April 2023
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How the Food Industry Can Branch Out with Botanicals

Lavender's Evolving Role in Flavor Applications

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How F&F Companies Are Facing Challenges in Traceability

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- WPC 2022 Re-Cap

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Naturals Market Growth Driven by Extraction Innovation



The April issue shines a light on the latest innovations and insights in the naturals market.

The global natural flavors and fragrances market size[a] is expected to reach $15.83 billion by 2030, registering a CAGR of 6.3%, according to Business Wire. The report also projects the essential oils segment is expected to witness the fastest growth rate from 2022 to 2030 owing to the increasing consumer preference for natural and organic products from various end-use industries like food and beverages and cosmetics.

The April issue highlights the latest innovations and formulation insights within the extractions and botanicals markets. This month's edition also includes a digital exclusive podcast with senior perfumer Vilobha Joshi currently discussing her journey in scent and creating fragranced consumer products for developing countries (*www.perfumerflavorist.com/multimedia*). *Perfumer & Flavorist+* also shares the details on a speaker set to take the stage at *Flavorcon* 2023. For a sneak peek at the yet-to-be-announced session, and a little background on the speaker, flip to page 18. More details regarding *Flavorcon*'s return can be found below.

Flavorcon 2023

Ready to make your way back to Cincinnati, OH, for *Flavorcon* 2023? We've got some exciting conference sessions up our sleeve for this year's lineup. This year's theme is **Flavor's Fruitful Future**, digging into the taste tech of tomorrow, transmission of knowledge from seasoned flavorists to newcomers and the latest ingredient launches to hit the developer's palette.

Flavorcon is hyper-focused on sensory and taste solutions for flavor chemists and flavored product innovators across all applications. This niche event is the only place where flavor chemists and product developers convene to learn, discuss, collaborate and network with their peers. To ensure the best rates, be sure to visit *www.flavorcon.com* to register for your ticket to the two-day conference and expo hall experience.

[a]*www.businesswire.com/news/home/20221117005887/en/Natural-Flavors-and-Fragrances-Market-Trends-Analysis-Report-2022-2030---ResearchAndMarkets.com*



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Programs like ADM's joint venture in Madagascar, Savan, traces vanilla beans back to the farm of origin—encouraging more transparency throughout the company's food system.

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INDUSTRY INSIGHTS:

How F&F Companies Are Facing Challenges in Traceability

Discover sustainability programs and global consumer research concerning the evolving demands in traceability.

The concept of traceability from a consumer's perspective is growing. How did their products arrive on the shelf? Are they supporting companies that value ESG practices?

ADM's Global Sustainability Programs director Michelle French connects to discuss evolving consumer demands and how companies are rising to the challenge.

***Perfumer & Flavorist+* [*PF+*]: When it comes to traceability, what requirements are clients currently requesting? What are the current challenges with traceability?**

Michelle French [MF]: Consumers are increasingly interested in learning about the origins of their food, how it was made and the ingredients used. Manufacturers are starting to garner consumer trust, with research showing that 42% of global consumers have become more trusting of environmental claims made for products by brands in the last two years[a]. Brands are also taking a more proactive approach to communicating these efforts, ensuring information is easily accessible and transparent. This has sparked consumer desires to feel connected to the food they eat and the communities they support, in addition to increased levels of transparency about the country of origin and provenance of products.



Michelle French

For example, programs like our joint venture in Madagascar, Savan[b], traces vanilla beans back to the farm of origin—encouraging more transparency throughout our food system. Through Savan, we've pioneered a large-scale digitally traceable supply chain, recording all purchase details in a central database through an application on smart phones used in the field. Savan adds another layer of authenticity and reinforces the demand for single-origin and traceable vanilla ingredients, while highlighting future growth opportunities that directly impact Malagasy farmers and their communities through improved income diversification and access to quality healthcare, education and more.

***PF+*: What are some of the nuances of traceability that companies need to take into account when sourcing products?**

MF: In a highly interdependent global food system, we design our sustainability programs to withstand market disruptions through the strength of our direct partnerships. Collaboration with farmers around the world is key to ensuring responsible agricultural practices and shortened supply chains.

Consumers associate shortened supply chains with locality, which they consider more trustworthy and better quality. Research shows that 75% of global consumers are willing to pay extra for food and drink products with a shortened supply chain, leading to increased demand for locally sourced options. We can help meet this demand with products like our HarvestEdge[c] Gold flour, which is certified sustainable by Food Alliance and directly sourced from farmers into ADM's verified net carbon neutral flour mill in Spokane, Washington.

Furthermore, our palm oil supply chain maintains a high level of visibility by working directly with suppliers to track products back to the plantation of origin. We offer a transparent process for stakeholders to share their concerns through a helpline and public grievance log, which provides valuable insight into performance and ensures high-risk sourcing areas are actively monitored. We also publish updates of our mill list and traceability information and through our semi-annual progress implementation report, we highlight progress on our palm oil action plan.

[a]FMCG Gurus, Route to Sustainability Report, 2022

[b]Savan is a trademark of ADM

[c]HarvestEdge is a trademark of ADM

Ingredients and Equipment

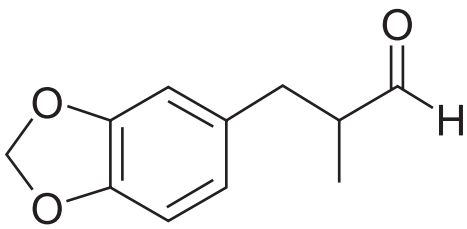


Pegasus BT with Phaser Pro Olfactometry Accessories

LECO Corporation

www.leco.com/product/pegasus-bt

Sensory-directed analysis has never been easier than with LECO's new accessory add-ons for the Pegasus BT series. The new aroma accessories kit partners with GL Sciences to include the Phaser Pro olfactory sniffer port and optional Olfactory Voicegram software. Easily characterize the chromatogram in real-time by comparing the scents your nose picks up with the full mass spectrometry data from the Pegasus BT. Combine GC-O with TOFMS for an unparalleled dive into your aroma samples.



Floramelon

Hangzhou Grascent Co., Ltd.

www.hangzhougrascent.com

Floramelon (FEMA# 4599, CAS# 1205-17-0), also known as α-methyl-3,4-methylenedioxy-hydrocinnamic aldehyde, offers a fresh floral odor with melon top-note.



2-Isopropyl-4-Methyl Thiazole

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www.oamicus.com

2-Isopropyl-4-methyl thiazole (FEMA# 3555, CAS# 15679-13-7) offers tropical, fruit, green, vegetable, nut, rooty and earthy aroma characteristics at 0.10% ppm in dipropylene glycol. Taste characteristics at 2 ppm are alliaceous, earthy, sulfurous, and coffee with a tropical fruity nuance.



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Natural Germacrene D 85

Isobionics

https://www.isobionics.com/global/en/product-finder/natural-germacrene-d-85.html

Isobionics natural germacrene D 85 (FEMA# 4974, CAS# 23986-74-5) is a clear colorless to pale yellow liquid. It is EU and U.S. natural, pesticide free, kosher and halal certified. Isobionics natural germacrene D 85 is compliant to EU and U.S. food grade regulations. The 85% purity makes this a unique product suitable for formulation of beverages and oral care applications.





Vanillin, Natural

Aurochemicals

www.aurochemicals.com/product/vanillin-au-natural

With its smooth notes and creamy texture, it's no surprise that vanillin, natural (FEMA# 3107, CAS# 121-33-5) is found in hundreds of flavor and fragrance combinations; but endless possibilities need a supply to match. At Aurochemicals, vanillin, natural is at the top of our list. We're stocked so you'll never have to delay production.



Lemon Essential Oil 5 Fold

Agrumaria Reggina Srl

https://bit.ly/masterofcitrus

Lemon essential oil 5-fold (FEMA# 2625, CAS# 84929-31-7) is a premium quality, pure and concentrated oil extracted from lemon-peel and then folded by distillation. Its refreshing citrus scent makes it ideal in flavors. The 5-fold distillation enhances persistence and aroma, making it a sought after ingredient in flavor, beverage and natural wellness world.



Buchu Oil

Berje

https://www.berjeinc.com/products/essential-oils/buchu-leaf-oil/

Berje's buchu oil (FEMA# 2169, CAS# 68650-46-4) provides an excellent modifier to cassis, raspberry, mango, grapefruit, and other "tart-fruity" profiles. Buchu's powerful diffusive properties also work well in a wide range of colognes and chypre bases, adding to the material's overall versatility.



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Sensient Flavors & Extracts is a division of Sensient Technologies Corporation and one of the world's leading flavor and extract companies, operating in 30 countries. Sensient's innovative technologies offer optimal choices for complete flavor system development.



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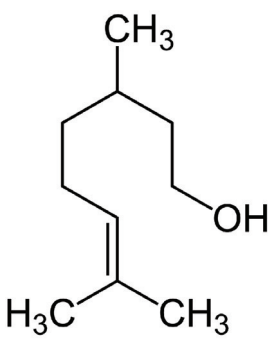


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Indesso Aroma

www.indesso.com

Citronellol (FEMA# 2309, CAS# 106-22-9) is a naturally occurring compound extensively used in fragrance and flavor applications. It has rosy, floral characteristics indispensable for fresh floral fragrances, and can also be used to give a unique accent to fruity flavors. It is EU and U.S. natural.



Aurelione

Symrise AG

https://www.symrise.com/de/scent-care/aroma-molecules/ingredient-finder/#Aurelione

Aurelione (CAS# 88642-03-9), a readily biodegradable musk of Symrise, lends warm texture and powdery facets. In tiny amounts, it rounds off floral accords, in higher dosages, it imparts fresh clean fabric effects. It blends very well with salicylates, other musks and soft amber notes. Aurelione and Macrolide supra harmonize symbiotic on skin.



Natural 2-Methyl-4-Propyl-1,3-Oxathiane

Natural Advantage, LLC

www.natadv.com

Natural Advantage introduces matural 2-methyl-4-propyl-1,3-oxathiane (FEMA# 3578, CAS # 67715-80-4), the characterizing flavor principle of purple passion fruit, with sweet, juicy and fruity notes. Used at 0.1 ppm, it is useful for passion fruit and other complex tropical flavors. It is worldwide natural, kosher, vegetarian and non-GMO.

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Google Spin-Off Osmo Develops AI to Create Aroma Molecules for Fragrances

Osmo is a new startup based in Cambridge, Massachusetts, with the mission of giving computers a sense of smell to improve the health and well-being of human life, with a $60 million Series A funding round led by Lux Capital and Google Ventures.

Led by neuroscientist and entrepreneur Alex Wiltschko, Ph.D., Osmo's team is said to have built the first map of odor to predict what a molecule smells like from its structure. Osmo is now using this map and generative artificial intelligence (AI) to create a new generation of better, safer, environmentally friendly aroma molecules for everyday products such as perfumes, shampoos, lotions and candles.

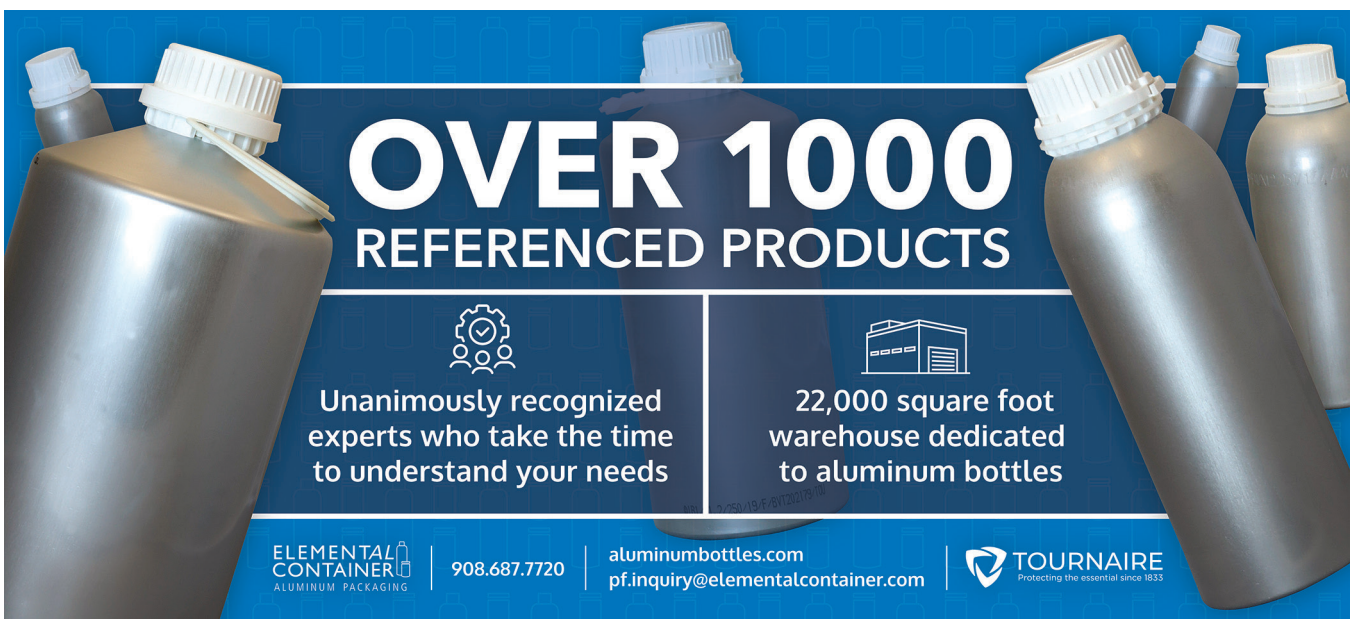
Osmo combines machine learning, data science, psychophysics, olfactory neuroscience, electrical engineering and chemistry in a multi-disciplinary approach.

"The digitization of the human senses of vision and hearing have led to incredibly impactful leaps in technology that enrich our lives, from better healthcare to photography to digital music," said Wiltschko. "We're excited to play a part in unlocking the potential for olfaction to change the world in fields like flavor [and] fragrance, medical diagnostics, agriculture, and beyond."

Wiltschko added, "To tackle this difficult, historic problem, we've brought together a founding team of world-class neuroscientists, machine learning experts, psychophysicists, hardware and software engineers, data scientists, and chemists. I'm looking forward to the journey with them and others who join us along the way."



Osmo aims to revolutionize the $30 billion fragrance industry by using AI to predict scent molecules.



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Symrise Invests in Danish Aroma Company EvodiaBio

Symrise has acquired a minority stake in Danish biotech company EvodiaBio.The investment comes as a result of EvodiaBio's recent capital increase, in which the startup was seeking strategic investors to support its fast-growing business.

EvodiaBio has developed a new technology that uses precision fermentation to produce sustainable taste products for both food and beverage. Both Symrise and EvodiaBio are interested in promoting a greener method of production, with Symrise eager to support EvodiaBio in its future endeavors.

This technology uses yeast cells to secrete individual aroma components, which are combined in an effort to mimic the standard aroma profiles of different hops. This allows for more cost-effective and sustainable biotechnological production of volatile aroma molecules from hops. It also helps to avoid the depletion of plant resources, which also reduces water and CO_2 emissions by over 90%.

The capital increase brought in 45 million Danish kroner (approximately $6.4 million) for EvodiaBio, with 14 million kroner coming from the BioInnovation Institute, a Danish accelerator funded by the Novo Nordisk Foundation. The other 31 million kroner came from other international funders, with Symrise acting as a strategic investor and Nordic Foodtech VC acting as the lead investor.

"Our vision is to create a sustainable, global company within the development, production, and commercialization of natural aromatic substances and this funding is our opportunity to realize this vision," said co-founder and chairman of EvodiaBio, Jarne Elleholm. "The funding was made possible by a strong support from the BioInnovation Institute and by the great progress we have made during our only one-and-a-half-year lifetime."



EvodiaBio has developed a new technology that uses precision fermentation to produce sustainable taste products for both food and beverage.

EvodiaBio will focus on addressing the taste of non-alcoholic beer first. Its new aroma blend, Yops, is designed to improve the taste of said beer, with EvodiaBio eventually focusing on developing aromas for other beverages, perfume and additional segments.



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Firmenich Debuts Re: New Collection of Renewable and Upcycled Ingredients

Firmenich has launched a collection of 10 renewable and upcycled ingredients as part of its ongoing efforts to reduce the perfumery industry's reliance on fossil fuels.

The Re:New Collection is powered by Sylvergreen, Firmenich's innovation program designed to convert essential fragrance ingredients obtained through traditional petrochemistry means into renewables created from carbon sources.

The ingredients in the Re:New collection are derived from pine trees specifically grown in poor soil, where food crops cannot be grown. Pine and other items with sustainable origins are upcycled and transformed in Firmenich's ingredients facilities by scientists, who turn them into renewable molecules using green chemistry principles.

"We have been pioneering unique and impactful fragrance ingredients that empower creators since 1895," said Maud Reiter, Ph.D., vice president, Discovery Chemistry & Development at Firmenich. "With the Sylvergreen innovation program we are now going the extra mile following green chemistry principles to convert perfumery ingredients towards renewable versions, with the intention to minimize their environmental footprint. We are extending our legacy for the benefit of perfumers, customers, consumers and planet Earth."

Firmenich aims to make 100% of its fragrances renewable by 2030.



Firmenich has launched the Re:New Collection, ten renewable and upcycled ingredients, as part of its efforts to ensure that 100% of its fragrances will be renewable by 2030.

p&f+

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IFF Sells Flavor Specialty Ingredients Business to Exponent



IFF CEO Frank Clyburn, shared, "The sale of FSI will improve our capital structure while allowing us to focus on our core businesses to enhance growth and returns."

In late December 2022, IFF announced the sale of the company's Savory Solutions Group to PAI Partners. According to IFF CEO Frank Clyburn, the Savory Solutions Group sale is an "important milestone" that will allow IFF to return focus to its highest-return businesses while enhancing growth and improving its capital structure.

On February 16, 2023, IFF announced it has entered into an agreement to sell its Flavor Specialty Ingredients (FSI) business to Exponent, a UK-based private equity firm, for $220 million in cash proceeds. Cash proceeds from the transaction, net of taxes and expenses, will be used to reduce outstanding debt.

"Aligned with our strategy, we're continuously evaluating our portfolio to identify opportunities to strengthen our financial profile," said Clyburn. "The sale of FSI will improve our capital structure while allowing us to focus on our core businesses to enhance growth and returns. We appreciate the contributions of our FSI colleagues, who have shared our commitment to quality and customer service. We will work closely with Exponent to have a successful transition and look forward to FSI's bright future."

IFF's FSI is a manufacturer of specialty base aromas with a broad range of more than 1,000 aroma chemicals and natural extracts, which provide inputs primarily to the flavor market. FSI includes four dedicated manufacturing and distribution facilities at Teesside and Hartlepool, United Kingdom; Cincinnati, United States; and Pucheng, China, with additional points of distribution in Mexico, Brazil and Hong Kong. With approximately 340 employees, IFF's FSI business serves more than 970 customers and generated more than $100 million in revenue over the last 12 months.

IFF and Exponent expect to close the transaction by the end of Q3 2023, subject to customary closing conditions. Centerview Partners LLC acted as financial advisor to IFF, and Cravath, Swain & Moore LLP provided legal support.

p&f+

Mane Debuts Renovated New York Fine Fragrance Creative Center



L to R: Medhi Lisi (president, Global Fine Fragrance), Birgit Benayoun (vice president, Fine Fragrance), Samantha Mane (president, EMEA), Tathiana Remick (president, Fragrance North America) and Victor Mane (director of Ingredients).

Over the last few months, Mane has put major emphasis on expansion. Two major milestones were facility debuts in India—in both Angamaly, Kerala and Byadgi, Karnataka celebrated in December 2022.

In that same month, Mane announced the grand opening of its Fine Fragrance Creative Center in New York City. Among the various updates, the New York center now hosts an open-floor concept that is designed to combine Mane's heritage in naturals with a modern-day industrial aesthetic to stimulate creativity and collaboration. The space is said to echo the company's commitment to co-creation with clients, with a focus on transparency, client engagement and green innovation. The Fine Fragrance Creative Center is one of three, with other locations stationed in Paris and São Paulo.

Birgit Benayoun, vice president, Fine Fragrance, stated, "The Creative Center unveils a unique open-floor concept that combines Mane's heritage in naturals with a modern-day industrial aesthetic to stimulate creativity and collaboration."

Tathiana Remick, president, Fragrance North America, shared, "We are thrilled to expand our footprint in New York and invest in a space that has a modern vision for the future of fine fragrance and ways of working in the heart of New York City. The space embraces our commitment to transparency, and green innovation."

Mehdi Lisi, president, Global Fine Fragrance, added, "Our state-of-the-art Fine Fragrance Center reflects a space where Mane will pioneer the future of scents and share incredible moments."

p&f+

Givaudan Unveils AI Technology Myrissi to Predict Emotional Perception of Fragrance



Maurizio Volpi, president of Fragrance & Beauty, says, "Myrissi represents a step change for the [i]ndustry. As e-commerce remains the privileged channel for customers, we must answer their need of an olfactive digital experience, something impossible to address until now."

Givaudan has introduced Myrissi, an artificial intelligence (AI) technology, said to translate scents into color patterns. The technology is currently only available in western Europe, the United States, Brazil and Japan.

Myrissi is a layer in Givaudan's 2025 strategy to expand customer-centered digital solutions. The technology is said to capture and predict the spontaneous emotional perception of fragrance experienced by consumers, determining the best alignment between colors, emotions and scents.

Per Givaudan, the Myrissi algorithm is designed to deepen the understanding of consumers' emotional mechanisms. This technology is the result of a decade of academic research in brain imagery and AI, to decode the spontaneous olfactory connection with color, modeled on the basis of a database of more than 25,000 consumer tests.

Myrissi has the ability to drive the company's creative and product development process starting either from a chemical composition to predict the color code association, or from a chromatic base to determine the appropriate olfactive affiliation. It also generates the visual mood board and the verbal ecosystem surrounding any fragrance—from packaging to campaign storytelling, consumers' emotional nuances are translated in their most complete and consistent form.

Maurizio Volpi, president of Fragrance & Beauty, says, "Myrissi represents a step change for the [i]ndustry. As e-commerce remains the privileged channel for customers, we must answer their need of an olfactive digital experience, something impossible to address until now. With Myrissi, we allow consumers to 'smell' visuals and colors that elicit the same emotions as the perfumes they are facing. This technology also enables Givaudan to support impactful marketing strategies for our customers, by matching their product designs with their scent, making the consumer experience delightful and fulfilling."

"Myrissi offers trailblazing support in crafting consumer-centered solutions, covering a wide scope of product categories, from Consumer Products to Fine Fragrances, driven by the powerful connection between color and scents," adds Muriel Jacquot, Neuroscience development manager. "With Myrissi, Givaudan inaugurates the 'Feel colors, smell emotions' approach in perfumery and strengthens its leading position in neuroscience research."

Geno Wins ICIS Innovation Award for Third Consecutive Year

Geno has been selected to receive the ICIS Innovation award for its efforts in developing sustainable materials for the third year in a row. The company won the Best Product Innovation from an SME for its advances in developing a new plant-based nylon-6 in an effort to reduce greenhouse gases.

The award recognizes Geno's progress in bringing said sustainable materials to brands like Unilever and Kao, following its launch of a $120 million venture with both. The initiative will use Geno's technology to develop plant-based palm oil alternatives that will both halve carbon emissions and diversify supply chains.

The ICIS Innovation Awards recognize and reward companies that continue to pave the way in terms of product, process and innovations that demonstrate a commitment to sustainability. Previously, Geno won the award for Process with the Best Benefit to the Environment and Sustainability, winning Best Sustainable Process in 2020.

"Geno's mission is to accelerate this transition with breakthrough technology that can scale to meet soaring consumer demand for responsibly sourced products and play a meaningful role in combating climate change," said Geno CEO Christophe Schilling.



L to R: Eric Alvarez, senior business development manager, Geno and William Beacham, deputy editor, ICIS.

"This award for our nylon solutions is a testament to our vast technical talent that has set a new bar for delivering breakthrough innovations that are remaking the products we use every day—from cosmetics to carpets."

p&f+



PROFILES:
MICHAEL COLANGELO and VILOBHA JOSHI

Meet the minds formulating some of your favorite scents and tastes.

Welcome to this month's creator highlights. One of which is a digital magazine exclusive podcast with Givaudan senior perfumer Vilobha Joshi currently residing in Mumbai, Maharashtra, India. Joshi fired up her podcast mic to discuss her journey in scent and creating fragranced consumer products for developing countries. You can also tune into her interview by visiting *www.perfumerflavorist.com/multimedia*.

In the next two pages you'll meet Michael Colangelo, a flavor chemist for Surely Wines, who currently resides in San Francisco, California. Colangelo is set to take the stage at *Flavorcon* 2023 to discuss the technique of dealcoholizing wine. The flavor chemist will dig into the challenges and how to rebuild the flavor profiles in low-to-no wines and non-alcoholic sips. And yes, there will be plenty of samples ranging from full to non-alcoholic so that attendees can get a taste of the process. Be sure to visit *www.flavorcon.com* to join the mailing list for the event scheduled for November 8-9 in Cincinnati, Ohio. Without further ado, let's get to know Michael Colangelo.



Michael Colangelo

***P&F+*: What applications do you primarily formulate for? Do you have a favorite?**

Michael Colangelo [MC]: I primarily formulate/develop beverages; specifically, in the healthier living space. Currently, non-alcoholic and low-alcoholic wine, cocktails and beers.

***P&F+*: Are there any recent projects/wins you're particularly proud of?**

MC: Our most recent launch at Surely was for the Bubbly Red product—a non-alcoholic red wine (comprised of a dealcoholized blend of cabernet and pinot noir). What made this particular product launch special was the nature of the project, timing and circumstances. When I joined Surely in May 2022, they were already deep into the project and had hit a bit of a roadblock in regard to direction and consumer experience. We took a step back and reviewed the whole product brief, adjusted our objectives and in under three months had Bubbly Red ready for production. The teamwork, speed and agility to turn the project into a smashing success in such a short time frame is such a testament to the entire team.

***P&F+*: Any advice for people coming into the flavor field?**

MC: Two major things jump to mind with this question:

1. Embrace failure. This is hard to do but it can change the outlook of your work. Think about the number of failures (iterations) it takes to create a successful flavor or beverage. Every one of those iterations, or failures, is a learning experience. That can be applied to every facet of our jobs and businesses. Being able to embrace those failures allows us to take a more clear-minded approach to assessing what worked and what did not. Not only will you learn faster, you will find you succeed more because

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you're not afraid to try new things and learning from them when they fail. Also, one of them might actually work!

2. Learn data science techniques. I cannot stress this enough! The world around us is changing. Flavors are a creative space, but we have access to SO MUCH data. The more you can leverage this information, the more value you will create—data from scientific papers, data from consumer reviews and consumer studies, data from your own formulation work (remember those failures and use them to mine for new learnings). Data is everywhere and learning to use it can open intriguing possibilities.

***P&F+*: How has the job of flavorist changed during your career?**

MC: I work in a unique area of the field—start-ups. The last three roles have all been for seed stage start-up companies which is a very different environment from the traditional flavor company. Something I never really anticipated or expected to have a major impact on my career has been data. With smaller teams, smaller budgets and tight timelines, data science has become a *massive* influence on how we do business. The ability to incorporate data into the development process has become critical to the success of projects.

***P&F+*: Are the types of projects you're working on changing over time? How are the creative demands of the job evolving?**

MC: More and more of the projects have become centered around health and wellness trends. This is starting to become less of a trend and more ingrained in the culture. For example, as more studies come out showing the negative impacts of alcohol, many businesses are exploring alternative adult beverage solutions. We've also been witnessing the continuous rise of plant-based foods with the launches brands like Impossible, Beyond Meat and more. Sustainability is another concern for consumers. Younger generations are taking a strong stance on the types of products they are willing to accept and that requires adjustments to what products get launched.

These market effects have forced me to look at development in unique ways. How do you make non-alcoholic wine taste like wine when you've stripped approximately equal to 20-30% of the product? How do you mimic chocolate or coffee when you can't just take the agricultural product and utilize it? The creative demands are requiring a more holistic approach that encompasses matrix effects from the sugars and acids but also the surface tension, vapor pressure, particles in solution, etc. It's much more than an aroma or flavor now, it's about the totality of the experience.

***P&F+*: What is the best part of your job?**

MC: The best part (and it's not close) is working with talented people from so many different backgrounds, experiences and fields of study. I learn so much from the people I get to work with every day, whether they be coworkers or vendors and suppliers. When all the pieces come together to create a product that hits the shelves and wows customers, that's proof of the people who are behind those labels.

p&f+

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One thousand ppm is ideal in most flavors but, cost permitting, 2,000 ppm is even more effective in wild strawberry profiles.



BY JOHN WRIGHT
johnwrightflavorist@gmail.com

Flavor Bites: gamma-Dodecalactone

gamma-Dodecalactone in orchard, tropical, berry and dairy flavors.

In the universe of creamy peach notes there are three clear leaders, gamma-decalactone, gamma-undecalactone and gamma-dodecalactone (FEMA# 2400, CAS# 2305-05-7). They all have similar peach notes, with only subtle aroma profile differences. They are most obviously differentiated by very unsubtle aroma strength and cost-in-use differences.

gamma-Undecalactone easily wins the cost-in-use battle, especially for naturals, but its use is declining rapidly. gamma-Decalactone is a close second, with increasing use. gamma-Dodecalactone really is the tortoise in this cost-in-use race and finishes a very distant third. Despite that, its use is increasing rapidly. Why?

The answer lies in taste effects. gamma-Dodecalactone adds a very realistic depth of taste when used as a junior partner to gamma-decalactone.

Note that the dose rates given throughout this article are the levels suggested for use in flavors intended to be dosed at 0.05% in ready-to-drink beverages or in a simple bouillon.

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Orchard Fruit Flavors

Apple: Apple flavors are driven by volatile notes and gamma-dodecalactone adds depth at around 30 ppm.

Apricot: One thousand ppm is the ideal level in apricot flavors, rising to 1,500 ppm in dried apricot flavors.

Nectarine: One thousand ppm is also an ideal level in nectarine flavors, working in conjunction with gamma-decalactone.

Peach: The combination of around 8,000 ppm of gamma-decalactone and 1,000 ppm of delta-dodeca-lactone adds depth and authenticity to peach flavors. This may be impractical in natural flavors on cost grounds and the level of gamma-dodecalactone can be reduced, if needed, to around 200 ppm. This is not ideal but it still provides noticeable benefit.

Plum: The effect of gamma-dodecalactone in plum flavors is noticeable at levels of addition in the region of 50 ppm.



One thousand ppm is the ideal level in apricot flavors, rising to 1,500 ppm in dried apricot flavors.

Tropical Fruit Flavors

Dragonfruit: Realistic dragonfruit flavors can be harsh and vegetal. Four hundred ppm of gamma-dodecalactone softens the effect.

Jackfruit: Jackfruit flavors need depth and creamy character to underpin the sulfur notes. gamma-Dodecalactone can play a leading role at 200 ppm.

Lychee: The rose, floral notes of realistic lychee flavors benefit from the added complexity of up to 200 ppm of gamma-dodecalactone.

Mangosteen: Mangosteens are obviously related to mangoes but they are less assertive. In consequence the ideal level of gamma-dodecalactone is around 100 ppm.

Mango: Mango flavors vary dramatically, especially in respect of the level of terpene hydrocarbon mango skin notes. A soft profile gains considerably from around 200 ppm of gamma-dodecalactone, but the harsh character of strong skin notes can be offset by levels ten times higher.

Passionfruit: Moderate levels, around 200 ppm, restore an attractive taste balance to passionfruit flavors.

Pineapple: Pineapple flavors gain depth and attractive creamy character from as little as 50 ppm of gamma-dodecalactone.

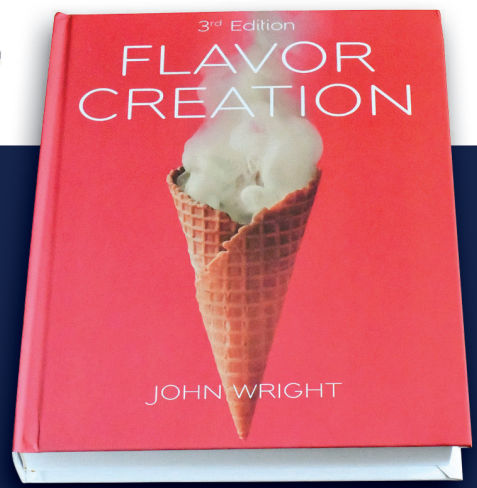
Sapodilla: Fifty ppm of gamma-dodecalactone adds interest and realism to sapodilla flavors and lifts them out of the ordinary.

Soursop: Two hundred ppm of gamma-dodeca-lactone is an effective taste background for soursop flavors, adding attractive depth.

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Watermelon: An authentic watermelon flavor would benefit from up to 500 ppm of gamma-dodecalactone and the same is true of the popular fantasy flavors.

Berry Fruit Flavors

Blackberry: Three hundred ppm of this raw material adds depth and authenticity to blackberry flavors and helps to integrate the musk notes.

Raspberry: A similar level, 200 ppm, works equally well in all styles of raspberry flavors.

Strawberry: gamma-Dodecalactone is particularly important in strawberry flavors. One thousand ppm is ideal in most flavors but, cost permitting, 2,000 ppm is even more effective in wild strawberry profiles.

Dairy Flavors

Butter: The effect of gamma-dodecalactone in dairy flavors is a little different. delta-dodecalactone provides most of the taste effect and gamma-dodecalactone serves to add authenticity as a secondary note. Six hundred ppm is an ideal level.

Cheese: The ideal level in cheese flavors depends on the type of cheese, ranging from 20 ppm in hard cheese flavors up to 200 ppm in soft cheese flavors.

Cream: gamma-Dodecalactone works best in the more authentic styles of cream flavors. Fifty ppm is a good starting point. Heavily vanillin dependent styles can also benefit, but to a lesser extent.

Condensed milk: The effect of gamma-dodecalactone in condensed milk flavors is important. Three hundred ppm is ideal.

Yogurt: Only 30 ppm of this ingredient exert a subtle, but useful, effect in authentic yogurt flavors.

Other Flavors

Chicken: This ingredient seems somewhat at odds with meat flavors, delta lactones being a more obvious choice. The situation is similar to dairy flavors and gamma-dodecalactone plays a backup role at around 50 ppm.

Chocolate: Cocoa flavors only benefit marginally from gamma-dodecalactone, but the dairy aspect of chocolate flavors means that this raw material is effective at 30 ppm.

Coffee: The effectiveness of gamma-dodecalactone in coffee flavors is unrelated to any dairy connections. One hundred ppm adds interest and depth to the dominant roast and sulfur notes.

French vanilla: gamma-Dodecalactone combines attractively with the floral notes, such as anisaldehyde, in French-style vanilla flavors. One hundred ppm is an effective level.

Grill: Grill flavors or process flavors easily overemphasize the unsaturated aldehydes and taste thin. A small, around 10 ppm, addition of gamma-dodecalactone helps solve the problem.



Realistic dragonfruit flavors can be harsh and vegetal. Four hundred ppm of gamma-dodecalactone softens the effect.

Ham: The comments above about chicken flavors also apply to ham flavors, the only difference being that the ideal level is lower, around 20 ppm.

Hazelnut and praline: Both hazelnut and praline flavors are given depth by a subtle addition of gamma-dodecalactone, in the region of 20 ppm.

Hibiscus: The interesting and delicate floral notes of hibiscus flavors blend well with the creamy backdrop of gamma-dodecalactone. Levels vary but 100 ppm is normally effective.

Cooked white fish, seafood: White fish flavors can be quite a challenge, especially getting the taste characteristic right. Thirty ppm is a reasonable starting point.

Smoke: gamma-Dodecalactone can helpfully balance the phenolic notes in smoke flavors, adding depth and smoothing the taste at 100 ppm.

Brown sugar: There is a delicate, rather fruity, aspect of brown sugar that is somewhat lost in molasses. Damascones are probably the main drivers of this note but gamma-dodecalactone certainly helps at 50 ppm.

Whisky: Is gamma-dodecalactone a useful ingredient in whisky flavors? Tradition would suggest not. The reality is that good whisky, and by that I'm afraid I mean malt or Kentucky, is amazingly complex. A tiny hint, even as low as 1 ppm, of gamma-dodecalactone adds complexity and elusive indiscretion.

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HOT TROPICS



Ionone, Alpha, Natural
FEMA 2594
~ fruity, raspberry

Isoamyl Butyrate, Natural
FEMA 2060
~ banana, fruity, sweet

Styrallyl Acetate, Natural
FEMA 2684
~ fruity, raspberry, sweet, tropical

Methyl 2-Methylbutyrate, Natural
FEMA 2719
~ fruity, ripe, tropical

Methylthio-1-Hexanol, Natural
FEMA 3438
~ fruity, kiwi, passion fruit, raspberry, tropical

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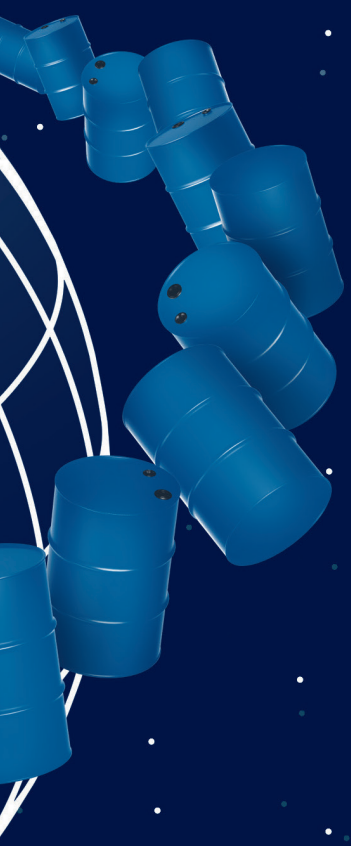
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Lavender's Evolving Role in Flavor Applications

Discover the ingredient's evolution in F&F and how it has become a rising star in sweet and savory culinary menus.

BY CYNDIE LIPKA, principal flavorist, Bell Flavors & Fragrances



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What do you think of when I say the word lavender? Do you think of your grandmother's perfume? (Or even worse, your mother's grandmother?) Do you think of harsh and cloying candles or aromatherapy? Or do you think of culinary masterpieces? Would you imagine lavender to be an up-and-coming ingredient in the culinary world? Who would have guessed that something which has been with us since ancient times would be the new rising star on savory and sweet culinary menus?

As so many factors come together in a perfect storm of flavorful joy (internet recipes, Pinterest, blogging, COVID-19), we find lavender used in savory dishes perhaps a bit unexpectedly. After all, who would have imagined that a strongly floral ingredient such as lavender would find a happy place in savory? Enter chef Julia Child who reigned supreme as *the* French chef during the early 1960s through the early 1970s. She introduced the world of French cooking to the American public in an enjoyable and informative manner in one of the very first cooking shows on television. Who could have ever predicted that cooking shows would entertain millions and upgrade kitchen fares across America for decades to come? Child included a recipe for Poulet Saute aux Herbes de Provence in her classic cookbook *Mastering the Art of French Cooking*. Since then, that blend has been used in a variety of stews, sauces, cheeses and in unexpected recipes such as deviled eggs, turkey soup and roasted asparagus and tomato penne salad. Then in 2009 the movie *Julie and Julia* burst out onto the landscape and those at home chefs who maybe dabbled in upscale and restaurant quality cooking at home then began a movement and interest in home cooking in earnest for young chefs still going strong. If you Google recipe blogging, you get 1.1 trillion hits!

Pairing with Lavender

As we know, trends follow a predictive path from inception, to adoption, through proliferation ending in ubiquity. About a quarter of the population likes or loves lavender. Lavender pairs really well with rich or fatty foods since it cuts through all that and provides lift. According to MenuTrends[a], lavender use on menus has increased 66% over the past four years. It's making its way into the savory side of menus with dishes such as lavender honey roasted butternut squash and honey lavender grilled porkchops and even in a Moscone grilled cheese sandwich!

[a]*issuu.com/ensembleiq/docs/pg_1021/s/13606990*

We see it on bar menus in such delicious goodies as a lavender blueberry bee's knees cocktail or a St. Germain lavender champagne cocktail. But I think it is shown most often in sweet applications.

A quick scan of Google, shows that lavender is used perhaps more often than we thought. It shows not only in trendy restaurants but also in upscale magazines like *Bon Appetit,* and websites such as *Epicurious*. There seems to be a lot of application of lavender honey with different desserts such as in a raspberry crème fraiche tart, or in a lavender honey tea bread. It shows up in scones either with buttermilk or lemon. It tops lemon cakes and is blended with apricot yogurt. Chefs have put lavender dairy-based applications to great success as well. Recipes list lavender in combination with crème brulee and blended with Marcona almonds. A particularly lovely sounding dessert has roasted pears with blackberry ricotta and lavender sugar. Lavender—it's not just for chocolate anymore.

Nuances of Lavender

What is it about this flower that has such staying power and longevity? Well some of that resurgence can be attributed to the blurring of lines between



We're seeing the emergence of lavender on bar menus in such delicious goodies as a lavender blueberry bee's knees cocktail or a St. Germain lavender champagne cocktail.

health, beauty and food. But folks, are all lavenders created equal?

Lavender can actually be traced back to Roman times and is an amazing genus containing 47 species. And in current times, the terms "English lavender" "French lavender" and "Spanish lavender" are not used correctly. "English lavender" typically refers to *L. angustifolia*, whilst "French lavender" may refer to *L. stoechas*, or to *L. dentata*. And "Spanish lavender" could refer to *L. lanata* as well as the two listed French species.

OK so that's the plants. How does this affect how flavorists could look for ways to use lavender?

Commercially, the essential oil from *Lavandula angustofolia* is the principal oil used in the flavor industry. I've heard it referred to as real lavender and true lavender (FEMA #2622, CAS#8000-28-0, FDA# 182.20). Bulgaria and France are the major producing countries, however, Morocco, Hungary, Italy, Russia, Spain, Romania, Ukraine and Turkey also have significant production as well.

The flowering tops are steam distilled to deliver us the beautiful oil we know and love. As we know, botanical materials grown in different geographical locations will have slightly different components based on the difference in soil composition, water source, light and temperature ranges. Processes will also affect the composition if the oil as well. Primary components include linalool, linalyl acetate, β-ocimene and eucalyptol.

Do not confuse this with lavandin (*Lavandula hybrida grosso*) which is the same genus but different species (FEMA# 2618, CAS# 8022-15-9, FDA# 182.20) There are a lot of similarities. Lavandin is grown in the same general geographic locations in France and Spain. The same part of the plant is utilized in a steam distillation. And the primary components are linalool, linalyl acetate (similar) but then there is upwards of 8% camphor in lavandin. Therein lies the big difference.



Some of lavender's resurgence can be attributed to the blurring of lines between health, beauty and food.



Lavender will give a nice floral component to chocolate profiles that might be missing from the cocoa beans and extracts commercially available.

How to Utilize Lavender in Flavor

I think that lavender fits nicely in many flavor profiles. Berries, of course, come to mind and I would say all of them. Lavender would give a delightful lift to heavy sulfury profiles such as guava, papaya or passionfruit and black currant. Other fruits such as apricot, cherry, cupuacu, date, kiwi, litchi, peach, pineapple, plum and fig. It will give a nice floral component to chocolate profiles that might be missing from the cocoa beans and extracts commercially available. If we think in terms of alcoholic beverage profiles, I could see this in gin certainly, certain fruit brandies and maybe in tequila and potentially in beer. It may also find a home in tea or rooibos tea profiles as well. And lastly, I would mention tomato as lavender would add brightness and deliciousness all the way around.

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Access to a vast portfolio of botanical oils, absolutes and extracts, as well as technical advancements and formulation expertise, are crucial tools for new product development.

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How the Food Industry Can Branch Out with Botanicals

Explore the diverse flavor notes of lesser-known oils, absolutes and extracts that can elevate new concepts in a broad range of categories.

BY MARIE WRIGHT, president of Creation, Design & Development and chief global flavorist, ADM



Marie Wright

Natural raw materials have rich historical significance and add creative depth to the taste in new product development. However, many natural oils, absolutes and extracts are often overlooked. With consumer tastes evolving to include more global flavors and culinary offerings, flavorists have a world of noble naturals to inspire food and beverage innovation. The diverse flavor notes of lesser-known oils, absolutes and extracts can elevate new concepts in categories ranging from beverages to marinades to confectionery. Nature is a generous source for these exciting ingredients, and their availability and quality continue to inspire creativity with their use in all forms.

Tea, Tisanes, Syrups & Spirits

For millennia, people across cultures have turned to botanicals such as *Camellia sinensis* to brew tea for various perceived wellness benefits. Today it is a daily beverage enjoyed for its many varieties and nuanced flavors, owed in large part to the botanicals in the brew. But botanicals are equally essential to aromatic spirits like gin, bitters and flavor syrups. While chamomile and lavender are comfortingly familiar, flavorists can help bring more options to the forefront.

Immortelle absolute (*Helichrysum angustifolium*), also known as everlasting, has rich caramel, honey, tobacco and herbaceous notes with floral and fruity undertones. The plant, with its bright yellow everlasting flowers, is native to Corsica and found in the Mediterranean area of Europe. It can be used in tisanes and incorporated into flavors like butterscotch, toffee, tequila, bourbon and molasses.

> “As awareness and inclusions continue to grow, flavorists are encouraged to incorporate a wider array of natural selections.”

Cassie absolute (*Acacia farnesiana*) is known as sweet acacia or yellow acacia and is used in tisanes. Its sophisticated profile includes mimosa, violet, woody and medicinal aroma with honey-like, powdery undertones. Native to Central America, it is also cultivated in Morocco and Egypt.

Vetiver oil (*Vetiveria zizanioides*), also known as the oil of tranquility, East Indian grass or khus,

is native to India and also produced in Haiti and Indonesia. It has an ethereal, woody, balsamic and mossy aroma prized for its use in tisanes and the well-known khus syrup.

Clary sage oil (*Salvia sclarea*) is commonly called clary wort, See Bright or eyebright and is produced in France, Russia, Morocco and Bulgaria. Its captivating citrus and herbaceous notes are combined with warm, woody cedar and tobacco undertones. This essence is a delightful addition to vermouth, wines, liqueurs, teas and smoothies.

Culinary Seasonings

Herbs and spices have the potency to alter a dish dramatically, adding distinctive flavor and endless innovations to otherwise ordinary dishes. These aromatic and flavorful plants have been used for thousands of years as dyes and perfumes, as well as to season and preserve food. We've seen the creation of regionalized palates, simply from the uniqueness of blends and combinations from each far-flung locale. From the Middle East to Iceland, globally sourced botanicals are inspiring chefs and product developers to take everyday cuisine to new heights.

Summer savory oil (*Satureja hortensis*), also called bean herb, has herbal, woody and pepper notes. Produced in France and Hungary, it provides a savory base to bean dishes and is a great addition to savory flavors such as pork or chicken, providing a more subtle herbaceous note than other herbs like thyme or sage.

Ambrette seed absolute (*Hibiscus abelmoshus*) is known as ambrette, musk okra, must dana or musk mallow, with a complex, exotic profile of musky, woody, seedy and berry undertones. Mainly grown in China and India, it is mostly known for its use in berry flavors though it's frequently used as an ingredient in Middle Eastern spice blends and may be added to coffee to enhance berry notes.

Orris root oil concrete (*Iridis germanica or Iris florentina*), also called orris butter or beurre d'iris, is native to Italy, France and North Africa. The elegant floral notes are complemented by earthy, woody and rooty undertones, providing a sweet-bitter element to spice blends like ras el hanout. Orris butter is also found in aromatic syrups and spirits.

Asafoetida gum oil (*Ferula assafoetida*), commonly called hing or devil's dung, is native to India and produced in Iran and Afghanistan. The complex savory, meaty, vegetative, sharp onion, leek, alliaceous notes are used in Indian cuisine, often tempered by fenugreek.

Seaweed absolute (*Laminaria digitata*) is also known as oarweed and is a type of kelp native to the cooler waters of the North Atlantic Ocean. Today it's harvested in France and Iceland for use in snack foods and seasonings, bringing fishy flavor through fresh, salty, fatty and iodized marine notes.



Today seaweed absolute harvested in France and Iceland for use in snack foods and seasonings, bringing fishy flavor through fresh, salty, fatty and iodized marine notes.

Sweet Treats

Edible flowers are a beautiful way to add a gourmet touch to food and drink, with colorful petals available in nearly every flavor profile. Tart hibiscus, floral rose, honey-like dandelion, peppery chrysanthemum, citrusy begonia and spicy cornflower are only a few of the delicious flowers that can garnish a dish. Flavorful florals can also be an aromatic addition to jellies, cakes, pastries and meringue as well as hot and iced teas, smoothies and cocktails.

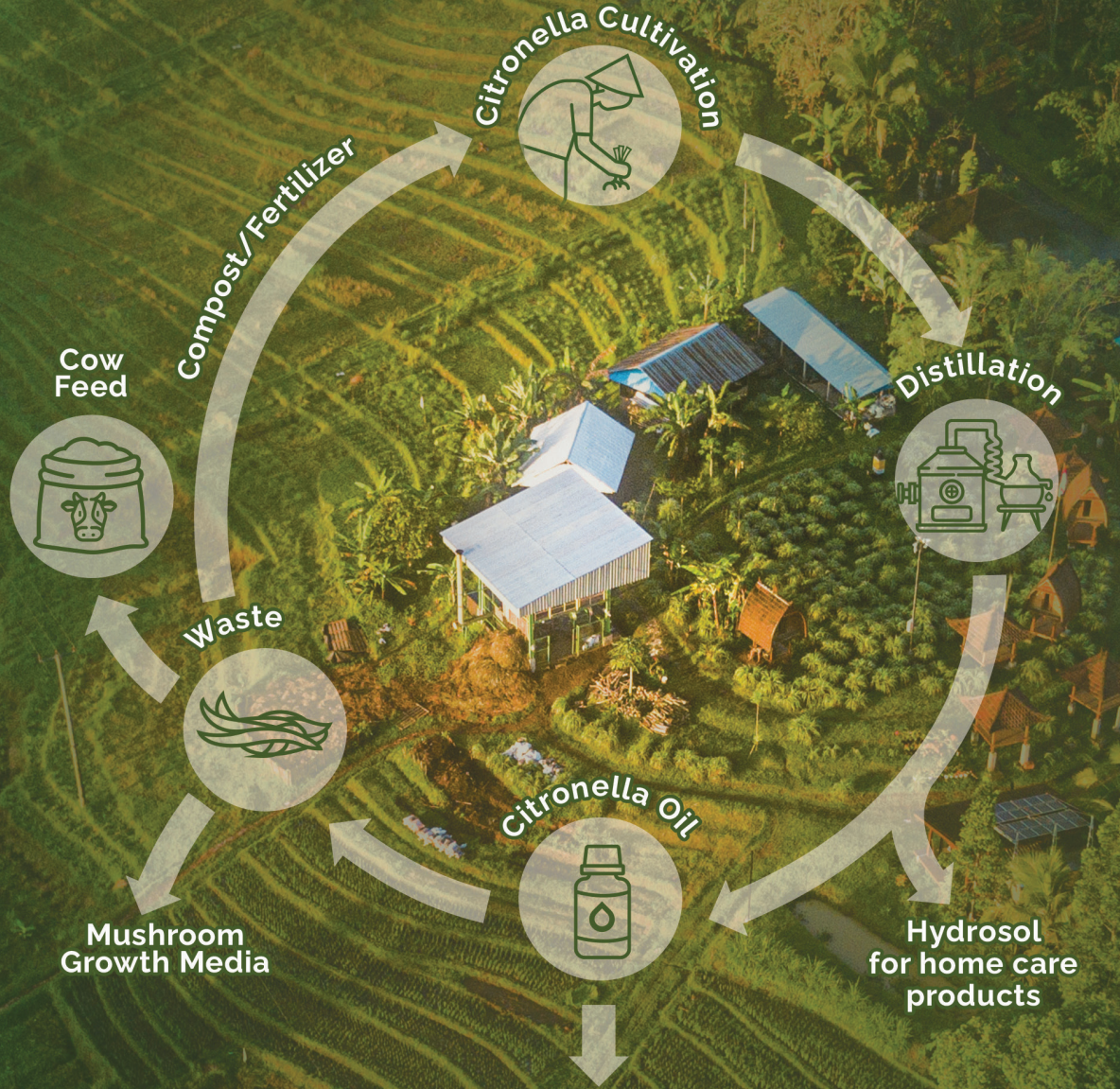
Elderflower absolute (*Sambucus nigra*) is known as sureau and, while native to many regions, it's primarily produced in Austria, Italy and the United Kingdom. Its exquisite floral, herbal and spicy aroma with

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tobacco undertones can be used as a flavor ingredient on its own or in combination with other flavors. The taste of elderflower is perfectly suited for several sweet and savory applications, including jams, cookies, smoothies, liqueurs, hard seltzers and dressings.

Blackcurrant buds absolute (*Ribes nigrum*) has common names black currant and bourgeons de Cassis. Native to the Burgundy region of France and also grown in Tasmania, popular inclusions include decadent Parisian ice cream and the crème de cassis liqueur that defines the classic Kir cocktail. Its bold flavor profile is tomcat, herbal with complex woody and spicy undertones, used as a catty flavoring ingredient in flavors like blackcurrant, passionfruit, bell pepper and peach.

Ylang ylang (*Cananga odorata*) is also called ilang ilang, cananga or poor man's jasmine. It has an exotic, evanescent, sweet jasmine-like floral note with custard-like, sweet and fruity banana overtones. This "flower of flowers" is native to islands of the South Pacific, such as Indonesia, Malaysia and the Philippines, and today it's produced mainly in Madagascar and Comoros. Ylang ylang is a fabulous ingredient in jasmine tea, white peach and strawberry flavors, and can be used in tea, ice cream, custards, meringue and confections.



Ylang ylang is a fabulous ingredient in jasmine tea, white peach and strawberry flavors, and can be used in tea, ice cream, custards, meringue and confections.

Intriguing Extracts & Essential Oils

Whether sweet, spicy, savory or somewhere in between, naturals are increasingly used to elevate culinary creations. Notably, 71% of consumers[a] are aware of at least one botanical. Additionally, research finds shoppers have many favorable perceptions of botanical ingredients. Common characteristics perceived by consumers[b] include sustainable, better-for-me and trustworthy, along with an array of potential wellness associations that are attractive to many different types of shoppers. These perceptions are in part driven by associations with contemporary products; however, they may also have roots in historical, cultural and generational uses of these unique naturals.

As awareness and inclusions continue to grow, flavorists are encouraged to incorporate a wider array of natural selections. Access to a vast portfolio of botanical oils, absolutes and extracts, as well as technical advancements and formulation expertise, are crucial tools for new product development. By bringing once-overlooked naturals into more foods and beverages, flavorists can help satisfy consumers' evolving tastes and expectations.

p&f+

[a]Botanical, Herbal & Plant Extracts That Deliver Health & Wellness Benefits Naturally

[b]FMCG Gurus, Non-Alcoholic Beverages, Global Report, 2022



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Consumers report ingredient labels are a factor more than 70% of the time when they are choosing what to eat and drink.

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LEVERAGING EXTRACTS TO MAXIMIZE TRACEABILITY & CLEAN-LABEL CLAIMS

Showcasing how extracts can be a versatile and effective tool to develop flavor profiles as well as adjust for volatile supply and demand.



Fabio Catone

BY FABIO CATONE, senior strategy and portfolio manager, Extracts & Beverage, Sensient Flavors & Extracts

Food and beverage manufacturers wisely listened when consumers began questioning long lists of ingredients with hard-to-pronounce chemical names. They realized that a shift toward well-being would create a market for new products and it did. While it started as a niche category, the global clean-label ingredients market[a] is expected to grow by 8.65% and hit $32.08 billion in sales by 2026.

Consumers are becoming increasingly discerning regarding their food and beverage products as the market grows. Consumers report ingredient labels[b] are a factor more than 70% of the time when they are choosing what to eat and drink. In fact, four in ten consumers[c] say it's important to them that a food or beverage includes only a few ingredients and that they want those ingredients to be recognizable. Those polled also said they select food and beverage products with fewer ingredients primarily to support their health, whether that be a "better-for-you" mindset or a desire to avoid unhealthy-sounding chemicals.

Busting the Bland Myth

While health and wellness are top of mind, food and beverage manufacturers will need to do more than swap out ingredients to create a natural palette. In addition to a product profile that answers their concerns about healthy lifestyles, consumers also demand great taste and adventurous flavors. This



On the functional side, ginger continues to gain momentum as a bold, botanical flavor, working well in alcohol and brewed drinks, when an earthy, spicy note is desired.

[a] *www.prnewswire.com/news-releases/global-clean-label-ingredients-market-report-2022-market-to-surpass-32-billion-by-2026---market-developments-product-launches-business-expansion-301520790.html*

[b] *news.gallup.com/poll/238169/americans-overlook-restaurants-nutrition-labels.aspx?g_source=link_NEWSV9&g_medium=NEWSFEED&g_campaign=item_&g_content=Most%2520Americans%2520Overlook%2520Restaurants%27%2520Nutrition%2520Labels*

[c] *ific.org/media-information/press-releases/2021-food-health-survey/*

can take the form of a unique mashup, adding a new spin to a classic flavor, or tapping into global offerings that give a sense of adventure.

How to get there? Natural extracts are a way to meet all of these needs, checking off the boxes for clean labeling, providing unique and desired flavor profiles and farm-to-table traceability.

Bold Flavors and Functional Ingredients on the Rise

As food and beverage manufacturers look to the latest flavor trends to leverage, botanicals and complex heat[d] are rising to the top. Chili extracts such as habanero, ancho or jalapeño offer manufacturers an opportunity to use spicy ingredients in food and beverages that cannot use traditional formats, such as powders and pieces. These extracts can elevate a mocktail, provide sweet heat to ice cream and other dairy applications, and add complexity to sauces, dressings, marinades and snacks.

On the functional side, ginger continues to gain momentum as a bold, botanical flavor. By sourcing from the native region, extracts like Nigerian ginger provide the traceability consumers want. With fewer citrus notes than Chinese ginger, Nigerian ginger works well in alcohol, brewed drinks, ice cream, seasonings, salad dressings and even dip applications when an earthy, spicy note is desired. Extracts maintain more flavor compounds during processing, enabling manufacturers to deliver a more true-to-botanical taste.



Chili extracts such as habanero, ancho or jalapeño offer manufacturers an opportunity to use spicy ingredients in food and beverages that cannot use traditional formats, such as powders and pieces.

Going Beyond Nutrition

When asked what "clean label" means, consumers rank ingredient source, natural color and flavor and sustainability/fair trade as essential attributes. The words "natural" and "extract" also have a solid appeal to this market segment[e] and the desire for transparency is only going to grow.

There are multiple factors for manufacturers to consider when aligning new product formulations with clean label standards. While clean label is primarily associated with nutrition, there's more to it. It also includes the product's processing level, ingredient sourcing and other elements with a health/wellness focus.

This is where manufacturers must thread the needle carefully. Consumers expect their food and beverages to do more than fuel their activities. They want those products to open windows into new cultures or recall a fond childhood memory and they are looking for manufacturers to offer products that do this without fat, sugar, salt, preservatives and other unhealthy fillers.

Optimizing Resources

Using the right ingredients and working with the right partner is essential for any product formulation. While extracts are well-known for their unique role in creating better-balanced, more consistent flavor profiles, as well as a way to infuse new flavor into products, extracts can provide manufacturers with a wider variety of benefits, including:

[d] *issuu.com/shivaniisaxena1998/docs/2023_trends_report-_sept_22_1_.pptx*
[e] *www.euromonitor.com/clean-label-from-health-to-transparency/report*

- Extended shelf life
- Extended taste performance across a finished good's shelf life
- Enhanced stability
- Raw-material traceability and screening
- Decreased microbiological concerns compared to dried spices
- Reduced need to add sodium
- Consistent flavor intensity
- Consistent taste profiles through different harvests
- Consistent colors

These qualities show how extracts are a versatile and effective tool, especially when adjusting for volatile supply and demand that can throw off production schedules. Extracts can be stockpiled, for instance, and used in various ways that allow for quick reformulations and faster-to-market product development and delivery. (e.g. if a natural disaster affects the availability of orange juice, it may not have the same impact on orange extract, which uses the rind).

In addition to improving ingredient availability, the stable nature of extracts can also help with shipping and logistics. Extracts don't require refrigeration and special handling other ingredients may need. Lastly, by extending shelf life, extracts allow manufacturers to maintain quality while taking advantage of available materials and production time to produce larger batches of a product.

What the Future Holds

Once the consumer market has pivoted to a new set of demands, it's unlikely to change and as the preference toward purposeful consumption and sustainability continues to grow, the importance of natural foods and clean label will remain top-of-mind. For instance, parents who opt for



Extracts are a versatile and effective tool, especially when adjusting for volatile supply and demand that can throw off production schedules.

"better-for-you" products are teaching their children what to look for and what to avoid when purchasing foods and beverages.

One area where we can expect to see an increase in clean label products is packaged products as meal occasions continue to shift. Natural extracts can help manufacturers capture and keep this growing market with products that provide taste, color and excitement. And on the production side, extracts bring predictability, durability, and stability, helping to lower costs and provide more opportunities for innovation.





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Senior Perfumer Talks Creation of Paco Rabanne's FAME Feminine Fragrance

_P&F+_ connected with connected with Dora Baghriche to discuss the scent's inspiration and formulation.

BY JENNA RIMENSNYDER, managing editor, *Perfumer & Flavorist+*

In early February 2023, Paco Rabanne launched FAME feminine fine fragrance. The scent is described as a blend of jasmine, mango and incense, in a mission to capture the new era of feminity. The fragrance was created by a team of four Firmenich perfumers, Dora Baghriche, Marie Salamagne, Alberto Morillas and Fabrice Pellegrin.

Perfumer & Flavorist+ (*P&F+*) connected with Baghrice to discuss the inspiration behind the creation. The final question was provided by the brand with insights from the entire team.

***P&F+*: What was your inspiration behind creating this fragrance?**

Dora Baghriche [DB]: The inspiration for this fragrance was really empowered, confident, distinctive female icons. Think Jane Fonda, Audrey Hepburn and Bridget Bardot. These incredibly chic and covetable women were pioneers of a new era of femininity and we wanted to create a fragrance that really embodied that.

> "[In 2023 and beyond we see] a demand for a more sustainable and socially responsible approach to creating fragrances."

Actress Elle Fanning is the face of Paco Rabanne's FAME feminine fine fragrance.



FAME co-creator and senior perfumer, Dora Baghriche shared, "The inspiration for this fragrance was really empowered, confident, distinctive female icons. Think Jane Fonda, Audrey Hepburn and Bridget Bardot."

***P&F+*: Can you touch on the palette of notes you used to create this fragrance?**

DB: The palette is filled with cutting-edge, eco-friendly ingredients. A few standout hero notes include jasmine which was harvested using micro-liquid technology from Grasse, and the first mango accord made 100% of natural origin. It was a Sicilian mango that was processed in Grasse, using a Firmenich technique called Nature Print. We captured the scents of mango and mango leaf, analyzed them, and reproduced them as closely as possible to their original scent, using only natural ingredients.

We were also able to incorporate Firmenich's hero molecule, Dreamwood, which is a natural, renewable, and biodegradable material produced through a white biotechnology process to create an irresistibly creamy and woody combination.

***P&F+*: Any ingredients that came to mind first when trying to capture the "new era of femininity?"**

DB: To emphasize the "new era of femininity," we chose an explosive trio of incense, wrapped in the addictive sensual warmth of sandalwood and vanilla. To even further exemplify femininity, we brightened the notes with jasmine and mango for a naturally cheerful, fresh and delicious note. The result of these scents tied together creates a free and disruptive woman to embody this new era of femininity.

***P&F+*: From your perspective, how are consumer demands changing when it comes to luxury fragrances? Any trends you're witnessing?**

DB: In 2023 and beyond, we will see several trends in fragrance such as:

- A demand for a more sustainable and socially responsible approach to creating fragrances. For FAME we used notes that are sourced responsibly such as the vanilla from Madagascar, the incense blend and the sandalwood.
- Scents that are feel good and FUN–pushing our comfort zone with flavors and edible textures that take scents to the next level. This was accomplished in the FAME fragrance with the use of both creamy, clean and juicy mango with green, yellow and red tones.
- The use of comforting notes like vanilla, musks and woods. Since the beginning of COVID, we've seen a rise in comforting smells. Vanilla for example with its gourmand yet natural aspect is often a central element for comforting fragrances and is often associated with white

musks and woods. It is a complex ingredient because it has a wide range of facets— rich, sweet, balsamic, woody, spicy, and sometimes even a tobacco aspect. It conveys all types of feelings but also calls for sensuality with its carnal texture and it helps convey sensuality in FAME.

FAME: There are four of you. How did you work together?

Salamagne: The Paco Rabanne teams provided terrific guidance. In this great shared adventure, each one of us sought our own paths before coming together. Around the table, we let ourselves be surprised by the others' visions, which we then embraced and discussed. We all learned a lot from each other.

Morillas: The original idea was [Baghriche]'s, but we worked symbiotically. At each stage, each of us proposed something, then we restarted from the formula selected by the Paco Rabanne team. So there was both harmony and a personal quest at the same time. That was how we proceeded, without self-interest or ever wanting our idea to be the one chosen. We really took great joy in developing it, and you can smell this in the perfume.

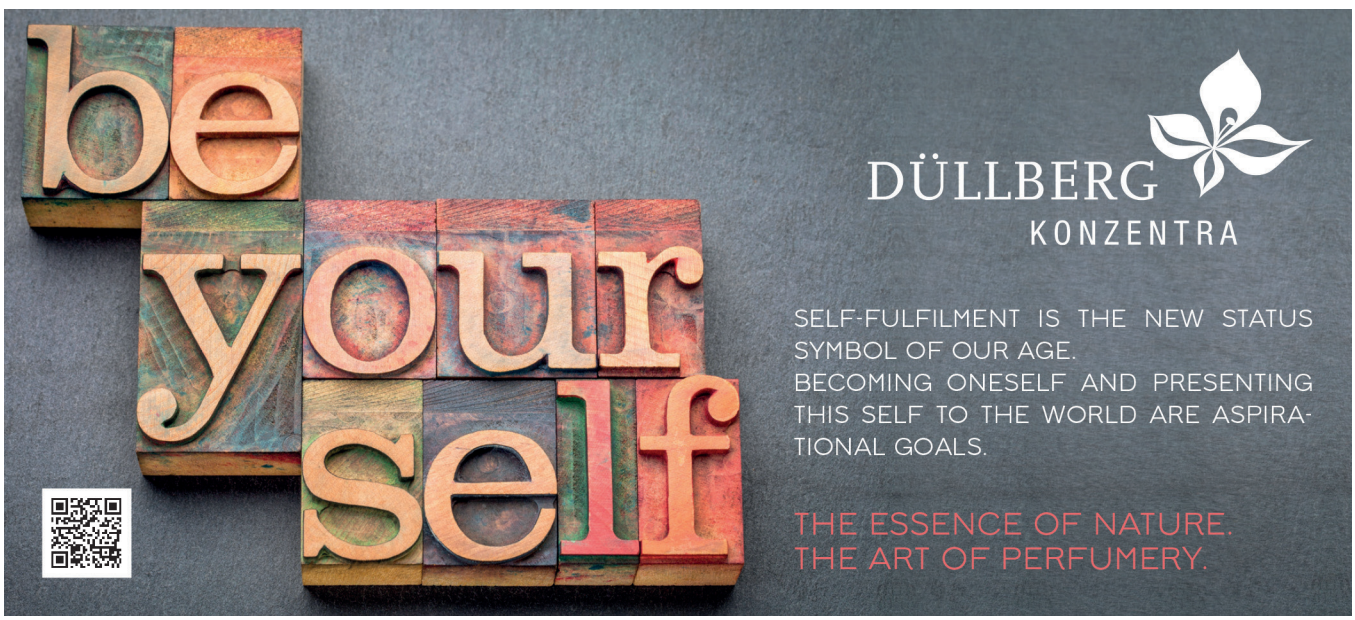
DB: The note had so many facets to explore that each of us had a kind of feeling for one of the facets of the perfume, and contributed to refining it.



To emphasize the "new era of femininity," the team chose an explosive trio of incense, wrapped in the addictive sensual warmth of sandalwood and vanilla.

Salamagne: We were aware that we were so lucky to work on this accord, which we found wonderful, and we put a lot of energy into it, because we were happy to be working together, we love the brand, and you can smell it in the fragrance!

p&f





The panel thought that methyl-cis-5-octenoate contains some interesting aspects to it, with possible applications in peach, strawberry and kiwi.



Organoleptic Characteristics of Flavor Materials

The month the panel evaluates galangal root oil, 9-decenoic acid, difurfuryl disulfide and more.

BY CYNDIE LIPKA
Principal flavorist,
Bell Flavors and Fragrances

Organoleptic Evaluation Panelists

- **Bill Aslanides**, Senior Flavorist, Synergy Flavors, Inc.
- **Deborah Barber**, Senior Flavorist, FONA
- **Nicole Hernandez**, R&D Manager and Senior Flavorist, FlavorChem
- **Christina Hook**, Flavorist, Bell Flavors and Fragrances
- **Judith Michalski**, Senior Flavorist, abelei flavors
- **Andrew Petrou**, Flavorist, Savory, Bell Flavors and Fragrances

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Lemon terpenes, natural

Source: MilliporeSigma, a product of Simone Gatto
FEMA# 4848, CAS# 68917-33-9
Natural occurrence: Lemon.
Odor: @ 1%. Citrus, mildly lemon, very fresh, herbaceous, sweet.
Taste: @ 1 ppm. Bright, clean, mildly citrus, sweet, slightly herbal finish.
Taste: @ 2 ppm. Bright, clean, mildly citrus, fresh, lemon, juicy, slightly fatty middle and late green herbal finish.
*Possible application*s: This very clean and fresh lemon terpene sample is a real joy to behold. Oddly, this is a new(ish) FEMA number and a welcome one at that. This packs more impact than I had expected and there is no mention from the panel of a candy profile. So, where to use this? Obviously in all lemon and citrus blends. This would add pop to margarita and cosmopolitan flavors. But this will also play well in herbal and vegetable profiles and be equally at home in raspberry and mango for brightness.
➤**MilliporeSigma:** *www.sigmaaldrich.com*

Methyl-cis-5-octenoate

Source: Bedoukian
FEMA# 4165, CAS# 41654-15-3
Natural occurrence: Mango, pineapple.
Odor: @ 1%. Fresh, green, waxy slightly pulpy, slightly aldehydic, melon, fruity, juicy, cucumber skin, candied, green.
Taste: @ 0.1 ppm. Green, waxy, cardboard, mild, fatty, slight bitter end.
Taste: @ 0.2 ppm. Fatty, cucumber, green, slightly tropical, fresh, pulpy and more pleasant at this level.
*Possible application*s: This material contains some interesting aspects to it. While definitely in the green waxy camp leading people to mention obvious things like pineapple, honeydew, cantaloupe, watermelon and certainly cucumber and pickle it also made the panel mention other fruits. We thought of apple, apricot, grape, pear, plum, peach, strawberry and kiwi, and some tropicals such as mango and papaya. We also thought this would be at home in jalapeño and an appropriate note for cheese rind.
➤**Bedoukian:** *bedoukian.com*

Anisyl alcohol, natural

Source: Natural Advantage
FEMA# 2099, CAS# 105-13-5
Natural occurrence: Anise, honey, fennel, pumpkin, star anise, vanilla, whisky.
Odor: @ 1%. Sweet, floral, powdery, cherry, creamy, coumarinic, marshmallow, vanillic.



Lemon terpenes would add pop to margarita and cosmopolitan flavors.

Taste: @ 1 ppm. A bit low, heavy, floral, alcoholic, sweet, cherry, vanillic, fennel, creamy, slightly powdery.
Taste: @ 2 ppm. Waxy, floral, powdery, creamy, heavy, oily, sweet and coumarinic.
*Possible application*s: This alcohol made me think of pumpkin and hard squash like butternut and acorn and sweet flavor profiles such as marshmallow, spun sugar or cotton candy and honey. It is a natural for black licorice and fennel profiles. And can contribute to cherry flavors as well with some mentions of raspberry and blackberry. There is also a home for this in Tahitian vanilla profiles as you know.
➤**Natural Advantage:** *www.natadv.com*

2-Methyltetrahydrothiophen-3-one

Source: MilliporeSigma
FEMA# 3512, CAS# 13679-85-1
Natural occurrence: Beef, beer, butter, brandy, cider, coffee, black currant, corn, malt, peanut, pork strawberry, whisky, wine, yeast.
Odor: @ 1%. Sweaty, fruity, sour, beefy, cooked, braised, wok/fired, brown coffee, roasted, grilled, brown, alliaceous.
Taste: @ 1 ppm. Weak, waxy, savory, meaty. Less impact than anticipated based on odor profile.
Taste: @ 3 ppm. Generic, cooked beefy note, slightly fatty, waxy, nutty, slightly woody, heavy and alliaceous.
*Possible application*s: I had totally expected to be blown away by the taste impact based on the odor impression! The odor is strong and the taste impact is not. Oddly. I had totally thought I'd need to be scraping my tongue off but turns out it was not necessary at all. So, just sort of bear that in mind while formulating. With that being said, this compound I think carries some very interesting lift to it. Tropical profiles such as black currant, papaya and passionfruit would benefit. The panel also said that beef, coffee and roasted flavors (chicken, pork, sausage) would benefit from this. There were several mentions of stir fry profiles, use in roasted pepper profiles and ancho chili and use in garlic or onion and green onion profiles as well. This material is sometimes called blackberry thiophene so it might be a consideration for that flavor as well.
➤MilliporeSigma: *www.sigmaaldrich.com*



The panel's notes on 9-decenoic acid point to applications in a vast lineup of dairy products.

Difurfuryl disulfide, natural

Source: Natural Advantage
FEMA# 3146, CAS# 4437-20-1
Natural occurrence: Beef, bread, chicken, coffee and sesame seed.
Odor: @ 1%. Coffee, skunky, roasted, beef, onion, smoky, bready, dry out is ham-like.
Taste: @ 0.5 ppm. Great roasted notes, bready, sesame, stir fry notes, meaty, burnt, green onion, smoky, coffee.
Taste: @ 1 ppm. Roasted coffee, fried, oily, alliaceous, skunky, asparagus and roasted meat.
*Possible application*s: We should probably start with all the different iterations of coffee (including mocha) right off the bat. But expanding our view, we also saw bread and sesame seeds, roasted vegetables, and stir fried profiles, cabbage and Brussel sprouts. Beef came to mind (especially Kona crusted beef), and pork, and chicken stock and ham. A few panelists thought this would work well in dark caramels or dark roasted peanut.
➤**Natural Advantage:** *www.natadv.com*

9-Decenoic acid

Source: Bedoukian
FEMA# 3660, CAS# 14436-32-9
Natural occurrence: Beer, blue cheese, butter, cheddar, Parmesan, provolone, Romano and wine.
Odor: @ 1% (PG). Mild, milk fat, waxy, creamy, dairy, late green, sour, cheesy, dries with Parmesan or Italian cheese notes.
Taste: @ 0.1 ppm. Slightly sweet, waxy, dairy, mild, creamy, cheesy and important for butter.
Taste: @ 0.3 ppm. Slightly sweet, waxy, dairy, creamier, fatty, heavy.
*Possible application*s: Well, you likely have the concept if you read the notes. This acid screams dairy. Butter, milk, provolone, Swiss, Parmesan, Romano, blue, aged cheddar, goat cheese, Asiago cheeses, mascarpone, cream cheese, sour cream, whipped cream, cheesecake, rice pudding eggnog and yogurt.
➤**Bedoukian:** *bedoukian.com*

Galangal root oil

Source: Berjé
FEMA# 2500, CAS# 8024-40-6
Odor: @ 1%. Herbal/botanical, balsamic, green and brown, camphoraceous, terpenic, dill, earthy, spicy and woody.
Taste: @ 0.2 ppm. A bit low, musty, earthy, terpenic, green herbal, tea-like.
Taste: @ 0.5 ppm. Herbal, vegetative, earthy, green slightly minty, cardboard, terpenic, balsamic.

*Possible application*s: Almost half of this oil is comprised of 1,8-cineole if that points you in any direction for how this material smells if you are unfamiliar with it. However, it is also quite versatile. Certainly spices showed up such as ginger, turmeric, black pepper and cardamom. Fresh herbs were also mentioned such as dill and celery. At lower levels this could make a play in tea or woody mango or seedy notes in sweet fruits. There is a briny character to this where it might help a green olive profile as well. One panelist thought this might be interesting to add to cola or root beer or ginger/ginger beer profiles.

➤**Berjé:** *www.berjeinc.com/*

Bis-(2-methyl-3-furyl) disulfide, natural

Source: Natural Advantage

FEMA# 3259, CAS# 28588-75-2

Natural occurrence: Beef, chicken, grapefruit, pork, salami, fermented soy, tea, yeast.

Odor: @ 0.1%. Roasted, beefy, chicken bones, pork, bologna, liverwurst, brothy, cooked milk, vitamin C, grilled fat, cooked sugar, dried meats (jerky, salami), bready.

Taste: @ 0.5 ppm. Brown, roasted, bread crust, meaty.

Taste: @ 1 ppm. Burnt, roasted, bready, meaty, boiled chicken, cured meat, beefy, caramelic and chocolate.

*Possible application*s: This compound had a scary name but not such a scary profile. Most of the panel thought that it would work in a wide range of applications. We found cooked dairy notes in this so cooked milks, flan, caramel and chocolate came up. And it might have potential as a sulfurol replacer. Additionally, the generic brown notes would lend this to bread, coffee and nutty profiles at low levels. At higher levels, we saw this in more savory roles such as chicken stock, pork, lunch meat, pepperoni, salami, onion and garlic.

➤**Natural Advantage:** *www.natadv.com*

Isopropyl-3-methylbut-2-enthioate

Source: MilliporeSigma

FEMA# 4260, CAS# 34365-79-2

Found in nature.

Odor: @ 0.1%. Oddly creamy, horseradish, rye bread, meaty, brown, alliaceous and fades quickly.

Taste: @ 0.1 ppm. Waxy, fatty, creamy, alliaceous, green, vegetative, tropical.

Taste: @ 0.5 ppm. Vegetative, waxy, boiled meat, alliaceous.



For 4,5-epoxy-(e)-2-decenal, the panel came up with meat fat, oily nut notes and potato or French fry profiles.

*Possible application*s: Savory, beef, brothy and alliaceous profiles were by far the most commonly mentioned applications. It might have a home in rye bread or also coffee or pork. If we direct our thoughts to vegetables, we can see this in celery, green bell pepper and jalapeno pepper. I would try in tropical flavors or grapefruit as well.

➤**MilliporeSigma:** *www.sigmaaldrich.com*

4,5-epoxy-(e)-2-decenal

Source: Bedoukian

FEMA# 4037, CAS# 188590-62-7

Natural occurrence: Apricot, beef, bread, grapefruit, ham, mandarin, orange, popcorn, rye, sesame seed, soybean, tea, tomato.

Odor: @ 0.01%. Generic fatty, oily, fruity, tropical, herbal, citrus, turns dairy on dry out.

Taste: @ 0.01 ppm. Fatty, oily, weak, green, vegetal.

Taste: @ 0.05 ppm. Fatty, oily, green, apple skin, herbal, citrus, beany.

*Possible application*s: If we focus on the fatty aspect here, we came up with meat fat, oily nut notes and potato or French fry profiles. But when we focused on the green oiliness we found uses in apple, pear, pineapple, guava, strawberry melons, citrus (specifically tangerine and orange) cucumber and cilantro.

➤**Bedoukian:** *bedoukian.com*

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One product. Endless possibilities.

With its smooth notes and creamy texture, it's no surprise that Vanillin, Natural can be found in hundreds of flavor and fragrance combinations. But endless possibilities need a supply to match.

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The Natural Choice for Flavor and Fragrance Ingredients

Developing Better Products through Natural Chemistry

Penta Manufacturing Company is Family Owned and Operated for Over 40 Years.

Here is a partial listing of our Family of Natural Essential Oils utilized in Flavor and Fragrance formulations.

For detailed paperwork on all of our items consult our web site at www.pentamfg.com

- ARMOISE OIL
- BALSAM PERU OIL
- BERGAMOT OIL BERGAPTENE FREE
- BLACK PEPPER OIL
- CARDAMOM OIL
- CEDARWOOD OIL TEXAS
- CELERY SEED OIL
- CORRIANDER OIL
- COSTUS ROOT OIL
- DILLSEED OIL
- JUNIPER BERRY OIL
- LIME OIL DISTILLED
- LOVAGE ROOT OIL
- NEROLI BIGARADE OIL
- ORANGE OIL BITTER
- SANDALWOOD OIL
- SPRUCE OIL
- TANGERINE OIL
- YLANG YLANG OIL
- VETIVER OIL

For a complete list of all our natural, natural identical and synthetic ingredients visit us at www.pentamfg.com

Penta®

Penta Manufacturing Company

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