Milk and Dairy Alternatives, DSM Food Specialties*

The plant-based category in recent years has shown exponential growth and is expected to remain a highly lucrative market as it evolves and matures. To investigate the trends that are shaping the market globally, DSM surveyed 5,000 consumers across 10 countries worldwide. The research revealed that 53% of consumers will be looking for more plant-based alternatives in the coming years, but also that people are increasingly seeking better-for-you options that support their health and wellbeing. With consumers more health-savvy than ever, it comes as no surprise that 85% are aware that they might not be meeting the recommended intake levels of essential vitamins and minerals. Dairy alternatives that are fortified to offer a nutritional profile that matches that of traditional dairy are therefore increasingly in demand, with more than 50% of dairy alternatives on the market now fortified. These added benefits enable manufacturers to differentiate their products with in-demand label claims. But how can manufacturers create appealing dairy alternatives that stand out on the shelf and satisfy today's health-conscious consumer demands?

Enhancing consumer appeal

To ensure the plant-based dairy market is well positioned to continue its upward trajectory, it is important that manufacturers have the tools they need to navigate the challenge of creating nutrient-rich, great-tasting plant-based dairy alternatives.

A source of protein, calcium and other nutrients, dairy is considered a key part of a healthy, balanced diet by many people worldwide. Unfortified dairy alternatives, however, typically have a lower nutritional value than traditional dairy products, particularly with respect to vitamin B2, vitamin B12 and calcium, which may present a stumbling block for producers.

At the same time, although health remains a key concern for today's consumers, it is important to note that the taste and texture of plant-based solutions remain a strong influencer of the consumer purchasing decision. 62% of people say that taste is their number one priority when buying food or drink products. To create strong appeal, producers must therefore create high-quality plant-based dairy products with the sweetness (without adding sugar), texture and mouthfeel that consumers expect. This can be difficult to achieve, as starch-based drinks like oat milk do not initially possess consumer-friendly properties, such as taste, texture and mouthfeel, and require additional steps in the production process to ensure they offer the right sensory profile. To overcome this, starch must be made soluble, the often undesirable flavor off-notes of plant protein have to be masked and the natural sweetness in raw materials like rice and oats has to be unlocked.

Accounting for regional variations in preferences for the sweetness of plant-based dairy alternatives



(photo: DSM)

can also make the product development process even more complex. Northern Europeans, for instance, look for plant-based varieties with less sweetness and more of a focus on cereal flavors compared to their southern European counterparts, who typically prefer sweeter dairy alternative products. Producers are therefore increasingly seeking solutions to help deliver the 'perfect' sweetness profile for their target regions without, or with limited, added sugar to optimize nutritional appeal – without compromising sensory properties.

Next generation innovation

DSM offers a wide portfolio of solutions, including vitamins and enzymes, to improve nutritional value as well as options to optimize the taste, texture and sweetness of plant-based drinks and dairy alternatives. This, as well as quality support throughout the product development process, is backed by a global team of plant-based experts with industry expertise and insights and DSM's market-leading nutrition science, to help customers achieve the right balance.

To deliver on consumer demands for more nutritious dairy alternatives, manufacturers can leverage

DSM's high-quality, reliable, traceable and sustainable Quali vitamins and premix solutions which can be added to plant-based dairy products. Combined with DSM's fortification expertise, producers can develop nutrient-rich plant-based dairy alternatives that will appeal to health-driven consumers across the globe.

Meanwhile, DSM Delvo@Plant enzymes can help to further bolster the nutritional value of plant-based drinks. For example, DelvoPlant PHY is a phytase enzyme that increases the availability of the minerals present in plant-based proteins, such as iron, zinc, calcium and magnesium, to elevate nutrient content. DSM's DelvoPlant range can also help manufacturers leverage the sugars naturally present in raw materials like oats to create healthier plant-based drinks without added sugar and create a more drinkable texture with an appealing viscosity. Furthermore, plant-based dairy manufacturers can leverage DelvoPlant enzymes to easily adjust the natural sugar profile present in the starch base by leveraging the glucose (high sweetness) and maltose (low sweetness) inherently present in the oat or starch. For manufacturers looking to create an appealing sensory experience, the DelvoPlant enzymes can also help to optimize the taste, texture and



Accounting for regional variations in preferences for the sweetness of plant-based dairy alternatives can make the product development process even more complex (photo: DSM)

mouthfeel of cereal-based (such as oat and rice) and non-cereal-based (like soy and almond) dairy alternative drinks.

DSM’s GELLANEER hydrocolloid and ModuMax taste modulation solutions also provide additional benefits during saccharification. GELLANEER is a naturally-fermented polysaccharide – or gellan gum – that is widely used in many plant-based food and beverage applications. Highly versatile, gellan gum delivers superior functionality as a suspension, stabilization and texturizing agent. For example, in plant-based dairy products with fortified nutrients, it improves product

stability and contributes to more body and a creamy mouthfeel. Meanwhile, ModuMax enhances taste by masking the off-flavors created by raw materials and sweeteners and improves mouthfeel to support the production of premium plant-based products. For example, in cereal- and non-cereal-based drinks, this solution supports a milky texture and appealing taste.

Stepping into action

As the plant-based market is booming with an exciting opportunity for differentiation, now is the perfect time for producers to create unique, nutrient-rich offerings and meet the needs of today’s health-conscious consumers. DSM’s plant-based experts work with manufacturers across the globe to bring solutions that enable them to overcome formulation challenges and optimize nutritional value, taste and texture to create market-leading products. Alongside next generation innovation, DSM is a one-stop-shop provider providing market, scientific and regulatory expertise, helping manufacturers get to market faster with winning plant-based dairy alternative products.

To find out more about DSM’s uniquely broad portfolio of plant-based dairy solutions, visit: https://www.dsm.com/food-specialties/en_US/markets/dairy/plant-based-dairy-alternatives.html

SMART PROTEINS ON THE RISE A multi-billion dollar business

Smart proteins or alternative proteins that can replace meat and dairy are fast emerging as a major sector with most of the big players in the food and beverages segment showing an interest in it. According to available data, the total invested capital in the smart proteins sector globally as in 2020 was somewhere around \$3.1 billion – three times bigger than the previous year, the Business Standard reported.

By the end of this year, another \$4 billion is expected to be invested in the sector. Globally, the alternative proteins market is projected to reach \$290 billion by 2035.

- 1 Bloomberg Intelligence – Plant-based foods poised for explosive growth (August 2021)
- 2 DSM, Future of Food survey, 2020.
- 3 DSM, 2019 Global Health Concerns study.
- 4 Mintel 2020
- 5 DSM, Future of Food survey, 2020.

ProLeiT

Power to the pea – disruption of the milk industry



Author:
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Milk alternatives are all the rage these days. An increasing number of people are giving up cow's milk in favor of plant-based substitutes, such as soy, oat, almond and pea drinks. Once considered a niche item, they are now hugely popular with many consumers – especially vegans and so-called flexitarians.

We are currently experiencing enormous growth in the market for milk alternatives. Young startups, in particular, are driving this development through innovative solutions and practices. As a leading supplier of process control technology, our focus in 2022 will, therefore, also be on supporting these business startups from day one in all things automation through the compact entry-level solutions of our process control systems Plant iT compact and Plant iT express. Moreover, it is true to say that startups that opt for scalable automation early on can achieve success faster and leave their competitors standing. Thanks to our highly flexible software solution, we not only grow with our customers but also provide them with valuable support and assistance to standardize and optimize their processes from the earliest possible stage. The costs for the ProLeiT entry-level solutions are recouped relatively quickly, meaning startups can expand production effectively, efficiently and skillfully.

This current mood of change is also being felt at large dairy cooperatives. Although sales of conventional dairy products are still significantly higher than those of plant-based substitutes, transformation of the market is now unstoppable and steadily gaining momentum. Many long-established companies are still on the fence when it comes to vegan alternatives, but at the same time they are struggling with declining demand for their products. Long overdue investments in automation are being put on the back burner – replacing the entire control level would simply be too costly in the current situation and the associated production downtime would not be feasible due to the full utilization of resources. Thanks to the new ProLeiT Batch Engine, we are able to meet this challenge by introducing an intermediate level through which key topics such as cyber security and traceability can be implemented – without extensive and expensive downtime.

Through the plant-wide MES reporting and workflow management system Plant Integrate iT and the optionally available add-ons, ProLeiT also offers intralogistics solutions to guarantee full transparency and permanent optimization of internal processes.

Plant-based products without dogma

What makes Berief Food successful

Berief Food GmbH, based in Beckum is one of the most successful plant-based products companies in Germany. Benefiting from the general trend towards alternative protein supply, turnover increased by almost 1,300% to €90 million between 2009 and 2021. IDM asked Bernd Eßer, Managing Director, about the reasons for success.



Bernd Eßer, Managing Director, Berief Food: Our products have a unique character, we do not want to imitate dairy products in any way

"The family company Berief Foods has its beginning in an idea, after a trip to Asia in 1985. Here, they studied tofu production and designed a machine with which tofu could be produced in better quality. However, the machine concept came too early, the market was far from being ready for alternative vegetable products. The Beriefs stuck to their idea anyway and jumped into tofu production without further ado," explains Bernd Eßer.

Manufacture gives way to industry

Berief Foods has long since left the initial production method, which was more like a manufactory, behind. At the latest with the construction of a second factory in 2016, the company is pursuing a course as an industrial manufacturer. In doing so, Berief does not rely

on standard processes, but on technology developed in-house, which is implemented by renowned machine manufacturers. The focus is always on how the raw materials can be handled even more gently in order to achieve ever better product quality.

The growth of Berief Foods is also reflected in the number of employees. Whereas in 2009 there were only about 30 employees, today 358 people work in the two Beckum factories. Production takes place in three shifts, six days a week. In the pandemic year 2020 alone, the workforce was increased by 100, whereas in normal years it is usually up by about 30.

Berief Food manufactures a broad range of plant-based drinks





The new Berief Food plant built in 2016



Berief Food plans to label all products with the Nutri-Score

Raw materials from Europe

Only organic raw materials from Europe are processed, from soy to rice and oats to spelt and almonds (coconut and cashew not included). The range includes vegetable drinks, yoghurt alternatives, cooking creams and spreads as well as tofu in various preparations. Eßer: "Our products have a unique character, we do not want to imitate dairy products in any way, but we want to establish our own position in the market by targeting consumers who, for whatever reason, want to eat a plant-based diet".

In fact, when you visit Berief Foods, you don't get a whiff of ideology or the "moral acid" that is common among some plant-based processors. Rather, professionalism determines the business. As Eßer explains, any new plant-based raw material sources are first thoroughly checked to see whether they actually meet a consumer need and whether they are also available in sufficient quantity and quality. "We don't do any product development just because a raw material is being hyped at the moment," says Eßer. In the meantime, there are only two or three product innovations that come onto the market every year, preferably they are presented at BioFach.

The Berief Food products are mainly delivered to food retailers, both as own-brand and private-label products. In addition, they are exported to 26 countries. In contrast to the philosophy of many dairies, the batch volume in production is not a control variable. Since the

company has been dealing with niches for a long time and always has to deal with allergens, Berief Food has developed into a specialist for complex production.

Digitalisation

Professionalism is also evident in Berief Food's digitalisation strategy. The 25-person IT department is constantly combing through all processes in order to possibly optimise them further and to create cost-cutting effects. Berief Food is the only company in the German State of North Rhine-Westphalia to carry out a state-subsidised 5G project, which is intended to develop applications for fast mobile communications technology in an industrial environment.

The extent to which Berief Food has developed in the past five years is not only shown by substantial investment; at the end of 2021, the Beckum-based company started sponsoring TV shows for the first time. The marketing department was expanded in order to be able to serve social media as well as print. In addition, the brand was relaunched with a big "B" that reflects the company name, the city of Beckum as a guarantor of regionality and the focus on organic ("bio" in German).

There seem to be few limits to the further growth of Berief Foods. The company is still hardly represented in the organic or natural food trade, and cooperation with franchise chains has not yet been seriously considered.

The Future is Flexitarian

Investing in both dairy and plant protein innovation



Author:
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Only about ten years ago, swapping animal-based food and drink products for plant-based ones was a niche interest – reserved almost exclusively for vegetarians and vegans. Today's picture, however, couldn't be more different. Look at the shelves in your local supermarket, and you're likely to see a range of plant-based alternatives on offer from all kinds of companies. In fact, as brands look to diversify their offerings to include both plant and animal-based protein products, it's estimated that the value of the global plant protein market – which stood at \$29.4 billion in 2020 – could surpass \$162 billion by 2030. That's 7.7% of the entire global protein market.¹

So, what's causing this NPD explosion? It's a response to a trend that's rapidly gained traction in recent years: the flexitarian diet. Global data suggests that a significant 42% of people consider themselves flexitarians. In comparison, only 4% and 6% consider themselves vegan and vegetarians, respectively.² It's this movement, where consumers increase their intake of plant-based products without entirely eliminating animal-based products, that's driving brands to innovate with plant-based ingredients and bring new products to market.

But before you decide to ditch traditional protein sources from your innovation pipeline, take pause. Sources suggest that products like dairy-based protein aren't going anywhere. Investing in, and inno-

vating with, both plant and traditional animal-based proteins is likely to be the key to unlocking long-term relevance and growth for brands. Here's why.

Consumers are flexible, not fixed

Some people believe flexitarianism is a pathway to vegetarianism or veganism, but this isn't necessarily the case.

Let's take research from the UK as an example. One study suggests that most UK consumers actively want to reduce their consumption of animal products, regardless of whether they identify as a meat/dairy eater (26%) or a flexitarian (69%). And 75% of self-defined flexitarians in the UK say it's unlikely they will eventually become vegetarian in the near future, while only 7% consider it likely.³

For today's health-conscious consumers, being a flexitarian is a conscious and deliberate lifestyle choice in itself, rather than a path to a new diet. These consumers want to ensure that they have a full, balanced and healthy diet by enjoying animal-based products alongside plant-based alternatives.

Picking proteins

This is particularly true when we look at the current protein boom. As consumer health-consciousness continues to grow, protein has been in high-demand, being incorporated into our everyday foods. Snacks



Before you decide to ditch traditional protein sources from your innovation pipeline, take pause (photo: FrieslandCampina Ingredients)

are one example where protein is big – over a third of global consumers snack on protein bars and nearly one third regularly opt for ready-to-drink protein drinks for a tasty, filling refreshment.⁴

Historically, this nutritional boost to functional foods has come from dairy-derived proteins – in part due to their formulation benefits and consumer perceptions that dairy-derived protein is tasty, nutritious, and affordable.⁵

However, what we're now seeing is a levelling of the playing field – research suggests that active consumers find plant protein equally as attractive as traditional dairy-derived proteins. In one survey, where consumers were made to choose their preferred source of protein, the differences between the sources were minimal – 57% of active consumers chose plant proteins, while 55% chose whey as their go-to protein source.⁶ These trends suggest that consumers are increasingly happy to obtain protein from a variety of sources, instead of favouring one over the other.

The taste and texture test

Despite all the interest in plant-based proteins, it's not necessarily an easy sell. Flexitarians are discerning, and when you have both animal and plant-based options to choose from, you're going to choose the ones that taste best. A huge 83% of global consumers say that a product's flavour is a key influence in their purchasing habits.⁷

This isn't as big a challenge with more traditional ingredients. While dairy protein innovation has gone from strength to strength, with new and improved formats emerging like clear sports drinks and protein bars, plant protein formulation, by comparison, is still in its infancy. Although the category has made leaps and bounds in recent years, overall formulating with plant proteins remains somewhat of a challenge. This is particularly true when formulating with ingredients like peas, which, while one of the most nutritious sources of plant protein, can sometimes leave consumers with an unappealing aftertaste if formulated into products without the right know-how.



To capture the attention of the growing flexitarian market, and to ensure a regular spot in consumers' shopping baskets in an increasingly crowded market, formulators must innovate with the right ingredients to elevate the plant-based product experience. In-depth understanding of protein formulation and consumer expectations is key – consumers may be happy to get their protein from a range of sources, but not all proteins are created equal.

The future is flexitarian

The growing flexitarian trend is quickly moving away from being simply a trend. It's a movement that's fundamentally shaping how we eat. More and more, consumers see including a mixture of plant and animal-derived proteins as a way of life.

To stay relevant, companies need to provide a range of protein solutions for consumers' changing needs – providing dairy and plant-based proteins side by side. To respond to this growing need, FrieslandCampina Ingredients recently collaborated with AGT Foods to launch Plantaris™ – a new range of plant protein solutions using pulse ingredients, designed to overcome the common formulation challenges associated with plant protein innovation. By delivering dairy and plant proteins side-by-side, the aim is to help companies serve the market better and deliver on consumer expectations, including exceptional taste. The future is flexitarian. And future-focused brands are those investing in innovation of exciting, tasty, and nutritious plant-based and animal-derived protein products to fulfil every need.



Research suggests that active consumers find plant protein equally as attractive as traditional dairy-derived proteins (photo: nico/stock.adobe.com)

- 1 Bloomberg Intelligence, 'Plant-based foods poised for explosive growth', 2021. Available at: <https://www.bloomberg.com/company/press/plant-based-foods-market-to-hit-162-billion-in-next-decade-projects-bloomberg-intelligence/>
- 2 Euromonitor, 'Going Plant-Based: The Rise of Vegan and Vegetarian Food', 2021. Available at: https://go.euromonitor.com/sb-packaged-food-210330-rise-vegan-vegetarian-food.html?utm_source=Pitch&utm_medium=PR&utm_campaign=CT_SB_21_03_30_Rise%20Vegan%20Vegetarian%20Food
- 3 YouGov, 'Is the future of food flexitarian? YouGov analysis of Brits' dietary habits and attitudes to meat consumption', 2019. Available here: <https://yougov.co.uk/topics/resources/articles-reports/2019/03/18/future-food-flexitarian>
- 4 FMCG Gurus, 'Snacking Series: High Protein Snacks are Growing in Popularity', 2021. Available at: <https://fmcggurus.com/blog/fmcg-gurus-high-protein-snacks-are-growing-in-popularity/>
- 5 FMCG Gurus, 'Consumers prefer animal protein over plant protein', 2019. Available at: <https://fmcggurus.com/blog/animal-protein-over-plant-protein/>
- 6 FMCG Gurus, 'Meat, Dairy, or Plant Based Protein Sources', 2020. Available at: <https://fmcggurus.com/blog/fmcg-gurus-meat-dairy-or-plant-based-protein-sources>
- 7 FMCG Gurus, 'Flavor, Color, Texture Survey Series', 2020

YANGYOO

Vegan cheese alternative

Korean company Yangyoo launched the country's first vegan cheese alternative at CES 2022. Yangyoo exhibited its vegan cheese alternative that Armored Fresh, its US subsidiary, has developed, and the company said it is expecting to draw attention from the global market. The company said its Armored Fresh vegan cheese alternative provides flavor and taste comparable to regular cow-milk based cheese by fermenting plant-based protein milk the same way as natural cheese. The Armored Fresh product contains protein, up to 20%, similar to cow milk cheese.

Armored Fresh is available in formats such as sliced, shredded, cube spreadable, camembert,



and burrata in eight flavors; plain, strawberry, blueberry, citron, garlic herb, spicy jalapeno including injeolmi, salted caramel, and chocolate.

In 2022, Yangyoo plans to launch products using vegan cheese on its own brands, Young Man dduk, and Spaceman Pizza.

GOOD PROSPECTS

Pea protein gains more market share

A recently published market report on MarketsAndMarkets offers comprehensive insights and forecasts for the global pea protein market. According to the report, the market is estimated to reach \$844 million in 2021 and is expected to grow at a CAGR of up to 13.5% to reach \$1,588 million by 2026.

Pea protein is one of the most versatile ingredients and can be incorporated into drinks, foods, snacks and even functional foods in various forms. Despite the high prices of pea protein, the market has grown strongly in developed countries with high disposable income and demand.



Pea protein sales are forecast to grow significantly despite its high price (photo: COLOURBOX1467372)

NO MORE VEGAN SURCHARGE

Starbucks' finally turn in

All of Starbucks' 1,020 stores across the UK offer all of plant-based milk options, including oat, almond, coconut, and soy for no extra charge. Starbucks has finally announced that it will drop the upcharge for alternative milks.

Starbucks also has a fifth vegan option. The exclusive Starbucks Original Nut Blend uses a mixture of light rice milk, hazelnuts, and cashews. Developed over the course of 15 months, the nut blend, which is also fortified with B12, B2, Vitamin E, and D2 is a perfect choice in an espresso and will also be on offer at no extra cost.

The decision to ditch vegan milk upcharges came a few weeks after a clever campaign – which went viral – called out Starbucks for its vegan upcharge policy.



Formulating dairy alternative beverages

The locust bean gum supply crisis

More European consumers reassessed their food choices during the pandemic and shifted to plant-based foods and beverages. According to the Smart Protein Project, which was funded by the EU, it's a "fundamental shift" driven by flexitarians who seek to diversify their diet. In the middle of 2021, the Smart Protein Project conducted a study that showed the plant-based product Europeans consume the most is milk alternatives: 28% of all survey respondents and 36% of those who identify as flexitarian stated that they consume plant-based milk alternatives "at least one to three times a week or more." When asked about their future plans, 40% of survey respondents said that they plan on reducing their dairy consumption even more (1). In another

survey, Datassential reports that 67% of U.S. adults tried a plant-based dairy alternative in 2021(2). These are just a couple of examples of changing consumer preferences that have led to huge growth in the global dairy alternatives market and an anticipated CAGR rate of 7% between 2021 - 2025(3).

2022 is being called a "high-stakes brand battleground" for plant-based products. There is tremendous potential to win over even more consumers. Those who succeed in this next phase of innovation will drive improvements in taste, texture and nutrition profile to turn the curious flexitarians into loyal repeat purchasers. What motivates consumers to try plant-based protein is perceived health benefits. Taste is

A new gellan gum grade, KELCOGEL DFA Gellan Gum, has been developed for replacing or reducing the need for locust bean gum (photo: CP Kelco)



what keeps them coming back for more. Consumers do not want to compromise. They want the benefits of plant-based protein as well as the creamy taste and silky mouthfeel of dairy. Because of the health halo surrounding plant-based products, a long list of unpronounceable ingredients on the label may be a turn off. Globally, consumers prefer fewer ingredients on packaging.

The challenges

This expanded market presents a great opportunity for manufacturers who can conquer the formulation challenges of working with plant protein. We know that the molecular structure and functionality of plant proteins are very different from dairy protein. Additionally, most dairy alternative beverages are fortified with extra protein, calcium and vitamins, which require help to ensure the micronutrients stay evenly suspended. Formulators require help with the suspension of insoluble particles and to control syneresis, as well as to protect and stabilize the protein over shelf life.

Manufacturers have long turned to locust bean gum (LBG), a clean label friendly thickener, to add texture and create the right mouthfeel in dairy alternative beverages. They combine it with gellan gum, a multifunctional, nature-based ingredient for suspension. However, demand for LBG, shortages and supply chain issues have sent prices soaring. There is simply not enough volume available, and it takes up to 10 years for new carob trees to start producing pods. So, what is a product developer to do?

The LBG alternatives

The good news is that a new gellan gum grade, KELCOGEL DFA Gellan Gum, has been developed that is a dual-function solution for replacing or reducing the need for LBG. With one ingredient, both suspension and texture can be addressed. It delivers the functionality of both LBG and standard gellan gum combined, so you can remove LBG completely from your formulation or reduce the use level of LBG. This new solution can help product developers solve many dairy alternative formulation challenges:

- » It uniformly suspends ingredients in a fluid gel structure.
- » It provides a desirable viscosity – very similar to that of standard gellan gum and LBG together – and a creamy dairy-like texture consumers love.
- » It helps eliminate sedimentation of ingredients on the bottom of the container.



2022 is being called a “high-stakes brand battleground” for plant-based products (photo: CP Kelco)

- » It simplifies the manufacturing process and the product label as one nature-based ingredient does the work of two.
- » It is sustainably produced, made from fermentation in a controlled environment that is focused on lowering waste, saving water and minimizing carbon footprint, unlike viscosity modifiers that come from crops. .
- » KELCOGEL Gellan Gum is already a proven ingredient for solving beverage formulation challenges.

In addition, standard gellan gum can be paired with other viscosity modifiers such as carrageenan, xanthan gum or NUTRAVA Citrus Fiber to tailor body and mouthfeel. CP Kelco can help product developers find their best option. Plant-based innovation begins with nature-based ingredients that can help your brand succeed in a competitive market when winning over flexitarians is important.

-
- 1 Nov. 2021, *What consumers want: a survey on European consumer attitudes towards plant-based foods with a focus on flexitarians.* https://smartproteinproject.eu/wp-content/uploads/FINAL_Pan-EU-consumer-survey_Overall-Report-.pdf
 - 2 Jan. 13, 2022, *Adweek.com, As 71% of Americans Dabble in Plant-Based, 2022 will be a high-stakes brand battle* <https://www.adweek.com/commerce/as-71-of-americans-dabble-in-plant-based-2022-will-be-a-high-stakes-brand-battleground/>
 - 3 *GlobalData Sector Report: Dairy & Soy Food > Grain, Nut, Rice, Seed Milk Alternatives and Soymilk & Soy Drinks, Nov. 2021.*

Plant-based revolution

Palsgaard's survey shows options for quality improvement

A recent survey by emulsifier/stabiliser specialist Palsgaard shows that plant-based diets are firmly in the mainstream, and consumers are keen to explore the full range of what manufacturers have to offer. Standards are currently high but there is still room for improvement and brands that best tackle concerns will gain the edge in a competitive market.

The plant-based revolution

Many sectors within the plant-based market are seeing high levels of growth. For example, the dairy-alternative milk market now accounts for 15% of the total European milk market, according to the Vegan Society. It is predicted this market will grow at a CAGR of 13.8% between 2020 and 2025, to a total of \$694.9 million.¹



Similarly, the global dairy-free ice cream market was valued at \$520 million in 2019 and is anticipated to reach \$805.3 million by 2027.²

The most common problems facing manufacturers of plant-based products are similar to those encountered with their dairy-based counterparts, a sector Palsgaard has worked with for 100 years across many global markets.

However, the sheer number of different proteins and raw materials that can be used in plant-based recipes also throws up some unique challenges, so in many cases a bespoke solution is required.

Plant-based hits the mainstream

While COVID may have encouraged many consumers to think carefully about their diets, plant-based eating was hitting the mainstream long before its arrival. For example, research in January 2020 showed that UK consumers were increasingly choosing to eat more meat-free dinners, with 29% of evening meals believed to be vegetarian.³

There are clear signs that producers are being more creative with their plant-based recipes, for example by selecting from a wider pool of raw materials and using them across a raft of applications. For example, fava beans, often found in meat alternative products, are now successfully being used as a base for dairy-free ice cream. It all goes to show that this market is still in its infancy, with huge opportunities for innovation ahead.

Younger consumers are plant-based heroes

One key point to note from Palsgaard’s research is that purchase behaviour varies between age groups.

Sustainability is high on the agenda for younger consumers but features much further down the list for those aged over 55. Younger shoppers were also far more likely to identify as flexitarian: 40.6% of those aged 18–24 follow this diet, compared with just 32.9% of those aged over 65.



Since the onset of COVID-19, nearly half (**47.7%**) of younger consumers (**aged 18-24**) increased the number of plant-based products they buy



For those **aged 55-64** only one third (**34.8%**) bought more



There are more vegans in the **younger age groups**:

6.9% of 18–24-year-olds*

0.9% of 55–64-year-olds*

*Source: Palsgaard survey of 1,307 consumers in Mexico, France, Russia, USA, and Vietnam, September, 2021



The good news

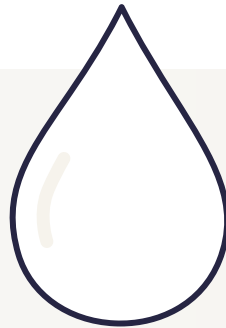
The most positive message from the survey is that overall, consumers are relatively happy with the plant-based products they currently buy.

When asked why they bought into the plant-based sector, 51.3% of respondents said it was primarily because they liked the taste of the products they purchase. We delved a little deeper here and asked what they thought about the taste of the current plant-based milk alternatives on the market and 89.9% said they were either happy or very happy with them. There was a similar percentage for plant-based yoghurts (89.6%), rising to 91.7% when we asked about plant-based frozen desserts.

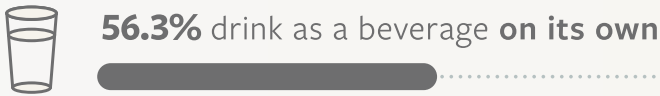
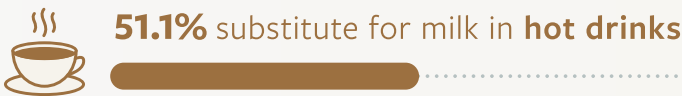
The other piece of good news is that the market is exciting, with consumers using these products in multiple ways. As an example, 51.1% said they used plant-based 'milks' as a substitute for milk in hot drinks, while 56.3% consumed it as a beverage on its own and 56.7% had it with cereal. It is also used in baking (38.5%) while 43% were happy to use it in cooking.

This shows that clearly the existing range of products is versatile, and consumers want to incorporate them into different areas of their diets.

But there is room for improvement.



Consumers buy **plant-based 'milks'** for many different reasons:



Nearly three-quarters (**70%**) of consumers have noticed sedimentation in dairy-free milk

34% chose “avoiding sedimentation” in their top three when asked how to improve plant-based beverages

Savvy about sedimentation

Creating a beverage, yoghurt or ice cream without using dairy can be a complex process. The wide range of protein sources and raw materials available, and differences in manufacturing processes, mean texture and creaminess can vary dramatically.

Connected to this is the issue of sedimentation, an issue high on the consumer radar (70%). When asked, consumers how they think plant-based beverages could be improved, “reducing the amount of sedimentation” was highlighted as their top priority.

This visible separation of liquids and particles within the beverage can be off-putting for consumers, especially those buying into the market for the first time. It can also influence the taste and mouthfeel of a product.

Spotlight on shelf-life

A total of 5.5% of consumers were not happy with the amount of time plant-based milks could be used after opening. If we consider that 51.1% like to consume these products as a substitute for milk in their teas and coffees (and therefore will only be using a small amount at a time), this is clearly an area where manufacturers should be looking to make improvements.



1 Nielsen MarketTrack, Sept/Oct 2018 to 2020
 2 Allied Market Research, June 2020
 3 Kantar, year to January 2020

Texture and creaminess

When asked to choose the top three ‘areas for improvement’, texture was chosen by 32% and creaminess by 29% of respondents.

A useful contrast can be drawn with attitudes to taste. If we take plant-based frozen desserts for example, 91.7% of survey respondents said they are happy or ‘very happy’ with the taste of existing products on the market. When asked what they thought about the creaminess or texture of these ice-cream alternatives, however, the figures dropped a little, to 82.5% and 88.8% respectively, indicating there is room for improvement here.

Zoning in on those who said they were unhappy, the area where this is most noticeable is creaminess. If we look first at plant-based yoghurts, 2% said they were not happy with the creaminess of plant-based yoghurts, compared with just 1.1% who were unhappy with the taste.

Perfecting dairy-free yoghurts

The survey also indicated water separation within plant-based yoghurts as a point of concern. More than seven in ten respondents (71.8%) said they had noticed water on the surface of their plant-based yoghurt products.

This is another area where Palsgaard has expertise. Clean-label stabiliser blends can help to minimize this effect, thereby improving the visual quality – and the mouthfeel – of the plant-based yoghurt once opened.

A range of solutions for plant-based

The plant-based market is thriving, but it is still relatively new and therefore manufacturers are continuously learning about the challenges raw materials can present when creating alternatives to dairy.

Palsgaard can help with these challenges and assist manufacturers in developing products tailored for their particular markets.

Palsgaard has six global Application Centres, and several start-up tried-and-tested recipes can be shared.

The full report is available for download via www.palsgaard.com/plant-based-potential



4Choice by Sacco

Innovation in the plant-based world by fermentation expertise

It is undeniable the growth of plant-based foods in the world, which is linked to different drivers, such as sustainability, life-style choices or dietary restrictions. Independently from the drivers, consumption of plant-based food is highly recommended, both for health and environmental concerns. However, at present, food manufacturers are facing many challenges to design optimal plant-based foods due to different sensorial and functional properties of the plant-based ingredients when compared to the animal-derived ones. Fermentation is a technique that has been used for centuries to improve the shelf-life of food, but also for food processing, hence changing the structure and functionality, as well as the flavors. The most common example is the fermentation of the milk to produce yoghurt, the textural properties of the milk change by coagulation of the caseins micelles, and eventually by exopolysaccharides (EPS) producing lactic acid bacteria (LAB) which contribute to improve the textural properties, many aromatic components are also produced, as well as acids which will increase the shelf-life. Fermentation of plant-based matrix is challenging due to the different nutrients, not only lactose, available for the lactic acid bacteria, when compared to milk.

A dedicated screening of different unexplored microorganisms can lead to identify the most suitable bacteria not only able to ferment plant-based matrices, but also to improve textural and sensorial properties. Optimal microstructure, hence textural properties, could be created by identify the optimal EPS structure which could strength the binding between the plant-proteins, hence create a stable and stiff gel network, which in turn will result in reducing or even eliminating the texturizing hydrocolloids used to formulate dairy-alternative products. Moreover, the complexity of the aroma compounds and their perception should be carefully studied to achieve a balance aroma profile, with distinct flavor notes, such as creamy or botanic. Sacco has been working on those topics for almost 10 years, and it is enriching its knowledge by continuing



photo: baibaz/stock.adobe.com

and starting new collaborations with National and International leading Universities, as well as with ingredients producers, and customers.

We are aiming to achieve starter culture solutions which will be satisfy all the consumer's needs, in terms of texture and flavors, by keeping the nutritional benefits of consuming fermented products. We believe that the world of plant-based food is in continues evolution, and we want to bring the scientific knowledge generated in this field into the life of the consumers. We will do this by continuing our research and innovation in this field, and by listening to the desired of our customers.

SACCO 4CHOICE hypoallergenic cultures are designed to ensure a uniform and controlled production of plant-based cultured products.

SACCO 4CHOICE cultures are designed to support product developers, with clean label ingredient capable of improve flavor profiles with a low post-acidification during shelf life, and mouthfeel perception, allowing the use of fewer stabilizers cost-effectively.

SACCO 4CHOICE cultures is the first CHOICE among plant-based product developers aiming to bring innovation in their products. saccosystem.com

Discover a **NEW** world of texture and flavour
for your plant-based fermented products



4CHOICE cultures are designed to support product developers, with clean label ingredient capable of improve flavour profiles with a low post-acidification during shelf life, and mouthfeel perception, allowing the use of fewer stabilizers cost-effectively.



Plant-based dairy alternatives

Sisterna sucrose esters

**Author: Lia Bax, Product & Technical Sales Support
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Sisterna sucrose esters are emulsifiers with unique and powerful functionalities. Not only are they very effective oil-in-water emulsifiers, they also interact with proteins, which protects proteins from coagulation. These are just a few of the numerous benefits of using Sisterna sucrose esters.

In the area of dairy alternatives there are three different products that we can focus on for sucrose esters; milk alternatives, vegan ice and cream sauce.

Emulsification/aeration

Dairy milk contains a high level of proteins (roughly 3%), which are natural emulsifiers in milk and dairy products. Plant-based alternatives, with the exception of soy, generally contain far less protein. Sisterna sucrose esters are very powerful oil-in-water emulsifiers, that can help to keep milk alternatives stable for a long time. Sucrose esters strongly decrease the surface tension between oil and water, and therefore it is easy to reach very small oil droplets during homogenisation. Also, with sucrose esters it becomes easy to incorporate air. A side effect of the large number of small oil droplets and/or air bubbles is their effect on colour; the products appear whiter.

Suspension of particles

Besides emulsifying oil and fat, sucrose esters also seem to be able to "emulsify" fatty particles. Sucrose esters have the ability to keep the particles of cocoa and almonds longer in suspension, and slow down their sedimentation in a drink. We do not see this effect in oat drink. Probably the fat content of a particle plays a role.



Protection of proteins

There is a third benefit to use sucrose esters in dairy alternatives. Sisterna sucrose esters are known for their interaction with various sources of protein. This interaction makes proteins less sensitive to coagulation due to acid, heat, shear or destabilising components like alcohol.

Just like caseinate, proteins of most milk alternatives have an iso-electric point – the pH at which the proteins have the same charge, making it possible to move towards each other, and coagulate.

A suspension of soy protein in water was heated (60°C): the reference without any addition, and the variant with 0.2% Sisterna SP70. After cooling, acid was added to give several acidity levels. Fig. 1 shows the effect of sucrose esters SP70.

Milk alternatives

Milk alternatives have become increasingly popular in recent years. They may be based on soy, rice, coconut and several types of nuts, seeds and grains.

Most plant material (e.g. nuts and seeds) that is ground to make milk alternatives contain oil. In other cases, oil is added (e.g. for rice and grain milk). Emulsification is important in liquid products, because there is no help from the texture to prevent oil droplets from creaming and coalescing on the surface. In liquid products, the use of a powerful oil-in-water emulsifier like sucrose ester is crucial to ensure a stable emulsion for the whole shelf life. This is particularly so because most milk alternatives have a long shelf life at ambient temperatures. The emulsifying power of sucrose esters also works on fatty particles like cocoa and nut-particles. They remain longer in suspension with sucrose esters.

Although the protein level of milk alternatives is generally low (0.2 – 1.0% (soy milk 3 – 4%)), flocculation can deteriorate the appearance of the drink. Sucrose esters are able to keep the proteins well in solution.

Milk alternatives have a mild taste. Sisterna sucrose esters are very neutral in taste and odour, and therefore they are an excellent choice for almost all

food stuffs. Your plant based drink will keep its original natural taste.

Vegan ice

Sucrose esters have multiple functionalities in vegan ice (cream). Sucrose esters facilitate the emulsification of the fat in the mix. It is possible to shorten the ageing time, which makes the production more flexible. Sucrose esters ensure quick and high overrun. The vegan ice that is prepared with sucrose esters has good firmness, is nicely scoopable and has clean eating properties.

Cooking cream sauce

In cooking cream sauce it is possible to replace the dairy components in the recipe with sucrose esters. Sucrose esters are able to emulsify the fat, and keep the sauce very stable and smooth. By using sucrose esters as emulsifier, it is possible to remove most (or all) proteins from the recipe. That means that the Maillard reaction (browning) can be prevented from taking place. With sucrose esters it is possible to create a stable, smooth and white sauce, that can withstand harsh treatments like sterilisation and oven heating.

Suspensions of 6% soy flour in water



pH 7.5 (original)

pH 6

pH 5

pH 4.5

pH 4

pH 3.5



Suspensions of 6% soy flour in water with 0.2% Sisterna SP70

The picture below shows the effect of sucrose esters SP70.



New Food Trends, New Opportunities

Stephan processing solutions for vegan analog cheese



Author:
*Dirk Hennig Schönfelder, Food Technologist
at Stephan Machinery/ProXES GmbH*

As part of a healthy, sustainable lifestyle, the consumption of vegan cheese substitutes is becoming increasingly important. Motivated by social trends, climate protection and health reasons, vegan cheese alternatives are in demand more than ever. In a dynamic market, ProXES with its Stephan processing solutions provides you with the knowledge and machinery to benefit from the latest food trends in the production of vegan analog cheese products.

As Versatile as Analog Cheese Itself: Vegan Raw Materials

A wide range of raw materials exists to produce vegan cheese analogs, which differ in type and purpose: For example, a high starch content or other thickeners of up to 30% w/w build texture that mimics ordinary cheese - fresh or processed. Milk fat is replaced by coconut fat, palm fat and increasingly by other vegetable oils to give the analog cheese the same organoleptic and melting properties as a classic milk fat-based cheese. The aromas that would otherwise develop, for

example, a result of fermentation and ripening, are compensated by the addition of appropriate flavorings. Colorants are used to give the vegan cheese an appealing appearance. In addition, it can be assumed that more and more vegetable proteins will be used in the future to more closely match the nutritional profile of classic cheese. This will bring new challenges, whether sensory or process-related.

Important Aspects in the Manufacturing Process

Currently, such analogs are primarily produced in batch processes. The manufacturing processes must take the following aspects into account: First, the raw materials mentioned must be homogeneously combined. In addition, fat and water must form a stable emulsion. The effect of heat melts the fat, which can only then be emulsified. Furthermore, starches and other hydrocolloids are activated and thus lead to an increase in viscosity, to achieve the desired texture of the product. At the same time, of course, the product is pasteurized and thus preserved.



The Stephan Principle

According to the Stephan principle of our Universal Machine (UM), the process takes place in only one vessel. After water dosing, powder components, fats and oils can be dosed directly into the bowl. Mechanical energy is introduced into the product by the frequency-controlled main motor, which is directly connected via the motor shaft to the working tool, which is adapted to the process. The ingredients are dispersed and emulsified at ranges of 300 - 3,600 rpm (depending on the recipe) with different tools according to the requirements. Due to the special geometry of the working tools, the agitator, the vessel, as well as the slight tilting of the vessel, products will be ideally mixed in the so-called "cross-mixing" process and circulates in the vessel. Direct steam can be injected into the turbulent mixing, which aids in development and pasteurizes the ingredients. Highly viscous products, such as the vegan cheese substitutes mentioned above, can be heated gently and economically without off-flavor or color change. If required, heating can also be carried out indirectly via the jacket of the vessel. The entire process is carried out under vacuum, which has a positive effect on gloss and structure and at the same time avoids unwanted bubbles in the product.

Schematic illustration of the mixing effect in the tank of the Stephan Universal Machine



High Viscosity as a Challenge: No Problem for the Stephan Universal Machine

After development of the starch, the cheese substitutes exhibit high to very high viscosity over the entire temperature range, which must be handled. This is because, depending on the recipe, the product is no longer free-flowing. These high viscosities pose challenges for discharge, which can be easily mastered with the tiltable process vessel of the Stephan universal machine. The Universal Machine is available in sizes from 5 to 200 liters. With our 5 L and 24 L models, product and process development can be easily mapped. Scaling up to production plants with batch sizes of up to 170 liters is conceivably simple and the next logical step.

Stephan Universal Machine UM 200

Large Batches? Stephan Combicut!

The Stephan Combicut works on a similar principle and can produce batches of 280 - 580 liters. Feeding as well as emptying takes place via so-called slides at the top and bottom. The vessel remains in its fixed position. Grease/fat, powders, and other raw materials can be loaded directly into the mixing vessel via the in-let slide or flow-able fats, water, and powder components can be dosed directly into the vessel via dosing ports. Discharging of the final recipe happens via the bottom slide and is assisted by the mixing baffle. The entire batch is discharged without a pump, while the vessel remains in position. This enables the processing of highly viscous products (resembling a dough), such as vegan cheese analogs that will eventually be made into shreds, sliced products, and other type products.



Stephan Combicut TC 600



Stephan Vacutherm VMC 801/150 (left) and Stephan Combitherm CT 800 (right)

Low Viscosity? There's Also a Solution

Lower viscosities, such as those found in fresh vegetable cheese, can be processed by the Stephan Vacutherm and the Stephan Combitherm. In the Vacutherm, a rotor-stator system is responsible for dispersing and emulsifying the raw materials. In the Combitherm, which operates according to the principle of the Stephan Universal Machine, a fast-acting functional tool is used. In these machines, discharge takes place by means of a product pump. Batch sizes of up to 1,200 l

can be produced with these systems. In addition, CIP cleaning systems are integrated in the machines to guarantee easy and thorough cleaning.

The above-mentioned process solutions presented have been in use worldwide for years. The production of processed cheese and the production of plant-based analogs does not pose any new challenge for our Stephan equipment.

SILK

Three varieties of almond drink

Dairy-free brand Silk has introduced Silk Extra Creamy Almondmilk. Blended with three different varieties of almonds, Silk says the product offers a much smoother texture and mouthfeel than regular almond milk. According to the company, 73% of consumers curious about plant-based foods start with buying almond milk. The Extra Creamy product is a rich source of calcium and vitamin E, has zero cholesterol, and contains 50% more calcium than reduced-fat dairy milk.

Silk has launched an extra creamy almond drink made from three types of almond (photo: Silk)



Stephan – A ProXES Premium Brand

With three leading brands FrymaKoruma, Stephan and Terlet under one roof, ProXES combines long-standing expertise with a challenging mindset. As an agile partner, we support our customers from first product concepts to industrialisation and empowering them to bring their ideas to life. Together we set trends: Through sustainable and innovative solutions, we drive our customers success for today and help them shape markets for tomorrow.

From Inspiration to Feasibility

Our process technology and training centre is a place to try out new ideas, and help our customers think outside the box. Here you can develop or improve formulas in a professionally equipped laboratory, test any kind of machine, perform scale-ups, and produce test batches. You will receive expert advice and support on all our capabilities of our processing equipment as well as any modifications that would be needed to fit to your processing needs. Visit www.proxes.com for more information



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The GEA ABF 2.0 is GEA's next-generation FDA-certified H₂O₂-based preform sterilization technology. Offering the highest levels of safety and efficiency, as well as increased productivity and cost savings, the ABF 2.0 dry sterilization process is constantly monitored and controlled to deliver a premium end product.



The plant-based category is skyrocketing

Here's how to stand out

The popularity of plant-based alternatives is skyrocketing, and the global plant-based beverage market is estimated to be worth US\$ 22.8 billion in 2027, according to Vision Research Reports. But as the category balloons, the competition is stiffening. Choosing the right packaging has proved to be an essential part of the formula for success with plant-based products.

The global plant-based beverages market size was valued at US\$ 12.5 billion in 2020 and is anticipated to grow at a CAGR of 8.0% during forecast period 2021 to 2027, according to Vision Research Reports.

So there is no denying that the demand for other plant-based products is rising sharply. Soy and almond are the most popular raw materials, but the demand for beverages based on oat, rice, coconut, cashew, and hazelnut is also increasing quickly.

Without any additives, Wholly Moly! products retain their original nutrition and sweetness.

We dare to use the original taste of healthy cereals



(photo: Ecolean)

The unique possibilities of the plant-based category are attracting both traditional dairy companies and new plant-based manufacturers, and new products are launched at a breathtaking tempo. As the competition hardens, it gets tougher to build a brand and get picked from the shelves.

Make a plant-based drink stand out

If you use the same type of packaging as the competition, there's a big risk that your drink doesn't get the attention it deserves. Ecolan's lightweight packages are based on the same ideas as the plant-based revolution: meeting new customer demands and lowering the environmental impact. In addition, they are convenient and have an eye-catching design. All this makes them exceptionally well suited to help make your plant-based drink a success.

Progressive companies within the beverage, dairy and liquid food industry turn to Ecolan's lighter packages when looking to stand out. The unique shape with a distinctive air-filled handle and large printing surface intuitively appeals to the eyes of the consumer on the store shelf, but also in the way the packages offer added convenience and less environmental impact.

It is easy to see that many players in the plant-based industry choose conventional packaging formats when launching their products, giving the store shelves a quite plain look. The match between Ecolan's lightweight packaging solutions and plant-based liquid food products exceeds the differentiation aspect – both offering significant reductions in environmental impact as well as appeal to modern, health and sustainability conscious consumers through their offerings.

Sustainability and health conscious Chinese consumers can now look to US-owned brand Wholly Moly! to enjoy dairy-free drinks with an oat base, in Ecolan's lightweight flexible packages.

Wholly Moly! chose Ecolan's packages when looking to differentiate in the highly competitive, yet fast-growing plant-based beverage category.

Headquartered in Silicon Valley, California, US and Shanghai, China, Wholly Moly! is a leading brand in whole-grain and oat products tailoring to a new generation of Chinese consumers. Wholly Moly!'s oat drinks are set to innovate not only their product category by offering an oat product without any additives, but also through the packaging they have chosen to



Ecolan lightweight packaging solutions address both consumer convenience and environmental awareness

launch their drinks in. Ecolan's lightweight packaging solutions address both consumer convenience and environmental awareness. A minimal amount of packaging material means less resources used throughout the package's life cycle – for example less energy and water in production, and lighter packaging during transport. The result – a liquid food package with less impact on the environment, offering a lighter footprint for both customers and consumers.

"Without any additives, Wholly Moly! products retain their original nutrition and sweetness. We dare to use the original taste of healthy cereals. The oats grow in the fresh soil and sunlight of the Midwest of the United States and southern part of Canada, and are packaged under strict North American standards, bringing high-quality oat products to health and sustainability conscious consumers in China," says Claire Fang, CEO at Wholly Moly!.

"We welcome the launch of Wholly Moly! oat drinks in Ecolan packages, as a great fit for our approach to sustainability and being a responsible business in the packaging industry," says Johnny Sajland, Chief Commercial Officer at Ecolan. "As a global packaging producer offering lightweight packaging solutions for both chilled and ambient distribution, Ecolan is active on more than 30 markets worldwide and partners with many of the most well-known brands within the dairy, beverage and liquid food industry."

Wholly Moly! is a subsidiary of Yum Delight, headquartered in California, US. The products are available in the Greater China region and the US, through both direct-to-consumer e-retail and supermarkets and has been available in Ecolan packaging since 2020.

Yoghurt vs. plant-based yoghurt alternatives

The technology point-of-view



*Author: Katarina Ternstrom,
Sub Category Manager Dairy
Chilled at Tetra Pak*

Yoghurt is an incredibly versatile product, from taste and type to when and how people consume it. Regardless of the specific consumption habits, enjoying milk that has been fermented with bacterial culture is a booming phenomenon. Consumers are recognising the major impact our digestive system has on our overall health and yoghurt is one of the best sources of friendly bacteria. Eating more fermented foods is seen as a way to improve health and wellbeing. Yoghurt is easy to include in your diet because of its appealing taste and the many varieties that make sure there is one yoghurt product for every preference.

The global yoghurt market is forecasted to grow by \$26.08 billion between 2019 and 2023, at an average rate of 5.36% per year, according to British market research firm Technavio. Trends shaping today's yoghurt market are; growing interest in gut health and cultured products; healthier diet; clean label products; plant-based yoghurt-style products; indulgence and experience.



(photo: Tetra Pak)

The interest in health benefits is the reason behind the boom in "concentrated" products like Greek yoghurt and quark. These have a thicker consistency than standard yoghurt and are often rich in protein. Indeed, protein-enriched fermented dairy products are one of the fastest-growing areas in the yoghurt category.

Yoghurt lines also need to be increasingly versatile. Local varieties increasingly attract global appeal. As they do so, yoghurt lines need to offer greater flexibility to support the production of multiple varieties and support trends such as the shift from traditional fruit-based products to more vegetable tastes and spices.

The taste, texture and stability of yoghurt are very sensitive to certain processing steps, so it is crucial to understand exactly what the producers' needs are, both present and future, in order to design the right solution line. One yoghurt processing challenge is cost-effective production, this is obtained through a customised line which allows the producer to make the most of its raw material and optimise energy consumption.

Yoghurt production is energy-intensive because it involves a lot of heating and cooling. However there are ways to minimise this, Tetra Pak helped dairy group Cremo in Switzerland towards their sustainability goal with effective processing equipment such as a pasteurizer that reduces product losses and saves energy, a separator with minimum energy consumption and a plate heat exchanger for efficient heat treatment. "We wanted a single supplier for our processing equipment and automation [and] appreciate Tetra Pak's expertise in the yoghurt sector" says Frédéric Métrailler, CEO of Cremo.

Flexibility and cost efficiency are key factors for success, and this was certainly true for small Swiss dairy Puracenter's production site, as the volumes vary greatly during the year. Carlo Wasescha, Dairy Division Manager at Puracenter explains: "When you set up a new production plant, Tetra Pak's longstanding and international experience covers quite a lot – and we get it from one source".

Meanwhile, when Molkerei Davos planned to build a new dairy, Tetra Pak's experience was appreciated.




Protein fractionation is our strength

Plant Proteins – a growing trend

In addition to milk and whey as raw materials, more and more products from plant-based alternatives are on the focus, such as from potatoes, peas, soy beans or oats, and products from fermentation processes as well. We provide our experience and know-how from membrane filtration for the creation of vegan protein sources for the food industry.


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"The efficient homogenization and the high-precision inline standardization are very good and Tetra Pak's engineers gave us important input on how to optimize product quality", says Andrin Zenklusen, Production Manager at the Davos dairy.

Interest in alternatives to dairy products is increasing among consumers around the world. Plant-based products are often associated with health benefits, but also, plant-based foods are often positioned as climate-friendly choices. There is a wealth of plant-based ingredients on offer, from the more traditional soya, to oats, coconut and even peas.

Plant-based yoghurt alternatives

While the production of yoghurt in its traditional form is already well-mastered within the industry, the new phenomenon of plant-based yoghurt-style products is striving to achieve the same degree of standardisation and efficiency.

There are three major technology and production challenges to address here. Namely, optimising viscosity and other characteristics with the right ingredients and processing set-up; optimising heat treatment to ensure food safety and quality; and optimising fermentation parameters, including the culture addition.

Since the plant-based yoghurt-style production area is still new, combining food application knowledge with recipe and process expertise is the best way forward.

Take oat as an example ingredient. Oats are available in a variety of forms. For example, some might have an extra-high fat level or an extra-high beta-glucan level. As a result, the oat base can be tricky to handle. Based on the experience gained in our laboratories and in customer installations is that the processing design and parameters for the oat base must consider the raw materials (kernels, ground flour, or ready-made compositions); the need to enzymatically control how starch and proteins behave during processing; and using specialised equipment for high shear mixing, fibre separation and deaeration.

When the protein content is not high enough to ensure that fermentation alone will achieve the desired consistency of the plant-based products, other ingredients must be added to the base ingredient.

The heat treatment is strongly determined by the recipe, especially the type of starch and any other thickeners and stabilizers. It is important to design the heat treatment to fit the thickening system, but never go below what is acceptable from a food safety point of view.



When making plant-based yoghurt alternatives, there are challenges regarding optimising viscosity, heat treatment and fermentation (photo: Tetra Pak)

There are plant-based products with live bacteria, and others where the bacteria have been inactivated in a heating step after fermentation. The benefit of inactivating the culture is a more stable product with a longer shelf life. A third option is to inactivate the culture but add probiotic bacteria before filling, although these products are commonly sold as chilled.

The development of plant-based yoghurt-style products is still in its infancy, but the rate of innovation is skyrocketing. There is a whole world of opportunities opening up for producers with the right mindset and competence – and who are open to partnering with an expert in plant-based products who can help them avoid making costly mistakes.

Our technologists and engineers work closely with research institutes, starter culture developers and ingredient suppliers to support producers on the front lines of yoghurt innovation. And with deep knowledge of the essence of yoghurt, we develop processing solutions that give yoghurt products the best taste, mouthfeel, texture, stability and appearance every time – without compromising on production economy or flexibility.

Wild & Furrow

New family-run fresh oat drink business

With UK farmers facing significant cuts to their subsidies (a 50% cut to the Basic Payment Scheme by 2024 for most), one Leicestershire family farm has devised a creative solution. Three siblings – Miles, Angus and Hannah have started a family run oat drink business on their farm near Market Harborough. Wild & Furrow produces a premium fresh barista oat drink in a glass bottle, made from a

blend of British oats. The brand focusses on sustainability by reducing food miles and working with local partners to use a bottle returns scheme.

"Last year I left my job and moved back to the farm. I realised that we needed to diversify the farm business to remain profitable in light of the approaching cuts, we took action to find out how we could produce a product that would add value to our own produce", explains Miles.

"When Miles came to me with this concept, we quickly realised that this was a real opportunity with so few truly British oat drink producers out there. We hope that this is going to be a real game-changer. Not just for our family farm, but for British farming as a whole and we are very excited about the future prospect for oat drinks", says Angus.

Pratik Master from Wigston Deli (Leicestershire delicatessen focusing on sourcing products from the best local producers in the area) said: "Their ingenuity has created new opportunities for the local business community. We welcome any product that gives greater choice to our customers. They love a product that focusses on provenance and sustainability. The customer feedback on this new oat drink has been amazing!"

The new Wild & Furrow products come in glass bottles and are available in local stores. (photo: Wild & Furrow)



Machinability is the key

FAM comments on (plant-based) cheese alternatives

Plant-based cheese alternatives are sometimes difficult to make and sometimes even more difficult to process, according to Dr. Ali Sedaghat Doost, Food Process Engineer at FAM. FAM as a major manufacturer of cheese cutting technology is dedicating more emphasis on processing of these products as they are getting ever more popular with consumers which in turn is boosting production volumes.

The interest for plant-based cheese products as alternative to natural cheese products is increasing, with the global market for such products growing at a compound annual growth rate of 7.6% from 2016 to 2024, and is expected to reach a value of almost \$4 billion by 2024. It has been also reported that there would be a growth in plant-based cheese analogue sales of around 42% from 2019 to 2020 of which \$270 million being sold in the USA in 2020.

"Cheese is generally classified into three main groups based on its main ingredients: natural, processed, and imitation or substitute cheeses.", explains Dr. Sedaghat Doost.

"The main ingredient of a natural cheese is milk while a processed cheese may contain the mixture of milk- and non-milk-based ingredients. And here in the plant-based cheeses, the main difference is the complete absence of casein".

It is easy to define what generally is understood in being a cheese analogue. Such cheese substitutes or imitations generally are products which are intended to partly or wholly substitute or imitate cheese and in which milk fat, milk protein or both are partially or wholly replaced by non-milk-based alternatives, principally of vegetable origin. And therefore, this kind of products may not be referred to as cheese (see Codex Alimentarius).

But cheese analogues, just like traditional cheese, are emulsions of oil and water, wherein proteins or other plant-based ingredients function as emulsifiers and provide structure throughout a gel matrix similar to natural cheese. However, the production of cheese substitutes follows a different regime, due to the different nature of plant-origin materials.



(photo: FAM)



Dr. Ali Sedaghat Doost, Food Process Engineer at FAM: When designing cheese analogues, manufacturers must not only look at appearance, utilization properties (e.g. meltability), and taste but also on textural behavior mainly machineability characteristics

Look beyond texture and taste

When manufacturing, or even before when designing cheese analogues, manufacturers must not only look at appearance, utilization properties (e.g. meltability), and taste but also on textural behavior mainly machineability characteristics. There are different challenges that need to be considered when a plant-based cheese is desired as compared to conventional natural cheeses, such as similar physicochemical and sensorial attributes. As there is no casein network in plant-based cheeses and they are rather a colloidal system, their machineability characteristics are often unknown and difficult to predict until one has a final product at hand.

Machineability and in particular shreddability and diceability of a cheese play a key role for some specific applications such as pizza and toppings by facilitating its utilization and accelerating melting behaviours. The shreddability and diceability of cheese are influenced by a set of material characteristics and is mainly controlled by a fine balance of its viscoelastic behaviour.

Soft cheeses, which have relatively high moisture contents, low storage moduli, and high surface energies, exhibit strong blade adhesion during cutting, which decreases their shreddability and diceability. Therefore, it is the utmost importance that a vegan cheese can be processed after production, meaning that it has the required characteristics for size reduction processing step. The R&D applications department of FAM is closely working with research centres as well as manufacturers to better understand the textural behaviour of plant-based cheeses and to provide input on their formulated cheeses whether they can be further processed.

In easy terms

Generally spoken, cheese analogues that have to be shredded, grated or sliced should not have smearing or crumbling characteristics if they are to pass processing equipment in order to end up as an acceptable



Machine suppliers like FAM can help process cheese analogues by adjusting technology to the product (photo: FAM)

finished product. While such characteristics have to be managed by the manufacturer, the machine supplier can help by adjusting its technology to the cheese analogues. "We can work with a combination of parameters like temperature, speed, special cutting tools, different knife materials and the like", says Dr. Sedaghat Doost. In the end, the FAM cutting machines evolve with the market trends, even if the latter set a series of new challenges. The FAM R&D department is continuing to set up collaborations in order to gain further knowledge in these products for the future.

Winning new target groups

Growth opportunities for plant-based milk alternatives and hybrid products

In the booming market for plant-based alternatives, the milk alternatives segment alone has posted annual growth rates of almost 25 percent since 2015. The new segment of hybrid products now offers additional opportunities.

According to Innova Market Insights, Western Europe is the largest market for dairy alternatives. 58 percent of the plant-based variants launched globally between 2015 and 2020 came to market in Western Europe. North America is in second place with 22 percent. Looking at the different segments, the number of product launches is increasing in all areas - from dairy drinks and yoghurt to ice cream and frozen yoghurt to cheese and desserts. By far the biggest growth is in plant-based alternatives to dairy drinks. Here, Innova Market Insights forecasts annual sales growth of 13.4 percent by the end of 2022.

The main drivers are flexitarians in particular. According to market research, around 40 percent of consumers belong to this target group. The reasons for the reduced consumption of animal products vary. On the one hand, flexitarians like to try out new products, on the other hand they attach importance to healthy nutrition. Other significant aspects are tasty enjoyment and a special brand loyalty. In Germany, new enjoyment experiences and animal welfare are the strongest drivers, followed by taste experience, climate and environmental protection and health.

Taste and texture determine success

"The consumer surveys once again highlight the importance of taste and indulgence for flexitarians," comments Dr Dorotea Pein, Head of Product Management Planteneers." In fact, the results have long since ceased to be a secret. We've known since the launch of the first products that plant-based alternatives only establish themselves successfully in the market if they convince in terms of taste and texture."



Plant-based products should have a creamy or elastic texture and convey a pleasant, familiar mouthfeel (photo: Planteneers)

And precisely these factors are always a challenge when developing new plant-based products. When it comes to taste, it is important to avoid off-key. Depending on the product, the texture should be creamy or elastic and convey a pleasant, familiar mouthfeel. In addition, the product should look appetising and delicious and allow for a simple manufacturing process.

"All these requirements can be implemented very well with hybrid products," says Dr Pein. Hybrid products are a new category in the dairy sector. They consist of animal and plant components and appeal to all those consumers who want to reduce their consumption of animal products for ethical or health reasons, but only want to make minor compromises in terms of taste and consistency. The core target group is therefore consumers who like to experiment and try something new. This primarily includes users of classic dairy products as well as flexitarians who hardly

Dr. Dorothea Pein, Head of Product Management Planteneers:
Plant-based alternatives only establish themselves successfully in the market if they convince in terms of taste and texture (photo: Planteneers)



With the help of special stabilisation systems, dairies can easily reduce the animal content in the end products by half (photo: Planteneers)

ever consume plant-based products because, from their point of view, they are not convincing in terms of taste and price.

Hybrid products are an exciting alternative. A survey conducted as part of a master's thesis shows the potential of these combinations. Of the 2,000 participants, mainly students, just under half would try a hybrid drink, for example. A third would even buy it. In addition, 46 percent would like to see more hybrid products in the dairy sector - especially in yoghurt, cheese and cream cheese.

Requirements for product development

In order for hybrid products to establish themselves as real alternatives to pure animal dairy products, they must be as identical as possible to the animal original in terms of taste, texture and appearance. In addition, they should also offer added value, for example, a high nutritional value through added vi-

tamins and minerals, or they must be convincing in terms of sustainability. Many manufacturers already market these advantages as a selling point on the packaging.

Another aspect is the simple production of the hybrid products. "For example, we have developed stabilisation systems for this new segment that already contain the vegetable component," reports Dr Pein. "Dairies can easily reduce the animal content in the end products by half. During development, we paid specific attention to maintaining the original taste of the dairy products." The end product is, for example, a drink that is half milk and half oat drink. In addition, the compounds can also be used to make fermented dairy products such as yoghurt, as well as hybrid-based cheese preparations and puddings. By enriching them with micronutrients, they offer dairies additional value-added potential and enable further growth opportunities for the industry.

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