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October 2024

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FACE VALUE

Can't miss interview with U.S. FDA on MoCRA's new authority, fragrance allergens and animal testing on page 38.

Flavorcon 2024 is Serving Flavor Chemists in Atlantic City

9 Little Used Aroma Chemicals to Create A Luxurious Vanilla Flavor

Perfumer & Flavorist+ Reveals 2025 Taste & Scent Themes

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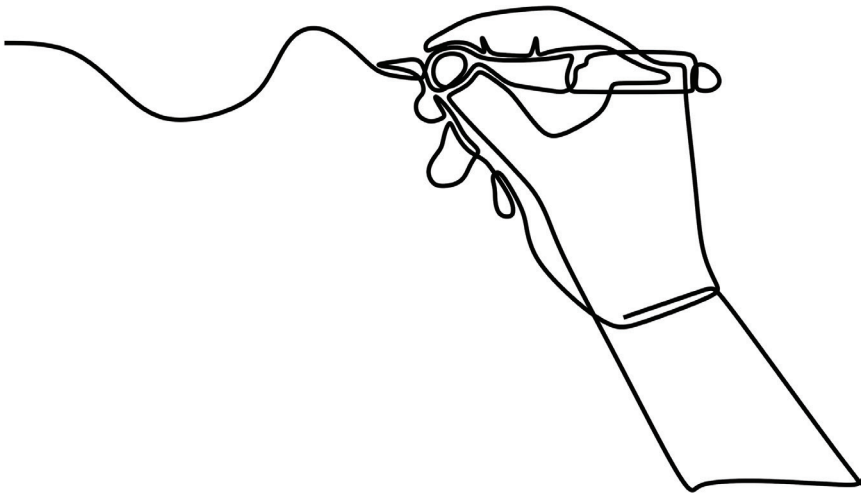
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A Call for Fresh Voices in Taste & Scent



P&F+ is looking for fresh voices to pen an article for upcoming issues of the magazine.

As we creep toward the close of 2024, *Perfumer & Flavorist+* has launched its taste and scent themes for 2025 (**page 28**). With this in mind, I wanted to put a call out to flavor and fragrance professionals to weigh in on trends, topics, white space, segments, or even ingredients that are exciting them. I'm looking for fresh voices to pen articles for the coming year or be open to a conversation about the evolving F&F industry.

2025 marks my fourth year as the managing editor for *Perfumer & Flavorist+* and my introduction to the intricate ecosystem that is the flavor and fragrance industry. I know that I still have so much to learn and my job is to tell the story of the makers, companies, and technicians behind the growth of the industry. Are you that voice?

My wishlist includes:

- International trend insights
- Perspectives from students and mentors alike
- Love letters to ingredients from both perfumers and flavorists
- Insights on home care, air care and personal care as it pertains to fragrance
- Insights on oral care and tobacco as it pertains to flavor
- A high-level and layman's breakdown of the state of labeling
- Research articles that can spark innovation within F&F

Never written an article? No problem. Send me an email with your pitch and we can schedule a call to fine-tune your vision. Be sure to visit *https://www.perfumerflavorist.com/page/author-guidelines* prior to sending your pitch (jtroyli@allured.com).

If you're looking for specific insight, please share your feedback! I can work with our diverse advisory board to find the right professional to shed light on any topic in the industry. The floor is yours, and I'm ready and willing to facilitate!

Be sure to follow *P&F+* along on LinkedIn and Instagram (@perfumer_flavorist+) for event coverage, polls and other exciting multimedia content.





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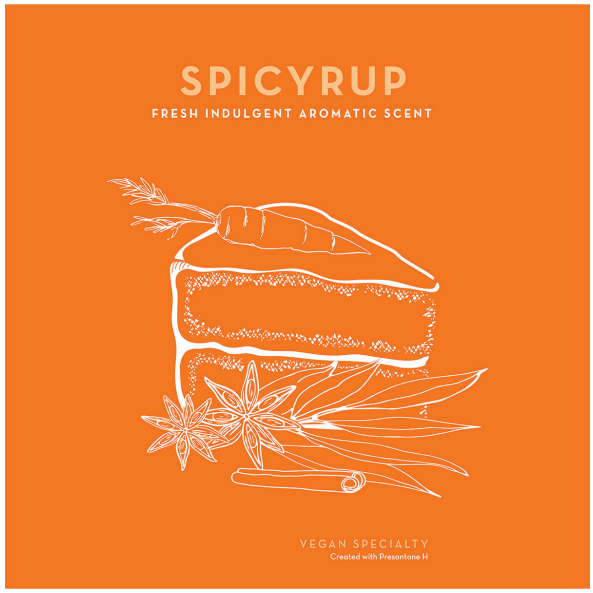
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Ingredients



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Created with Mane captive molecules, Spicyrup reveals a long-lasting multi-faceted profile. Initially fresh and aromatic, it will then awaken the senses with an earthy scent and warm spicy facets. Finally, powdery notes of vanilla and caramel make it exquisitely gourmand. Its scent gives new meaning to the word "addictive."



α-Sinensal

Berjé Inc.

https://www.berjeinc.com/contact/sales/

Berjé's α-sinensal (FEMA# 3141, CAS# 17909-77-2) imparts a pleasant sweet-citrus aroma, with green and slightly waxy undertones. The material can enhance the natural intensity and aromatic potency of citrus materials such as orange and tangerine.



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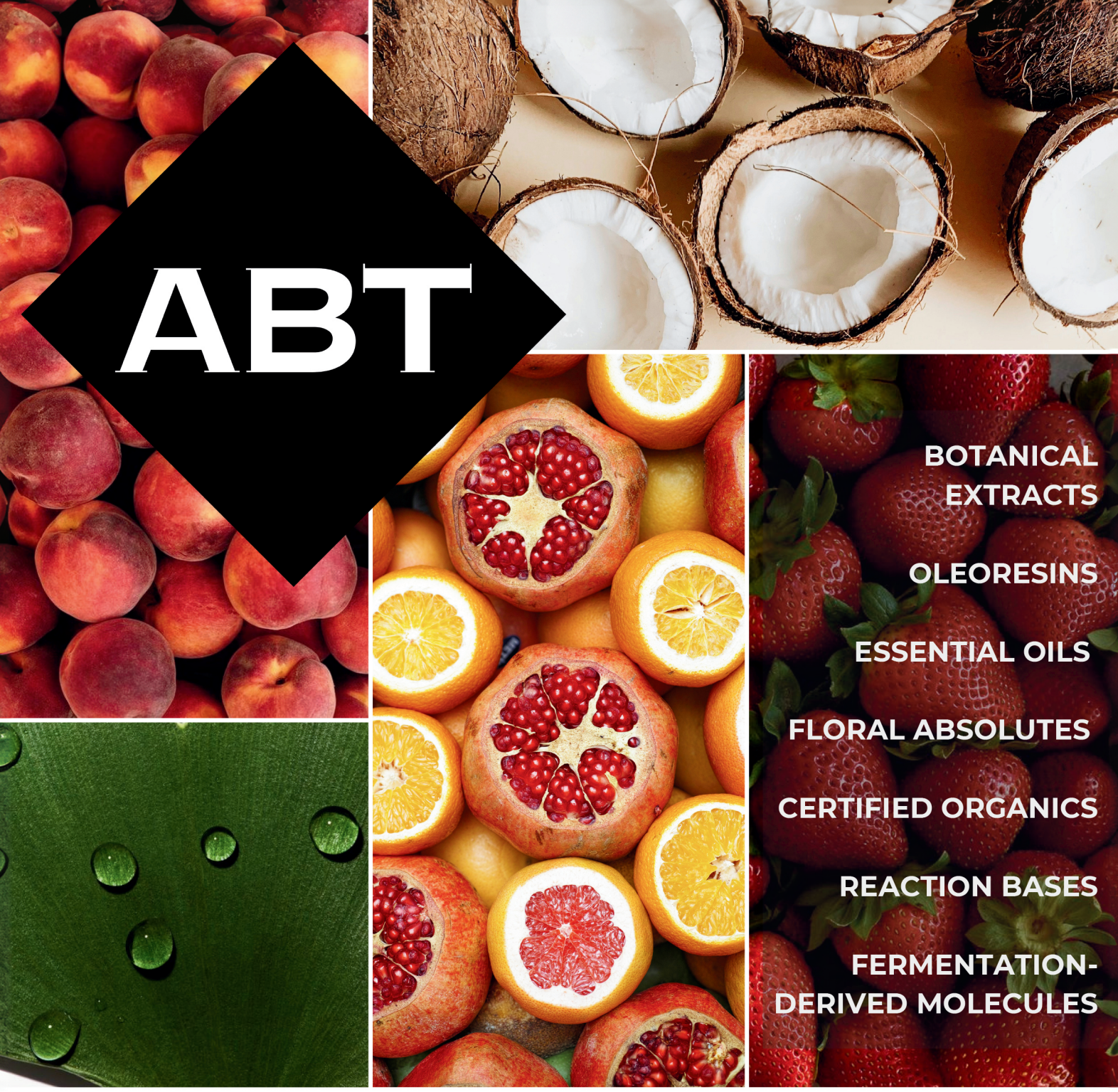
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Avant Organics

avantorganics.com

Cocoa hexenal (FEMA# 3199, CAS# 21834-92-4). Indulge your senses with the rich, velvety aroma of cocoa hexenal. This captivating flavor compound evokes the comforting embrace of creamy cocoa and the bittersweet depth of dark chocolate. Its powerful aldehydic, chocolate, and nutty notes will tantalize your taste buds and transport you to a world of pure indulgence. Whether crafting decadent candies, savoring aromatic coffees, or sipping on velvety milk drinks, cocoa hexenal will elevate your creations to new heights of deliciousness. Its ability to enhance the creamy texture of chocolates, deepen the richness of coffee, and create irresistible gourmand aromas will leave you craving more. Avant Organics provides this material as U.S. Natural, Kosher, non-GMO and Halal. For your free sample please email info@avantorganics.com.

Images courtesy of the manufacturers



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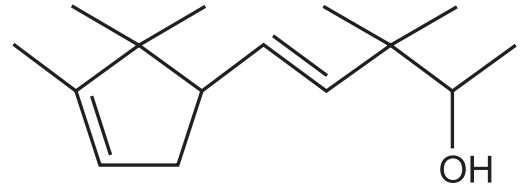


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www.hangzhougrascent.com

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Natural Methional

Xiamen Bestally Biotechnology Co., Ltd.

http://www.bestally.com.cn/

Natural methional (FEMA# 2747, CAS# 3268-49-3) boasts a taste description at 0.01 ppm to 5 ppm of musty tomato, potato, vegetative, mold-ripened cheeses, onion and beefy brothy. This ingredient can be used in potato, cooked meat/onion flavors in sauces at 12 ppm, in bakery and frozen foods at 5 ppm as well as dairy and drinks at 2 ppm.

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FLAVOURS

BY CAMILLE & CHARLOTTE
× MANE

The organoleptic palette crafted for our flavourists is boundless. From universal tastes to those of a single land, we offer gustatory journeys to delight every palate. These sensory experiences spring from a blend of unexpected recipes and innovative solutions delivering authentic, unforgettable tastes, each a symphony of flavour, a feast for the senses.

Camille & Charlotte are the winners of the Capture What Moves photo competition held by MANE.



Influencer Jade Bodley Shares Experience of Working with Perfumer to Craft Pêche Délicieuse by Le Monde Gourmand

Pantone named Peach Fuzz as the 2024 Color of the Year. Since then, we've been seeing numerous scents created with peach at the center. The latest is Le Monde Gourmand's Pêche Délicieuse, crafted by Jade Bodley.

Pêche Délicieuse is described as "a sensory journey, a symphony of sumptuous scents designed to transport you to a world of indulgence without guilt."

Top Notes: Peach, crumble, cinnamon and orange
Mid Notes: Cocoa, white rose and caramel
Base Notes: Creamy vanilla, soft woods and baked musks

Perfumer & Flavorist+ connected with Bodley (JB) to discuss the inspiration behind the scent and the process of working with a perfumer to have the concept come to life.



Pêche Délicieuse is described as "a sensory journey, a symphony of sumptuous scents designed to transport you to a world of indulgence without guilt."

Peach is currently trending in fragrance, can you speak to how peachy notes are being utilized in fragrances? What are consumers looking for with this note?

JB: I feel like people look for 1 of 3 different types of peach fragrances. The fresh peach (think fruity shampoo), the juicy peach (think Trader Joe's peach halves), and the sweet peach (think peach desserts). In Pêche Délicieuse I wanted to capture the juicy peach and the sweet peach as I feel like the fresh peach has been done many times before in fruity floral fragrances especially paired with osmanthus. I wanted to create a new, fun, and delicious take on peach!

What did the process of creating this fragrance with a perfumer look like? Anything you didn't expect? What was the most exciting part of the process?

JB: The process of making Pêche Délicieuse was so fun because I had complete creative control. I made a video board for the fragrance house filled with images, food, fashion, colors, and even songs. There was a ton of burnt orange coloring, peach cobbler, and even Peaches by Justin Bieber and Peaches and Cream by 112. With this inspiration, the perfumer made different modifications of the fragrance so I could find my favorite. There were things I liked and disliked about every mod in the first round and I was able to communicate that to eventually get my perfect peach perfume after 3 rounds of mods! We probably went through 20-39 mods before landing on what is now Pêche Délicieuse. I loved how interactive the experience was and like I said, I had completely creative control. They were so kind listening to the feedback and really understanding what I was going for. The most exciting part was smelling all of the modifications. Even the ones that weren't necessarily what I was going for were still all amazing. Some even made me want to reconsider my direction and I wear them to this day.

How does peach complement the other ingredients in this fragrance?

JB: The orange note definitely emphasizes the juiciness of the peach. It makes it smell more succulent. I know I wanted a peach cobbler-inspired scent but I still wanted the peach note to be prominent and very juicy without getting lost in all the sweetness. The orange really supports that. The caramel and peach work well together because it gives it that syrupy vibe of peaches being cooked down and simmering on a stovetop; the base to peach cobbler was so important for me to capture.

How does this fragrance differentiate from what's currently on the market?

JB: I have yet to see a peach cobbler-inspired perfume on the market. It's a dessert that's so nostalgic to me so

Courtesy of Jade Bodley

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I had to bottle up the fragrance. Most peach fragrances that I've seen on the market have been fresh and/or floral. I wanted the fruity aspect of peach but not necessarily any freshness or heavy florals. Peach is often paired with osmanthus which is a flower or something musky like ambrette. Additionally, many gourmand fragrances didn't feature peach as a prominent note while we were creating this perfume. At the time, the lemon gourmands were trending, nutty and pistachio gourmands were having a moment but there wasn't a moment for peach. This is different because it has that juicy fruity aspect while also being mouthwatering and smelling like a baked dessert. I find a lot of fruity fragrances really focus on the fruits and sometimes those baked dessert gourmand fragrances really focus on the cakey/baked goods aspect. It's hard to find a fragrance that does both. And because of that, Pêche Délicieuse is really a gourmand that works all year round. It's sweet and edible enough for fall/winter wear but juicy and fruity enough for the spring/summer.

p&f+

Dolce&Gabbana Debut Fefé, The First Luxury Alcohol-free Fragrance Mist for Dogs



Dolce&Gabbana Fefé features ylang ylang, musk, and sandalwood.



Dolce&Gabbana Fefé fragrance comes in a green lacquered glass bottle, decorated with a red metal cap and adorned with a 24k gold-plated paw at its center.

In late 2023, Dior launched a scent specifically for babies, Bonne Étoile. Now, we're witnessing the first luxury alcohol-free fragrance mist for dogs—Dolce&Gabbana Fefé. Made by Dolce&Gabbana, the fragrance mist was crafted by renowned master perfumer Emily Coppermann.

The fragrance features is described to feature a blend of the following ingredients: cocooning and warm ylang ylang, a clean and enveloping touch of musk, and soft and creamy sandalwood.

According to a release, Dolce&Gabbana Fefé was created to offer a pampering experience for both dog and owner alike. The alcohol-free fragrance mist is said to ensure safety for the dog's skin and eyes while providing malodor control for a "luxurious scented experience of companionship that caresses the senses of owners and their dogs."

The product has been certified according to the SAFE PET COSMETICS protocol, the only voluntary protocol that applies the same standards that regulate human-use cosmetics.

p&f+

Courtesy of Dolce&Gabbana Fefé

T. Hasegawa Registered for USDA-certified Meat and Poultry Flavor Production



T. Hasegawa is adding equipment, resources and production space to produce USDA-certified meat and poultry-based products, such as soups, food bases and seasonings.

T. Hasegawa has officially registered with the U.S. Department of Agriculture (USDA) for the production of USDA-certified meat and poultry flavors. The company's facilities have been approved by the USDA since 2023, the new registration enables T. Hasegawa to begin production of USDA-certified flavors.

The company has announced it is adding equipment, resources and production space to produce USDA-certified meat and poultry-based products, such as soups, food bases and seasonings.

To obtain certification, T. Hasegawa USA was required to implement significant enhancements to its Cerritos, California production facility to ensure compliance with USDA regulations. All production spaces and equipment undergo daily pre-operation inspections by a USDA inspector, who approves the standard operating procedure (SOP) before production begins – and then reviews each batch's flavor formula, declared ingredient labels and individual ingredients.

Starting this month, T. Hasegawa will offer a comprehensive range of USDA-approved meat and poultry flavors, including beef, pork, chicken and others. These flavors are available in a variety of delivery systems including powders, liquids and pastes.

"Securing USDA certification marks a major milestone in T. Hasegawa's savory flavor capabilities and greatly expands our production opportunities for meat and poultry flavors" said Tom Damiano, CEO of T. Hasegawa USA. "We continually set the bar for the highest standards of quality and safety standards, and offering USDA-certified flavors ensures that our customers will receive products produced under rigorous oversight in an approved facility."

"T. Hasegawa is widely recognized throughout the industry for meat flavor concepts that utilize our innovative technologies to provide great-tasting flavors that solve manufacturing challenges," said Mary Meier, director of savory technology at T. Hasegawa USA. "USDA certification allows us to apply our proprietary technologies and best-in-class flavor solutions with a wider range of applications and production possibilities for CPG brands and food operators that require USDA-certified ingredients."

p&f+

Courtesy of T. Hasegawa

Personal Care Company Native Partners with Cognitive Neuroscientist on the Psychological Science of Smell

Clean personal care company Native's Scent Alchemy campaign invested in a partnership with cognitive neuroscientist, Rachel Herz, Ph.D., to educate consumers on the psychological science of scent and highlight how your favorite fragrances can "do much more than simply smell good, they can lift your mood, calm your mind, and evoke memories."

Herz (a *World Perfumery Congress* 2022 speaker) has been researching the psychological science of scent, emotion, and cognition since 1990. Her research has demonstrated how odor-evoked memory is emotionally unique and powerful compared to other memory experiences, and how emotions can become associated with scents and these emotions are instantly activated when we smell these fragrances again.



An assortment of Native's most popular scents and products, curated into captivating scent stories including Solar Florals and Balancing Nature.

"The sense of smell is unique compared to any of our other senses because when we smell something, we are activating the same part of the brain that processes emotion and memory," says Herz in a release by Procter & Gamble. "This is why a scent can bring back memories, make you feel transported, and take you back to the original time and place when you first connected the emotion."

To guide consumers in their journey of discovering a new scent layering routine, Native chief fragrance officer, Natalia Lebedev, curated an assortment of its most popular scents and products into captivating scent stories, including Sparkling Citrus, Balancing Nature, Solar Florals, and Elevated Gourmands.

Each scent story features products like deodorant, body wash, shampoo, and conditioner that are paired to enhance a unique kind of mood:

Sparkling Citrus: An uplifting combination of citrus and herbal notes in scents like Citrus & Herbal Musk, Lilac & White Tea, and Grapefruit & Bergamot to help you feel uplifted, happy, and find bliss in your morning routine.

Balancing Nature: A soothing and calming collection of nature-inspired scents like Sea Salt & Cedar, Cashmere & Rain, and Blackberry & Green Tea that work to create a relaxing and grounding at-home ritual.

Solar Florals: Featuring invigorating and transportive scents like Palm Leaf & Agave, Cotton & Lily, and Almond & Shea Butter to inspire a sun-kissed and beachy feeling no matter where you are.

Elevated Gourmands: A focus on creamy and delicious scents like Coconut & Vanilla, Sandalwood & Shea Butter, and Coconut Milk & Turmeric that promote all-day comfort and indulgence.

"At Native, we believe the scent journey for consumers is key," said Lebedev. "We joined together with Dr. Herz to bring an educational moment to share why we pair our scents the way we do, providing insight into the feelings of joy we aim to spark when using Native—since your personal care routine should be a time of self-care!"

"Smelling scents that we really like and give us positive feelings are good for our overall mental health and well-being," said Herz. "For example, I love the Sea Salt & Cedar in the Balancing Nature set because it reminds me of being in a cool pine forest when I lived in British Columbia. Whenever I smell it, I instantly feel restored, calm, and relaxed."

p&f+

Courtesy of Native

PROFILE: HONORIE BLANC

Blanc shares her journey in scent and what's exciting her as a a perfumer in this one-on-one interview.

Honorine Blanc, Master Perfumer

What led you to the fragrance industry?

Honorine Blanc [HB]: I've loved beauty products since I was 14 years old. I was born in Lebanon and I moved to Paris at 16 where my passion for becoming a perfumer truly began to take shape.

I love fragrances and enjoy experimenting with their formulas. What captivates me most is not the glamour or the end result, but the creative process itself. I find joy in crafting and refining my formulas, savoring the journey of creation rather than just the final product.

What applications do you primarily formulate for? Has this changed since you first began your career?

HB: Creating new scents—whether for shampoo, candles, or fine fragrances—is a challenge that I love because it's full of surprises and beyond control. Just like nature, fragrances offer endless possibilities and can evoke powerful emotions.

Over time, you may get used to certain ingredients, but the way you live and your emotions will always influence your creations. For me, the creative process is like a second personality, free from rules and constraints.

The most important aspects are the idea behind the fragrance, how it's constructed, and the experience it brings to the market. Ultimately, a fragrance should be a source of pleasure.

What are some of the current trends that are exciting you at the moment?

HB: Today, the young generation is breaking the rules, embracing authenticity over perfection, and expressing individuality beyond traditional gender norms. This shift allows everyone to be who they truly are. Men are now enjoying jasmine and roses, while women are wearing vetiver and leather, embracing their true selves.

In fragrance creation, simplicity and honesty in structure are becoming more valued. Consumers want to know what's in their products and appreciate transparency. There's a trend toward taking more risks with gourmand scents while keeping the construction simpler. The way we treat ingredients like rose is now intentionally imperfect, moving away from overly refined edges.

The trend of living in the moment and enjoying life's melodies is also reflected in fragrance creation. As technology advances, fragrances will become more elevated, meeting consumers' demand for quality and innovation. This evolution adds value and aligns with the growing desire for emotional well-being through scent.

Sustainability is another significant trend. The concept of green or sustainable fragrances is gaining traction, driven by a greater awareness of nature and the need to protect the earth. The young generation is leading this change, integrating sustainability into their creative processes from the outset.



Name: Honorie Blanc

Title: Master perfumer, dsm-firmenich

Courtesy of dsm-firmenich

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Advice for people coming into the fragrance industry?

HB: Today's creators must be more educated and innovative. Simply smelling is not enough—you need to engage with new technology and embrace its potential to enhance your understanding of the past. Technology offers historical insights on a plate, making it an invaluable tool for modern perfumers.

A perfumer today must be agile and willing to step out of their comfort zone, as true creativity often emerges from taking risks. Embrace the spirit of playfulness, remain open-minded, and don't become too attached to any single idea.

Just like musicians who create endless melodies from the same notes, perfumers should focus on the unique contributions of each ingredient rather than its price. The real value lies in what each element brings to the formula.

Never give up, and stay humble. Remember, the star is your product, not yourself. My goal is to be recognized for the fragrances I bring to the market and the students I mentor along the way. Embrace adventure, play, and surprise people. Enjoy the ride!

Describe yourself in three ingredients.

HB: I would rather choose to describe myself in three colors.

1. White: Because I love sensuality.
2. Pink: Because happiness is always important but also optimism in my work.
3. Black/dark: Because of the unexpected. I like the playing term of taking risks, I love pleasure and I love beauty.

p&f+



In cherry flavors, butyl acetate plays a secondary role, and levels range from 30 ppm to 100 ppm.



BY JOHN WRIGHT
johnwrightflavorist@gmail.com

FLAVOR BITES:

Butyl Acetate

How navigate the subtle nuance of n-butyl acetate can be utilized in fruit and non-fruit flavors.

In so many instances the choice between the normal and iso versions of flavor chemicals is fairly straightforward. Menthone is an easy winner over iso-menthone in mint flavors. iso-Amyl acetate usually performs vastly better than n-amyl acetate in fruit flavors. A studied, deliberately contrarian approach cannot be ruled out (and might be greatly admired), but the easy choice is pretty obvious.

The contest between n-butyl acetate and iso-butyl acetate is not so easy. The normal ester is a little brighter, but also a touch harsher. Whichever way you look at it, there is not a lot to guide your choice. That is also demonstrated in the similar annual use levels of the two esters.

For this article, I will look at n-butyl acetate (FEMA#: 2174, CAS#: 123-86-4). The character is mostly banana, with a hint of rum. This ester is very effective when used in combination with iso-amyl acetate in a wide range of flavors.

Image by viktoriagavril at Adobe Stock

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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 a simple bouillon.

Fruit Flavors

Apple: As so often in this article, butyl acetate is clearly not the primary ester in apple flavors, but it does round out ethyl 2-methyl butyrate in a very attractive way. Five thousand ppm is a reasonable level of addition.

Apricot: The effect is much more subtle in apricot flavors, and levels in the range from 500 ppm to 1,000 ppm are most effective.

Banana: Here the obvious partner ester is iso-amyl acetate. Three thousand ppm of butyl acetate adds welcome complexity without detracting from the impact.

Blackberry: The aliphatic ester note is relatively recessed in a number of berry flavors and blackberry flavors offer a typical example. A range of levels of addition of this ingredient can work, up to 400 ppm.

Blackcurrant: The same comments also apply to blackcurrant flavors. The ideal level can vary, but 100 ppm is probably as high as you need to go.

Cherry: The ideal level of butyl acetate in cherry flavors depends on the choice of other esters. It only plays a secondary role, and levels range from 30 ppm to 100 ppm.

Fig: Fig flavors, especially those aimed at fresh figs, are lifted and enhanced by 300 ppm of butyl acetate.



Butyl acetate brightens the fruity aspect of all types of plum flavors. Three hundred ppm works very well.

Grape, Concord: Methyl anthranilate can be way too dominant in Concord grape flavors. Two hundred ppm of butyl acetate, along with other esters, helps to smooth the profile without diminishing the impact.

Guava: Guava flavors inevitably owe much of their fruit profile to methyl cinnamate. A hint, around 100 ppm, of butyl acetate lifts that effect appreciably.

Jackfruit: Butyl acetate is much more at home in jackfruit flavors than in durian flavors, even though the profiles have some similarities. Four thousand ppm is not excessive.

JOHN WRIGHT'S FLAVOR CREATION,
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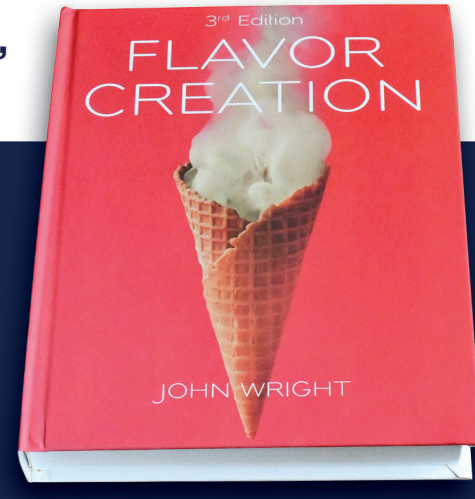


Image by volff at Adobe Stock

Mango: Butyl acetate is particularly good in mango flavors, adding a bright note and simultaneously mellowing the mango skin notes. Levels vary, but 300 ppm is a good starting point.

Melon: All melon flavors are in severe danger of being overwhelmed by iso-amyl acetate, this is especially true of cantaloupe melon flavors. Butyl acetate enables relatively high levels of iso-amyl acetate without that chemical being quite so obvious. Five thousand ppm is a good level.

Nectarine: The effect of butyl acetate in nectarine flavors is to lift and brighten the profile. As always, the level of addition is a question of creative opinion. Levels up to 1,000 ppm are, in my opinion, effective.

Passionfruit: Passionfruit flavors rely more on ethyl esters than iso-amyl esters, so the effect of this ingredient is quite subtle. One hundred ppm works well.

Peach: Levels ranging from 300 ppm to 1,000 ppm are acceptable in peach flavors. In this profile, I lean towards the lower end of that range.

Pear: Butyl acetate enhances and brightens the impact of hexyl acetate at levels of addition in the region of 5,000 ppm.

Plum: Butyl acetate brightens the fruity aspect of all types of plum flavors. Three hundred ppm works very well.

Pomegranate: Pomegranate flavors are an interesting challenge, with most of the key fruity notes being fairly non-volatile esters such as hexyl 2-methyl butyrate. This ingredient brightens the profile nicely at 300 ppm.

Raspberry: Butyl acetate combines well with several other esters in raspberry flavors and works particularly well with hexyl acetate. Three hundred ppm is ideal.



Two hundred ppm of butyl acetate only works around the edges of the profile, but it does add authenticity.



Butyl acetate provides an attractive note in sapodilla flavors. Levels of addition start around 500 ppm.

Sapodilla: This ingredient provides an attractive note in sapodilla flavors. Levels of addition start around 500 ppm.

Strawberry: Strawberry flavors are also more obviously dominated by ethyl esters. Eight hundred ppm of butyl acetate adds complexity and brightness.

Watermelon: Levels of butyl acetate in watermelon flavors vary, mostly depending on the level of fantasy aspects to the profile. Five hundred to two thousand is a good range helping, as with cantaloupe melon, to disguise the iso-amyl acetate.

Non-Fruit Flavors

Chocolate and Cocoa: Chocolate and cocoa flavors may seem to be an unexpected home for butyl acetate. The level of use is very modest, around 50 ppm, but the subtle brightening effect is very positive.

Milk, Condensed: Condensed milk and dulce de leche flavors are weighed down by so many heavy, sweet, cloying ingredients that a little lift is welcome. Only 100 ppm of butyl acetate provides that lift without being obvious.

Olive: I love good olive oil and replicating the flavor is a highly interesting challenge. Two hundred ppm of this raw material only works around the edges of the profile, but it does add authenticity.

Soy Sauce: Soy sauce flavors should have a very modest fruity character. Butyl acetate can contribute to this at around 20 ppm.

Walnut: The same comment is also applicable to walnut flavors. The ideal level of addition is a little higher, nearer 50 ppm.

Wine: Butyl acetate, in quantitative terms, is easily pushed into second place by iso-butyl acetate in all fermented flavors. Despite this, it can add a little sharpness as a secondary component. One hundred ppm in wine flavors is a good example of this effect.

p&f+

From top: image by CHAKKAPONG; volff at Adobe Stock



trans-2-Hexenal, Natural
FEMA 2560
green, fruity, and citrus flavor with notes of apple

2,5-Dimethyl-3(2H)-furanone, Natural
FEMA 4101
caramel, sweet, nutty, roasted, coffee, baked confection

2-Ethyl-4-Hydroxy-5-Methyl-3(2H)-Furanone, Natural
FEMA 3623
caramellic, sweet, sugar-like, spicy notes

Trimethyl Pyrazines, Natural
FEMA 3244
nutty, roasted peanut, cocoa

Anisyl Alcohol, Natural
FEMA 2099
vanilla, sweet, floral

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5 Superstars Spotted at *World Perfumery Congress* 2024

At the *World Perfumery Congress*, the best perfumery contestants show off their ingredient wonders.

BY LAURENCE ARRIGO-KLOVE, industry writer and editorialist at Essencional*



Laurence Arrigo-Klove

*This article first appeared in Essencional titled, "*WPC* Best In Show. A Cast of Superstars. The Perfume Ingredients."



A view from above of the World Perfumery Congress 2024 at the Palexpo Center in Geneva.

Photo by Peter Wynn Thompson, Caption by Laurence Arrigo-Klove

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While the *World Perfumery Congress* 2024 (*WPC*) is in progress and each industry contestant is showing off its wonders, the level of buoyancy becomes stronger. In Geneva, the excitement stems from ingredients novelties and contentment for innovative technologies. The visitor catches both the exhilaration and the tension as the heady scent of competition is in the air during one of the key events in the perfume industry. For my first visit to the *WPC*, I could not help falling head over heels, smelling magnificent ingredients while engaging with the most talented perfumers and experienced actors. There were three intense days full of scent diverse ways; uncovering concept stands, smelling ingredients, listening to conferences, mingling with participants, and finally networking and partying in the evening! In the end, so much learning resulted from attending.

A Relentless Quest For The Best Ingredients. And More.

The 2024 *WPC* is 'the sensory event for fragrance leaders'. For industry players who tackle the Olympic battle, the competition is all about innovation. The medals will reward the absolute best performances in fragrance trends, ingredients, creativity, and technologies. In my opinion, the motto '*a*ltius, citius, fortius' applies to the tempo of the perfume industry. One key finding was the understanding of two ingredient categories, captive and non-captive. Captive means proprietary and therefore exclusive to specific clients. Whereas the palette of non-captive is up for sale to the market, including direct competitors. A player can very well acknowledge the quality of an ingredient from another contestant and elect to purchase the molecule. Like a decathlon athlete who rarely is the best in all the ten disciplines of the contest. In the end, it is the overall best athlete who wins the game.

> "My intention is not to provide the reader with an extensive exhibitor summary but to outline a selection of personal highlights of my exhibition itinerary."



WPC *2024 hosted three intense days of mesmerizing conferences.*

Flavorcon (www.flavorcon.com)

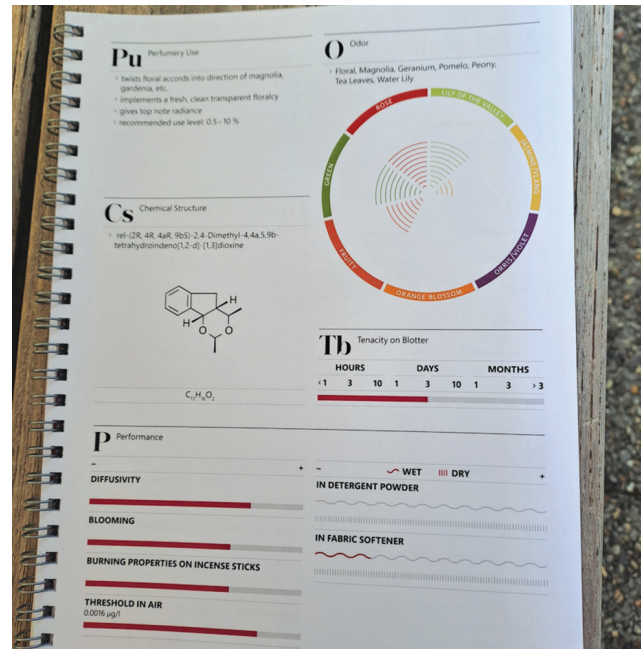


The Naturals Corner is the creation of Resperfuma inspired by the idea of an exploration all at once of seven destinations.

Without further ado, I start my paper with an original and 'natural' corner. The first-time stand was popular during the show and was not in the shadow, yet I want to show my appreciation for their grand mission.

1. The World 7 Wonders of Nature. The Naturals Corner.

The 7 wonders official list features the Iguazu Falls (South America), Ha Long Bay (Vietnam), Jeju Island (South Korea), Puerto Princesa Underground River (Philippines), Table Mountain (South Africa), Komodo Island (Indonesia), and the Amazon Forest (South America). At *WPC*, the 7 wonders are of a different nature with ingredients as superstars. The Naturals Corner exhibits seven world-independent producers and their stunning natural ingredients; rose and lavender in Bulgaria (by Enio Bonchev Production Ltd); vanilla and spices in Madagascar (by Jacarandas Madagascar); flowers and spices in India (by Jasmine Concrete Exports Private Limited); Peru balsam, styrax, guaiac wood and more in South America (by Nelixia); lavender in the South of France (by Cooperative SCA3P); spices, herbs



The Neomagnolan product data and a demonstration formula brochure, rich in chemical information, odor description, performance, and perfumery use.

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NATURAL FLAVOR INGREDIENTS

Bestally is a pioneer dedicated to developing natural flavor specialties and providing values to our partners since 2003. We focus on sustainable business which includes stable quality, fair prices and continuous supply. We devote ourselves to consistent ESG investment as our social responsibilities.



Natural Lactones

FEMA 2796 Natural Gamma Octalactone, Chiral
FEMA 3091 Natural Gamma Undecalactone, Chiral
FEMA 2400 Natural Gamma Dodecalactone, Chiral
FEMA 2361 Natural Delta Decalactone, Chiral
FEMA 2401 Natural Delta Dodecalactone, Chiral
FEMA 3590 Natural Delta Tetradecalactone, Chiral

Natural Specialties

FEMA 2747 Natural Methional
FEMA 2720 Natural Methyl 3-Methylthiopropionate
FEMA 3310 Natural Methyl Thiobutyrate
FEMA 3343 Natural Ethyl 3-Methylthiopropionate
FEMA 3155 Natural 2-Ethyl-3-Methyl Pyrazine
FEMA 3919 Natural 2-Ethyl-6-Methyl Pyrazine
FEMA 3149 Natural 2-Ethyl-3(5 or 6)-Dimethyl Pyrazine
FEMA 4434 Natural 2-Ethyl-5,6-Dimethyl Pyrazine
FEMA 3208 Natural 2-Methyl-3-Methylthio Pyrazine
FEMA 3132 Natural 2-Methoxy-3-Isobutyl Pyrazine
FEMA 3358 Natural 2-Methoxy-3-Isopropyl Pyrazine
FEMA 3433 Natural 2-Methoxy-3-Secbutyl Pyrazine
FEMA 3964 Natural 2-Acetyl-3-Methyl Pyrazine
FEMA 3134 Natural 2-Isobutyl Thiazole
FEMA 3555 Natural 2-Isopropyl-4-Methyl Thiazole
FEMA 3680 Natural 2-Ethyl-4-Methyl Thiazole

and coconut in Sri Lanka (Verger); various native naturals in Europe (by Agroforex Company).

In one instant glance, the independents express their stance of shared values and commitments wherever the sourcing of ingredients takes place. The Naturals Corner is the creation of Resperfuma inspired by the idea of an exploration all at once of seven destinations. The concept puts the limelight on seven key actors and displays their absolute passion and common dedication to responsible ingredient sourcing. During the conference moderated by renowned Dominique Roques, currently president of Balsam consulting, three Naturals Corner independents debated on the topic "Naturals, What Does it Take to Source Sustainably?"



The white shade of Symrise's WPC booth fits nicely with the floral bloom, infused with clean, calm and airy tones.

Now, moving on to the big names and their large stunning booths, I could not help but notice the stronghold of flowers. It seemed that blooms, naturals, or synthetic molecules, were everywhere and had taken the front door and space at *WPC*.



The Molecular Garden by Givaudan exhibited the versatility of 'Nympheal,' a new floral bloom.

2. Neomagnolan by Symrise. A White Blossom Transparency.

Five years of research and development led to the creation of Neomagnolan by Alexandre Illian, a perfumer in the aroma molecules division of Symrise. The name 'neo' conveys the idea that it is a new take on Magnolan; launched in the 50s the grand abstract floral is an industry classic. The new molecule is like a grandchild, respectful and zestful, raised to become the suitable successor of a 70-year-old senior member. With a broad smile and infectious enthusiasm, Illian kindly takes the time to describe the new creation and compare it with the older version. He promptly uses four adjectives to define Neomagnolan the new kid on the block: fresh, modern, luminous, and transparent. I can add: absolutely lovely. He also hands me product data and demonstration formulae brochure, rich in chemical information, odor description, performance and perfumery use.

The white shade picked by Symrise at the *WPC* fits nicely with the floral bloom, infused with clean, calm and airy tones. Surely, Neomagnolan belongs to the new generation of white and light florals, full of an irresistible attraction.

Surely, Neomagnolan belongs to the new generation of white and light florals, full of an irresistible attraction.

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dsm-firmenich revealed its authentic 'jewels,' its ingredients collection.

3. The Nympheal impressionist garden at Givaudan

Givaudan chose the theme of a garden, and what a garden!

Givaudan chose the name Nympheal inspired by Claude Monet's stunning impressionism paintings of water lilies or nymphéas. A clear flower inspiration behind the creation of a white magical floral and its transfiguration into distinct colors, volumes, and perspectives. A new landscape in full bloom, an evocative escape named The Molecular Garden. To demonstrate the versatility of the olfactory profile of Nympheal. Givaudan utilized the lovely muguet aldehyde in perfume, laundry fabric, softener, shampoo, candle and my personal favorite, textile formulations. I am a fan of Toile by Byredo, so I am particularly fond of the T-shirt spritz called Citrus pour soi. What a memorable impression of a sustainable creation! What's more, I love the opulence of the fragrance.

I also listened to the Givaudan conference session "Understanding & Capitalizing on Gen Z's New Olfactive Codes" presented by mesmerizing Arnaud Guggenbuhl, global head of marketing, Insights & Image Fine Fragrance and perfumer Nisrine Grillié.



WPC *hosted a conference session "Understanding & Capitalizing on Gen Z's New Olfactive Codes" presented by Givaudan's Arnaud Guggenbuhl(R), global head of marketing, Insights & Image Fine Fragrance and perfumer Nisrine Grillié(L).*

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THE OTHER IS JUST A BOTTLE OF CHEMICALS

GOURMET
INGREDIENTS
Shallots, Onions & Garlic

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Our onions, shallots & garlic are highly versatile and potent vegetables with much more under their layers then you might already know. That's why we turn them into 100% plant-based and naturally processed clean label ingredients for a wide range of applications. You can use them to create depth in savour, a pungent note, the right mouthfeel or the naturally sweetened version of your bestseller. Give your food and beverages an unmistakable taste signature. Our experts can help you with your formulation goals. Get in touch with us via our website.

Scan me!

As I had not seen the 'What Is Love' exhibition, the presentation was an amazing experience. I learned the social listening base of the solid two-year research and got a glimpse of a different world. I embraced the different language of the Gen Z generation, the 'no filter,' 'me myself and I,' 'swipe right,' and specific frames of mind on identity, gender, and dating. I was enthralled by the perfect translation into two perfumes; 'Cry Me A River' a protecting shield against anxiety and "Come as You Are" a pure expression of animal attraction.

4. dsm-firmenich Outstanding Ingredients Collection

The company has a rich history of magnificent perfumery ingredients, authentic jewelry treasures based on advanced scientific innovations and experienced natural extractions. I indulged in the 2024 six-collection novelties; two delightful naturals (Pink Pepper Madagascar, Jasmine Flower India), three magnetic synthetics (dihydroestragol, Velvet Musk, Cashmere Mush) and a superb patchouli based on biotech (Clearwood Prisma). I especially loved the daring of dihydroestragol, an original aromatic, tarragon with a licorice undertone. It was easy to engage in the dsm-firmenich experience; I smelled stunning ingredients, discussed with welcoming employees, scanned QR codes and played with fragrance-smelling pencils. The playful pencils are smelling tools, not to be applied on the skin, for the nose only. There is a large palette of pencils on display, which made me think of the name 'Beautiful Colors of Ingredients.'

To sum up dsm-firmenich's outstanding collection and obsession with ingredients quality. The conference session, "Innovation in Fragrance Creation: Partnership and New Technology at the Heart of New Ingredient Discovery" unveiled the raw passion of the company's François-Raphael Balestra, master perfumer & New Ingredients Discovery and Sarah Reisinger, Chief Science & Research officer.

5. Mane time space station. An exploration mission.

With the line 'We Capture What Moves' Mane took the visitor through a scientific journey in space and time…

Like the Geneva CERN Science Gateway, the tube created by Mane is a journey through space, time, science, and the environment. It is a limited edition scientific station as once the *WPC* is over, the paper-based station will be packed down and recycled. The original Mane station is an exploration mission of perfume ingredients. The creative capsule opens new horizons with wide perfume configurations and a



The dsm-firmenich WPC 2024 booth utilized playful pencils as smelling tools, not to be applied on the skin, for the nose only for attendees to experience scents.



At Mane's WPC 2024 booth, there was a splendid ingredients palette to discover at the gate with six molecules from the future available in the present.



R to L: Mathilde Bijaoui, senior perfumer Fine Fragrance (Mane) and Vanessa Handley, director of Conservation Science (The Red List Project) during the "Rescuing The Rare: Pairing Genuine Plant Conservation with New Responsible Ingredient Creation" session.



WPC *is the place to engage - and indulge - with the finest professionals and ingredients.*

beautiful world in transformation. The space position is for fragrance adventurers, molecules lovers, experts' station perfumers, enthusiastic visitors, and optimists' carbon reducers. There was a splendid ingredients palette to discover at the gate with six molecules from the future available in the present; Sublimolide, a warm vegan musk; Benzoin Siam, a spicy ambery pure jungle essence; Rosa Lani absolute, a uniquely delicate and fruity rose from Moldova; Antillone, a crispy biotech tropical molecule; Jasmine Sambac, with orange flower facet and E-Pure Jungle Essence; Spicyrup, a gourmand new creation inspired by a carrot cake. Spicyrup in itself encapsulates the 'traveling' story of Mane olfactory station; it is a surprising journey, taking off with a fresh and aromatic start, then cruising over a warm spice and woody licorice and finally landing on a vanilla and caramel embrace. Utterly mesmerizing!

The conference session, "Rescuing The Rare: Pairing Genuine Plant Conservation with New Responsible Ingredient Creation" was moderated by Sophia Gillio, director of Latin American Strategic Development (Mane) and included Vanessa Handley, director of Conservation Science (The Red List Project), Mathilde Bijaoui, senior perfumer Fine Fragrance (Mane) and Victor Mane, director, Creation, Fine Fragrance & Ingredients (Mane). The discussion highlighted the partnership between Mane and The Red List Project to set up a non-profit foundation dedicated to plant conservation. It aims to prevent the extinction of the world's endangered plant species. Through this session, I discovered three magnificent, endangered ingredients now protected by the foundation; Pacific Cycad, Magnolia Mashpi and Caribbean Juniper.

Swiss Double Cream is the Finest. And the World Perfumery Congress.

As a Swiss citizen living in Geneva, I was absolutely thrilled by the choice of the *WPC*. Choosing Geneva in the month of June was a promise of sunny temperatures, blue lake views, beautiful green parks, elegant outdoor scenery, and delicious sensory treats. The promise was somewhat tainted with powerful evening thunderstorms. No matter the mischievous weather, I was proud to brag about the country's advanced position in chemistry and perfumery and the overall high-quality experience. One of such 'peaks' is the white Swiss double cream, absolutely delicious. On my list of pinnacles, I have now added 'la crème de la crème,' the finest professionals and ingredients of the best show in perfumery, the *WPC*.

*This article first appeared in *Essencional* titled, "*WPC* Best In Show. A Cast of Superstars. The Perfume Ingredients."

Perfumer & Flavorist+ Reveals 2025 Taste & Scent Themes

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2025 is right around the corner; are you ready?

The global flavors and fragrances market size[a] was estimated at $30.61 billion in 2023 and is anticipated to grow at a compound annual growth rate of 5.4% from 2024 to 2030.

F&F is reaching new heights every day due to the tireless efforts of the industry's top minds from around the world whose mission is to set the trends while adhering to evolving consumer demands and regulations.

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Perfumer & Flavorist+'s 2025 Monthly Editorial Themes

JANUARY 2025

ENHANCERS, REDUCERS & REPLACERS
- Sugar Alternatives
- Fat Reducers
- Salt Reducers

SCENT & WELL-BEING
- Emotional & Wellness Benefits of Scent
- Taste & Mouthfeel Enrichment and Enhancement
- Carbon Zero Supply Chain
- Taste Modulation

[a]*https://www.grandviewresearch.com/industry-analysis/flavors-fragrances-market*



Ready to get buzzed? The February issue talks coffee and tea!

Industry Insights:
- Taste & Mouthfeel Enrichment and Enhancement
- Carbon Zero Supply Chain
- Taste Modulation

Product Roundup: Ingredients, Packaging, Equipment & Services

Magazine Due Dates:
Editorial: Mon 11/18/24
Ad Close: Mon 12/02/24

FEBRUARY 2025

WELLNESS & CLEAN LABEL
- Multi-Functional Ingredients
- Packaging for F&F
- Nutritional Ingredients
- Cosmetic Ingredients

COFFEE & TEA
- RTD Coffees and Teas

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Industry Insights:
- Functional Ingredient Technology
- Sustainable Ingredients

Product Roundup: Ingredients, Packaging, Equipment & Services

Magazine Due Dates:
Editorial: Tue 12/10/24
Ad Close: Tue 12/24/24

March 2025

CONSUMER PULSE
- Spotlight on Consumer Demands for 2025
- Industry Leaders Weigh in on New Technologies Aimed to Bridge Ingredient Gaps/Innovation
- Carriers, Solvents & Fixatives
- Latest in Packaging & Equipment
- Synthetics & New Molecules

REGULATORY LANDSCAPE UPDATES

Industry Insights:
- Delivery Systems & Encapsulation
- F&F Software
- Artificial Intelligence (AI in F&F)
- Robotics and Automation in F&F
- Synthetics & New Molecules

Product Roundup: Ingredients, Packaging, Equipment & Services

Magazine Due Dates:
Editorial: Tue 01/07/25
Ad Close: Tue 01/21/25

April 2025

NATURALS
- Extracts
- Testing, Analysis & Authentication
- Essential Oils
- New Naturals with Unique Benefits: Sourcing Strategies, Extraction Techniques



April is all about naturals -- have insights to share? Reach out ASAP to share with readers.



The May issue is dedicated to mint, including oral care innovations.

Industry Insights:
- Traceability & Provenance
- Materials sourcing
- Logistics, Importing and Exporting
- Organics

Product Roundup: Ingredients, Packaging, Equipment & Services

Magazine Due Dates:
Editorial: Mon 02/10/25
Ad Close: Mon 02/24/25

MAY 2025

MINT & SPICES
- Spice Production, Applications & Technology
- Trigeminal Stimulants
- Botanicals

MINT
- Mint & Oral Care Innovations

TOBACCO
- Flavoring for Tobacco Products

Industry Insights:
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- Technological Innovations in Delivery Systems & Performance

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PERSONAL CARE
- Fragrancing for Cosmetics
- Personal Care Fragrance Labeling

CONFECTIONERY
- Sugar Reduction
- Vanilla & Vanillin
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- Flavoring for Marijuana Infused Products

Industry Insights:
- Vanilla
- Sweeteners
- Clean & Allergen-free

Product Roundup: Ingredients, Packaging, Equipment & Services



Sweet tooths, unite! The October issue is ready is to talk all things confectionery

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November 2025

SAVORY
- High Impact Aroma Molecules
- Savory Solutions
- Vegan Ingredients & Alternatives
- Flavoring Alternative Proteins

HOME CARE & CLEANING PRODUCTS
- Trends & New Launches• Labeling & Regulations

Industry Insights:
- Umami, Kokumi & Savory Solutions
- Malodor Tech & Abatement

Product Roundup: Ingredients, Packaging, Equipment & Services

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December 2025

CITRUS
- Solubility & Stability Solutions
- Regional Citrus Varieties



The December issue is all things citrus (one of the hottest topics across F&F)!

- Citrus Ingredients
- Citrus Market Report
- Superfood Flavors

Industry Insights:
- Citrus Ingredients
- Citrus Solutions, Blends & Enhancers

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Flavorcon 2024 Serves Flavor Chemists in Atlantic City

Get a taste of what's to come as *Flavorcon* finally arrives to feed tastemakers' creativity.



Photos by Peter Wynn Thompson

Flavorcon is designed to give flavorists and product developers the tools they need to succeed in an increasingly complex market with carefully curated conference sessions.

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Flavor's favorite event is set to make its grand return to Atlantic City, New Jersey, this month, October 8-9, 2024, at Harrah's Resort & Casino. *Flavorcon* 2024 (*www.flavorcon.com*) is a must-attend for flavorists, product developers, and professionals in the food and beverage industry looking to stay ahead in the ever-evolving market.

This year's conference will feature an impressive lineup of presentations, interactive educational talks, and panel discussions. Attendees will have the chance to hear from industry leaders such as Givaudan, IFF, Kalsec, Sensient, and Takasago. Notable flavorists from consumer packaged goods (CPG) giants like PepsiCo, Campbell Soup and NotCo will also share their expertise.

Don't forget, breakfast and lunch are included in your registration fee! The *Flavorcon* crew will also be headed poolside on day one (October 8) for the Opening Reception.

Get a taste of what's to come as *Flavorcon* finally arrives to feed tastemakers' creativity in the expo hall and within the education discussions on the conference stage below!

>>>Register now to set your flavor innovation agenda; 1-day passes are available, as are group rates.<<<

Expo Hall Finds for Product Innovators & Flavor Chemists

The Flavorcon expo hall is where innovation comes to life. Immerse yourself in a sensory experience filled with flavors, aromas, and cutting-edge ingredients. Engage with industry leaders, sample the latest offerings, and discover new suppliers, partners, and service providers. This is your chance to stay ahead of the curve and bring fresh ideas back to your team.

Pre-Con, Monday, October 7

Flavorists, get your education started early with this first-come first-served pre-Flavorcon session on Monday, October 7! This session will take attendees on a guided tour through a lineup of organoleptic materials with the help of Bell Flavor & Fragrances principal flavorist, Cyndie Lipka, and junior flavorist Michael Morrison as well as a second session featuring independent flavorist and "Flavor Bites" columnist, John Wright and PepsiCo junior flavorist Giuseppe Bongiorno. This session has an additional fee and lunch is included!

Click above to play



Attendees will be split into two groups, first attending a 45-minute session with one of the flavorists and then swapping to join a 45-minute session with the other.

Tuesday, October 8

- "How Social Media Can Inspire Innovation in Flavor Formulation" by Addison Cain, Insights & Marketing Lead at Spate
- "Fermentation for Flavor and Functionality" by Suja Senan, Ph.D., Senior Innovation Scientist at Sensient Technologies
- "How NotCo Utilizes AI for Flavor Formulations" by Cindy Sigler, Ph.D., Senior Flavor Scientist, AI and Francisco Clavero, Machine Learning Team Leader at NotCo USA
- "The Flavorist's Take on Artificial Intelligence" with panelists Jenifer Augelli, Senior Flavorist (Givaudan), Trevor Groome, Digital Innovation Platform Lead (IFF) and Paul Ricciardi, Principal Flavorist (Campbell Soup)
- "Navigating the World of Smell and Taste Dysfunctions" by Stephanie Feuer, Co-founder and Executive Director at World Taste & Smell Association
- "John Wright: Ask Me Anything" is an interactive session allowing attendees to ask seasoned flavorist John Wright burning questions related to his career, industry updates, and creative formulation solutions. Wright will also be sharing anecdotes from his past, and his current projects and breaking down how he's seen the industry evolve over the years.

Wednesday, October 9

- "Have you ever thought about using these components in a chocolate flavor?" by Andrea Albertino, Ph.D., Senior Flavorist / Honorary President at The British Society of Flavourists at Esarom
- "Navigating Regulations & Rising Prices in Citrus Oils Panel" with panelists Toshifumi Nozawa, Associate Director, Beverage Technology at T. Hasegawa USA, Inc. and TBA participants



Here's a shot of smiling flavor professionals from the 2018 Flavorcon *Opening Reception at Harrah's poolside party!*



The Flavorcon expo hall is where innovation comes to life. Don't miss out on tasting, smelling and experiencing the latest and greatest the flavor industry has to offer.

- "Swicy: The Fusion of Hot and Sweet" by Shane McDonald, Ph.D., Principal Flavor Chemist at Kalsec
- "How Flavor is Currently Being Utilized in Beer" by Joshua M. Bernstein, Veteran Journalist and Author
- "Understanding Alternatives for Changing the Commercial & Technical Landscape for Vanillin" moderated by Scott Chaplin, Principal at SCMC Consulting with panelists Mahdi Abu-Omar, Founder and CEO at Spero Renewables and Yang Zhou, Global Sales Director at SiyoMicro Biotech

New to *Flavorcon*?

Flavorcon is designed to give flavorists and product developers the tools they need to succeed in an increasingly complex market, *Flavorcon* will connect the dots among emerging R&D advances, food and beverage market and flavor trends, and supply chain innovations. The two-day conference will include a series of data/analytics presentations, interactive educational talks and panel discussions featuring some of the industry's leading experts. Attendees will come away inspired with new tools and connections to create flavorful wins and products consumers love.



[interview] U.S. FDA on MoCRA: New Authority, Fragrance Allergens, Animal Testing and More

In this interview, the FDA describes its new MoCRA-mandated authorities, 5 requirements for industry (and how it will enforce them), the mandate for listing fragrance allergens, why animal testing was omitted from MoCRA and more.

BY RACHEL GRABENHOFER, Managing Scientific Editor, *Cosmetics & Toiletries*



Rachel Grabenhofer

Image by Fotograf at Adobe Stock

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The Modernization of Cosmetic Regulation Act of 2022 (MoCRA) is the most significant expansion of the FDA's authority to regulate cosmetics since the Federal Food, Drug and Cosmetic (FD&C) Act of 1938. In this interview, the FDA describes its new MoCRA-mandated authorities, 5 requirements for industry (and how it will enforce them), the mandate for listing fragrance allergens, why animal testing was omitted from MoCRA, how the FDA is assisting companies with compliance and more.

"In the United States, federal laws are enacted by Congress, which authorizes certain government agencies, such as the Food and Drug Administration (FDA), to create regulations," the FDA writes, framing the following discussion. "The Office of Legislation (OL) directs and manages FDA's interactions with Congress and ensures that Congress has the most accurate and up-to-date information regarding FDA regulatory actions.

"On December 29, 2022, President Biden signed into law the Modernization of Cosmetic Regulation Act of 2022 (MoCRA), which expands FDA's authority over cosmetics and the ingredients in them. MoCRA is the most significant expansion of FDA's authority to regulate cosmetics since the Federal Food, Drug, and Cosmetic (FD&C) Act was passed in 1938. [It] provides new authorities to FDA, directs FDA to issue certain regulations, and establishes new requirements for industry."

Reporting Requirements Before MoCRA

As the FDA outlines, prior to MoCRA:

- Manufacturers were not required to register their cosmetic facilities or file their product listings;
- The FDA published nonbinding recommendations in a draft guidance on cosmetic Good Manufacturing Practices; and
- The industry was not required to submit adverse event reports (including serious adverse event reports) to the FDA.

2 New MoCRA-mandated FDA Authorities

Now, new FDA authorities provided by MoCRA, include:

1. *Records access:* "If certain conditions are met, the FDA can access and copy certain records related to a cosmetic product, including safety records," the FDA explains.
2. *Mandatory recall authority:* "If the agency determines there is a reasonable probability that a cosmetic is adulterated or misbranded and the use of or exposure to the cosmetic will cause serious adverse health consequences or death, FDA has the authority to order a mandatory recall if the responsible person refuses to do so voluntarily," the agency continues.

MoCRA also requires that FDA establish regulations for:

- Good Manufacturing Practice (GMP) requirements for facilities that manufacture cosmetic products;
- Fragrance allergen labeling requirements (described below); and
- Standardized testing methods for detecting and identifying asbestos in talc-containing cosmetic products.

5 New MoCRA Mandates for Industry

According to the FDA, besides providing the agency with new authorities, new requirements for industry are mandated by MoCRA. These include the following.

1. *Adverse event reporting:* A responsible person is required to report serious adverse events associated with the use of cosmetic products in the United States to FDA within 15 business days;



MoCRA requires that FDA establish regulations for fragrance allergen labeling requirements.

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2. *Facility registration:* Manufacturers and processors must register their facilities with FDA and renew their registration every two years;
3. *Product listing:* A responsible person must list each marketed cosmetic product with FDA, including product ingredients, and provide any updates annually;
4. *Safety substantiation:* For safety substantiation, under U.S. law, cosmetic products and ingredients do not need FDA approval before they go on the market. The one exception is certain color additives, which must be approved for their intended use. Companies and individuals who market cosmetics have a responsibility to ensure the safety of their products. **MoCRA does not change this requirement,** *however* under MoCRA, a responsible person is now required to ensure and maintain records supporting adequate safety substantiation of their cosmetic products. Manufacturers can use relevant safety data that is already available to support the safety of their products. Animal testing is not a requirement for marketing a cosmetic product. It's important, however, that all data used to support the safety are derived from scientifically robust methods; and
5. *Product labeling:* Cosmetics must be labeled properly as per the FD&C Act and the Fair Packaging and Labeling Act (FPLA). MoCRA establishes that cosmetic labeling must include contact information such as domestic address, phone number or electronic contact so that the responsible person can receive adverse event reports.
   - Cosmetic products for professional use must include a clear and prominent statement that the product shall be administered or used only by licensed professionals, and it also must include the same information on its label required of cosmetic products intended for consumers.

How will the FDA Prioritize, Monitor and Enforce MoCRA Checks and Balances?

"FDA monitors cosmetics through surveillance, inspections and compliance programs," the agency writes. "FDA's enforcement actions include product seizures, injunctions and prosecution. We prioritize removing products from the market that pose a risk to public health."

The agency adds, "Businesses should follow our social media handle, @FDACosmetics on X (formerly Twitter), and subscribe to email updates at the Cosmetics News & Events | FDA Web page to stay up to date as we continue to make more announcements related to MoCRA."

Requirement to List Fragrance Allergens: In Progress

The FDA explains the requirement to list fragrance allergens: "Currently, if a cosmetic is marketed on a retail basis to consumers, it must have a list of ingredients. In most cases, each ingredient must be listed individually. But under U.S. regulations, fragrance and flavor ingredients can be listed simply as 'Fragrance' or 'Flavor' because the FPLA is not allowed to be used to force a company to tell 'trade secrets.'

"Fragrance and flavor formulas are complex mixtures of many different natural and synthetic chemical ingredients, and they may include cosmetic components in mixtures that are most likely to be 'trade secrets.' To learn more, see Fragrances in Cosmetics | FDA."

The agency continues, "FDA has been working with industry and the major cosmetic trade organizations to have manufacturers voluntarily label any known allergens found in their products. Some firms that market their cosmetics in the United States list fragrance ingredients on the product labels, especially if the fragrance ingredients are known allergens. To learn more about the common allergens found in cosmetic products and what consumers can do, see Allergens in Cosmetics | FDA.

"However, MoCRA adds several new authorities to chapter VI of the FD&C Act for FDA, including explicit authority to require manufacturers to list specific fragrance allergens in the ingredient list on the product label, which would include the listing of a fragrance allergen that might be found within the allowable 'Fragrance' or 'Flavor' declaration. Specifically, MoCRA requires that FDA establish regulations for fragrance allergen labeling requirements. FDA is developing these regulations."

Was the Definition for What Constitutes a *Cosmetic* Reconsidered?

"The Federal Food, Drug, and Cosmetic Act (FD&C Act) defines cosmetics as 'articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body...for cleansing, beautifying, promoting attractiveness, or altering the appearance' [FD&C Act, sec. 201(i)]," the FDA reminds us. "Among the products included in this definition are skin moisturizers, perfumes, lipsticks, fingernail polishes, makeup, cleansing shampoos, permanent waves, hair colors and deodorants, as well as any substance intended for use as a component of a cosmetic product.

"The FD&C Act defines drugs, as 'articles intended for use in the diagnosis, cure, mitigation, treatment

or prevention of disease' and 'articles (other than food) intended to affect the structure or any function of the body of man or other animals'. Some products meet the definitions of both cosmetics and drugs.

"MoCRA did not change the definition of cosmetic but amended the FD&C Act to include 'cosmetic product' which is defined as 'a preparation of cosmetic ingredients with a qualitatively and quantitatively set composition for use in a finished product' [FD&C Act, sec. 361]. It did not change the definition of cosmetic in the FD&C Act."



The agency shares, "FDA has been working with industry and the major cosmetic trade organizations to have manufacturers voluntarily label any known allergens[..]."

Why Was No Animal Testing Ban Included in MoCRA?

"At this time, neither the law nor FDA regulations require specific tests to demonstrate the safety of cosmetic products or ingredients. As such, animal testing is not a requirement by FDA for marketing a cosmetic product. MoCRA states that it is the sense of the Congress that animal testing should not be used for the purposes of safety testing on cosmetic products and should be phased out with the exception of appropriate allowances.

"FDA has a long-standing commitment to the replacement, reduction and refinement (the 3Rs) of animal testing, including by promoting the development and use of new technologies to better predict human and animal responses to substances whose uses are relevant to our regulatory mission.

"In December 2017, FDA released the Agency's FDA's Predictive Toxicology Roadmap | FDA. In January 2021, FDA published the report Advancing New Alternative Methodologies at FDA providing examples of alternative methodologies being investigated at FDA and, in some cases, in partnership with others. More information, including examples of FDA programs and projects to advance alternative methods, can be found on the Advancing Alternative Methods at FDA | FDA Web page.

"While FDA supports the development and use of alternative methods that are backed by science and provide the necessary data showing whether products are safe, it is important to recognize that animal testing may still be necessary, in certain circumstances, to thoroughly evaluate certain health risks of products used on people."

How is the FDA Helping Companies Comply with MoCRA?

The FDA outlines several measures.

"... On December 18, 2023, FDA issued a final guidance for industry on cosmetic product facility registrations and product listings, as mandated by MoCRA. The guidance assists stakeholders with cosmetic product facility registration and product listing submissions to FDA by describing who is responsible for making the registration and listing submissions, what information to include, how to submit, when to submit and certain exemptions to the registration and listing requirements.

"In November 2023, FDA issued guidance on its intent to delay enforcement of the requirements for cosmetic product facility registration and cosmetic product listing requirements under MoCRA for six months until July 1, 2024, to help ensure that industry has sufficient time to submit facility registration and product listing information.

"To help industry comply with MoCRA's registration and listing requirements, FDA has developed multiple platforms by which owners or operators of facilities that manufacture or process cosmetic products can register their facilities, and by which manufacturers, packers, and/or distributors can list their products. For more information, see *https://www.fda.gov/cosmetics/registration-listing-cosmetic-product-facilities-and-products.*"

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The IFRA Green Chemistry Compass: A Harmonized Tool to Support the Fragrance Industry's Pivotal Journey Toward Greater Sustainability

A breakdown of IFRA's Green Chemistry Compass, the 12 Principles of Green Chemistry and key takeaways of the initiative.

BY MARTINA BIANCHINI (IFRA), AMY CANNON (Beyond Benign), JOERG THILO FISCHER (Symrise), TONY PHAN (Mane), THIERRY ROGER (Robertet), FRANCESCO SANTORO (dsm-firmenich), JONATHAN WARR* Lead Author (Takasago)



The IFRA Green Chemistry Compass Tool was designed to guide the fragrance industry in evaluating and enhancing the environmental and health profiles of their products.

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Preamble

The terms 'product' and 'ingredient' will be used interchangeably throughout this article. A product is a fragrance raw material which is also a fragrance ingredient. For the purposes of the IFRA Green Chemistry Compass, the term 'product' refers to a fragrance ingredient.

Introduction – Policy Context and Drivers

With the growing concerns over consuming the earth's finite resources and the need to address global challenges such as climate change, all actors ranging from political and governmental institutions to commercial and civil society organizations are keen to promote actions towards a greener future. To make these actions tangible for the fragrance and flavor (F&F) industries, IFRA and its sister organization IOFI have developed a common sustainability charter for the F&F sectors which sets the framework for collective industry action towards greater sustainability.[1]

The IFRA-IOFI Sustainability Charter makes a specific commitment: *"We foster the application of green chemistry principles."* In order to make this commitment actionable, the IFRA Green Chemistry Compass Tool was designed to guide the fragrance industry in evaluating and enhancing the environmental and health profiles of their products. The IFRA Green Chemistry Compass is grounded in the principles of green chemistry, which aim to reduce or eliminate the use and generation of hazardous substances in the design and manufacture of fragrance ingredients. It offers a comprehensive framework that can be used by companies of all sizes to assess their current practices and identify opportunities for improvement, that also align with the United Nations Global Sustainable Development Goals (SDGs).

The global SDGs were launched in 2015 and the 17 goals frame the actions needed to transform the world for a more sustainable future.[2] The European Green Deal passed by the European Commission in January 2020 translated the global SDG framework into a package of



policy proposals for Europe.[3] Europe should achieve a green and digital transition by 2050 and the Green Deal covers many aspects from farming to energy and innovation. Whilst there are some accepted standards for certain aspects of corporate "green" performance, like the Carbon Disclosure Project (CDP), the Science Based Targets Initiative (SBTi), and the USDA Biopreferred® Program, there is a lack of specific sectorial industrial standards that can apply to a particular sector such as the fragrance industry.[4,5,6]

Introduction – The IFRA Green Chemistry Compass Tool

For the fragrance industry, which may be considered a part of the larger chemical industry, a common starting point is to refer to one or more of the 12 principles of green chemistry, a framework developed by Anastas and Warner.[7] To develop a more harmonized and broadly accessible approach to foster the application of green chemistry principles, IFRA partnered with Beyond Benign to develop the IFRA Green Chemistry Compass.[8] It made an open call for interested scientists from fragrance industry member companies to form a working group, together with the independent scientists from Beyond Benign. The approach was designed to be fully inclusive, ensuring that both small and large companies are equipped with sustainability tools that enable them to evaluate the ingredients they manufacture.

The overall objective of the IFRA Green Chemistry Compass is that companies can learn and improve with regard to the manufacture of greener products, and not to grade one manufacturer as better than another. All 12 principles of green chemistry were considered for inclusion. The most relevant principles were expanded upon and, when necessary, updated to include new elements relevant to the fragrance industry today, given scientific and industrial advances.

It is important to note that green chemistry is only one element in evaluating the overall sustainability of a fragrance ingredient and other aspects need to be considered to take a more holistic view, such as land and water use, or ethical standards. The IFRA Green Chemistry Compass considers the manufacture of fragrance ingredients and certain safety aspects of the final fragrance ingredient. For practical reasons, hazard classifications are used as one criterion when considering reagents and products. A risk assessment approach would be more appropriate, but at this time an approach that would be easy to apply in this framework was not identified. The green chemistry tool can aid companies in adopting a "safe and sustainable by design" mindset by applying these principles to their fragrance ingredient developments and manufacturing in a systematic manner.

Adapting the 12 Principles of Green Chemistry to the Fragrance Industry

The Fragrance Industry uses more than 3500 commercial ingredients as outlined in the IFRA Transparency List.[9] These ingredients range from synthetic materials made from fossil and renewable carbon sources using traditional chemistry, to natural extracts and materials made using biotechnology.[10] The approach of the IFRA Green Chemistry Compass can be applied to the full spectrum of ingredients.

The project team started from the 12 Principles of Green Chemistry which can all be applied to the flavor and fragrance industries. For the purposes of developing the IFRA Green Chemistry Compass, the most relevant principles were prioritized and mapped against the five focus areas of the IFRA-IOFI Sustainability Charter and the UN Global Sustainable Development Goals (SDGs). This creates a holistic interconnected matrix helping to visualize the bigger picture of priorities and impact.

Three green chemistry principles "Atom Economy," "Real-Time analysis for pollution prevention" and "Reduce Derivatives" were considered less relevant or in part covered by other principles, as detailed below.

For each of the remaining 9 principles the working group devised a set of questions that need to be answered by the ingredient manufacturing company so that in the end, an approach to classification in 1 of 3 categories is achieved: "Most preferred," "Needs improvement," "Least preferred." Whilst this approach may be considered subjective, these categories were made with consideration for current industrial practices. No doubt over time these categories will be reviewed and updated. The logic used for each of the retained green chemistry principles will be briefly reviewed following the order of the principles and the links between the IFRA-IOFI Sustainability Charter commitments. These links are illustrated in **F-1**.

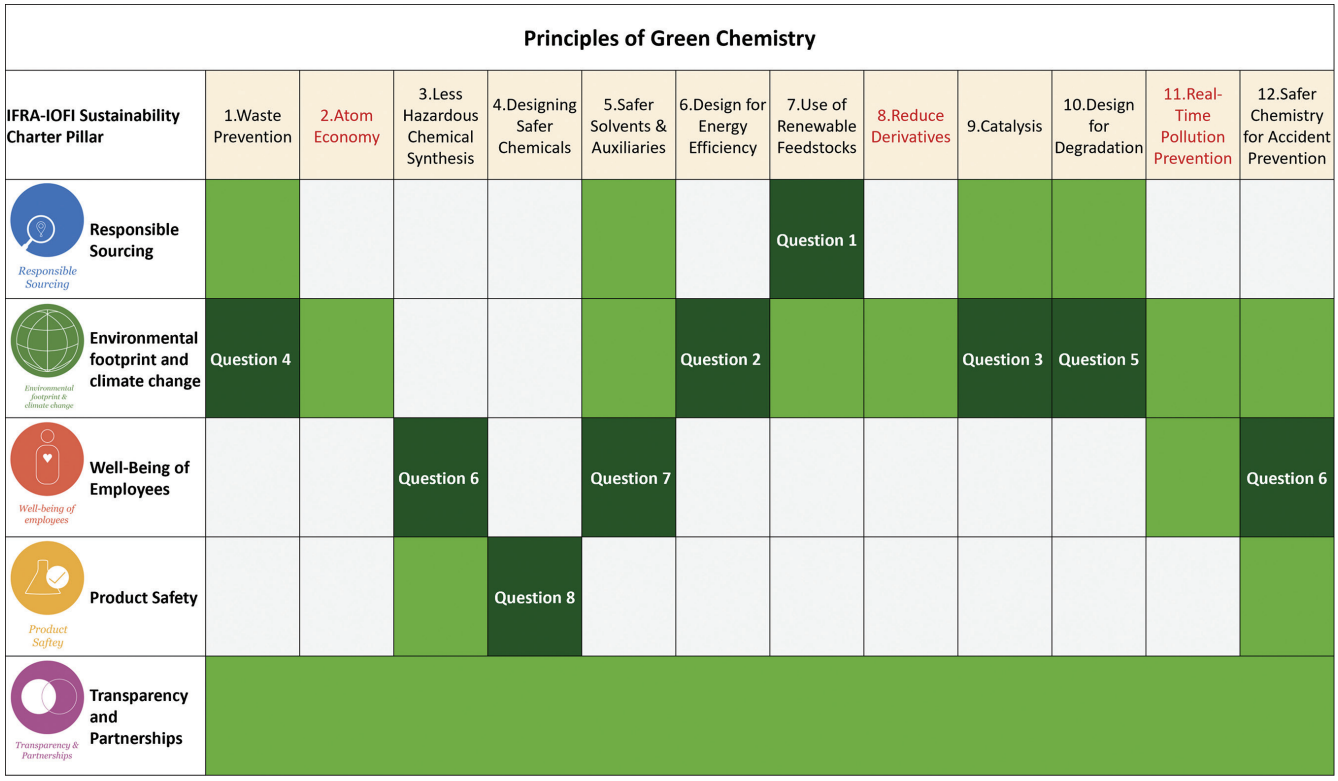
Green Chemistry - Principles and Questions

Principle 1: Waste Prevention

Question 4: How much waste is generated in the process?

Waste reduction in chemical processes can reduce the overall environmental footprint of a product lifecycle, therefore reducing the overall impact on ecosystems and climate change. Waste generation is a measure of the efficiency of the manufacturing process.

F-1 Connection between the five IFRA-IOFI Sustainability charter commitments, the 12 Principles of Green Chemistry and resulting Green Chemistry Compass Questions.



Several metrics were considered including Process Mass Intensity (PMI = (sum of mass of materials)/ (mass of isolated product)), used extensively in the pharmaceutical industry, atom economy (AE = (MW of product)/ (Sum of MW's of all reactants)) and E-factor (E-Factor = (Total mass of waste from process)/ (total mass of product)). In conclusion, it was decided to use the E-factor as it is the most focused measure of waste generation, whereas PMI is more linked to process efficiency and AE does not directly assess waste generation. The thresholds were set in line with common industry guidance, with <5 being the most preferred.[11]

Principle 2: Atom Economy

This principle was not considered explicitly as it is partly captured by Question 4 as a measure of waste; an ingredient manufactured with very high atom efficiency would likely have a low E-factor and vice-versa.

Principle 3: Less Hazardous Chemical Synthesis

Question 7: Process Safety and Hazards: Do the reagents or raw materials pose any physical, health or environmental hazards?

For this principle, a calculation is performed based on all the reagents used for the ingredient manufacture and their hazard classification (H-statements). For each reagent, the physical, health and environmental hazard classifications used are the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS) of the ingredients listed on the Safety Data Sheets (SDSs) of the reagents.[12] Physical hazards encompass hazards such as flammability, combustibility, oxidizers, and explosivity. Health hazards include a range of acute and chronic mammalian toxicity from mild to extreme hazards. Environmental hazards include hazards to the environment and ecosystems, including aquatic toxicity and ozone depletion. The aggregated score of

Courtesy of IFRA

the reagents, based on the severity of H-statement and frequency of occurrence is used to define the 3 groups. The calculation runs automatically within the IFRA Green Chemistry Compass software tool. If there are no data for a reagent in the relevant section of the SDS the score is defaulted to "least preferred."

Principle 4: Designing Safer Chemicals

Question 8: Does the product pose any physical, health or environmental hazards?

In a similar fashion to Principle 3 above, the GHS classifications of the fragrance ingredient (the product) are used to calculate a score for the final product and based on this score it can be placed in one of the 3 categories.

The regularly updated IFRA-IOFI Labelling Manual can be used to find GHS hazard statements for fragrance ingredients. Equally, the SDS of the ingredient can be used.[13] If there is no data in the relevant section of the SDS the score is defaulted to "least preferred."

Principle 5: Safer Solvents & Auxiliaries

Question 6: What type of solvents are used?

Solvents are used for both the conventional organic synthesis of fragrance ingredients and for obtaining natural extracts, in particular absolutes. There is an existing categorization of solvents in terms of their desirability developed by the pharmaceutical industry, the American Chemistry Society (ACS) Green Chemistry Institute's Pharmaceutical Roundtable Solvent Selection Guide, and this was adapted to the typical solvents used by the fragrance industry to establish the 3 groups.[14] If the solvents are not recycled the score is downgraded, however, if made from renewable carbon the score can be improved.

Principle 6: Design for Energy Efficiency

Question 2: a) To what extent is the process for making this product energy-intensive?

b) Is renewable energy used in whole or in part in the process?

Reducing energy use and favoring more renewable forms of energy reduces net emissions and yields lower carbon footprints.

For this principle, the working group considered several options to gauge the energy intensity of a given manufacturing process.

If known, internationally recognized standards in line with the Greenhouse Gas protocols (GHG), such as ISO 14040/14041 should be used to measure carbon footprint (cradle to gate) as a means of establishing a value for this question.[15] To date, relatively little data are publicly available for fragrance ingredients, although this situation is evolving. Multi-step, high-energy, low-yield manufacturing processes will inevitably lead to high footprints. The thresholds selected will need to be updated over time as more data become available and <10kg CO_2/kg is consistent for example with Genomatica's manufacture of 1,3-butylene glycol (low temperature and pressure) biotechnology.[16] Land use change (LUC) and Biogenic carbon contributions – if relevant - should be excluded from the carbon footprint value used, as these elements are not linked to energy efficiency.

Alternatively, the temperature, pressure and time conditions for the most energy-intensive step in the manufacturing process can be used. The thresholds were set in line with typical conditions used in the fragrance ingredient manufacturing industry (most preferred <5 atm, -10°C-50°C, <24 hours). If the energy source to generate the temperature and pressure is >50% renewable, the score can be improved.

Principle 7: Use of Renewable Feedstocks

Question 1: Is the product derived or extracted in whole or in part from a renewable, Biomass Balance (BMB) or carbon capture resource?

Where fossil carbon is used today, the overarching goal is to encourage a move for ingredient manufacturing from virgin fossil carbon to renewable or recycled carbon. Whilst today fossil carbon plays a major role in the fragrance industry, there are a number of fragrance ingredients that can be manufactured either from fossil or renewable carbon.[17] In addition, there have been two relatively recent developments that can further accelerate the transition away from virgin fossils: bio-mass balance and carbon capture. Bio-mass balance (BMB) mixes renewable and fossil starting materials, like methane or ethylene, and certifies the mass of the final ingredient that can be attributed to the renewable source.[18] A number of BMB fragrance ingredients are already available. Carbon capture has so far not been commercially applied to fragrance ingredient manufacture, but the process to capture CO and CO_2 and transform them into ethanol has been industrialized and we can imagine that it will be applied to fragrance ingredient synthesis in the future.[19]

The threshold of >50% renewable/BMB/ carbon capture was used to distinguish the groups of "needs improvement" from "least preferred" as this is the limit in ISO 16128 to define a material of "natural origin."

Principle 8: Reduce Derivatives

This principle was not considered actionable for the fragrance industry in the context of the IFRA Green Chemistry Compass. The expert group could not easily define specific parameters to assess fragrance ingredients against "reduce derivatives." In addition, this principle is very specific to synthetic chemistry and therefore would increase the complexity of the compass tool significantly since this tool is designed to also cover natural ingredients.

Principle 9: Catalysis

Question 3: a) What type of catalyst, if any, is used in this process?

b) What is the mol-recycle number for the catalyst used (if applicable)?

The use of catalysts is, in principle, good in that it typically allows lower manufacturing temperatures and higher yields, and in the case of the fragrance industry allows stereo-selectivity where 1 isomer has a specific olfactive profile different from that of the racemic mixture.

Many factors can determine how sustainable a catalyst is within a chemical process, including toxicity, earth abundance in the case of metal catalysts, efficiency, reusability/recyclability, selectivity and more.

The overall logic of preference is Biobased > non-metal > earth-abundant metal > precious metal. With this consideration, the thresholds favor biobased catalysts like enzymes as group 1 most preferred, then non-metal over metal catalysts, and within the metal catalysts there is a further division based on toxicity and earth abundance; certain metals are scarce, so extraction is difficult and unsustainable. If the metal catalyst has a high turnover number, > 1000, the score is improved.

Principle 10: Design for Degradation

Question 5: To what extent is the product biodegradable?

Biodegradation is the process by which organic molecules (comprised of carbon) are completely broken down by microorganisms into harmless products (e.g., carbon dioxide, water, and mineral salts). Biodegradability is a material property that describes the potential for complete biodegradation under environmental conditions (e.g., rivers, wastewater treatment plants, lakes, ponds, etc.). In order to classify a material as biodegradable it needs to reach certain pass criteria in standardized test methods (e.g., OECD TG 301).[20] The ultimate goal is that all fragrance ingredients will be readily or inherently, ultimately biodegradable, leaving no trace in the environment after use.

Key Takeaways

- ✓ The IFRA Green Chemistry Compass is a harmonized tool to implement the IFRA-IOFI Sustainability Charter commitment 2.3 *"We are inspired by Green Chemistry."*
- ✓ It incorporates the relevant green chemistry principles across all aspects of fragrance ingredient production, ranging from starting reagents, manufacturing, and considering the health and safety aspects of the reagents and products to identify the areas for improvement.
- ✓ It drives forward looking conscious and systematic reagent and ingredient choices that are less harmful to people and the planet.
- ✓ It benchmarks progress towards incorporating green chemistry principles.
- ✓ It instills a sustainability mindset by applying sustainability principles in a systematic manner thereby helping companies to improve their sustainability business case.
- ✓ The IFRA Green Chemistry Compass is available as an open-source tool from *www.ifrafragrance.org*.

Within the fragrance industry, a group of experts has written a white paper that details the conditions for an ingredient to be considered "readily biodegradable," corresponding to the category "most preferred" and "inherently, ultimately biodegradable" corresponding to the "needs improvement" category, based on the results from the screening test methods OECD 301/310 (and equivalent) and OECD 302 (and equivalent).[21] Ingredients that either do not pass these conditions or for which there are no data are considered to be in the "least preferred" category.

For Natural Complex Substances (NCS) like essential oils, biodegradability can be assessed either on the NCS itself or by considering the biodegradability of their constituent parts as detailed in the white paper.[21] Natural Complex Substances (NCS) are defined by the EFEO-IFRA Guidelines on substance identification and sameness of Natural Complex Substances (NCS) under REACH and CLP as "a very diverse family of substances that are notably used as ingredients in fragrance formulations and [directly or indirectly] added to cosmetic and other consumer products. NCS is well described in ISO standard 9235 (Aromatic natural raw materials - Vocabulary). The most common

NCSs are Essential oils; Concretes and Absolutes; Oleoresins and Resinoids; CO_2 extracts; Infusions and alcoholic extracts."

For defined chemicals where no data are available, biodegradability can be predicted using software such as the BIOWIN™ estimation program, part of the EPI Suite™, provided by the United States Environmental Protection Agency.[22] However, such predictions are not considered sufficient and should therefore not be used to assess which category an ingredient should be placed in, with a narrow exception related to constituents of NCS as detailed in the white paper.

Principle 11: Real-Time Pollution Prevention

This principle was not considered actionable for the fragrance industry, and it was decided by the expert group that no specific parameters to assess fragrance ingredients against "real-time pollution prevention" could be easily defined.

Principle 12: Safer Chemistry for Accident Prevention

Covered by Question 7 (Principle 3).

A summary of the criteria thresholds is provided in **T-1**.

Summary and Conclusion

The IFRA Green Chemistry Compass offers a new, comprehensive, and harmonized framework tool that helps companies of all sizes assess their current practices and identify opportunities for continuous improvement.

The IFRA Green Chemistry Compass is the first attempt at a cross-industry agreement on green chemistry principles for the fragrance industry by building on the collective experience of the industry and independent experts. In this way, fragrance manufacturers, large and small, and all around the world can benefit from a harmonized assessment tool that was developed by global green chemistry experts. This tool is tailormade to fragrance ingredients and recognizes the particularities of the fragrance sector.

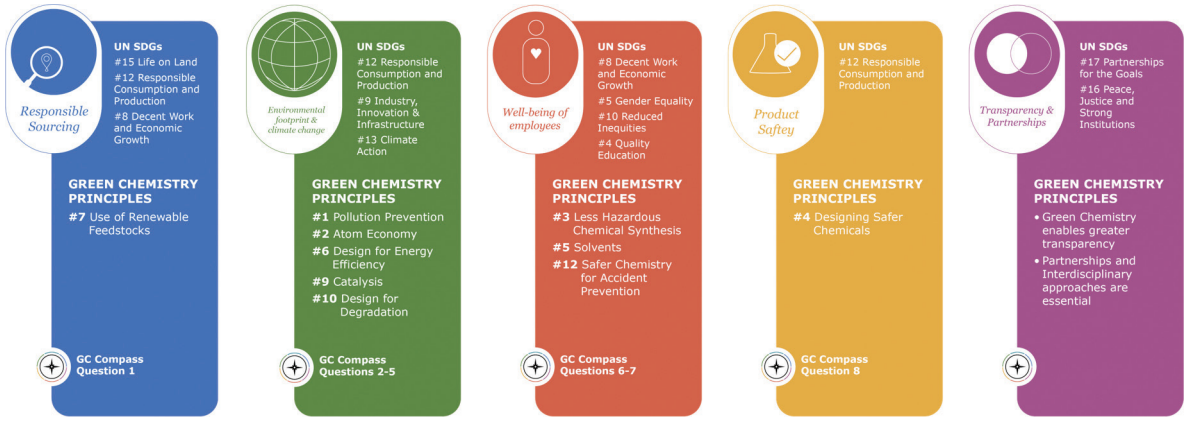
The IFRA Green Chemistry Compass has been successfully piloted and was subject to a global public consultation. The comments received during the global public consultation are incorporated into the harmonized tool. The IFRA Green Chemistry Compass complements the individual green chemistry approaches published by fragrance companies and customers.[23,24,25,26]

The link between the IFRA Green Chemistry Compass, the five pillars of the IFRA-IOFI Sustainability Charter and the UN global Sustainable Development Goals (SDGs) is illustrated in **F-2**.

Call for Action

Whilst the use of the IFRA Green Chemistry Compass tool is voluntary, we encourage its use and uptake since it is an open-source resource for the fragrance industry and any interested stakeholders all over the world. With this innovative and harmonized tool, big and small companies can assess the profile of the fragrance ingredients they currently make or intend to make, and identify ways to improve for a better future.

F-2 Connection between the five pillars of the IFRA-IOFI Sustainability Charter, the 12 Principles of Green Chemistry, the Green Chemistry Compass Questions and the UN SDGs.



Courtesy of IFRA

T-1. Summary of Threshold criteria to calculate the green chemistry score of fragrance ingredients into 3 groups "Most preferred," "Needs improvement" and "Least preferred."

Question	Group 1 Most Preferred	Group 2 Needs Improvement	Group 3 Least Preferred
Q1. Is the product derived or extracted in whole or in part from a renewable, Biomass Balance (BMB) or carbon capture resource?	100% of product carbon is derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.	>50% - <100% of product carbon is derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.	≤50% of product carbon is derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.
Q2. a) To what extent is the process for making this product energy intensive? b) Is renewable energy used in whole or in part in the process?	Temperatures used are between -10 and 50°C and the pressure is <5 atm and the process time is <24 hours. OR The LCA carbon footprint is <10 kg CO_2/kg material.	Temperatures used are between -78 and 200°C or the pressure is ≤20 atm or the process time is <144 hours. OR The LCA carbon footprint is 10-100 kg CO_2/kg material. *If ≥50% of the process uses renewable energy, the score will be bumped up a level.	Temperatures used are between <-78 and >200°C or pressures are >20 atm or the process time is >144 hours. OR The LCA carbon footprint is >100 kg CO_2/kg material. *If ≥50% of the process uses renewable energy, the score will be bumped up a level.
Q3. a) What type of catalyst, if any, is used in this process? b) What is the mol-recycle number for the catalyst used (if applicable)?	Preferred catalysts (enzymes) are used in the reaction.	Abundant, low hazard metal catalysts, or acid/base catalysts are used in the reaction. *A TON (Turn-Over-Number) >1000 the score will be bumped up a level.	Scarce and/or high hazard metal catalysts are used in the reaction. Consider using an alternate catalyst. *A TON >1000 the sore will be bumped up a level.
Q4. How much waste is generated in the process?	E-factor <5	E-factor 5-25	E-factor >25
Q5. To what extent is the product biodegradable?	The product is readily biodegradable according to the test methods OECD 301 A-F or 310 (and equivalents).	The product is inherently, ultimately biodegradable according to the test methods OECD 301 A-F, 302 or 310 (and equivalents).	The product does not pass the readily or inherently, ultimately biodegradable criteria, or there is no data.
Q6. What type of solvents are used?	All solvents used in the process are preferred solvents. Recycling is standard practice.	One or more of the solvents used in the process could be improved. *Scores are downgraded one level if solvent recycling is not standard practice. *Use of biobased solvents upgrades score one level.	One or more of the solvents used in the process is not preferred. *Scores are downgraded one level if solvent recycling is not standard practice. *Use of biobased solvents upgrades score one level.
Q7. Process Safety and Hazards	The Hazard Score of this process, according to the Hazard Score Calculator is <3.	The Hazard Score of this process is 3.	The Hazard Score of this process is 4 or 5. Or, a reagent has no data.
Q8. Does the product pose any physical, health or environmental hazards?	The Hazard Score of this product, according to the Hazard Score Calculator is <3.	The Hazard Score of this product is 3.	The Hazard Score of this product is 4 or 5. Or, the product has no data.

Courtesy of IFRA

The IFRA Green Chemistry Compass tool can be downloaded free of charge from the IFRA Website[9]. A tutorial video and detailed guidance notes are also available on the IFRA website. For additional questions about the use of the IFRA Green Chemistry Compass, please contact info@ifrafragrance.org.

Disclaimer

The IFRA Green Chemistry Compass is designed to be used for forward-looking internal purposes only. The IFRA Green Chemistry Compass is not suitable to serve as a basis for making B2C or B2B claims. The compass tool provides general guidance and is not meant to be a substitute for a company doing its own due diligence on its ingredients and manufacturing processes. The compass draws on the experience of leading companies in the flavor and fragrance industries that already have their own tools and provides an accessible harmonized tool for all companies to use, particularly small and medium-sized companies that do not have the resources to develop their own tools.

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9 Little Used Aroma Chemicals to Create A Luxurious Vanilla Flavor According to A Principal Flavorist

Can't we be more creative and show vanilla some love? Why yes, people! Yes, we can.

BY CYNTHIA LIPKA, principal flavorst, Bell Flavors & Fragrances



Cynthia Lipka

My goal is always to create a flavor that mimics Mother Nature as closely as I can.

Image by Sujid at Adobe Stock

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What flavor chemist isn't a little bored with vanilla flavors? Who has not seen the same old cast of characters over and over again? Vanillin, ethyl vanillin, maltol, ethyl maltol, veratraldehyde, heliotropine, acetoin, maybe some lactones. Sigh.

As a bottle-fed baby, my first exposure to vanilla was from birth, so it is my longest relationship with any flavor. Is it any wonder that vanilla is my favorite flavor profile? Doesn't the aroma of a great vanilla extract or oleoresin just make your eyeballs roll into the back of your head with its sumptuousness? Then why is it, that we so often stop at the threshold of greatness and settle for the same old, same old? Can't we be more creative and show vanilla some love? Why yes, people! Yes, we can.

I'm often combing databases and research papers to find the aroma compounds which occur naturally in different foods. My background is in research and development. Data and facts are comfortable to me. My goal is always to create a flavor that mimics Mother Nature as closely as I can. I have prided myself on being a flavorist who has embraced this huge variety of aroma chemicals and understanding what that nuance will bring to the flavor overall. So, I comb those lists of materials to gain insight into that particular profile and look specifically at things that make me say "huh!" and allow myself to be jettisoned out of ordinary one-dimensional flavors.

So, let's just start with vanillin. The preferred IUPAC name is 4-hydroxy-3-methoxybenzaldehyde. Keep that in the back of your mind while reading this because some of these babies are closely related structurally. Vanillin is present in Bourbon vanilla extract at about 8,000 ppm to 23,000 ppm. So, the materials we will chat about here are just accent notes with a giant bow to the queen of spices.

1. 4-Hydroxy-3-methoxybenzyl alcohol

One such compound is 4-hydroxy-3-methoxybenzyl alcohol or vanillin alcohol or vanillyl alcohol (FEMA# 3737, CAS# 498-00-0). It shows up at about 100 ppm in Bourbon vanilla extract. This compound is a dry powder and when diluted presents as a sweet, almost heliotropine-like impact and has somewhat of an anisic lift to it. It also carries a bit of a smokey phenolic note. It has a creamy mouthfeel and has a slight balsamic quality when tasted. It is found in a few other foods but at less than 1 ppm levels. I'd put a checkmark next to this one folks.



2. 4-Hydroxy-3-methoxybenzoic acid

4-hydroxy-3-methoxybenzoic acid (FEMA# 3988, CAS# 121-34-6) is also known as vanillic acid. Bourbon vanilla extract contains between about 1,000 ppm and 2,000 ppm of this material which is certainly the highest level found in foods. But you can also find this in whiskey, rice bran and date. FEMA is not nearly as gracious as their use levels hover around 5 ppm to 25 ppm in finished items. I find this material to be not only vanillic but also rounded, brown and somewhat resinous. Also, very deserving of a check mark.

3. 4-Hydroxybenzaldehyde

Another interesting player is 4-hydroxybenzaldehyde or 4-formylphenol. (FEMA# 3984, CAS# 123-08-0). This compound is found in several different foodstuffs such as apple brandy, beer, coffee, brandy, sake, sherry, tea, vinegar, whiskey and wine. It's in vanilla extract at a pretty good slug running between 1,000 ppm and 2,000 ppm. The initial odor is slightly plastic and has a mild yeasty note. Not something I would ordinarily love based on those descriptors. When tasted, it is a bit astringent and has a slightly brown alcoholic note and has some heliotropine character as well.



4-Hydroxybenzaldehyde is found in several different foodstuffs such as apple brandy, beer, coffee, brandy, sake, sherry, tea, vinegar, whiskey and wine.

4. 4-Vinyl phenol

4-vinyl phenol (FEMA# 3739, CAS# 2628-17-3) achieves a similar aroma impact as the 4-hydroxybenzaldehyde. That typical, band-aid impression with slightly earthy, dirty notes. This item shows up at about 20 ppm to 100 ppm in the bourbon extract but also makes an appearance in peanut, popcorn and some wines. When tasted, this is phenolic but also contains some Tahitensis-like character and some smokey earthy notes. I also think this would work especially well aiming for Indonesian or Mexican profiles. I think this is important for grounding, but I think I would start somewhere close to a 5 ppm usage rate.

5. 2-Methoxy-4-vinylphenol

Perhaps another phenol we might think of is 2-methoxy-4-vinylphenol also known as 4-vinyl guaiacol. (FEMA# 2675, CAS# 7786-61-0). The odor is sweet, smokey, phenolic, warm, powdery, vanillic, clove, cinnamic and brown. At 2 ppm, it is mild, slightly vanillic, spicy and warming. It's present in Bourbon vanilla at about 1,200 ppm but also shows up in coffee, curry, corn, sage and wine.



I think 4-vinyl phenol would work especially well aiming for Indonesian or Mexican profiles.

6. Vanilla Oleoresin

Vanilla oleoresin contains many fatty acids. These fatty acids bestow a somewhat yellow or glossy appearance to the oleoresin. (I'm sure you are visualizing that right now.) So, which fatty acids are we talking about? Palmitic acid at about 35 ppm to 40 ppm; linoleic acid in the 60 ppm to 100 ppm range; stearic 10 ppm to 15 ppm and oleic at 13 ppm to 23 ppm. But depending on the solvent system that you are considering for your flavor, these might not work for you. In times when solubility is at issue, I consider the ethyl and methyl esters of these acids as an answer. Methyl myristate (FEMA# 2722,

From top: images by Ruslan Batiuk; Worldillustrator at Adobe Stock

CAS# 122-10-2) is present in the extract at 40 ppm. If you are fortunate enough to have access to methyl linoleate (48%) (FEMA# 3411)/methyl linoleate (52%) check that one out. I can't find a vendor for this.

7. p-Anisyl acetate

Oddly, p-anisyl acetate (FEMA# 2098, CAS# 104-21-2) is present in Bourbon vanilla (which I would not have expected) at 200 ppm but push that number up to 4,500 for Tahitensis profiles (where I certainly would have expected it). Vanilla is the only food item that this material occurs in.

8. Methyl cinnamate

Another interesting compound is methyl cinnamate (FEMA# 2698, CAS# 103-26-4). Depending on the isomer you could have between about 150 ppm to almost 600 ppm. I think most people typically think strawberry when considering this compound.

9. 5-Methyl furfural

I will leave you with another option that made me say "huh!" Maybe you know this one. It's a commonly used flavor ingredient. 5-methyl furfural (FEMA# 2702, CAS# 620-02-0) is found at a bit over 100 ppm in Bourbon vanilla.



2-Methoxy-4-vinylphenol is present in Bourbon vanilla at about 1,200 ppm but also shows up in coffee, curry, corn, sage, and wine.

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Now there are no excuses to produce a ho-hum vanilla flavor. Permanently leave your safe vanilla creation place in a brave and confident way. Sally forth my friends!

A Quick Thanks

I would like to express gratitude for the numerous samples donated to me for this article from Millipore Sigma. They have been my friends and supporters since the very beginning of my flavor career!

Aroma compounds donated by Millipore Sigma for evaluation (not all of these were presented in this article):

- W398403 4-Hydroxybenzaldehyde
- W373923 4-Vinylphenol solution (10% in PG)
- W394505 p-Anisic acid
- W373702 Vanillyl alcohol
- W398802 Vanillic acid
- W398705 4-Hydroxybenzyl alcohol
- W370906 Methyl nicotinate
- W310808 Vanillin acetate
- W381512 Vanillyl ethyl ether
- W481015 Ethyl homovanillate
- W343900 Myrtenol

p&f+



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- NATURAL INDOLE
- NATURAL ANISYL ACETATE
- NATURAL ANISYL BUTYRATE
- NATURAL BISABOLOL
- NATURAL BUTANETHIOL
- NATURAL BUTYL BUTYRATE
- NATURAL BUTYL CAPROATE
- NATURAL BUTYL BUTYRYL LACTATE
- NATURAL BUTYL CAPROATE
- NATURAL CAFFEIC ACID
- NATURAL CAPSAICIN
- NATURAL CARAMEL FURANONE
- NATURAL DELTA-3-CARENE
- NATURAL ALPHA-CARYOPHYLLENE
- NATURAL 1,4-CINEOLE
- NATURAL CINNAMIC ALCOHOL
- NATURAL CINNAMYL CINNAMATE
- NATURAL CINNAMYL ISOBUTYRATE
- NATURAL CINNAMYL PROPIONATE
- NATURAL PARA-CRESOL
- NATURAL TRANS-2, TRANS-4-DECADIENAL
- NATURAL TRANS-2-DECENOL
- NATURAL DIHYDROCARVONE
- NATURAL 2,3-DIMETHYL PYRAZINE
- NATURAL OCIMENE
- NATURAL 2,6-DIMETHYL PYRAZINE
- NATURAL TRANS-2-DODECENAL
- NATURAL DODECYL BUTYRATE
- NATURAL ETHYL ANISATE
- NATURAL ETHYL BUTYRATE
- NATURAL ETHYL CAPRYLATE
- NATURAL ETHYL CYCLOPENTENOLONE
- NATURAL 2-ETHYL-2-HEXENAL NATURAL
- NATURAL ETHYL-3-HYDROXYBUTYRATE
- NATURAL ETHYL-2-HYDROXYCAPROATE
- NATURAL ETHYL ISOVALERATE
- NATURAL ETHYL LAURATE
- NATURAL ETHYL LEVULINATE
- NATURAL ETHYL LINOLEATE
- NATURAL ETHYL-2-METHYL BUTYRATE
- NATURAL 2-ETHYL-3-METHYL PYRAZINE
- NATURAL ETHYL-3-METHYL THIOPROPIONATE
- NATURAL ETHYL STEARATE
- NATURAL FURFURYLIDENE ACETONE
- NATURAL HEPTANAL
- NATURAL 3-HEPTANOL
- NATURAL TRANS-2-HEPTENAL
- NATURAL ISOPROPYL ISOBUTYRATE
- NATURAL IONONE ALPHA
- NATURAL IONONE BETA
- NATURAL SULFURYL ACETATE
- NATURAL SULFURYL BUTYRATE

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