

Delighting the senses



Colour and flavour solutions are essential across the food and beverage industry, enhancing the taste and appearance of products while boosting their palatability. In plant-based, where products often aim to emulate those traditionally made from meat or dairy, these solutions play a crucial role. Amid increasing demand for more natural and 'clean label' ingredients, we explore the latest developments in plant-based colours and flavours.

Colours

The colour and general appearance of food and beverage products must not be underestimated in the quest to develop crave-worthy delights for today's consumers. Numerous studies have shown that we are conditioned to associate certain colours with specific flavours. The presence of unappealing colours in the context of a given food – such as hues that suggest the food might be unsafe or unpleasant – can directly lessen the desire to eat, and impact the overall eating experience.

Manufacturers are increasingly getting creative with the use of food colour to stand out. For example, Heinz unveiled a limited-edition pink 'Barbiecue' vegan mayonnaise earlier this year to celebrate the 65th anniversary of the Barbie brand, capturing consumers' attention thanks to its candy-coloured hue, achieved using beetroot extract.

Or, more notably in the plant-based space, Impossible Foods' 'bleeding' patties, made entirely from plant-based ingredients and yet bearing a striking resemblance to a traditional, medium-rare beef burger. This is all thanks to its innovative soy leghemoglobin protein ingredient, made via the fermentation of genetically engineered yeast and responsible for the burgers' meaty taste as well as their colour.

Colour development is evolving in response to consumer preferences for more natural food ingredients. Across the globe, various labelling regulations require manufacturers to disclose information about additives, including colours, on ingredient labels. Consumers are now more aware than ever of the presence of synthetic ingredients, with certain artificial colours being linked to adverse effects such as hyperactivity in children.

According to FMCG Gurus research, 73% of European consumers and 75% of North American consumers agree or strongly agree with the statement: 'It is important that food and drink products do not contain artificial colours'. This is particularly significant for plant-based consumers, who often choose these foods because they

perceive them as natural and healthier. However, some plant-based alternatives have faced reputational challenges in recent years due to processing methods and the use of additives, especially amid the increased discourse around ultra-processed foods.

Hélène Moeller, vice president of global product marketing for flavours and colours at ADM, emphasised that consumers are not willing to sacrifice appearance, taste or cost, which creates a challenge for manufacturers to deliver on variables such as the stability, intensity and consistency of colour solutions. Additionally, the regulatory landscape can vary from region to region, posing further difficulties.

"In order to solve these challenges, ADM focuses on colour innovation and optimisation," Moeller said. "Rigorous attention to raw materials, technology and application science helps us deliver colour solutions derived from natural sources that are at the forefront in the industry."

The global ingredients giant offers a range of colour solutions derived from fruits, vegetables and botanicals that promise not to impact flavour as a result of deodorising and masking technologies.

"Our extraction technology also removes sugars, starches and potential proteins so they can withstand even the harshest processing environments," she explained. "One of our latest innovations in the colour space is PearlEdge. This cleaner label replacement of titanium dioxide provides a range of white shades derived from vertically integrated, natural sources, such as native corn starch."

"The PearlEdge portfolio was purposefully developed to address the unique challenges within different applications, from beverages and confectionery to meat and dairy alternatives."

Ingredients producers must evolve with the changing landscape and innovate to produce more natural solutions, leveraging plant sources. However, cost can present another challenge.

Kristin Soave, leader of Kalsec's plant-based proteins platform, told *The Plant Base*: "Synthetic ingredients are cheap and effective, but they're becoming outdated...As we're currently seeing, some states are banning certain artificial colours due to a variety of reasons. We believe these bans will continue to grow...as experts keep digging deeper into health and wellness."

Among Kalsec's recent launches are a natural, fungal-derived beta-carotene solution, described by Soave as cost-effective, sustainable and delivering a vibrant orange hue while adhering to clean label requirements. Also included within its portfolio is its Durabrite line, which protects against pigment oxidation to ensure food maintains its colour, quality and shelf life.

Lycored offers a portfolio of naturally derived colours that also includes a fungal-derived beta-carotene alongside lycopene sourced from tomatoes. The company's range includes vibrant shades of yellow, orange, red and pink, all of which are vegan-friendly, non-GMO and stable under harsh conditions such as heat, light and pH extremes.

Caroline Schroeder, Lycored's global head of marketing, explained that its latest addition – 'ResilientRed BF,' launched in July – is ideally ▶



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suited for plant-based applications like meat alternatives and UHT dairy alternatives, such as pea- and soya-based milks.

"Derived from lycopene sourced from Lycored's own tomatoes, this colourant is Whole Foods-compliant, vegan-friendly, and free from sugar esters and palm oil, making it ideal for premium markets," she enthused.

"The strength and vibrancy of ResilientRed BF allow brands to achieve their desired shade in smaller doses, potentially using up to 20% less colour than some competitor products in the case of meat alternatives."

As we continue to see advancements in biotechnology, further innovation in sustainable natural colours is expected, leading to the production of higher-quality clean label plant-based alternatives. Technologies like fermentation are fuelling product development – this summer, GNT announced its expansion into fermentation to enhance its Exberry colour portfolio.

The company has been innovating in natural colours since 1978 and is now embracing the unique benefits of modern fermentation methods to unlock new opportunities within its range. It has partnered with Plume Biotechnology, a UK-based start-up specialising in fermentation science and bioprocessing, as part of these efforts.

Theresa Wilms, technical sales manager and lead of the plant-based category team at GNT Group, said: "Fermentation has the advantage that it's produced in a closed system, so it gives us precise control over the growing conditions. That helps us to achieve high yields all year round as well as exceptional levels of standardisation."

"Another benefit is that we can use some of the side streams from our fruit, vegetables and plants as a culture medium. We see Plume's fermentation technologies as a great fit for our ambitions and we're hugely excited about the potential."

GNT launched its first-ever oil-soluble colour concentrate last year, made from non-GMO paprika. The orange colouring is suited for fat-based applications and has a high intensity, ideal for applications such as plant-based cheese and smoked salmon alternatives.

Additionally, its recent introduction of a range of clean label brown colour concentrates based on caramelised carrot can provide an attractive solution for plant-based burgers and steaks. They are available in liquid, powder and micronised powder formats, and are made by heating the sugars from the carrot without any chemical solvents.

"Plant-based colours aren't a plug-and-play solution," Wilms added. "They rely on the natural pigments in fruit, vegetables and plants, so there are various technical factors to bear in mind. Because of that, developing effective formulation strategies is a big part of our innovation focus."

She cited the formulation of meat alternatives as an example, explaining that red colour concentrates, such as carrot and radish, contain anthocyanin pigments and are influenced by the pH of the base product.

"To achieve a really strong red hue, it's best to try to reach the lowest possible pH. Beetroot concentrates, which contain a betanin pigment, are an alternative option that aren't affected by pH. They can also be used to achieve a nice red shade in plant-based burgers, but the betanin is heat-sensitive so they usually can't be used in products like cold cuts."

Wilms continued: "The possibilities with plant-based colours have changed dramatically over the last few decades. In the years ahead, innovation can continue to drive improvements in terms of colour performance, but also sustainability."

Flavours

It goes without saying that flavour is vital to the success of plant-based foods. Recent research from Innova Market Insights found that 44% of consumers want to see improved flavour in plant-based products.

Mawele Shamaila, senior scientist alternative proteins at Symrise North America, told *The Plant Base*: "Consumers want plant-based products that taste real and delicious, without common issues like beany, green or bitter flavours, poor texture, or high costs".

"One of the key challenges in this space is keeping pace with the innovation of new plant protein ingredients, such as sunflower, watermelon, canola and aquafaba, as well as other 'animal-free' proteins like cultured meats, fish and fats."

Symrise's Symlife portfolio offers natural flavours and taste balancers that can eliminate undesirable attributes such as off-flavours in plant proteins, while also improving texture.

Janis Sinton, vice chair of the UK Flavour Association, observes a preference for naturalness, botanicals and masking flavours for functional products within the wider F&B industry.

While she emphasised that non-natural or artificial flavours should not automatically be perceived as 'bad' – as these flavours are highly regulated ▶



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across global markets to ensure consumer safety – the clean label trend is also evident within flavour solutions.

Sustainability is another key consideration within the plant-based industry – many consumers who follow a vegan diet do so for environmental reasons, and want to be sure the products they are consuming are made with eco-friendly ingredients.

Sourcing raw materials sustainably is a constant challenge for the flavours industry, but Sinton said that businesses within the sector continue to find solutions and work with local farmers to ensure end products are made as sustainably as possible.

“We are also working with food producers and supermarket chains to utilise surplus food – extracting flavour from remnants not otherwise used, then re-using this flavour in new products,” she said. “For example, taking the ‘wonky fruit’ not deemed suitable for supermarket sale, and reworking it as an ingredient in beverages.”

Just as fermentation is being harnessed in colour development, it is also driving innovation in sustainable new flavours, allowing for natural aroma materials to be produced without using the traditional plant source, Sinton noted.

“High efficiency distillation and separating techniques, such as spinning cone and molecular distillation, help create new materials for flavour innovation and make the most of the natural and botanical resources we have access to. This has significant sustainability benefits too.”

FMCG Gurus research shows that consumers are more curious than ever about trying new flavours, with 70% of European and 78% of North American consumers saying they like food and beverage products with new and unusual/exotic flavours.

Kalsec’s Soave mentioned that the company is observing an emerging trend in savoury flavours that are not derived from meat.

“Plant-based consumers are looking for a taste that does not mimic animal flavours, they want their plant-based foods to be delicious in their own unique way,” she explained, adding that Kalsec will be launching a new line of natural savoury flavours in 2025.

Whether in meat alternatives or elsewhere in plant-based, ADM’s Moeller said manufacturers must remember the importance of authenticity.

“For plant-based products to succeed, they must result in repeat purchase. That means it’s not just about the right flavour, it’s also about the right mouthfeel. This is of particular importance when creating plant-based alternatives to animal proteins.”

She added that ADM’s TasteSpark flavour modulation technology, which uses naturally derived ingredients to craft solutions that rebalance flavour profiles, can help to replicate traditional dairy’s creaminess and support functionality. Additionally, its recently launched Corefold technology uses separation and concentration methods to enhance taste.

“It focuses on the core part of citrus oil, emphasising the molecules responsible for impact and mouthfeel while capturing top notes for freshness and aroma,” Moeller commented.

Overall, she believes that both the colours and flavours industries are experiencing nearly unlimited opportunities for growth. “We predict that the future will keep getting brighter and more flavourful with custom creations. Flavours and colours are truly what bring innovation to life, moving our culinary renditions from test kitchen to the grocery shelf.” ●

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