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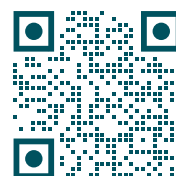
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SCAN TO LEARN MORE

50 Years Later, the Mission Still Smells Familiar

The *American Perfumer* was founded in 1906, 120 years ago.

Under various permutations, the publication continued to cover the worlds of cosmetics, fragrance and flavors under a single title. Then, in 1975, the outlet was split into two: *Cosmetics & Toiletries*, designed for the formulating cosmetic chemist, and *Perfumer & Flavorist*, serving the flavor and fragrance industry and its creatives.

In 1976, after its first year of publication, *Perfumer & Flavorist* took stock of what it was trying to accomplish. The ambition was clear: give perfumers and flavorists a dedicated source of information, reduce the secrecy that had long surrounded the professions, connect practitioners with suppliers and professional societies, and bring developments in materials, science and technology into the creative process.

Nearly 50 years later, information moves at a radically different speed and the tools of the trade have changed. AI, biotechnology, neuroscience and new ingredient platforms have transformed how the industry discovers, creates and communicates.

But the underlying need has barely moved.

The 1976 assessment argued that professionals would read and, importantly, act on what they learned. It envisioned a publication that could accelerate the spread of knowledge, connect people across borders and help promising new materials and ideas find their way into the hands of creators.

That remains the job.

The industry may now be navigating molecular discovery, AI-assisted creation, sustainability, regulation and a vastly more connected global marketplace, but the essential equation is unchanged: knowledge + access + community = innovation.

What was true in year one is still true in 2026. The value of an industry publication isn't simply in reporting what is happening, but also helping the people who make up the industry understand what matters and decide what to do next.

Here's to the next 50 years.

Want to read 50 years of archives? Visit <https://tinyurl.com/Perfumer-and-Flavorist>.



The year before Opium was launched on the market, this publication took stock of its mission to educate and give context in the world of flavors and fragrances.



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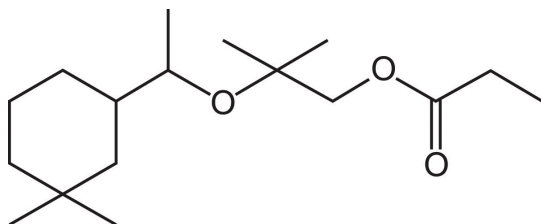


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Methyl phenylacetate is useful in red wine flavors and cask aged white wine flavors. Ten ppm works well.



■ BY JOHN WRIGHT
johnwrightflavorist@gmail.com

The Honeyed Power of Methyl Phenylacetate

Methyl phenylacetate (FEMA#2733, CAS# 101-41-7, COE# 2155, DG Sante# 09.783) is a powerful and economical bright honey note. It is especially useful in chocolate flavors, but also helps in savory, nut, brown and fruit categories.

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

Adding Depth to Savory Profiles

- **Beef, roast:** Methyl phenylacetate can be used in many meat flavors. Roast beef is the most obvious choice. Levels are, as always, a question of creative opinion, but high levels, 500 ppm and up, can work well.
- **HVP:** Methyl phenylacetate is also highly compatible with HVP flavors. High levels are also effective, up to 1,000 ppm.
- **Mushroom:** Methyl phenylacetate has an interesting effect in all mushroom flavors, but is most at home in dried mushroom profiles at around 50 ppm.
- **Soy sauce:** The effect in soy sauce flavors is very similar to that in HVP flavors. The ideal level of use depends on the type of soy sauce that is targeted, but should be around 300 ppm.



Methyl phenylacetate (FEMA#2733, CAS# 101-41-7, COE# 2155, DG Sante# 09.783) is a powerful and economical bright honey note.

Rounding Out Nut Flavors

- **Almond:** This ingredient is also effective in many nut flavors. Almond flavors are given attractive added depth by the addition of 10 ppm.
- **Hazelnut:** It is even more useful in hazelnut flavors. Twenty ppm works well, but higher levels can be interesting.
- **Peanut:** Ten ppm of methyl phenylacetate is just a cautious starting point in peanut flavors.
- **Praline:** This raw material harmonizes with both hazelnuts and chocolate, so it is not surprising that it is perfect in praline flavors. Sixty ppm is a reasonable level.

- **Walnut:** With walnut flavors we are back to more subtle additions of methyl phenylacetate, starting at around 10 ppm.

Adding Complexity to Fruit Flavors

- **Apricot:** Methyl phenylacetate can be surprisingly effective, deepening apricot flavors at the modest level of ten ppm.
- **Blackberry:** It is even more effective in blackberry flavors. Twenty ppm is a good starting point, adding depth and complexity.
- **Blackcurrant:** Five ppm of methyl phenylacetate is a useful addition to all styles of blackcurrant flavors, working equally well with buchu based flavors and with more realistic true to nature profiles.

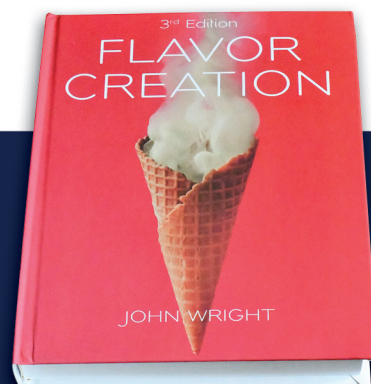


Methyl phenylacetate is very much at home in raspberry flavors and combines particularly well with zingerone.

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- **Cherry:** The same comments also apply to cherry flavors. Twenty ppm of this ingredient is equally beneficial in benzaldehyde based formulations and also in more natural profiles.
- **Fig:** The dried character of fig flavors fits perfectly into the profile of methyl phenylacetate. Fifty ppm is a subtle level of addition, but higher levels can be very attractive.
- **Lychee:** Rose is normally the dominant note in lychee flavors. Methyl phenylacetate helps to broaden the profile, while still retaining the floral character. Ten ppm is a good starting point in lychee flavors.
- **Peach:** The effect of methyl phenylacetate in peach flavors is very similar to that in apricot flavors. Five ppm is a good level.
- **Pineapple:** Low levels of addition, in the region of 5 ppm are useful in fresh pineapple flavors, adding an extra element of depth. Higher levels are better in canned style profiles.
- **Plum:** Ten ppm of methyl phenylacetate also help to round out realistic plum flavors but higher levels can also be used. The obvious danger with higher levels is that they drift in a “dried” direction.
- **Raspberry:** Methyl phenylacetate is very much at home in raspberry flavors and combines particularly well with zingerone. Twenty ppm is a good level.

Elevating Brown, Rich Flavor Profiles

- **Butterscotch:** Methyl phenylacetate is effective in butterscotch flavors at around 200 ppm, adding depth and an attractive floral nuance.
- **Chocolate and cocoa:** There is a clear connection between the predominantly honey note of methyl phenylacetate and the predominantly cocoa note of isoamyl phenylacetate. The two ingredients are perfect together in chocolate and cocoa flavors. One hundred ppm of methyl phenylacetate is a good starting level.
- **Coffee:** Coffee flavors are often in need of rounding out to counteract furfuryl mercaptan or similar sulfur notes. Twenty ppm of methyl phenylacetate works well in this context.
- **Maple:** Methyl phenylacetate has an interesting effect in all styles of maple flavors, adding useful depth. Levels of addition are subtle, around 5 ppm.
- **Sugar, brown:** Thirty ppm can be helpful in brown sugar and molasses flavors, adding depth and complexity.
- **Tea:** At first sight methyl phenylacetate might seem to be more suited to black tea flavors than green tea flavors, but the reverse is true. Moderate additions, around 20 ppm, are all that is needed to fit in very well to the profile of black tea flavors. Much higher levels, nearer 200 ppm, work better in green tea.



Coffee flavors are often in need of rounding out to counteract furfuryl mercaptan or similar sulfur notes. Twenty ppm of methyl phenylacetate works well in this context.

- **Vanilla:** Methyl phenylacetate adds helpful depth to vanilla bean style flavors at around 10 ppm. In contrast higher levels, up to 80 ppm, fit ideally into the profile of “French” style vanilla flavors.

Versatility Across Spirits, Sweet and Floral Flavors

- **Brandy:** Methyl phenylacetate can be helpful at low levels in many spirit flavors but it is especially appropriate in brandy flavors. Fifteen ppm is a good starting point.
- **Honey:** Here methyl phenylacetate really comes into its own when combined with ethyl phenylacetate. Four thousand ppm is ideal.
- **Condensed milk:** Condensed milk and dulce de leche flavors cover quite a range of different profiles. Methyl phenylacetate is most effective in the more processed styles of flavors at levels in the region of 40 ppm.
- **Peppermint:** Pushing cheap cormint oil in the direction of real peppermint oil is the holy grail of peppermint flavors. No single ingredient does the trick, but ten ppm of methyl phenylacetate goes a long way in the right direction.
- **Rose:** The combination of a modest honey note, derived from 100 ppm of methyl phenylacetate, and floral rose notes is very attractive.
- **Rum:** Of all spirit flavors, the most obvious connection to this ingredient is dark rum. Fifty ppm of methyl phenylacetate is excellent in both dark and light rum flavors.
- **Wine:** Methyl phenylacetate is not equally useful in all wine flavors. It does not help in bright white wine profiles, such as sauvignon blanc. Where it is useful is in red wine flavors and cask aged white wine flavors. Ten ppm works well. 



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MAPPING THE GLOBAL SENSES

(Part 3 of 3): Flavors Meet the Machines

■ BY MINDY YANG

People describe "vanilla" the same way whether they're smelling it or tasting it. Most AI flavor models are trained on exactly this kind of descriptive data—language that collapses two distinct neurological experiences into a single word. The models don't know the difference. Neither, in most cases, do the datasets.

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Part 1 of this series appeared in the April 2026 issue of *Perfumer & Flavorist+*; Part 2 of this series appeared in the September edition of the magazine. -Editor

Editor's introduction: From an AI-driven cocktail bar in Abu Dhabi to machine-learning systems reshaping formulation, the boundaries between sound, emotion, memory and flavor are beginning to blur. But as algorithms get better at predicting what consumers might like, author Mindy Yang says one stubborn question remains: can AI learn what flavor actually feels like?

Abu Dhabi: When Sound Becomes Something You Can Taste

Everything discussed so far in this series—fermentation, emotional coding, the tension between novelty and familiarity—converges in an unlikely place: a cocktail bar inside the Four Seasons Hotel Abu Dhabi.

Saikindō opened in late 2025, designed by AvroKO, a firm whose portfolio includes James Beard Award-winning restaurants and projects across 22 countries. The concept draws from Japan's listening bar culture—spaces where the music is not background but the point—and filters it through omotenashi, the Japanese hospitality philosophy built around anticipating what a guest needs before they say it.

The interior pulls from two unexpected sources: Japan's post-war Metabolism movement, which favored modular, adaptable architecture, and the Bosozoku biker subculture, with its customized motorcycles and embroidered jackets. L-Acoustics speakers are built into wooden panels at mid-height rather than aimed at the room, dispersing sound evenly so that every seat hears the same thing.

The bar is led by beverage director Marco Corallo, who previously worked at London's Artesian—the bar that held the World's Best Bar title for four consecutive years, from 2012 to 2015—alongside head mixologist Ann Pinsuda, formerly of The Bamboo Bar at Mandarin Oriental Bangkok, which debuted at number 35 on the World's 50 Best Bars list. The credentials are serious. But what's technically interesting for



Saikindō, a cocktail bar inside the Four Seasons Hotel Abu Dhabi, draws from Japan's listening bar culture—spaces where the music is not background but the point—and filters it through omotenashi, the Japanese hospitality philosophy built around anticipating what a guest needs before they say it.



Japan's listening bar culture features spaces where the music is not background but the point.

anyone working in flavor development is what they're attempting with AI.

The team used machine learning to translate musical elements—tempo, tone, key—directly into cocktail recipes, creating drinks that correspond to whatever is playing on any given night. This is not as speculative as it might sound.

The research foundation already exists. Cédric Colas, working out of a computational neuroscience background, trained a self-supervised transformer model on 30,000 MIDI files and mapped musical pieces into a shared representational space with cocktail recipes. His system represents each cocktail in a 13-dimensional “taste space” that includes alcohol content, sourness, sweetness, bitterness, herbiness, fruitiness and complexity. It learns to connect music and taste through shared semantic labels—“Cuban” applying to both Latin jazz and rum-and-mint cocktails, “Romantic” applying to both Chopin nocturnes and complex, bittersweet drinks.

Before Colas, Tramontina partnered with Spotify and neuroscientist Dr. Marcelo Costa to build a synesthetic algorithm that translated millions of songs into flavor profiles. Beethoven's Fifth became foie gras terrine with salmon caviar. A samba rhythm mapped to dense, layered food. The results were imperfect—synesthesia is not a solved problem—but they demonstrated that the connection between sound and taste is not purely metaphorical. There are measurable neurological overlaps between auditory and gustatory processing, and machine learning is starting to find them.

What Saikindō is doing is essentially a commercial deployment of this research: a bar where the cocktail menu shifts with the music, where every drink is available in both alcoholic and non-alcoholic versions, built around seasonal Japanese ingredients, sake, and shōchū. Whether it works—whether guests actually experience cocktails that feel compositionally linked to what they're hearing—remains to be seen. But it represents something genuinely new: the first serious attempt to use AI-driven synesthetic flavor translation in a real hospitality context, at a venue with the talent and the backing to do it properly.

The food follows an izakaya rhythm—compact, shareable, designed for comfort rather than spectacle. Maguro crunch with spicy tuna and grilled Japanese eggplant, a melt-in-your-mouth wagyu skewer that is likely to become one of the venue's defining dishes.



Cédric Colas trained a self-supervised transformer model on 30,000 MIDI files and mapped musical pieces into a shared representational space with cocktail recipes. His system represents each cocktail in a 13-dimensional “taste space” that includes alcohol content, sourness, sweetness, bitterness, herbiness, fruitiness and complexity. It learns to connect music and taste through shared semantic labels such as “Romantic,” which applies to both Chopin nocturnes and complex, bittersweet drinks.

Bob Suri, general manager of Four Seasons Hotel Abu Dhabi, described it as “an inspiring journey of creativity, collaboration and innovation,” developed with support from Abu Dhabi's Department of Culture and Tourism. The programming extends beyond the bar itself: vinyl takeovers, guest DJ sets, record collectors' nights, masterclasses on Japanese spirits. Every detail is orchestrated, which is either the purest expression of omotenashi or the most elaborate marketing exercise in the history of cocktail bars. Possibly both.

Lausanne, Switzerland: When the Algorithm Learns Restraint

Everything discussed so far in this series is being fed into algorithms now—the fermentation data, the emotional coding, the nostalgia research, the sound-to-flavor experiments. The question is whether the algorithms are sophisticated enough to do anything useful with it.

Givaudan's ATOM^a tool uses AI to identify positive and negative flavor drivers and explore ingredient

^aGivaudan's Advanced Tools for Modelling (ATOM) apply AI to accelerate food and flavor formulation, drawing on more than two decades of research to identify ingredient combinations aligned with consumer preferences. In one early application, ATOM helped develop a cheese snack with 33% less salt that performed as well as the original in taste testing, while significantly reducing the number of formulations requiring trial and error.



Most flavor preference research captures what people say they like—survey responses, purchase history, click patterns. What it doesn't capture, or captures very poorly, is what people actually experience when they taste something.

Most flavor preference research captures what people say they like—survey responses, purchase history, click patterns. What it doesn't capture, or captures very poorly, is what people actually experience when they taste something. Those are not the same thing, and the gap between them is where AI flavor development currently lives.

The Human Problem Nobody's Solving Fast Enough

Paul Breslin at Rutgers has spent decades studying the intersection of taste, smell and what we actually call flavor—which turns out to be a far more complicated neurological event than most people realize. His work focuses on taste discrimination, enhancement, suppression, and the interactions among gustation, chemesthesis and olfaction that together constitute the experience of flavor.

The core finding is this: how we perceive flavor when eating is fundamentally different from how we perceive it when smelling. The route aroma takes during eating—up through the back of the throat to the olfactory epithelium, what scientists call retronasal olfaction—creates a different neurological signature than smelling through the nose. Research has shown that retronasal odorants activate encoding patterns in the insula similar to their paired tastants, with overlapping representations particularly in the ventral anterior insula. Retronasal

synergies. In an early project focused on reducing salt in cheese snacks, ATOM identified the ideal recipe quickly enough to justify the investment, delivering a 33% salt reduction that scored as highly as the original in blind testing. The company's Carto system takes it a step further: an intuitive touchscreen interface where perfumers select raw materials and a robot produces instant samples, collapsing the development cycle from weeks to hours.

Elsewhere, Symrise collaborated with IBM on Philyra, an AI assistant designed specifically for perfumery innovation. In addition, Firmenich (prior to the formation of dsm-firmenich) announced its first AI-created flavor in partnership with Microsoft in 2020 and followed it with Scentmate in 2021.

The tools are impressive. The limitation is always the data feeding them.



What we actually call flavor turns out to be a far more complicated neurological event than most people realize.

odor perception requires taste cortex. Orthonasal does not. These are not subtle differences.

And yet people describe “vanilla” the same way whether they’re smelling it or tasting it. Most AI flavor models are trained on exactly this kind of descriptive data—language that collapses two distinct neurological experiences into a single word. The models don’t know the difference. Neither, in most cases, do the datasets.

Then there’s the temporal dimension, which is even harder to capture. Flavor perception is dynamic. The intensity of what you’re tasting changes moment to moment as you chew, breathe, salivate, move your tongue, and swallow. Flavor release doesn’t happen all at once—it occurs in steps, producing gustatory, olfactory, and trigeminal sensations that layer over each other in ways that time-intensity research is only beginning to map. Studies on potato chip consumption have shown that chewing rate significantly affects maximum flavor intensity. A flavor that works beautifully at 40 chews per minute might fall apart at 120. The algorithm doesn’t know that yet.

Clinical trials that track real sensory perception—neurological response, temporal flavor release, emotional associations measured over time—are expensive, slow, and difficult to scale. But they’re necessary, because without them we are training machines on proxies. On language instead of experience. On what people say instead of what they feel.

Where This Lands

The brands that seem to be winning right now are doing something that sounds simple but is remarkably



Data still can’t tell you whether a flavor feels right at 8 a.m. versus 8 p.m. Whether the third bite tastes different from the first. Those are still human questions. And for now, at least, they still need human answers.

difficult in practice: holding cultural specificity and scalable systems in the same hand.

The flavorists who thrive in the next decade won’t be the ones who can replicate traditional flavors most accurately, or the ones who can deploy AI most aggressively. They’ll be the ones who understand that technology is only useful when it amplifies what humans actually experience—not what humans say they experience, not what humans click on, but what happens in the mouth, in the nose, in the parts of the brain that process taste and memory and emotion all at once.

The data still can’t tell you whether a flavor feels right at 8 a.m. versus 8 p.m. Whether the third bite tastes different from the first. Whether it triggers comfort or curiosity. Whether it works at 40 chews per minute or needs 80. Whether it will make someone feel something they didn’t expect to feel when they sat down to eat.

Those are still human questions. And for now, at least, they still need human answers. 



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EVERY SHADE OF GREEN: NEW F&F NOTES

Moss, cucumber, melon, celery, fresh-cut stems and more.



From mossy depth to watery freshness, a new generation of green ingredients is expanding the palette for fragrance and flavor.

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Today's green aromatic palette goes far beyond simple "fresh." From mossy depth and wet-stone realism to cucumber, leafy florals, tropical buchu and juicy melon, these ingredients show how suppliers are pushing green notes into more textured, naturalistic and sustainable territory^a.

Maximoss, a Sustainable Alternative to Traditional Moss Notes

Osmo's Maximoss is a fragrance molecule designed to deliver the depth, realism and authenticity of classic moss accords while addressing growing regulatory challenges surrounding traditional moss ingredients.

Featuring a woody, mossy, earthy, green, marine and mineral olfactive profile, Maximoss creates the impression of clean, deep woods with a fresh, wet-stone character. The molecule brings naturalistic complexity and texture to fragrance compositions, offering perfumers a modern tool for building earthy freshness and atmospheric depth.

According to Osmo, Maximoss is 100% biodegradable and non-sensitizing, providing a sustainable alternative for formulators seeking to recreate the richness of moss-inspired scents while navigating evolving ingredient regulations.



Osmo's Maximoss is a fragrance molecule designed to deliver the depth, realism and authenticity of classic moss accords while addressing growing regulatory challenges surrounding traditional moss ingredients.

^aNOTE: Ingredient availability and regulatory status may vary by region. Not all materials featured in this roundup are commercially available in every market. Readers should consult respective suppliers to confirm regional availability, approved uses and any applicable regulatory restrictions before formulation or commercialization.



3,6-Nonadien-1-yl acetate is especially useful in melon and light fruit flavor constructions.

Buchu Mercaptan with a Bold, Green Tropical Intensity

At De Monchy's showcase at FlavourTalk 2026, its buchu mercaptan delivered a highly potent signature note defined by bold, green tropical intensity characteristic of buchu, with a distinctive ability to lift and amplify fruit profiles such as pineapple.

Alongside its powerful green impact, the material also carries a subtle floral facet, adding a layer of brightness and diffusion that helps round its overall sensory profile while maintaining strong tropical character.

Fresh Green Lift with Juicy Melon and Soft Floral Depth

3,6-Nonadien-1-yl acetate (CAS# 76649-26-8) from Bedoukian is an aroma ingredient valued for its soft, fresh green character with a subtly fatty, floral nuance.

In fragrance applications, it functions primarily as a modifier that enhances naturalness in floral compositions, adding airy green lift and helping bridge middle notes with a gentle floralcy; it is typically used at trace levels up to 2% and shows strong substantivity with a blotter tenacity exceeding 48 hours.

In flavor systems, it delivers a distinctive cantaloupe-like melon note, while also supporting fresh fruit profiles such as apple, pear and strawberry by adding realism and juiciness at very low use levels (2-20 ppm), making it especially useful in melon and light fruit flavor constructions.

Green, Watery, Alive: Next-Gen Freshness

At Advanced Biotech, a focused set of materials explores the evolving language of fresh, green and watery profiles.

- *cis*-4-Heptenol 1% PG natural introduces a crisp squash, cucumber, and melon character, setting a clean hydrating tone.
- 2,6-Nonadien-1-yl acetate 5% ETOH natural reinforces this freshness with a classic cucumber-violet leaf signature, balancing green sharpness with soft floral lift.
- Extending the profile further, (Z)-3-hexen-1-yl phenyl acetate natural and *cis*-3-hexenyl isobutyrate natural layer in leafy, floral, pear-like and subtly fruity nuances, adding dimension and diffusion.

Together, these ingredients demonstrate how modern green accords can move beyond simple “fresh” cues into vivid, multi-faceted structures suitable for both fresh and fruit-forward applications.

Styryllyl Acetate: The Secret to Fresh-Cut Green Florals

Riverside Aromatics’ styryllyl acetate natural (FEMA# 2684) is a classic character ingredient prized for its vibrant green, leafy freshness and distinctive gardenia-like floralcy.

Combining crisp rhubarb facets with dewy foliage notes and subtle earthy nuances, it brings natural realism and lift to floral, fruit, and botanical flavor creations.



Riverside Aromatics’ styryllyl acetate natural (FEMA# 2684) is a classic character ingredient prized for its vibrant green, leafy freshness and distinctive gardenia-like floralcy.



Celery ketone delivers a distinct celery-like, fresh green character that adds crisp vegetal realism to savory profiles.

Often used to recreate the freshness of freshly picked flowers and green stems, styryllyl acetate adds brightness, complexity and a living garden quality to sophisticated flavor profiles.

Capturing Cucumber: Preserving Nature’s Freshest Flavor

Known for its crisp, watery freshness and clean green character, cucumber remains one of the most challenging flavors to authentically reproduce due to its highly volatile aroma compounds.

Aromaplant’s Cucumber FTNF (from the named fruit; seen at FlavourTalk 2026) is designed to overcome that challenge through sensitive low-temperature processing that preserves the ingredient’s delicate sensory profile. The result is a true-to-nature flavor delivering fresh, crisp, green, watery, aldehydic and clean notes suitable for a wide range of beverage, confectionery and flavor applications.

By maintaining the nuanced characteristics of freshly cut cucumber, the ingredient offers formulators a versatile tool for creating refreshing hydration concepts and other products seeking an authentic garden-fresh taste experience.

Fresh Green Aroma Building Blocks

Millipore Sigma's celery ketone (CAS# 3720-16-9, FEMA# 3577) and β -farnesene (CAS# 18794-84-8, FEMA# 4971) are green aroma chemicals used to build fresh, naturalistic top notes in flavor and fragrance systems.

Celery ketone delivers a distinct celery-like, fresh green character that adds crisp vegetal realism to savory profiles. β -farnesene contributes a broader fresh-green, slightly spicy and sweet nuance with subtle warmth, often used to round and lift green accords.

Together, these materials support green, herbal, and fresh vegetable-style formulations where natural freshness and subtle complexity are required.

Spicy Green Anisic Nuance with Tea-Like Depth and Creamy Undertones

3-Methyl-2,4-nonanedione (CAS# 113486-29-6) is a Bedoukian aroma ingredient known for its distinctive anisic, spicy-herbal green profile with a subtle lactonic undertone.

In fragrance applications, it acts as a powerful modifier that adds complexity and lift, contributing a dry herbal-spicy-green character at extremely low levels (traces to 1%) with strong substantivity (>48 hours on blotter).

In flavor systems, it shows impressive versatility, delivering dry hay-like notes reminiscent of green and black tea, alongside soft creamy nuances that enhance caramel and dairy profiles at low doses (0.02-2 ppm). It also brings realistic green, savory depth to dried herbs like parsley, chive, and spinach, and even supports seafood accords such as anchovy and seaweed, making it a high-impact multifunctional ingredient across savory and sweet applications.



3-Methyl-2,4-nonanedione is a Bedoukian aroma ingredient that, among other profiles, supports seafood accords such as anchovy and seaweed, making it a high-impact multifunctional ingredient across savory and sweet applications.

Green, Fruity, Sweet Aroma Modifier

Millipore Sigma's 1,1-diisobutoxyethane (CAS# 5669-09-0, FEMA# 4527, Flavis# 06.053, FG grade, $\geq 95\%$ assay) is a flavor and fragrance ingredient with a green, fruity, and sweet organoleptic profile. It is used to introduce fresh, slightly sweet fruit-green nuances in aroma and flavor systems.

The material is compliant with EU regulations (EU 1334/2008 and 178/2002) and FDA 21 CFR 117, and is available as natural (U.S.) and kosher grade. It contains no known allergens and is suitable for applications requiring clean, lifted fruity-green character in complex formulations. 



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Finding Her Signature in Fragrance

For Donna Ramanauskas, perfumery began at home, surrounded by her father's blotters and daily creations. Now a senior perfumer at Agilex Fragrances, Ramanauskas reflects on her first big win, an accidental amber breakthrough, and why the best creative discoveries can come from constraints and even mistakes

What led you to the fragrance industry?

Ramanauskas: I was introduced to the fragrance world long before I thought of it as a career. My dad was a perfumer and growing up I was surrounded by blotters and bottles of his daily creations. That early exposure shaped my curiosity. Over time, I realized I didn't just admire my dad's work but wanted to follow in his footsteps. The fragrance industry felt like home to me.

Can you share a defining moment or breakthrough in your career as a perfumer?

Ramanauskas: A defining moment in my career, as I'm sure it is for all perfumers just starting, was my very first win. Something I remember vividly. For me, it was creating a lily of the valley fragrance for Crabtree & Evelyn. That brief becoming a finished scent, felt like a moment when everything clicked. It was the first time I saw my work move from an idea on a blotter to a fragrance out in the work touching people's daily lives. That experience gave me both confidence and clarity and remains a milestone I look back on fondly.

What were some of the biggest challenges you faced when entering the perfume industry, and how did you overcome them?

Ramanauskas: One of the biggest challenges I faced entering the perfume industry was a personal one. Stepping out from behind my dad's shadow to prove myself and discover what truly resonated with me creatively. Finding my own voice meant giving myself permission to explore beyond what I'd grown up around. Trusting my own instincts and leaning into materials that sparked genuine excitement for me. To



"When a formula forces me to adapt whether due to regulations, stability issues or cost, I'm pushed to explore materials I might not normally reach for," says Donna Ramanauskas, senior perfumer at Agilex Fragrances. "Those moments often open unexpected doors, helping me stretch beyond my comfort zone and push boundaries, spark experimentation and ultimately lead to a kind of newness that keeps perfumery evolving."

carve out a niche that felt authentically mine. This challenge helped me embrace honoring the foundation my dad gave, but also trusting my own curiosity enough to shape a new path.

Can you describe a time when a fragrance formulation didn't turn out as expected? How did you address the issue?

Ramanauskas: One moment that stands out was a formulation that was meant to be a soft, balanced composition when I accidentally overdosed a dry amber note. At the time, it was far from what consumers were gravitating toward and it immediately felt like a mistake. But this is exactly where magic happens in

perfumery. You're forced to look at scent through a completely new lens. Despite being "wrong," that so called error ended up sparking my deep love for amber notes, something that has since become an identifying thread in my work. What started as a misstep became a breakthrough, reminding me that some of the most exciting shifts in perfumery come from those unexpected happy accidents.

How do you find the right balance between artistic expression and the technical limitations of perfume formulation?

Ramanauskas: For me, the balance between artistic expression and the technical limitation of formulation isn't about choosing one over the other. It's about seeing those limitations as creative catalysts. I view restrictions as an invitation to think differently. When a formula forces me to adapt whether due to regulations, stability issues or cost, I'm pushed to explore materials I might not normally reach for. Those moments often open unexpected doors, helping me stretch beyond my comfort zone and push boundaries,

spark experimentation and ultimately lead to a kind of newness that keeps perfumery evolving.

Are there specific skills or knowledge areas you believe are crucial for a perfumer to master?

Ramanauskas: Beyond the obvious technical foundations of olfactive memory, raw material knowledge and the ability to construct a balanced formula, I believe the most crucial skills for a perfumer are rooted in creativity and adaptability. The ability to translate emotion, imagery and abstract ideas into scent. Curiosity and experimentation are equally important, because true innovation often comes from pushing beyond the expected and trying unconventional pairings. At the same time, perfumery isn't created in isolation. Collaboration and communication play a huge role in shaping fragrance. Being able to listen, interpret a brief, articulate your vision, and adapt when direction shifts is just as important. Ultimately, the combination of technical mastery, creative openness, and strong partnership skills is what allows a perfumer to bring idea to life in a way that feels both intentional and inspiring. 



The banner features a red and orange background with a molecular structure pattern. In the top left is the 'perfumer & flavorist+' logo with a leaf icon and the tagline 'The Resource for Sensory & Wellness Innovation'. The text 'Tune In!' is prominently displayed in the center. Below it are three circular icons: a microphone, a smartphone with concentric circles, and a play button. At the bottom, it reads 'Perfumer & Flavorist+ Multimedia' and provides the website 'www.perfumerflavorist.com/multimedia'.

ORGANOLEPTIC EVALUATION OF FLAVOR MATERIALS: A NEW CHAPTER

A new U.S. flavorist panel puts aroma and taste under the microscope.

■ BY BILL ASLANIDES, principal flavorist at Synergy Flavors



From left, Menzie Clarke, principal flavorist, McCormick Flavor Solutions; Rebecca Genovise, senior flavor chemist, Synergy Flavors; Holly Bohlke, principal flavorist, director of flavor creations, Imbibe; Jeb Gleason-Allured, group publisher, Perfumer & Flavorist+, who was present for the panel's debut session; Andrew Petrou, senior savory lab manager, flavorist, Bell Flavors & Fragrances; and Bill Aslanides, principal flavorist at Synergy Flavors, lead author for our U.S. flavor panel.

Since the 1980s, *Perfumer & Flavorist+* has documented the sensory character of flavor materials through its *Organoleptic Characteristics of Flavor Materials* series, pioneered by founding editor and author Gerard Mosciano. Now, that tradition enters a new chapter with a U.S.-based panel led by Bill Aslanides, principal flavorist at Synergy Flavors, alongside the publication's recently launched European panel overseen by Maria Palassarou.

For the inaugural U.S. evaluation^a, Aslanides was joined by Menzie Clarke, principal flavorist, McCormick Flavor Solutions; Rebecca Genovise, senior flavor chemist, Synergy Flavors; Holly Bohlke, principal flavorist and director of flavor creations, Imbibe; and Andrew Petrou, senior savory lab manager and flavorist, Bell Flavors & Fragrances. The series will also feature insights from Nicole Hernandez of Flavorchem and Christina Hook (Barrera) of Sensient.

As always, the latest series goes beyond technical specifications to capture what matters most to flavorists: what a material actually smells and tastes like—and how those sensory nuances translate into formulation opportunities.

Suppliers: Want to submit materials for review? Contact Mitchell Fox, business development manager, Perfumer & Flavorist+, mfox@allured.com.

-Editor

3-Methyl-2-oxo-ethyl pentanoate (Bedoukian trade name: Nuezate)

Supplier: Bedoukian; FEMA#4903; CAS# 26516-27-8; aroma assessed at 1%; taste dilutions: 1 ppm/3 ppm

- **Natural Occurrences:** No known natural occurrences.
- **Odor Descriptors @ 1%:** Cooked, brown sugar, jammy notes, dried fruit, green herbal, plum, Brown/burnt sugar, caramelized.
- **Taste Descriptors @ 1 ppm:** Brown, sugar, caramel, resinous, earthy, burnt ends.
- **Taste Descriptors @ 3 ppm:** Meaty, alliaceous, celery, burnt fruit, braised meat, root vegetable.
- **Suggested Flavor Applications:** (Note: Could probably use at higher rates than those the panel assessed.) Grilled/caramelized fruit, pie fillings, baked goods, braised meats, barbecue, celery/stock seasonings, melon/berry flavors, savory sauces, maple, burnt butter. Tropical nuances.

2,4-Undecadienal, natural

Supplier: Advanced Biotech; FEMA# 3422; CAS# 13162-46-4; aroma assessed at 1%; taste assessed at 0.3 ppm/0.6 ppm

- **Natural Occurrences:** Cucumber, mushroom, apple, cooked meats. Roasted and fermented foods; peanuts, potato chips, beer, soybean, malt.
- **Odor Descriptors @ 1%:** Fatty, green, oily, cucumber, tangerine, donut/fried note, cilantro.
- **Taste Descriptors @ 0.3 ppm:** Fatty, oily, green, waxy, tangerine.
- **Taste Descriptors @ 0.6 ppm:** Fried, mouth-coating, oily, cucumber, fatty.
- **Suggested Flavor Applications:** Fried foods, cucumbers/melon, citrus, bakery/donut, herbal flavors (cilantro, green pepper), fried dough confections, churro, chicken, pork, potato chips.

3-Decen-2-one

Supplier: Bedoukian; FEMA# 3532; CAS# 10519-33-2; aroma assessed at 1%; taste assessed at 1 ppm/4 ppm

- **Natural Occurrences:** Porcini mushrooms, Iberian ham, tuna, yogurt, and various fruits, juices and teas.
- **Odor Descriptors @ 1%:** Green waxy, herbal cilantro, waxy fatty, oily, green, earthy, buttery, blue cheese, mushroom, pickle, truffle, potato.
- **Taste Descriptors @ 1 ppm:** Green, cucumber, waxy, fatty, earthy, mushroom, buttery.



Bedoukian's Nuezate (3-methyl-2-oxo-ethyl pentanoate) is appropriate for applications such as grilled/caramelized fruit, pie fillings and more.

- **Taste Descriptors @ 4 ppm:** Cheese, oily, goaty, fatty, milky, mushroom, earthy, mouth-coating, papaya.
- **Suggested Flavor Applications:** Cheeses (blue/brie), melon/cucumber, mushroom, vegetables, dairy, beef/fish, seasonings, dill, tomato.

2-Ethyl-4-methyl thiazole, natural (1% in ETOH)

Supplier: Advanced Biotech; FEMA# 3680; CAS# 15679-12-6; aroma assessed as-is; taste assessed at 1 ppm/2 ppm

- **Natural Occurrences:** Cooked and roasted foods; Roasted coffee, cooked meats, roasted seeds and grains, traces in raspberry.
- **Odor Descriptors (Neat):** Intense brown/roasted, nutty, caramellic, coffee/chocolate, dark, brothy, nut skin/pistachio, mild tropical, gasoline.
- **Taste Descriptors @ 1 ppm:** Meaty, cooked, cocoa powder, brothy, alliaceous.
- **Taste Descriptors @ 2 ppm:** Roasted, meaty, burnt, dark chocolate, charred and roasted, heavy green vegetables, alliaceous.
- **Suggested Flavor Applications:** Nut flavors (hazelnut, almond, pistachio), peanut/peanut butter, beef, soup, roast vegetables, caramel, chocolate, bacon, citrus peel, cruciferous vegetables (broccoli/asparagus), charred, garlic/onion, lobster.



Advanced Biotech's 2-ethyl-4-methyl thiazole, natural (1% in ETOH) is appropriate for applications such as nut flavors, caramel and more.

Methyl dihydrojasmonate, natural (Firmenich (now dsm-firmenich) trade name: Hedione)

Supplier: Pearlchem; FEMA# 3408; CAS# 24851-98-7; aroma assessed at 1%; taste assessed at 0.5/2.0 ppm

- **Natural Occurrences:** Tea, jasmine, honey, osmanthus, bergamot.
- **Odor Descriptors @ 1%:** Floral, rosy, jasmine, citrus, peach.
- **Taste Descriptors @ 0.5 ppm:** Fresh green floral, strong lemony note, slight powdery note.
- **Taste Descriptors @ 2 ppm:** Jasmine, floral, honey, tea, citrus and blossom.
- **Suggested Flavor Applications:** Lemon and citrus, grapefruit, fruit punch, white peach, honey, white tea, berries, stone fruits, apricot, cherry and orange blossom, elderflower, pomegranate, fig, and tobacco.

Lemon oil Murcia (Spain)

Supplier: Bontoux; FEMA# 2625, aroma assessed at 1%; taste assessed at 2 ppm/15 ppm

- **Odor Descriptors (Neat):** Zesty, Fresh squeezed lemon, strong citrus, with light floral and very mild terpenic notes.
- **Taste Descriptors @ 2 ppm:** Subtle lemon, clean green notes and a lemonade-like profile. Juicy and fresh.
- **Taste Descriptors @ 15 ppm:** Full, clean, fresh, lemon citrus, sweet candied and mild zest peel character. Bright.



Bontoux's lavender oil Barrême (France) is appropriate for applications such as matcha tea, hibiscus, hemp, and cannabis terpene profiles.

- **Suggested Flavor Applications:** Lemonade, limeade, cola flavors, candy, lemon sorbet, margarita, and mojito. General fruit brightening. Can also be used in chili peppers, vegetables, cilantro, spice and seasoning blends.

Lavender oil Barrême (France)

Supplier: Bontoux; FEMA# 2622; aroma assessed at 1%; taste assessed at 0.5 ppm/1.0 ppm

- **Odor Descriptors @ 1%:** Very floral, perfumy, powdery, almost gin-like.
- **Taste Descriptors @ 0.5 ppm:** Juniper berry note, lightly floral, berry, gin character, mild fruit punch.
- **Taste Descriptors @ 1 ppm:** Intensely floral, earthy, strong linalool, powdery and berry-like.
- **Suggested Flavor Applications:** Blueberry, blackberry, gin, tea, honey, peach, apricot, matcha tea, hibiscus, hemp, cannabis terpene profiles.



Robertet's peanut CO₂ extract is appropriate for Thai-style peanut sauces, sesame profiles and other applications.

cream, French vanilla, custard, crème brûlée), caramel, meat flavors, grilled/charcoal profiles, egg flavors, elote, horchata and cereal/grain applications.

Natural sulfurol (milky type)

Supplier: Pearlchem; FEMA# 3204; CAS# 137-00-8; aroma assessed at 5%; taste assessed at 10 ppm/30 ppm

- **Natural Occurrences:** Roasted and grilled meats, cocoa, roasted nuts, trace in cognac and whiskey. By-product of Maillard reactions.
- **Odor Descriptors (Neat):** Brown, Milky, creamy, eggy, melted butter, slightly meaty.
- **Taste Descriptors @ 10 ppm:** Milky, creamy, dairy, butter, eggy and popcorn/corn masa-like notes, and had mouthfeel.
- **Taste Descriptors @ 30 ppm:** Cooked milk, eggy, mouth-coating, savory, popcorn, elote.
- **Suggested Flavor Applications:** Buttered popcorn, baked goods, cream needs (condensed milk, ice

Peanut CO₂ extract

Supplier: Robertet; aroma assessed at 5%; taste assessed at 10 ppm/40 ppm

- **Odor Descriptors @ 5%:** Cooked peanut, sesame, roasted, toasted, earthy and slight pan-fried notes.
- **Taste Descriptors @ 10 ppm:** Faint level, roasted peanut, sesame, earthy, oily, and savory.
- **Taste Descriptors @ 40 ppm:** Oily, mouthcoating, peanut butter, toasted sesame, roasted nut.
- **Suggested Flavor Applications:** Peanut butter, chocolate, coffee, Thai-style peanut sauces, sesame profiles, sauces, snacks, candy, pet foods. Modifier of other nut profiles, such as snickerdoodle-type cookies or broader nut blends. 



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SWEETNESS, REWIRED

From brain cues and receptor science to AI-designed sweeteners and taste modulation, a new generation of technologies is giving flavorists more ways to deliver less sugar without sacrificing satisfaction.

Recent research shows that 58% of Americans rank sweet-tasting food in their top two preferences among the five basic tastes, outperforming savory/umami (49%), salty (45%), sour (24%) and bitter (21%). Furthermore, 59% of respondents agree that sweet-tasting foods and beverages can be part of a healthy diet.

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According to a newly released “Healthy Aging Report” by ADM, a significant number of global consumers are now modifying their dietary and supplement choices to promote physical mobility, strength and cognitive resilience^a. This proactive approach to health is unlocking vast market opportunities, but it comes with a dramatic twist for product formulators. For decades, flavor was an uncompromisable king; however, today’s health-conscious public is opening the door to distinct sensory trade-offs.

Notably, the report reveals that a striking 67% of consumers state that products supporting vitality and healthy aging can taste less sweet. This willingness to scale back sweetness provides manufacturers with a massive green light to reduce sugar and heavy sweeteners without fearing consumer backlash.

These findings dovetail with a 2025 survey released by the International Food Information Council^b (IFIC), which found that Americans crave sweetness but want less of it. According to “Americans’ Perceptions Of Sweetness In Their Diets,” sweetness remains the most preferred basic taste quality in the United States, yet an overwhelming majority of consumers believe it is important to scale back the overall sweetness of what they eat and drink.

The Sweet Paradox

The IFIC study shows that 58% of Americans rank sweet-tasting food in their top two preferences among the five basic tastes, outperforming savory/umami (49%), salty (45%), sour (24%) and bitter (21%). Furthermore, 59% of respondents agree that sweet-tasting foods and beverages can be part of a healthy diet.

However, 78% of consumers state that reducing the overall sweetness of their diet is important to them (with 33% calling it “very important” and 45% calling it “somewhat important”). When asked why they want to cut back, respondents cited several primary motivators:

- Eating healthier in general: 49%
- Managing blood sugar/diabetes: 43%
- Managing body weight: 41%
- Improving dental health: 36%

Women were significantly more likely than men to cite these reasons for cutting back, including eating

^a<https://www.adm.com/en-us/news/adm-stories/aging-well-consumer-perspectives-on-longevity/>

^bMethodology: The IFIC Spotlight Survey was fielded online from February 14–19, 2025, among 1,000 U.S. adults aged 18 and older, with data weighted to ensure proportional demographic representation; <https://ifc.org/research/ific-spotlight-survey-americans-perceptions-of-sweetness-in-their-diets/>



When identifying where dietary sweetness originates, consumers point primarily to desserts and sweet snacks (53%), candy (49%) and fruit (41%), followed by sugar-sweetened beverages (36%), 100% juice (32%) and coffee/tea drinks (32%).

healthier (53% vs. 44%) and managing blood sugar (49% vs. 37%).

Anticipated Health Gains vs. Cravings Split

If consumers were to lower the sweetness in their daily diets, most expect clear health benefits. Sixty-four percent expect an increase in overall health and the healthfulness of their diet, while 58% expect a drop in calorie intake and 55% expect a decrease in body weight.

Yet, consumer sentiment remains completely split regarding how a less-sweet diet would affect cravings. Exactly 36% of Americans expect their cravings to increase, while an equal 36% expect their cravings to decrease.

Sources of Sweetness and the Functionality Gap

When identifying where dietary sweetness originates, consumers point primarily to desserts and sweet snacks (53%), candy (49%) and fruit (41%), followed by sugar-sweetened beverages (36%), 100% juice (32%) and coffee/tea drinks (32%).

The survey also uncovered a significant gap in consumer understanding of food science. While 77% of Americans recognize that sugar is added to foods and drinks for sweetness, far fewer realize its critical technical properties, such as texture (22%), shelf-life extension (21%), color development (16%) or moisture retention (11%).

Industry Outlook: Less Sweet, Still Satisfying

The findings present a major product development opportunity for food and beverage manufacturers. Because consumers still strongly prefer sweet profiles but want to consume less sweetness overall, developers are tasked with creating “less-sweet” formulations that maintain sensory satisfaction while helping consumers achieve their health objectives.

Fortunately, the challenge comes amid a rise in sensory science insights and sweet modification tools.

Sweet Science Gets Smarter: From Brain Cues to Taste Receptors

New research is revealing that sweetness is far more complex than taste alone. From brain-driven expectations to receptor-level interactions, emerging science is giving flavorists new ways to understand—and potentially engineer—the sweet experience. New research is revealing that sweetness is far more complex than taste alone. From brain-driven expectations to receptor-level interactions, emerging science is giving flavorists new ways to understand—and potentially engineer—the sweet experience.

Sweetness Is Shaped by More Than What's in the Glass

Recent research in *The Journal of Neuroscience* suggests that expectation can materially alter how consumers perceive and enjoy sweet flavors^c, with implications for sugar-reduction and sweetener formulation. In an fMRI study, participants who expected to receive sugar reported greater pleasantness when they actually received a non-nutritive sweetener, while their brains also showed increased activity in reward-related midbrain regions.



Product cues, flavor associations and consumer expectations could influence the perceived reward of a sweetener, potentially opening another dimension for designing sugar-reduced products.

For flavorists and food and beverage developers, the findings suggest that the sensory performance of a reduced-sugar product may depend on more than sweetness intensity or ingredient composition. Product cues, flavor associations and consumer expectations could influence the perceived reward of a sweetener, potentially opening another dimension for designing sugar-reduced products. The study also reinforces the value of evaluating sweetener systems in realistic consumer contexts rather than relying solely on controlled taste comparisons.

The research is preliminary, with 27 participants selected from an initial screening of 99 people, but it points toward a broader opportunity to connect sensory science, neuroscience and formulation in the development of next-generation sweetener systems.

Sweet Modulation Gets More Precise at the Receptor Level

Recent research in *Scientific Reports* could give flavor scientists a more targeted way to think about sweet modulation^d. Researchers found that compounds acting on the T1R3 subunit—shared by both human sweet and umami receptors—can affect the two taste pathways very differently. Three known sweet-taste inhibitors, including lactisole, were substantially more potent against sweet receptors than umami receptors, while

^c<https://www.jneurosci.org/content/46/12/e1121252026>

^d<https://www.nature.com/articles/s41598-025-11636-0>



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BY AGRUMARIA

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cyclamate and neohesperidin dihydrochalcone activated or potentiated sweet receptors without producing comparable umami responses.

For flavorists and food/beverage developers, the findings reinforce the potential of receptor-level taste modulation to fine-tune sweetness without necessarily disrupting other taste attributes. They could ultimately help guide the design or selection of more selective modulators for sugar reduction, sweetness optimization and masking—moving formulation beyond simply adding or subtracting sweeteners toward controlling how specific taste pathways respond. The work is still mechanistic and laboratory-based, but it offers a useful framework for developing more precise taste technologies.

The Emerging Toolbox for Sweetness Optimization

As sugar reduction moves beyond simple sweetener swaps, a new generation of technologies is targeting the entire sensory system around sweetness, from masking bitterness and astringency to engineering cleaner sweeteners and even activating sweet receptors with aroma molecules. The emerging palette spans taste modulation, AI-designed enzymes, encapsulation and receptor-level science, giving formulators new ways to make reduced-sugar products taste more complete.

Targeting the “Noise” Around Sweetness

MycoTechnology’s ClearIQ Natural Flavor is emerging as a taste-modulation tool for formulations built around alternative sweeteners and other challenging functional ingredients. Rather than simply increasing perceived sweetness, the technology is designed to

reduce the sensory “noise” that can obscure it—including metallic, bitter, sour and astringent off-notes—while harmonizing the overall flavor profile.

For sweetener reformulation, that could mean allowing the intended sweet and flavor characteristics to come through more clearly, potentially making alternative-sweetener systems taste cleaner, brighter and more balanced. The technology has broader applications across alcohol, alternative sweeteners, chocolate, confections, dairy alternatives, energy drinks, functional beverages, protein products and plant-based foods.

The broader opportunity is to treat taste modulation as a way of reshaping the overall sensory experience when sugar, dairy or other familiar ingredients are replaced. ClearIQ is positioned to brighten fruity flavors, enhance indulgent profiles, mitigate plant-protein off-notes and reduce bitterness, potentially giving formulators more room to build healthier products without sacrificing sensory appeal.

How AI and Biotech Are Rebuilding Sweetness

Earlier this year, Mane entered a strategic partnership with Seattle-based biotech company Arzeda to commercialize ViaLeaf Reb M, a natural-origin stevia sweetener produced by enzymatic bioconversion of stevia leaf extract. Arzeda’s AI-driven protein design technology is intended to make Reb M more efficient and cost-effective to produce, helping address its traditionally high cost while delivering a clean, sugar-like taste without the bitterness associated with some stevia grades. The collaboration combines Arzeda’s enzyme and protein-engineering capabilities with Mane’s flavor creation and taste-modulation expertise, targeting reduced-sugar beverages and other food and beverage applications.

“AI-designed ingredients and enzyme engineering are revolutionizing sugar reduction by enabling the creation of sweeteners that deliver a sugar-like taste without bitterness or lingering off-notes,” says Scott Fabro, senior director of sales and marketing, Mane ingredients U.S. “Mane’s recent strategic partnership with Seattle-based biotechnology company Arzeda exemplifies this innovation. Together, we leverage decades of biotech expertise to produce ViaLeaf Reb M, which is made by enzymatically converting genuine stevia leaf extract into Reb M at a minimum of 95% purity. This advanced process results in a clean, sugar-like sweetness, free from the bitterness and aftertaste typically associated with stevia products, allowing formulators to use ViaLeaf Reb M cost-effectively across a wide range of low- and zero-sugar applications.”



“Beyond taste, sugar also provides bulking, proofing and preservation functions,” says Scott Fabro, senior director of sales and marketing, Mane ingredients U.S. “Developers often turn to carbohydrates, gums, stabilizers and preservatives to compensate, but strict label requirements can complicate ingredient selection. Fortunately, effective natural solutions are available.”

Image courtesy of Mane

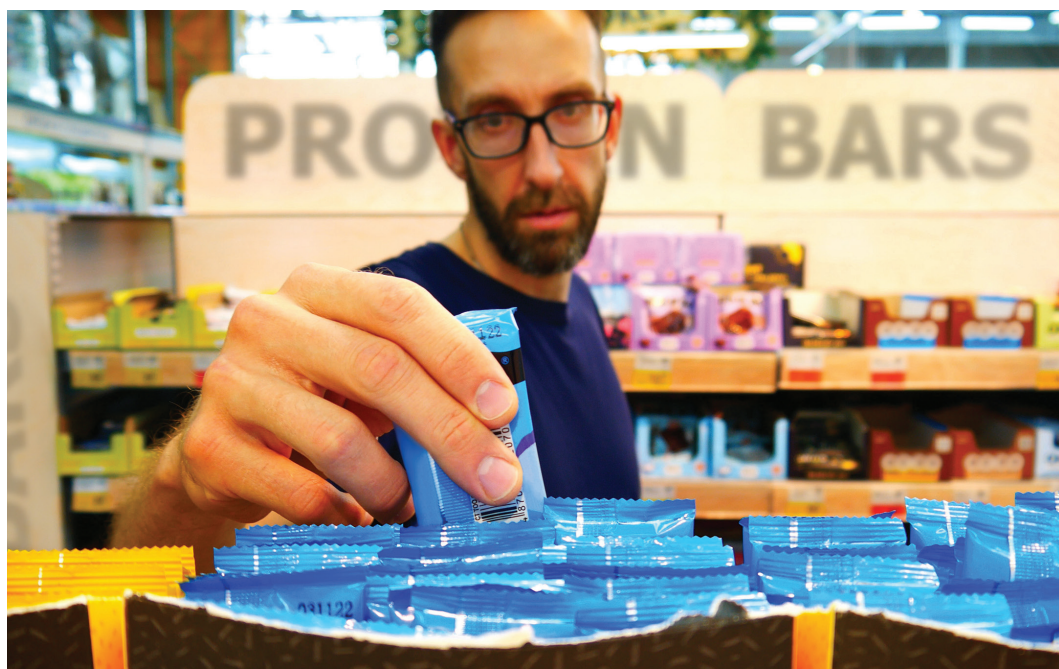
Fabro adds, “AI played a role in developing a more efficient, sustainable and cost-effective method for producing Reb M. By utilizing basic stevia extract, we minimize waste and maximize yield. The process relies on intelligently designed enzymes for efficient bioconversion, transforming genuine, less-processed stevia extracts into high-purity Reb M. The result is a clean-tasting, non-GMO sweetener that supports clean-label formulation under “stevia leaf extract.”

Yet there remain challenges when optimizing sweetness with next-generation Reb M and other advanced sweeteners across different food and beverage applications.

Fabro explains, “Reducing sugar alters the flavor profile and can reveal intrinsic off-tastes such as bitterness, sourness and astringency. In beverages, sugar reduction often leads to a thinner, waterier mouthfeel. Mane’s Sense Capture solutions are designed to reduce off-notes, enhance sugar perception and improve mouthfeel. Beyond taste, sugar also provides bulking, proofing and preservation functions. Developers often turn to carbohydrates, gums, stabilizers and preservatives to compensate, but strict label requirements can complicate ingredient selection. Fortunately, effective natural solutions are available. Mane’s encapsulated flavor systems deliver effective flavor while supporting extended shelf life.”

As novel ingredient technologies improve the cost and availability of premium sweeteners, flavor modulation strategies and product innovation pipelines will be reshaped.

“Historically, reduced-sugar formulations relied on inexpensive, artificial high-potency sweeteners,” says Fabro. “Today’s consumers demand simple formulations with natural, sustainable, clean-label alternatives, which often come at a higher price point. Arzeda’s ViaLeaf Reb M delivers clean sweetness at a lower cost, and ongoing technological advancements will continue to improve both quality and affordability. However, taste will always be the top priority. Until a low-cost, label-friendly, zero-calorie sweetener with the full taste profile of sugar is discovered, flavor houses with advanced taste modification strategies will remain essential to food and beverage product development.”



“Health-conscious consumers increasingly seek nutrient-dense products fortified with protein, fiber and other wellness ingredients, many of which introduce significant off-tastes and undesirable aromas,” says Fabro. “While consumers want the benefits of these ingredients, they don’t want to taste them.”

Beyond sweetness intensity, emerging ingredient technologies will play a critical role in recreating sugar’s full sensory experience, including mouthfeel, temporal profile and flavor release.

“Health-conscious consumers increasingly seek nutrient-dense products fortified with protein, fiber and other wellness ingredients, many of which introduce significant off-tastes and undesirable aromas,” says Fabro. “While consumers want the benefits of these ingredients, they don’t want to taste them. This is where flavor companies like Mane can make a difference. Mane’s proprietary Sense Capture natural flavor systems efficiently mask undesirable notes and enhance positive attributes such as sweetness, saltiness and fattiness. We offer a broad range of natural, clean-label flavors and ingredients that help developers create healthier, great-tasting products. Our encapsulated flavor systems can also be used to achieve customized temporal flavor characteristics for a more sugar-like sensory experience.”

Beyond formulation advantages, Mane’s recent deal with Arzeda points to AI’s growing role in ingredient innovation, taste modulation and application expertise.

“Sugar reduction is a global movement that continues to gain momentum, even as trends in functional ingredients rapidly evolve,” says Fabro. “Flavor innovators must keep pace, offering effective, lasting solutions that address these shifting demands. At Mane, our marketing and technical research teams work closely to identify

opportunities and develop unique flavor solutions that optimize sensorial experiences. We enhance our Sense Capture tools through the strategic development and use of new taste-modifying ingredients. Our recent acquisition of Chemosensoryx underscores our commitment to leading in taste technology. By pairing AI with Chemosensoryx's high-throughput receptor screening models, we can rapidly identify taste-active materials. These innovation pathways enable Mane to stay ahead of market trends with cutting-edge flavor technologies."

Plant Aromas May Hold New Keys to Sweetness

Research published in *Scientific Reports* last year suggests that some volatile plant aroma compounds may interact directly with human sweet taste receptors, opening a potentially important avenue for flavor scientists developing sugar-reduction strategies^e. Researchers found that compounds including *trans*-2-hexenal, anethole, perillartine and cinnamaldehyde activated the human TAS1R2/TAS1R3 sweet receptor; in sensory testing, *trans*-2-hexenal produced sweetness intensity comparable to sucrose at the concentrations tested.

The findings point toward a more sophisticated approach to sweet modulation: using aroma molecules to influence sweetness at the receptor level, rather than relying solely on traditional sweeteners or aroma-driven cross-modal effects. The work also highlights an important formulation consideration—some plant aroma compounds can inhibit sweet-receptor responses, suggesting that interactions between flavor ingredients may be more complex than their sensory descriptors indicate.

^e<https://www.nature.com/articles/s41598-025-89711-9>



Some plant aroma compounds can inhibit sweet-receptor responses, suggesting that interactions between flavor ingredients may be more complex than their sensory descriptors indicate.

For food scientists, the research could expand the search for new natural or nature-derived sweetness modulators and provide a molecular framework for designing flavor systems that deliver sweetness with less sugar. The findings remain early-stage, however, with human sensory testing conducted in just 11 participants. 

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The New Science of **Better-For-You Bakery**



Sugar reduction has evolved beyond simple sweetness replacement, creating sensory challenges in bakery applications. However, flavor modulation is helping close the gap.

Image by cottonbro studio at Pexels

Bakery reformulation is getting more complicated and strategic. As brands cut sugar, boost protein and fiber, navigate volatile ingredient costs and pursue cleaner labels, the challenge lies in rebuilding the full sensory experience. Peggy Dantuma, director of bakery applications at Kerry, discusses how taste modulation, enzymes, texture systems and AI are helping bakers balance nutrition, performance, cost and consumer expectations.

The Sugar Reduction Trap

Sugar reduction has evolved beyond simple sweetness replacement, creating sensory challenges in bakery applications. However, flavor modulation is helping close the gap.

“Reducing sugar without losing taste is one of the most complex reformulation challenges facing food and beverage manufacturers today,” says Dantuma. “The reality is that many products fall into what we call the ‘reformulation trap’: a product may meet a better-for-you requirement on the back of pack, but if the full eating experience is not rebuilt, consumers immediately recognize the compromise. In bakery, that means sugar reduction must be treated as a sensory and structural challenge, not simply a sweetness challenge. This is because sugar contributes far more than sweetness alone; it shapes flavor balance, mouthfeel, temporal sweetness and overall consumer satisfaction. When these elements are not addressed holistically, reformulated products fail to meet expectations.”

Dantuma adds, “In bakery applications specifically, sugar provides bulk, moisture retention, browning, texture and preservation. When sugar is removed without rebuilding its contributions, products can develop a flat or unbalanced taste, bitter off notes, a drier structure, and loss of tenderness, volume and crumb structure and the overall eating experience consumers expect. Alternative sweeteners address the sweetness gap, but rarely the rest. This is why reduced-sugar bakery products can often signal ‘reformulated’ from the very first bite.”

Kerry is taking a holistic approach to

sugar reduction, combining sweetness optimization, targeted masking, texture systems and enzymes to preserve taste, mouthfeel and overall eating quality while reducing sugar and managing off-notes from alternative sweeteners and functional ingredients.

“This integrated approach delivers functional benefits beyond sweetness intensity, including improved overall balance, preserving the characterizing flavor profile and restoring more authentic temporal sweetness profiles,” says Dantuma.



“When sugar is removed without rebuilding its contributions, products can develop a flat or unbalanced taste, bitter off notes, a drier structure, and loss of tenderness, volume and crumb structure and the overall eating experience consumers expect,” says Dantuma. “Alternative sweeteners address the sweetness gap, but rarely the rest. This is why reduced-sugar bakery products can often signal ‘reformulated’ from the very first bite.”

She adds, “Depending on the sugar reduction target, Kerry combines different technologies to deliver the desired sensory and functional outcome. In bakery applications, Tastesense Sweet and Tastesense Masking are often used together to maintain sweetness quality while masking off notes from ingredients such as leavening systems, hydrocolloids, starches and emulsifiers that become more noticeable as sugar is reduced. Manufacturers can leverage Tastesense Sweet, Kerry’s natural sweet modulation technology, to achieve up to 50% sugar reduction when paired with appropriate bulking systems, while maintaining a clean sweetness profile and preserving characterizing flavors. In applications such as brioche, sweet rolls and high-sugar breads, reducing sugar with Tastesense Sweet can also improve dough handling and fermentation performance.”

Finally, says Dantuma, “Beyond taste solutions, Kerry works with customers to optimize the broader formulation, leveraging technologies such as our Biobake enzyme solutions and Myvatex texture systems—modifying ingredients that help replicate sugar’s structural and moisture retention functionality in baked goods. By combining expertise in taste, texture and performance, Kerry helps manufacturers achieve deeper sugar reduction targets while maintaining the texture, indulgence and consumer taste preferences.”

Protein-Packed, Taste Intact

As manufacturers add protein, fiber and functional ingredients to baked goods, texture, mouthfeel and off notes often become more difficult to manage. Fortunately, flavor systems help restore indulgence without compromising nutritional goals.

“As manufacturers increase protein, fiber, and other functional ingredients, formulation complexity rises significantly,” says Dantuma. “Balancing nutrition, sensory appeal, and functionality within the same product has become a big challenge. Protein fortification can introduce off-notes and texture challenges, while fiber can affect fermentation performance and digestive tolerance. At the same time, changes in sensory preferences among some GLP-1 users mean products must deliver satisfaction while accommodating greater sensitivity to certain tastes and textures.”

She adds, “Protein and fiber fortification are becoming mainstream in new bakery launches. The bakery category is embracing the high-protein trend, but for brands pursuing higher protein targets success is increasingly defined by protein quality, functionality and consumer experience. Protein can introduce challenges ranging from chalkiness, bitterness and astringency along with dough handling, water absorption and volume loss.”

Kerry’s aforementioned Tastesense Masking targets the specific off-notes and sensory issues associated with different protein sources. The customized approach is designed to support higher-protein bakery formulations while maintaining taste and texture, including products using blends of multiple protein ingredients.

Dantuma continues, “Protein fortification, whether in a snack cake, muffin, bread or tortilla, all require advanced texture solutions to both processes, and provide an acceptable consumer product. Kerry’s line of Biobake enzymes and Myvatex texturants are designed to meet these challenges.”

Keeping Bakery Fresh From Oven to Shelf

Consumers continue to expect freshly baked taste and texture throughout shelf life. To meet these demands, technical advances are



“Changes in sensory preferences among some GLP-1 users mean products must deliver satisfaction while accommodating greater sensitivity to certain tastes and textures,” says Dantuma.

improving flavor stability and freshness perception while also reducing food waste.

“There are three components of “freshly baked” taste and texture: 1) antimicrobial, 2) texture and 3) taste,” says Dantuma. “Even if you have a product that is mold-free and soft, if the flavor doesn’t hold up, consumers are not likely to repurchase the item. Not all flavors are formulated for bake stability and extended shelf-life performance. Kerry specializes in targeted formulation for the end application whether the flavor is fry stable for a donut, encapsulated for extended shelf life in a croissant or a fermented flavor for a fresh bread experience.”

Targeted enzyme technology can extend bakery freshness by slowing starch retrogradation, the main driver of staling. According to Dantuma, Kerry’s Biobake Fresh enzymes help preserve crumb softness, moisture and elasticity while delaying firming and managing moisture migration.

She notes, “By maintaining that highly desirable just-baked softness and resilience, enzymes allow bakeries to maintain textural freshness over longer shelf life without compromising sensory quality. Additionally, to address mold-free shelf life, clean-label technologies such as fermentates and buffered vinegars can be used to maintain shelf life while protecting the product’s authentic taste. Kerry’s validated Food Waste Estimator, can estimate how increasing freshness performance over shelf life through reformulation can directly mitigate financial losses and enable more sustainable production using less water and producing less CO₂.”

The data points are stark:

- 10% of bread produced globally is lost or wasted, according to the FAO (2023)
- 32% of consumers regularly throw bread away, according to Kerry proprietary research
- 65% cite mold as a reason for discarding bread
- 46% cite textural staleness
- 28% cite unpleasant smell or taste

“From an operating perspective, waste is a massive financial drain,” says Dantuma. “During production, dough must tolerate harsh or complex process conditions and unplanned interruptions such as equipment downtime for repair, cleaning time or labor shortages. Without sufficient dough resilience, control and



“There are three components of “freshly baked” taste and texture: 1) antimicrobial, 2) texture and 3) taste,” says Dantuma.

tolerance, these disruptions can result in entire batches being wasted before they even reach the oven.”

She adds, Enzymes and texture systems are valuable ingredients in reformatted bakery systems because they stabilize the crucial areas most likely to break down: crumb structure, moisture retention and batch-to-batch consistency. In high-protein or reduced-sugar systems, they restore softness and resilience without adding label burden, which helps with performance and clean label goals at the same time. By using enzymes to improve dough consistency and strength, this will reduce the volume of product being lost or discarded before it ever leaves the bakery.”

When Commodity Costs Rewrite the Recipe

Rising costs for ingredients such as cocoa, eggs and wheat are forcing reformulation in the bakery sector. As a result, manufacturers are leveraging flavor technologies to reliance on high-cost ingredients while maintaining authentic taste and consumer acceptance.

“Bakery manufacturers are operating in a highly volatile environment shaped by supply chain disruption, raw material cost inflation, and mounting sustainability pressure,” says Dantuma. “From an ingredient perspective, traditional cost-saving measures such as simply swapping one ingredient for a

cheaper alternative is no longer sufficient to deliver long-term resilience. Manufacturers are actively seeking ways to mitigate the costs of volatile raw materials, such as wheat, gluten, cocoa, fruit, nuts and eggs, while maintaining the same great texture, taste, eating experience and operational performance.”

She adds, “In bakery, many brands discover that cost-focused reformulation can quickly fall into a trap where the consumer experience suffers. Consumers still expect the same taste, texture, aroma and overall eating experience, regardless of what is happening in commodity markets. If a reformulation removes key sensory cues without rebuilding them elsewhere, the product risks losing the authenticity and indulgence that drive repeat purchase. The challenge is no longer just ingredient replacement. It is protecting the eating experience while building greater formulation resilience and cost efficiency.”

Dantuma notes, “Eggs are a highly volatile and price-sensitive ingredient that can be reduced in recipes to deliver significant cost savings. As well as cost, eggs are increasingly becoming a consumer concern in relation to animal welfare and sustainability. Cost and sustainability savings can be quantified using Kerry’s Egg Reduction Estimator, and by using Kerry’s Biobake EgR manufacturers can reduce egg content by up to 30% in muffins, croissants and brioche while maintaining volume, texture and crumb structure. Additionally, Biobake GTNCA is used to replace or reduce vital wheat gluten

(VWG), maintaining dough stability while delivering significant cost-in-use efficiency.”

She adds, “Cocoa has also become one of the most complex commodities in the food industry. While prices have eased somewhat from the record highs seen over the past two years, the market remains vulnerable to disruption. For manufacturers, this is about much more than ingredient costs. Ongoing market volatility can affect supply continuity, product consistency, quality expectations and long-term planning. As a result, many companies are shifting their focus from short-term cost management toward building greater resilience into both formulations and sourcing strategies.”

Finally, she says, “Advances in taste technology mean manufacturers no longer need to choose between reducing cocoa usage and delivering an authentic chocolate experience. For example, Kerry’s Cocoa Booster technology can enable up to 50% cocoa powder reduction using natural solutions that help replicate cocoa’s depth, richness and flavor complexity.”

The Clean-Label Tradeoff Is Over

Clean-label expectations continue to grow, yet simplifying ingredient lists often limits formulators’ technical toolbox. Flavor and taste technologies are evolving to deliver premium sensory performance with more label-friendly formulations.

“Historically, bakers faced tradeoffs when relying on conventional additives, having to balance product stability against consumer demand for simpler labels,” says Dantuma. “However, by leading with advanced enzyme technologies, bakers do not have to accept a sacrifice in performance to achieve a label-friendly formulation.”

She adds, “Today, Kerry’s advanced clean-label flavor technologies are enabling manufacturers to transition from artificial flavors to cost-effective natural alternatives. Kerry also offers ultra-clean dairy and non-dairy flavor solutions that



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support allergen-friendly and free-from product development without compromising sensory performance. To meet the demand for clean-label products, bakeries are increasingly turning to advanced biotechnology solutions as a practical tool. Enzymes are biocatalysts found in all living things, including the flour and yeast used in baking. They are produced through fermentation, the same natural process used to make traditional foods like wine, beer, yogurt and kimchi.”

Dantuma says, “In bakery applications, enzymes, such as Kerry’s Biobake portfolio, act as highly targeted processing aids during dough preparation, improving performance at specific stages of production. Because they are deactivated during baking and do not remain active in the final product, they allow bakers to enhance quality while supporting simpler ingredient labels. And since they are classified as processing aids, they generally do not require declaration on the final packaging. Additionally, working alongside hydrocolloids and other stabilizing ingredients, enzyme systems can reduce or replace traditional emulsifiers, supporting cleaner labels without compromising quality. That combination makes them one of the more powerful tools available when navigating multiple reformulation goals at once.”

She adds, “Clean label bakery without compromising on quality is only achievable when the formulation accounts for what’s being removed. Replacing traditional emulsifiers and additives that do real functional work requires purpose-build systems that rebuild those functions. Protein, fiber, sugar reduction, clean label, and shelf life aren’t separate formulation problems that can be solved in sequence. They operate as one system, and approaching them this way helps unlock stronger, more consistent product performance.”

It’s necessary, then, to leverage taste modulation, biotechnology, formulation expertise and sensory science to balance reformulation trade-offs, ultimately prioritizing products that deliver the taste and performance needed to drive repeat purchase, not just a cleaner label.

The New Bakery Balancing Act: Health and Indulgence

Consumers increasingly expect bakery products to deliver both indulgence and wellness. In response, companies are balancing flavor intensity, sweetness, aroma and mouthfeel in products positioned around health, functionality or GLP-1-friendly eating patterns.

“Consistent with other published data, Kerry’s proprietary research shows that consumers taking GLP-1 medications seek foods richer in proteins—which poses interesting masking challenges—alongside and less

sugar and carbohydrates,” says Dantuma. “Research suggests an increased sensitivity to sweetness, reduced tolerance for overly sweet products and a preference for smaller portions with higher nutritional quality.”

She adds, “For brands, the challenge is to increase nutritional density while maintaining the comforting, indulgent eating experience that drives repeat purchase. Protein quality, functionality and sensory performance therefore become just as important as protein quantity. Kerry’s targeted approach to protein masking, helps address the bitterness, astringency and lingering off-notes commonly associated with protein fortification, while Kerry’s line of Biobake enzymes and Myvatex texture systems help rebuild the richness and fullness that can be lost in nutritionally optimized formulations.”

Dantuma continues, “At the same time, brands look to shift away from maximum sweetness intensity toward better sweetness quality. Sweetness optimization enables products to feel satisfying without excessive sweetness, making it particularly relevant for GLP-1-aligned product development.”

Finally, she says, “This consumer group is proactive about their health choices and often sophisticated about the nutritional value of the products they consume. Our holistic approach to sweetness optimization and emphasis on masking off-notes associated with added protein and functional ingredients enables formulators to deliver nutrient-fortified products without compromising on taste or clean labels.”

The Future of Bakery Is AI, Enzymes and Taste Science

“The biggest advances in bakery taste and performance over the next five years will not come from a single breakthrough ingredient, but from the convergence of enzyme science, taste modulation, biotechnology and AI-enabled formulation tools,” says Dantuma. “As bakery formulations become more complex, manufacturers are increasingly being asked to balance nutrition, cost, sustainability, clean-label expectations and consumer enjoyment simultaneously. Solving these challenges requires a more integrated approach to formulation.”

She adds, “Enzyme technology will continue to play a critical role, particularly as bakers look for label-friendly ways to improve texture, freshness and process efficiency. Historically, enzymes have been used primarily to maintain extended softness and improve dough handling, but the next generation of solutions will enable increasingly precise control over texture, moisture management and ingredient functionality. This

will help manufacturers create products that maintain a fresher, more indulgent eating experience throughout shelf life while reducing waste and improving production consistency.”

Dantuma continues, “At the same time, taste modulation will become increasingly important as manufacturers continue to reduce sugar, fortify with protein and fiber, and reformulate around changing consumer health priorities. At Kerry, we are strategically investing in precision fermentation, enzymatic biotransformation, and AI to develop the next generation of natural taste modulation. This unique combination of flavor science and biotechnology accelerates our innovation efforts in new ingredient discovery and next generation clean-label sweet and savory taste solutions.”

In addition, she says, “At Kerry, we see AI as a powerful accelerator of flavor innovation rather than a replacement for flavorists, sensory scientists

or food technologists. We are actively evaluating how AI can be combined with sensory science, consumer insights and formulation expertise to help manufacturers identify successful reformulation pathways faster, predict sensory outcomes earlier in development, accelerate optimization of nutritional properties such as PDCASS, and navigate increasingly complex trade-offs between taste, nutrition, cost and sustainability.”

Finally, says, Dantuma, “Ultimately, the future of bakery innovation will be defined by technologies that help manufacturers avoid the reformulation trap. Whether the goal is sugar reduction, protein fortification, ingredient cost mitigation or cleaner labels, consumers will continue to judge products based on their eating experience. The technologies that succeed will be those that help bakers preserve flavor, texture, aroma and indulgence while delivering on evolving consumer needs.” 



The graphic features a red-to-orange gradient background with a molecular structure pattern. At the top left is the Perfumer & Flavorist logo with the tagline "The Resource for Sensory & Wellness Innovation". In the center, the text "Tune In!" is displayed above three circular icons: a microphone, a smartphone with concentric circles, and a play button. Below these icons, the text "Perfumer & Flavorist+ Multimedia" is shown, followed by the website URL "www.perfumerflavorist.com/multimedia".

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ABTVanForAll Plus Natural from Advanced Biotech brings warmth and depth to bourbon, whiskey, rum, brandy, liqueurs and RTD cocktails.

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The Many Faces of Vanilla Notes: from High-Potency Extracts to Trigeminal Twists

Precision-fermented vanillin. High-potency Madagascar extracts. Natural warming modifiers. A new wave of vanilla-accented materials is giving flavorists and perfumers more ways to balance authenticity, intensity, functionality and sustainability. Our latest roundup of ingredients span applications from bakery and beverages to spirits, fine fragrance and personal care, while bringing added capabilities such as sweetness enhancement, off-note masking, mouthfeel modulation and trigeminal warmth.

NOTE: Ingredient availability and regulatory status may vary by region. Not all materials featured in this roundup are commercially available in every market. Readers should consult respective suppliers to confirm regional availability, approved uses and any applicable regulatory restrictions before formulation or commercialization.

Unlocking Sustainable Vanilla Flavor Performance for Flavor and Fragrance

Lallemand's Hevani (seen at FlavourTalk 2026) is a precision fermentation-derived natural vanillin designed to deliver the rich sensory experience of vanilla while offering formulators a sustainable and reliable alternative to traditional vanilla sources. Featuring a gourmand profile with vanilla bean, creamy, sweet and caramellic notes, Hevani enhances flavor impact in applications ranging from baked goods, dairy alternatives

and beverages to confectionery and functional foods. Beyond flavoring, the ingredient can mask off-notes, boost sweetness perception and improve mouthfeel at low use levels.

In fragrance and personal care applications, Hevani provides a natural vanilla signature that adds warmth, depth and longevity to compositions. The ingredient helps soften harsh notes, extend scent performance and create comforting, emotionally resonant fragrance experiences across fine fragrance, cosmetics, home care and aromatherapy products.



Lallemand's Hevani provides a natural vanilla signature that adds warmth, depth and longevity to compositions. The ingredient helps soften harsh notes, extend scent performance and create comforting, emotionally resonant fragrance experiences across fine fragrance, cosmetics, home care and aromatherapy products.

Produced through a fermentation-based process, Hevani offers 98% purity, supply stability, freedom from pesticides and heavy metals, and reduced environmental impact compared to conventional vanilla sourcing, making it an attractive option for brands seeking both sensory excellence and sustainability.

Vanilla with a Trigeminal Twist

Natural vanillyl butyl ether (FEMA# 3796; CAS# 82654-98-6) from Penta Fine Ingredients offers a warm, sweet and spicy vanilla profile with creamy and woody undertones, making it an effective impact note in both flavor and fragrance applications.

In flavor systems, the ingredient delivers a rich vanilla character suited for bakery, confectionery, and dairy applications, with typical use levels ranging from 1-10 ppm and strong stability under standard processing conditions.

It can also be used in no- and reduced-alcohol beverage flavors as a trigeminal warming modifier, where its clean, relatively short-lived warmth can help recreate a more authentic ethanol-like sensation.

Warm, Creamy, Unmistakably Vanilla

Natural vanillin ex vanilla beans (FEMA# 3107, CAS 121-33-5) from Axxence USA delivers the unmistakable sweet, creamy character of cured vanilla beans. Warm vanilla notes with soft balsamic undertones enhance confectionery, dairy and baked flavors while adding smooth, creamy sweetness. EU and U.S. natural, kosher, vegetarian and non-GMO. Usage level: 0.05 ppm-200 ppm.

A Vanilla Portfolio with High-Potency Extracts and Application-Focused Formats

Dutch Essentials showcased a range of bourbon vanilla solutions designed to deliver authentic Madagascar vanilla character across food, beverage, cosmetic and fragrance applications at FlavourTalk 2026.

The portfolio includes an artisan-crafted 4-fold bourbon vanilla extract made with 400 g of Madagascar vanilla beans per liter, alongside a propylene glycol-based alcohol-free 4-fold version that provides halal compliance without compromising aroma performance.

For more concentrated applications, the company offers a 10-fold extract featuring the full sensory profile of bourbon vanilla and a 50-fold extract produced via



Natural vanillyl butyl ether from Penta Fine Ingredients delivers a rich vanilla character suited for bakery, confectionery and dairy applications.

CO₂ extraction for a clean, highly concentrated solution suitable for foods, beverages, cosmetics and perfumes.

Rounding out the lineup is a bourbon vanilla extract powder formulated with vanilla absolute, providing a convenient format for chocolate and other dry applications where rich vanilla impact and processing flexibility are essential.

Vanilla Depth for Modern Spirits

ABTVanForAll Plus Natural (1797) from Advanced Biotech is a TTB- and FDA-approved natural vanillin perfect for alcoholic beverage applications. Delivering a sweet, creamy vanilla profile, it brings warmth and depth to bourbon, whiskey, rum, brandy, liqueurs and RTD cocktails.

This ingredient helps reinforce notes of oak, caramel and aged sweetness while maintaining balance in the finished flavor profile. In addition to spirits, it is also suitable for use in beverages, baked goods, frozen dairy, desserts and confectionery. 

The Essence of Sweet.



The accent for
taste and scent

Vanilla brings warmth, depth, and unmistakable character to every flavor experience.



**Natural Vanillin
ex Bean**

*Rich, sweet,
classic vanilla*

FEMA 3107

**Natural Anisyl
Acetone**

*Sweet, balsamic, vanilla-like,
floral/spicy*

FEMA 2672

**Natural
Maltol**

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cotton-candy, jammy*

FEMA 2656

Natural gamma Octalactone

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coumarinic, fruity, apricot, peach*

FEMA 2796

Natural gamma Decalactone

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fruity, fatty*

FEMA 2360

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34% Spanish Orange
33% Brazilian Orange
33% Egyptian Orange



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THE NEW POWER OF SCENT IN BEAUTY

How science, wellness and personalization are transforming fragrance from a sensory extra into a strategic beauty driver.

■ BY AGNES DUPRAT, Beauty Team Senior Manager, R&D Naturals, IFF Scent (MSc in Chemistry, MSc in Management); VANESSA GONNOT, Process Team Manager (Ph.D. in Chemistry) and CÉLINE MANETTA, Health & Wellness Director R&D, IFF Scent (Ph.D. in Psychology)



Consumers expect fragrances to go beyond hedonism, bringing combined emotional and hair and skin benefits.

Image courtesy of IFF

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Agnes Duprat



Vanessa Gonnot



Céline Manetta

Beauty is a highly emotional space, and scent is one of its most powerful drivers. In all categories, fragrance elevates everyday routines into meaningful moments of pleasure, self-expression and well-being. In an increasingly overstimulated world, its role in cosmetics has never been more important. IFF is exploring how fragrance is redefining consumer expectations across beauty and personal care categories, driving differentiation, emotional engagement and wellness benefits.

There are increasingly complex expectations around the purpose of scent in beauty products. Some fragrances are designed primarily for personal benefit; others fulfill a social function, helping consumers feel attractive, confident and expressive in their interactions with others. As beauty categories increasingly address both dimensions, brands are challenged to create scent signatures that balance personal emotions with social signaling. This shift influences fragrance character and creativity, as well as consumer expectations regarding intensity, diffusion, and longevity.

Across personal and social spheres, the “beauty wardrobe” effect is highly driven by growing perfume-centricity in beauty. Hair perfumes, body mists and newer whole-body deodorants are encouraging younger consumers to curate scented products around moods, seasons and social occasions. Frontiers between beauty zones and formats tend to disappear and “scent layering” has never been so hot on social media.

The Strategic Role(s) of Scent in Hygiene and Beauty

According to the IFF Choice Model Study, scent is—more than ever, whether consciously or not—a top driver of consumer choice across body segments^a. It has

the power to drive preference and help brands to stand out, as well as the potential to enhance the perception of functional promises. When driving desirability or signaling identity, it increases emotional attachment and encourages product loyalty. Scent is a highly strategic engine for the beauty industry. And as science unveils more potential behind fragrance, the value of scent will continue increasing.

The Choice Model Study, which includes recent research in China, Brazil and the United States, also shows that fragrance has become a key factor in body care, influencing choice, emotion and perceived value. For half of global consumers, scent is among the top two reasons for selecting products, especially in categories like shower gel, deodorant and body care, with its importance rising significantly in China.

Scent not only affects purchasing decisions but also fulfills consumers’ desire for pleasure and sensory satisfaction, connecting functional cues like freshness and care with emotions such as happiness and confidence. This helps brands address the wider demand for well-being, especially among body lotion users in Brazil.

As consumers seek emotional rewards and well-being from beauty products, fragrance acts as a vital link between functional performance and holistic needs—ushering in a new era of wellness-focused beauty.

Wellness: A New Era for Beauty Scents

The explosion of the wellness market into a \$2 trillion behemoth^b combined with 84% of consumers prioritizing wellness has redefined the sensorial purpose of scent in cosmetics, with emotional expectations for fragrance to soothe, balance or energize becoming new hygiene and beauty essentials. Cosmetic brands are asking for innovative and

^aIFF Choice Model Study (2023–2025)

^bMcKinsey & Company; The Future of Wellness: Trends Shaping the Wellness Market (2024); <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/future-of-wellness-trends>

consumer-meaningful benefit narratives as well as differentiating credentials.

As interest in the relationship between scent, emotions and wellness grows, fragrance development is becoming increasingly informed by sensory science, neuroscience, consumer research and AI, as demonstrated by IFF's Science of Wellness platform. These tools help researchers better understand how different olfactive experiences can influence emotional, cognitive, social and physical well-being. Rather than treating fragrance solely as a sensory or aesthetic element, the industry is increasingly exploring its potential to contribute to broader wellness experiences and translating those insights into more targeted fragrance concepts and benefit claims.

Built on decades of research into the links between olfaction, emotion and well-being, these tools help researchers better understand how different olfactive experiences can influence emotional, cognitive, social and physical well-being. Rather than treating fragrance solely as a sensory or aesthetic element, the industry is increasingly exploring its potential to contribute to broader wellness experiences and translating those insights into more targeted fragrance concepts and benefit claims.

Natural Fragrance Ingredients with Beauty Benefits

Consumers expect fragrances to go beyond hedonism, bringing combined emotional and hair and skin benefits. One example of this convergence is Lavandin Enflourage 2.0 offered through LMR Naturals, which combines sustainable^c sourcing with emotional, skin and hair benefits. It illustrates how natural fragrance ingredients are increasingly being developed to address both sensorial and beauty-related expectations.

This material is obtained with an exclusive proprietary process of extraction using a renewable and biodegradable solvent that gives a characteristic scent close to the genuine lavandin flowers linked to a specific composition in volatile compounds. It was studied using neuroscientific methods to measure brain activations in the areas associated with relaxation. In parallel, the in-vitro test showed an increase in expression of the skin barrier markers and in production of hyaluronic acid, and a decreased level of IL-6 and IL-8.

Independent third-party studies using neuroscientific methods measured brain activations in areas associated with relaxation, while separate in vitro testing

demonstrated increased expression of skin barrier markers, enhanced hyaluronic acid production, and reduced levels of IL-6 and IL-8.

In addition, LMR Naturals' Lavender Absolute Conscious and Cypress Ultimate Absolute demonstrated benefits for hair protection against UV damage. Lavender Absolute Conscious is obtained with a renewable and biodegradable solvent, while Cypress Absolute Ultimate is an upcycled ingredient obtained from distillation spent branches. These natural fragrance ingredients were tested on hair tresses under the protocol described in **F-1**. Both ingredients showed significant effects to protect the hair from UV damage such as hair fiber degradation, hair protein degradation and oxidation.

Sleep at the Crossroads of Wellness and Beauty

Sleep is emerging as a key beauty and wellness concern. Nearly two-thirds of consumers are actively looking for solutions to improve sleep quality, and many already incorporate fragranced cosmetic products into their sleep routines^d. The science is clear: sleep is essential for skin repair, hydration, elasticity and healthy aging. Good sleepers have been shown to exhibit healthier skin ageing profiles and better recovery from external stressors compared with poor sleepers^e.

Advances in biometrics and consumer research (as seen with IFF's MetaSleep platform, a part of Science and Wellness) are also opening new possibilities for fragrance at the intersection of sleep, beauty and well-being, with researchers exploring how scent can be designed to support relaxation and sleep quality. Advances in biometrics and consumer research, including IFF's MetaSleep platform within Science of Wellness, are also opening new possibilities for fragrance at the intersection of sleep, beauty and well-being, with researchers exploring how scent can be designed to support relaxation and sleep quality.

Green Innovation, New Ingredient Performance

According to the Global Wellness Institute, the concept of wellness extends beyond individual health to include people's environments; today's consumers view personal well-being and environmental well-being as

^cNielsenIQ. Trends in Sustainable Beauty 2023. Nov. 20, 2023; <https://nielseniq.com/global/en/insights/analysis/2023/trends-in-sustainable-beauty-2023/>

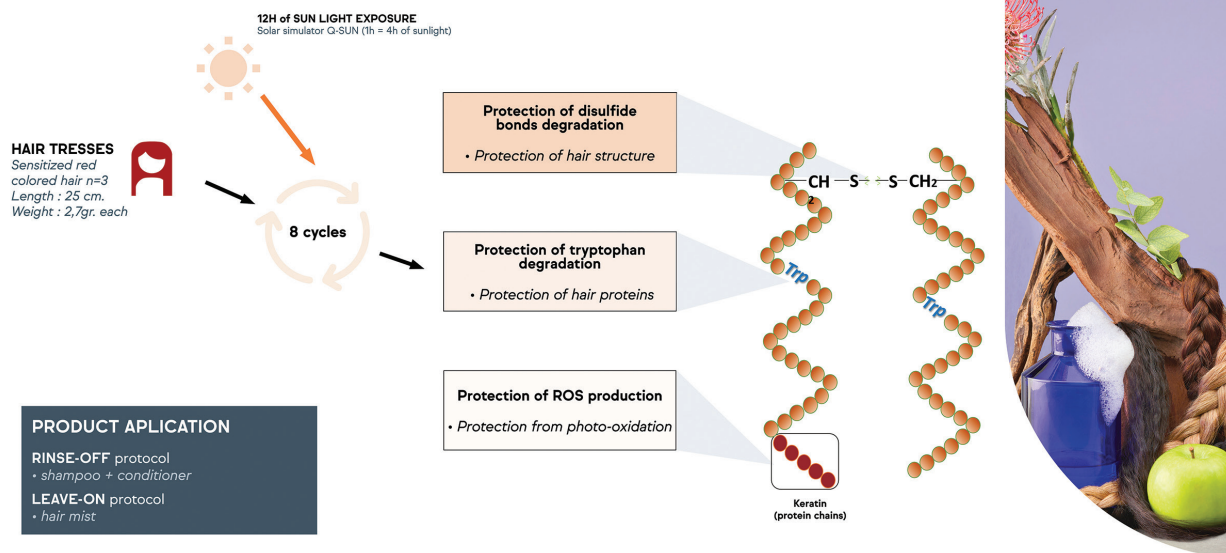
^dIFF Sleep Human Tracker; 9,000 participants from 13 countries

^eKim MA, Kim EJ, Kang BY, Lee HK. "The Effects of Sleep Deprivation on the Biophysical Properties of Facial Skin." *Journal of Cosmetics, Dermatological Sciences and Applications*. 2017;7:34–47; <https://www.scirp.org/journal/paperinformation?paperid=74581>

F-1 Ex-vivo study on hair tresses with Lavender Abs. Conscious or Cypress Abs. Ultimate

HAIR PROTECTION AGAINST UV DAMAGES

ex-vivo STUDY ON HAIR TRESSES



deeply interconnected. Wellness is now a top priority for 84% of consumers^f, while 62% say sustainability is more important than it was two years ago. Moreover, 65% of consumers globally aspire to lifestyles that are both healthier and more sustainable, reflecting a shift toward more conscious consumption.

Meeting these expectations is driving greater innovation across the natural fragrance sector, from more advanced agronomy and green extraction technologies to the use of bio-based solvents and upcycling. At LMR Naturals, ingredient development is informed by expertise spanning agriculture, sustainable sourcing, extraction science and perfumery, brought together within an integrated seed-to-scent framework. Supported by a global research ecosystem, this approach contributes to the development of natural ingredients that combine olfactive quality with measurable beauty benefits. More broadly, integrated development models of this kind are helping drive increasingly scalable, sustainable and high-performance fragrance solutions.

This approach is exemplified by LMR Naturals' Jasmine Conscious Absolute (2021), which pairs improved sustainability with the discovery of

antioxidant compounds such as hydroxytyrosol. Meanwhile, its Rose Essential (launched in 2012) highlights the value of upcycling. By valorizing rose distillation water, traditionally a by-product, LMR Naturals created an ingredient combining a delicate rose scent with proven cosmetic benefits, including support of skin hydration through enhanced hyaluronic acid production.

This convergence of process innovation, scientific validation and sustainability reinforces the role of fragrance as a technically driven and value-adding component in modern cosmetic formulations.

In many ways, fragrance is returning to its original role of enhancing well-being through everyday rituals. But today, that promise is backed by science, data, AI and vast insight.

Together, advances in consumer research, fragrance science, natural ingredients and green extraction technologies are helping shape a new generation of cosmetic fragrance at the intersection of beauty, wellness and sustainability. Through initiatives such as Science of Wellness and integrated seed-to-scent development models, IFF and its naturals house, LMR Naturals illustrate how fragrance innovation is evolving to address emerging expectations around beauty, wellness and sustainability. 

^fMcConnochie J., "The State of the Sustainable Consumer: Key Trends & Statistics (2026)." *Sustainable Jungle*. May 30, 2026

FRAGRANCE IS REWIRING THE PERSONAL CARE EXPERIENCE



A shower gel calls for a different olfactive strategy than a deodorant or solid bar, whether the goal is immediate impact and sensorial bloom or lasting freshness and a strong perception of efficacy.

Image by Beyzanur K. at Pexels

Fragrance is becoming an active part of the personal care experience, shaping mood, reinforcing efficacy and turning everyday routines into multisensory rituals. This includes neuro-sensoriality and emotional mapping to motion-activated technologies, as well as locally tuned scent profiles.

Across categories, perfumers are creating fragrances designed to do more. In this Q&A with Nadine Fernandes Leite, marketing manager beauty care EMEA, and perfumer Caroline Gaillardot, both of Mane, we explore how science, technology and evolving olfactive trends are redefining fragrance's role in personal care.

How can perfumers design fragrances that actively shape consumers' moods, confidence and well-being throughout the day?

Gaillardot: Beyond fragrance preference alone, what truly matters is why a scent creates emotional connection. Which olfactive facets make it instantly recognizable and memorable? Which notes evoke local culture, collective memories or familiar codes? And how can fragrance become part of a broader multisensory experience, engaging not only the sense of smell but also other sensory cues to amplify emotions and well-being?

Today, perfumers are designing fragrances with superior experiences in mind. Beyond delivering a pleasant scent, compositions are increasingly crafted to support specific emotional benefits, moods and sensorial experiences. This approach is opening new possibilities for fragrance to become a more active contributor to consumers' well-being throughout the day.

As neuroscience and sensory science continue to reshape the beauty industry, neuro-sensoriality, multisensoriality and well-being are becoming major drivers of both marketing and fragrance innovation. The challenge is no longer just to formulate a fragrance, but to translate emotions, sensations and even taste-inspired concepts into scent, and to understand how these sensory experiences can influence the way we feel.

This is where Mane's patented internal WellMotion^a technology brings an additional dimension to fragrance development. By combining scientific understanding with olfactive expertise, WellMotion^a supports the development of fragrances designed to act on mood and emotional well-being, helping transform a sensory experience into a more meaningful emotional benefit.

^aWellMotion is a Mane trademark

From creating multisensorial pleasure, to designing immersive olfactive experiences that influence how we feel, fragrance is increasingly experienced through more than the nose. It is experienced through the mind, emotions and the senses as a whole.

The future of fragrance may therefore lie not only in creating scents that smell good, but in creating multisensory experiences that feel good, and can actively contribute to our mood and well-being.

What new opportunities exist to create scents that evolve or activate during specific moments?

Gaillardot: Beauty routines are becoming more flexible and personalized, with fragrance layering enabling consumers to tailor the sensorial experience at every step of their routine.

This seems also to be influenced by bases innovation that open the playground of fragrances. Thanks to new fragrance technologies, for example ManeCaps^b, smart fragrance capsules reactivate with motion and moisture, releasing a second wave of scent to keep hair smelling fresh and boost confidence throughout the day. This way scent can also be a dynamic experience, turning a beauty routine into an even more personalized ritual.

How should fragrance creation adapt to increasingly diverse regional scent preferences while still delivering globally scalable personal care brands?

Leite: Understanding the evolution of both global and local olfactive preferences is at the heart of fragrance

^bManeCaps is a Mane trademark



"Solar signatures are ... gaining momentum, offering a feeling of warmth and getaway all year round through notes such as tiare flower, monoi and coconut," says Mane.

creation. By combining consumer data, marketing trends with perfumers' and fragrance development managers' expertise, it is possible to identify the universal olfactive pillars that drive global consumer acceptance while integrating locally relevant facets that reflect cultural references and regional preferences. The result is a fragrance architecture that balances global appeal with local acceptance, creating distinctive signatures that resonate with consumers.

What role will consumer neuroscience, emotional mapping and AI-powered insights play in developing the next generation of emotionally resonant personal care fragrances?

Leite: By combining consumer neuroscience, emotional mapping and AI-powered insights we can decode the feelings, memories and experiences triggered by fragrance, thanks to Mane's patented WellMotion technology. Fragrance is evolving beyond a sensorial attribute to become an invisible contributor to emotional well-being and plays a role of "infrastructure of effectiveness" for consumers. If consumers "feel" this sensorial moment it "confirms" the efficacy of their personal care routine.

How can perfumers optimize fragrance performance across complex personal care formats without compromising the intended sensory journey?

Gaillardot: Fragrance creation starts with the product format in mind. The base is a key part of the brief, to

guide perfumers to adapt their palette, raw materials and formulation strategy to each application.

[For example,] a shower gel requires a different olfactive approach than a deodorant or a solid bar, from immediate impact and sensorial bloom to long-lasting freshness and efficacy perception. All segments have their own technical rules. The challenge is to translate the same emotional concept across different formats while optimizing performance and preserving the desired fragrance experience.

Which fragrance trends and olfactive signatures are best positioned to transform routine cleansing into memorable, multisensory self-care experiences?

Leite: Gourmand notes are at the forefront of this evolution, with vanilla, honey, caramel, milky and almond facets creating a deeply comforting experience. They evoke indulgence, nostalgia, pleasure and a sensory escape.

Solar signatures are also gaining momentum, offering a feeling of warmth and getaway all year round through notes such as tiare flower, monoi and coconut.

Meanwhile, woody notes are bringing a more premium dimension to personal care. Sandalwood, in particular, pairs beautifully with gourmand accords like vanilla, adding depth, sophistication and a luxurious sense of comfort and softness.

Beyond fragrance, texture is becoming an essential part of the ritual. Rich, creamy and enveloping foams enhance the feeling of softness and indulgence, turning everyday cleansing into a truly multisensory wellness experience. 



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*Under 21 CFR 169.3(a), "vanilla beans" are defined as the properly cured and dried fruit pods of *V. planifolia* and *V. tahitensis*, thereby excluding other species from the standardized definition for vanilla extract and related flavorings.*

The History of *Vanilla pompona* Schiede in the U.S., Part 2 of 2

As interest grows in diversifying vanilla supply, strengthening crop resilience and exploring a wider range of sensory profiles, *V. pompona* may merit renewed consideration for possible inclusion among the species recognized under U.S. standards for vanilla products.

■ BY MARIA GALEAS, DAPHNA HAVKIN-FRENKEL, PH.D., THOMAS HARTMAN, PH.D., Rutgers University

Part 1 of this article, *Vanilla pompona's Comeback in the United States: A Sustainability Opportunity (Part 1)*, appeared in the February 2026 edition of this magazine^a and argued that *Vanilla pompona*, a historically important species in U.S. commerce, could diversify the crop base thanks to its disease resistance, hardiness and distinctive sensory profile. Recognizing *V. pompona* under U.S. vanilla standards could therefore support greater biodiversity, supply-chain resilience and new opportunities for domestic and regional cultivation.

Part 2 of this article is published in memory of our colleague, Daphna Havkin-Frenkel, Ph.D. -Editor

^a<https://www.perfumerflavorist.com/flavor/regulatory-research/article/22957630/vanilla-pomponas-comeback-in-the-united-states-a-sustainability-opportunity-part-1>

Vanilla is derived from the cured fruit of orchids in the genus *Vanilla*, a tropical group comprising more than 100 species. Of these, *Vanilla planifolia* Andrews, *Vanilla tahitensis* Moore and *Vanilla pompona* Schiede have been the principal species of commercial importance. As the world's largest importer of vanilla, the United States has had an outsized role in shaping the international vanilla market through its standard of identity. Under 21 CFR 169.3(a), "vanilla beans" are defined as the properly cured and dried fruit pods of *V. planifolia* and *V. tahitensis*, thereby excluding other species from the standardized definition for vanilla extract and related flavorings.

Yet historical trade and manufacturing records show that *V. pompona* was in commerce in the U.S. for many years and was used in foods, beverages, medicines, cordials, and vanilla extracts (Beringer, 1895; Childers & Cibes, 1948; Correll, 1953). That historical context remains relevant as the flavor industry considers more resilient vanilla germplasm, greater supply diversification (Chambers et al., 2021; Barreda-Castillo et al., 2023, Sustainable Vanilla Initiative, 2025), together with a broader range of natural sensory profiles (Galeas, 2015, Tran et al., 2024). This article reviews the evidence for *V. pompona* in U.S. commerce and explores the historical, commercial and regulatory factors that may explain its absence from the U.S. standards of identity for vanilla products.

Vanilla pompona in Early U.S. Commerce

Prior to the establishment of U.S. standards of identity, vanilla commerce was characterized by a multi-origin and multi-species supply network. Vanilla entering the United States originated primarily from Mexico, Central America, the Caribbean and, later, French colonial territories. Commercial practice emphasized geographic origin, curing quality, availability and sensory properties more than strict botanical identity (Rolfe, 1896). Nineteenth-century commercial references described vanilla as a product derived from three or four species whose beans were often grouped together in trade as commercial vanilla, including *Vanilla pompona* Schiede (Desvaux, 1848; Simmonds, 1877; Rolfe, 1896).

V. pompona was documented in producing regions of Mexico and Central America as early as 1676 (Correll, 1953). By 1839 it was established in the French West Indies, particularly Guadeloupe, Martinique and Dominica, where its fruits became commercially known as “vanillons” and entered international trade, including the U.S. market. **F-1** offers a historical view of “vanilla” preparation in Guadeloupe, one of the principal French West Indian producing origins.

Desvaux (1848) noted that vanilla lots from Veracruz often included *V. pompona*, known in France as vanillon. Beringer (1895) later observed that *V. pompona* was more widely diffused than *V. planifolia* in some producing regions, consistent with broader commercial distribution. By the early 20th century, *Encyclopaedia Britannica* recognized *V. pompona* as a distinct commercial variety from Brazil, Peru, and other parts of South America used in food, beverage, medicines and other applications (Ferguson, 1905, p. 22). The USDA program documented the introduction of *V. pompona* vines in



F-1. A historical view of vanillon preparation in Guadeloupe, one of the principal French West Indian producing origins

Puerto Rico from Guadeloupe, Panama and Mexico (U.S. Department of Agriculture, 1912). **F-2** places vanilla in the context of Martinique's principal exports from 1913 to 1915.

The strongest evidence for *V. pompona* in U.S. commerce comes from the convergence of U.S. government trade, contemporary botanical identification and American manufacture literature. The *Annual French West Indies Supplement to Commerce Reports* (1915-1920) identified vanilla as a principal export of Guadeloupe to the United States. Guadeloupe's export report explicitly distinguished vanilla and vanillons separately within the same export category of vanilla,

FRENCH WEST INDIES—MARTINIQUE.

3

Articles.	1913	1914	1915	Articles.	1913	1914	1915
Bananas.....	\$1,958	\$310	.....	Vanilla.....	\$14,725	\$8,440	\$7,412
Cassia.....	225	2,027	\$325	Pineapples.....	.....	1,718	19,686
Cocoa.....	206,110	179,125	238,600	All other articles.....	125,590	22,499	45,197
Cinnamon.....	.....	.....	811	Total.....	4,996,839	5,186,964	7,830,890
Coffee.....	4,619	9,261	4,413	Reexports.....	580,246	538,616	560,583
Hides.....	30,226	30,221	25,533	Total exports.....	5,577,085	5,745,580	8,391,473
Rum.....	2,234,205	2,538,853	2,904,818				
Sugar.....	2,378,851	2,328,060	1,582,420				
Sugar, raw.....	.....	6,450	1,649				

Principal Articles Imported into Martinique—Countries Supplying Goods.

The principal articles imported from the United States in 1915 were coal, fertilizers, provisions, edible oils, petroleum products, building materials, vehicles, and manufactured articles. The commodities furnished by France were manufactured articles, cloth, fabrics, machinery, vehicles, wines, liquors, and provisions, and the colonies sent molasses, tropical products, and reshipments of general supplies. Great Britain supplied fertilizers and a few manufactured articles, and its colonies and dependencies sent rice, molasses, provisions, and sundries. St. Martin maintains a steady trade with Martinique in salt, exports of this product amounting to \$7,235 in 1915, a gain of 24 per cent over 1914.

The following table shows the total value of imports received in Martinique from the various countries in 1914 and 1915:

Countries of origin.	1914	1915	Countries of origin.	1914	1915
Chile.....	.....	\$31,672	Italy.....	.....	\$1,746
France.....	\$1,847,706	1,533,525	India.....	.....	7,166
Reexportation from.....	.....	5,886	Panama.....	\$5,311	7,501
France.....	50,660	5,886	Porto Rico.....	.....	9,746
French colonies.....	159,204	93,200	St. Martin.....	.....	5,836
Reexportation from.....	.....	7,600	Switzerland.....	.....	1,073
French colonies.....	598	7,600	St. Thomas.....	.....	1,590
Great Britain.....	363,922	363,150	United States.....	1,545,896	2,254,618
Colonies.....	117,657	147,443	Venezuela.....	3,193	11,526
Germany.....	10,683	4,494	Other countries.....	3,023	2,748
Haiti.....	1,689	4,923	Total.....	4,269,498	4,492,724
Holland.....	155,998	.....			

Martinique's Trade With United States.

The imports from the United States into Martinique have gradually increased in quantity and value since 1909, and certain American products have become staples and now practically supply the demand. From 1909 to 1914 there was an increase of 55 per cent in the imports of American goods, but when compared with 1915 the increase is over 127 per cent.

The consumption of coal in the island increased in quantity 23,321 metric tons from 1910 to 1915 and in value, \$55,575. Small quantities were formerly procured from other countries, but it now practically all comes from America.

Construction materials in Martinique are largely of white and red pine, and are imported from America. A steady improvement in the lumber trade is shown by the statistics from 1909 to 1914; imports declined in 1914, however, and in 1915 lumber imports were 40 per cent less than in the previous year.

America's trade with the island in lime and cement has developed in the past five years. In 1910 the United States furnished the island with \$450 worth of these products; in 1915 the imports

F-2. Martinique export values for 1913–1915, showing vanilla among the island's principal traded products. Source: T. R. Wallace, “French West Indies: Martinique,” *Supplement to Commerce Reports*^a (1916); <https://babel.hathitrust.org/cgi/pt?id=pst.000072094433&seq=1>

TABLE 1.—Pounds of vanilla beans exported by leading countries from 1925 to 1945 (figures for Puerto Rico through 1947)¹

Year	French West Indies	French Oceania	Madagascar and Dependencies	Mexico	Netherlands Islands	Réunion	Seychelles	Puerto Rico
1925	69,082.2		905,918.2	323,371.4		133,339.8		
1926	76,753.6		1,362,486.4	263,663.4		203,266.8		
1927	19,965.0		1,086,027.8	243,867.8		190,812.6		
1928	19,965.0		1,499,055.3	243,731.4		255,503.6	2,884.2	
1929	8,052.0		2,402,397.8	206,804.4		216,189.6	10,135.4	
1930	2,420.0		1,440,450.0	316,267.6	45,062.6	66,440.0	7,999.2	
1931	3,291.2		1,753,164.6	317,119.0	39,388.8	110,440.0	2,134.0	
1932	7,497.6		1,905,325.4	249,937.6	44,679.8	72,600.0	2,743.4	
1933	10,707.4	116,600.0	1,450,314.8	119,198.2	20,281.8	46,200.0		
1934	13,387.0	226,600.0	1,005,853.2	208,617.2	75,880.2	74,580.0	1,060.4	
1935	18,255.6	191,400.0	1,017,940.0	170,557.2	39,435.0	42,680.0	259.6	
1936	28,267.8	207,240.0	1,193,280.0	358,745.2	36,126.2	138,600.0	1,265.0	462.0
1937	33,312.4		688,600.0	321,301.2	6,133.6	149,600.0	1,025.2	800.8
1938	23,067.0	² 250,000.0	829,400.0	335,440.6	29,570.2		4,642.0	37.4
1939	36,357.2	453,200.0	² 670,000.0	271,128.0	12,922.8			57.2
1940	² 20,000.0	264,880.0	² 526,000.0	468,600.0	48,851.0			862.4
1941 ²	² 9,800.0	465,520.0	² 716,000.0	572,000.0				1,773.2
1942	² 42,000.0	121,508.2	² 36,000.0	145,675.2				2,119.0
1943	² 10,600.0	228,602.0	² 214,000.0	404,848.4				4,000.0
1944	² 20,000.0	² 368,000.0	² 722,000.0	193,058.8				6,016.9
1945	² 38,000.0	² 148,000.0	² 674,000.0					5,983.5
1946								4,095.3
1947								± 4,600.0
Average	24,322.9	253,462.5	1,052,295.9	286,696.6	36,212.0	130,788.6	3,414.8	± 2,567.3

¹ Exportation data from some countries during World War II were not available when this publication went to press. Exports from Dominica (not included) during World War II increased rapidly from a few thousand to 50,000 pounds or more (14). Data from United States Department of Commerce, United States Government, Washington, D. C.

² Data taken from statistics section, L'Agronomie Tropicale (Seine), vol. 1: No. 1-2, 1946.

F-3. Vanilla-bean exports from leading producing regions, 1925–1946. The table documents the continued commercial presence of the French West Indies during the pre-standard period. Puerto Rico data extend through 1947. Source: USDA Puerto Rico Circular No. 28 (1948), based on U.S. Department of Commerce data. (Vanilla culture in Puerto Rico; <https://www.growables.org/information/TropicalFruit/documents/VanillaUSDA.pdf>)

corresponding to *V. planifolia* and *V. pompona*, respectively (Wallace, 1916). In Martinique, the report recorded exports of 23,963 pounds in 1914 and 23,476 pounds in 1915 to the United States, including a larger proportion than usual of vanillons. The report also noted that the United States was the second-largest importer of Martinique products and, together with France, a principal destination for Martinique vanilla beans (Wallace, 1916). **F-3** compares vanilla-bean exports from leading producing regions and documents the continued commercial presence of the French West Indies during the pre-standard period.

Trade continuity into the mid-20th century indicates that *V. pompona* remained in U.S. supply channels well into the pre-standard era. Between 1933 and 1944, the French West Indies, an important producing region for *V. pompona*, exported approximately 120 tonnes of vanilla, of which about 71%, entered the United States (Childers & Cibes, 1948). **F-3** also notes that Dominica's vanilla exports rose during World War II from a few thousand pounds to 50,000 pounds or more, while Correll (1953) reported that exports in 1945 and 1947 became an important source of income for the Caribbean Reserve. Federal price controls continued to list West Indies vanilla as a distinct commercial origin (Office of Price Administration, 1943), and by 1948 USDA

publications still recognized *V. pompona* under names including vanillon, West Indian, South American and *pompona* vanilla (Childers & Cibes, 1948). Correll (1953) mentioned a Guadeloupe's production of 12-15 tons of vanilla in 1950 and 1951, respectively, with half exported to the U.S. and Canada. Although the aggregate data do not identify individual shipments botanically, they document an active U.S.-bound trade route from a region strongly associated with vanillon production.

Collectively, the botanical, commercial, and government records provide strong evidence that *V. pompona* was commercially cultivated, traded under recognized names, and introduced into U.S. supply channels. Contemporary records further indicate that it was not only present in commerce but also understood as a source of vanilla flavoring for foods, beverages, medicines and extracts.

Use in American Flavor and Extract Manufacture

Vanilla pompona was recognized in the United States as a usable vanilla material during the period in which vanilla had become a major flavoring ingredient in American extract, confectionery, beverage and

ice-cream manufacture (Correll, 1953; Kramer, 1905; McCormick & Company, 1915). Culinary literature placed it among the vanillas available for American use. In *Practical American Cookery* (1885), Jules Arthur Harder described *pompona*, or “Babo vanilla,” from South America and the West Indies as suitable for medicine, perfumery and cookery, noting its dark brown pods and pronounced anise-like aroma and discussing it alongside commercial *V. planifolia* in preparations such as custards, creams and cakes (Harder, 1885). George Beringer likewise reported in 1895 that *V. pompona* had long been known as an article of commerce (Beringer, 1895). This positioning reflects not only market hierarchy but sensory distinctiveness.

Industrial sources more directly place it within extract manufacture. In *Kramer's Book of Trade Secrets* (1905), a technical manual for manufacturers and jobbers, *pompona*s or vanillons were listed among the materials used in making vanilla extract alongside Mexican, Bourbon and Tahitian beans (Kramer, 1905). Kramer further noted that vanillons and Tahiti vanilla contributed color and body to extracts. McCormick's *The Vanilla-Bean: A Talk on Tea* (1915) likewise treated vanillons as a distinct commercial category, placing them with Tahitian vanilla below the more highly regarded Mexican and Bourbon beans, yet still within a differentiated market for food and extract applications (McCormick & Company, 1915; Kramer, 1905; Correll, 1953).

Mid-20th-century federal and agricultural sources indicate that commercial recognition of *V. pompona* continued well beyond the 19th century. As shown in **F-4**, wartime federal price controls continued to list West Indies vanilla as a distinct commercial origin in U.S. trade (Office of Price Administration, 1943). Although the schedule did not identify species or quantify shipments, it shows that West Indies vanilla remained a recognized commercial origin within the U.S. import-pricing system (Office of Price Administration, 1943). Contemporary agricultural and botanical sources strongly associated that origin with *V. pompona* cultivation and trade (Childers & Cibes, 1948; Correll, 1953).

Commercial vanilla manufacture during this period commonly involved blending beans of different origins and grades to achieve desired flavor, color, body and cost characteristics in confectionery, beverages, bakery products and ice cream (Kramer, 1905; McCormick & Company, 1915). Within this context, *V. pompona* appears to have served two related functions: as a distinct vanilla material with a recognizable sensory profile and as a practical component of blended extracts. Later analytical studies described vanillons as exhibiting heliotropin-like, floral and anisic notes (Ehlers & Pfister, 1997). These characteristics invite comparison

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terial, and direct labor, computed at March, 1942, replacement prices, plus an average dollar-and-cents margin, as herein defined, obtained by the manufacturer between April 1, 1941, and March 31, 1942, on sales of holidays candy or chocolate covered cherries (whichever is being priced hereunder) of the same or the most nearly similar kind, sold to a purchaser of the same class: *Provided*, That in the case of fresh cherries, the manufacturer shall use, for purposes of calculating his cost, the actual cost to him of such ingredients.

(2) In those cases in which the manufacturer did not deal in the same or similar kind of holidays candy or chocolate covered cherries (whichever is being priced hereunder) between April 1, 1941, and March 31, 1942, the maximum price to each class of purchasers shall be the maximum price of the most closely comparable manufacturer of the same class for the same or the most nearly similar kind of holidays candy or chocolate covered cherries (whichever is being priced hereunder) sold to a purchaser of the same class.

(b) *Pricing*. Before making any sale of holidays candy or chocolate covered cherries, each manufacturer shall file with the Office of Price Administration in Washington, D. C., a list of his maximum prices for such commodities (which he proposes to sell at prices computed hereunder) for each class of purchasers, together with a detailed description of such commodities for identification and a full explanation of the manner in which such maximum prices for each class of purchasers (as above) shall be determined under paragraph (a) above. The maximum prices thus bona fide determined under paragraph (a) above, actual figures, shall be submitted herewith (and, all component costs, i. e., ingredients, packaging material, and direct labor.

(c) *Definitions*. (1) “Holidays candy” is any candy which is manufactured and marketed especially for such holidays or festivals as the following: St. Valentine's Day, Washington's Birthday, St. Patrick's Day, Easter, Mother's Day, Fourth of July, Halloween, Thanksgiving, and Christmas, and the form, color, or style of which definitely identifies it with the particular holiday or festival to the extent this is used. Candies coming under the sale after the general occasion for which they were made.

(2) The manufacturer's cost of ingredients and packaging material “computed at March, 1942, replacement prices” shall be prices no higher than the highest prices charged to a purchaser of the same class by the manufacturer's usual suppliers during March, 1942, for such ingredients or packaging material, or, if no charge was made for such ingredients or packaging material, then “March, 1942, replacement prices” shall be prices no higher than the highest prices charged during March, 1942, to a purchaser of the same class by a seller of the same class as the manufacturer's usual suppliers. Direct labor “computed at March, 1942, replacement prices” shall

be calculated at the rate of remuneration paid by the manufacturer to his employees engaged directly in the manufacture of the same or the most nearly similar kind of candy during March, 1942.

(3) “Average dollar-and-cents margin” of the manufacturer shall be determined by computing, for the period from April 1, 1941, to March 31, 1942, the difference between his average selling price and the average cost of ingredients, packaging material, and direct labor used in the manufacture of holidays candy or chocolate covered cherries (whichever is being priced hereunder). “Average selling price” and “average cost,” as used in this definition, shall be an average weighted by the volume of units sold or purchased.

(4) *Adjustment of maximum prices*. Any price determined pursuant to this section shall be subject to adjustment at any time by the Office of Price Administration.

(e) *Applicability*. The provisions of this section shall be applicable to the 48 states of the United States and the District of Columbia.

Sec. 13. *Vanilla beans*.—(a) *Maximum prices*. The maximum prices for vanilla beans shall be as follows:

Dollars per pound
f. o. b. New York
c. o. b. New York

Mexican—Superior to Extra (Prime)..... \$11.00

Mexican—Class First (Quality)..... 10.00

West Indies—Regular..... 10.00

Java—Pine..... 9.50

Tahiti—Yellow Label..... 6.50

Tahiti—White Label..... 5.75

In all cases the above descriptions apply to the best quality of each type and grade named. The maximum prices for grades and types not named shall be determined by applying the seller's discretion in effect during the period July-August 1941, or the differentials of the most closely competitive seller of the same class, if the seller had no established differentials during July-August 1941, for any grades or types of vanilla beans.

(b) The maximum prices quoted above are f. o. b. New York or Philadelphia. The maximum price f. o. b. any other point of entry will be determined by subtracting from the above prices the transportation charges over named the routes over available means of transportation from such point of entry to New York or Philadelphia, whichever is lower.

(c) The maximum delivered cost to the buyer shall be:

(1) In the beans are shipped from New York or Philadelphia, the maximum price quoted above, plus actual transportation charges from New York or Philadelphia to the buyer's destination.

(2) If the beans are shipped to the buyer from a point of entry other than New York or Philadelphia, the f. o. b. point of entry price as determined under (b) above, plus actual transportation charges from such point of entry to the buyer's destination.

(III) If the beans are resold, the maximum price at the point of resale, as determined in (1) or (II) above, plus actually incurred transportation charges to the ultimate buyer's destination.

(3) The maximum prices herein established shall include all commissions and other charges.

(4) Premiums shall be allowed on small quantity sales of 50 pounds or less as follows:

(i) A primary dealer may add one per cent to the maximum price for beans established in paragraph (a) above on all sales of quantities of 50 pounds or less.

(ii) A person other than a primary dealer may add 10 percent to the maximum price established by paragraph (a) above on all sales of quantities of 50 pounds or less.

(5) Premiums to carry out contracts made prior to September 30, 1942. Notwithstanding the provisions of paragraph (a) hereof, contracts entered into prior to September 30, 1942, may be carried out to contract prices: *Provided*, That these prices shall not exceed the maximum prices for vanilla beans as established by the General Maximum Price Regulation prior to the adoption of this section.

Before deliveries any vanilla beans under such contracts, premiums shall be paid to the Office of Price Administration, Washington, D. C., the following information:

(1) date of the contract, (2) the name and address of the buyer and seller, (3) the quantity, (and) name and grade of vanilla beans involved, (4) the cost of the vanilla beans to the seller, (5) the price contracted for with the buyer, and (6) the delivery date provided for in the contract.

(c) *Less than maximum prices*. Lower prices than the maximum prices established by this section may be charged, demanded, paid or offered.

(d) *Evolution*. The price limitations set forth in this section shall not be evaded, whether by direct or indirect methods, in connection with the purchase, sale, delivery or transfer of vanilla beans, or by way of premium, commission, service, transportation or other charge, or by changing trade standards, or by any other trade understanding, or by making the discounts direct or other items and conditions of sale more onerous to the purchaser than those available or in effect on September 30, 1942, or by any other means.

Sec. 14. *Halvah*. (a) The maximum price for halvah sold and delivered by any seller, whether producer, wholesaler or retailer, shall be determined by adding 1/4 cent per pound to the maximum price as determined under § 1493.2 of the General Maximum Price Regulation by any such seller, and the sum resulting shall be the stipulated maximum price for such halvah.

(b) “Halvah” means all kinds of halvah, including plain, nut, and chocolate halvah made by the processing of ap-

F-4. Wartime (1943) federal price controls continued to list West Indies vanilla as a distinct commercial origin in U.S. trade; [loc.gov/resource/fedreg.fr008140/?pdfPage=57&st=pdf](https://www.loc.gov/resource/fedreg.fr008140/?pdfPage=57&st=pdf)

with Tahitian vanilla, which likewise displays a floral and anisic profile distinct from that of Bourbon-type vanilla (Ehlers et al., 1994; Brunschwig et al., 2012). Kramer (1905) further noted that vanillons, together with *V. tahitensis*, contributed color, body and resin to vanilla extracts. Such blends may also have reflected economic considerations, including the extension of more expensive Mexican vanilla with lower-cost beans. Correll's observation that *V. pompona* was generally marketed as a distinct commercial product, its fruits packed separately or sold in bulk rather than mixed with those of *V. planifolia*, further supports its status as a recognized material within the broader flavor and extract industry (Correll, 1953).

Taken together, these culinary, industrial, and commercial records place *V. pompona* within the networks that supplied the American flavor and extract industry. The evidence indicates that it was recognized as a usable vanilla material and valued for a sensory profile distinct from that associated with Bourbon- and Mexican-type *V.*

planifolia beans. At the same time, the complexity of the vanilla trade and the growing use of synthetic and other substitute materials heightened concerns over authenticity, adulteration and standardization.

Adulteration and Authenticity of Vanilla

The commercial value of vanilla stimulated efforts to identify and isolate its principal aroma constituent, culminating in the first chemical synthesis of vanillin in 1874. As synthetic vanillin and other low-cost substitutes

became more available, federal concern centered increasingly on the authenticity of vanilla extracts, especially the use of undeclared artificial vanillin, coumarin-bearing additives such as tonka derivatives, and coloring materials, including caramel coloring, in products made with little or no natural vanilla from the beans themselves (Correll, 1953; Wiley, 1907, 1917).

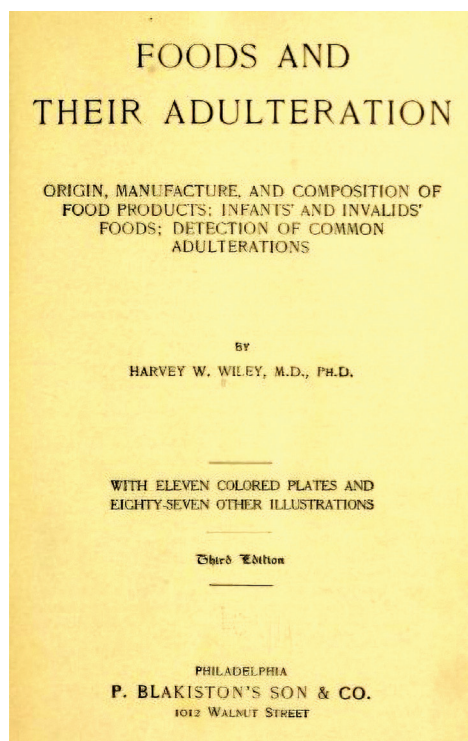
In reports to the U.S. Congress, Harvey W. Wiley of the USDA Bureau of Chemistry described the widespread adulteration of vanilla extracts with synthetic vanillin and tonka-derived coumarin, concerns that formed part of the broader public-health and misbranding objectives behind the Pure Food and Drugs Act of 1906 (U.S. Congress Senate Report, 1900; Wiley, 1907, 1917). **F-5** reproduces Wiley's treatment of artificial vanillin and other substitute materials in the 1907 and 1917 editions of *Foods and Their Adulteration*. Similar issues surfaced in a 1908 petition from Tahitian vanilla producers seeking federal action against substitution of natural vanilla with synthetic vanillin, and USDA enforcement records likewise documented adulteration cases involving vanilla products (U.S. Department of Commerce and Labor, Bureau of Manufactures, 1908; U.S. Department of Agriculture, 1912).

F-6 provides representative enforcement entries for vanilla extract and related flavoring products. Later oversight under the 1938 Food, Drug, and Cosmetic Act, together with the Federal Trade Commission [FTC] actions in 1939, continued to target economic deception in vanilla extract.

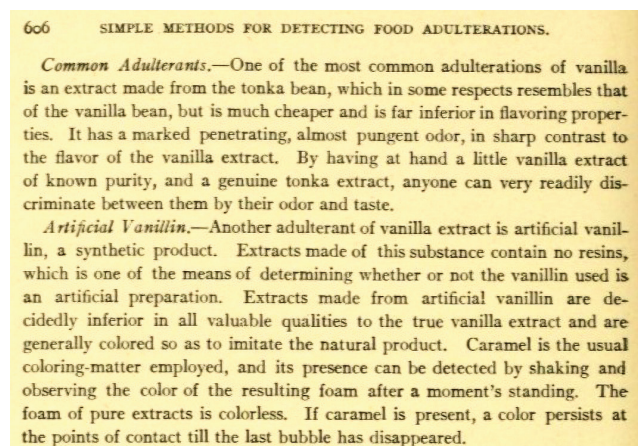
These records show that federal action focused primarily on imitation, adulteration and misrepresentation rather than on excluding multiple botanical vanilla sources from commerce (Wiley, 1907, 1917; U.S. Department of Agriculture, 1912; FTC, 1939). In his descriptions of vanilla beans, Wiley referred only to the cured fruit of *Vanilla planifolia* (Wiley, 1907, 1917), thereby omitting not only *V. pompona* but also *V. tahitensis*, a species later incorporated into the U.S. standard of identity for vanilla. Wiley's own discussions centered on artificial vanillin, tonka extracts and coloring practices. The description appears more consistent with prevailing supply conditions than with a deliberate effort to restrict regulatory acceptability of legitimate vanilla sources (Wiley, 1907, 1917; Correll, 1953).

Federal adulteration concerns specifically targeted coumarin-bearing additives such as tonka derivatives because of public health concerns (Wiley, 1907, 1917; FTC, 1939). Analytical work on vanillons found no detectable coumarin in the tested extracts, clarifying earlier unsupported claims that had associated vanillons with such compounds (Ehlers & Pfister, 1997). In that respect, the U.S. federal enforcement record does not identify *V. pompona* as an adulterant in

F-5a.



F-5b.



F-5a,b. Wiley's treatment of artificial vanillin and other substitute materials in the 1907 and 1917 editions of *Foods and Their Adulteration*

F-6a.

REPORT OF DOCUMENTS RECEIVED AND DISTRIBUTED—1911. 17		
<i>Detailed statement of documents received and distributed by the Department of Agriculture during the fiscal year 1911, etc.—Continued.</i>		
OFFICE OF THE SECRETARY—Continued.		
Title.	Copies received.	Copies distributed.
DEPARTMENTAL—continued.		
Notices of judgment—Continued.		
No. 660. Adulteration and Misbranding of Vanilla Flavoring Powder.....	11,500	10,840
No. 661. Adulteration and Misbranding of Lemon Extract.....	11,500	10,840
No. 662. Adulteration and Misbranding of Orange and Lemon Flavoring.....	11,500	10,840
No. 663. Adulteration and Misbranding of Vanilla Extract.....	11,500	10,840
No. 664. Adulteration of Fish.....	11,500	10,840
No. 665. Adulteration of Dehydrated Egg Powder.....	11,500	10,840
No. 666. Adulteration of Molasses.....	11,500	10,840
No. 667. Adulteration of Ice Cream Cones.....	11,500	10,840
No. 668. Adulteration of Canned Tomatoes.....	11,500	10,840
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No. 733. Adulteration of Canned Tomatoes.....	11,500	10,840

F-6b.

REPORT OF DOCUMENTS RECEIVED AND DISTRIBUTED—1911. 17		
<i>Detailed statement of documents received and distributed by the Department of Agriculture during the fiscal year 1911, etc.—Continued.</i>		
OFFICE OF THE SECRETARY—Continued.		
Title.	Copies received.	Copies distributed.
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Notices of indictment—Continued.		
No. 659. Adulteration and Misbranding of Vanilla Flavoring Powder.....	11,500	10,840
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No. 721. Adulteration of Canned Tomatoes.....	11,500	10,840
No. 722. Adulteration of Canned Tomatoes.....	11,500	10,840
No. 723. Adulteration of Canned Tomatoes.....	11,500	10,840
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No. 732. Adulteration of Canned Tomatoes.....	11,500	10,840
No. 733. Adulteration of Canned Tomatoes.....	11,500	10,840

F-6a, b. Representative USDA enforcement entries for vanilla extract and related flavoring products

vanilla enforcement actions (Wiley, 1907, 1917; FTC, 1939). Later federal restrictions focused instead on tonka-derived additives and added coumarin, with the prohibition codified in 1977 (42 FR 14659, Mar. 15, 1977; Wiley, 1907, 1917; FTC, 1939).

Vanilla pompona trade persisted through successive phases of U.S. food law under established names such as vanilla and West Indian vanilla, including the Pure Food and Drugs Act era and the period following the 1938 FD&C Act (Childers & Cibes, 1948; Correll, 1953). This enforcement history matters because it shows that early federal concern centered on substitution and misrepresentation, while *V. pompona* itself was not identified in official records as a source of safety or adulteration concern.

The historical record therefore raises a different question: not why *V. pompona* was excluded from commerce, but why a species that persisted through these regulatory transitions was ultimately absent from the standards of identity later adopted for vanilla in the United States.

Why Did *Vanilla pompona* Fall Outside the U.S. Standard of Identity?

The available evidence does not establish a single documented reason for the omission of *V. pompona*. It instead supports a market-representation hypothesis: the species declined in commercial visibility as standardized Bourbon vanilla expanded, leaving it absent from the industry petitions that framed the eventual rule. Three developments appear most relevant: the commercial preference for higher-ranked Mexican and Bourbon beans, the declining French West Indies production, and the absence of *V. pompona* from the industry petitions that initiated rulemaking.

Early 20th-century analytical and industrial literature increasingly defined vanilla quality through measurable compositional and commercial criteria. **F-7** reproduces a contemporary example: *Food Inspection and Analysis* (Leach & Winton, 1920) ranked Mexican and Bourbon beans among the highest grades, while

The Mexican vanilla beans are of the choicest grade, and command a high price, sometimes reaching fifteen dollars per pound. The Bourbon beans, grown in the Isle of Réunion, are next in grade. These beans are shorter than the Mexican and much less expensive. They resemble the Tonka bean in odor. Beans from Seychelles and Mauritius are even shorter than the Bourbon beans, and are largely exported to England. Cheaper varieties are those from South America, which do not bring half the price of the Mexican beans, and the cheapest are the Tahiti beans and so-called “vanillons,” or beans of the wild vanilla (*Vanilla pompona*). These latter are used more in sachet powders and perfumes, possessing an odor not unlike heliotrope.

F-7. Food Inspection and Analysis (Leach & Winton, 1920) ranked Mexican and Bourbon beans among the highest grades, while associating Tahitian beans and vanillons (*V. pompona*) with lower-priced applications

associating Tahitian beans and vanillons (*V. pompona*) with lower-priced applications. *The Microscopy of Vegetable Foods* (Winton & Moeller, 1906) described “vanilla of commerce” primarily in relation to *Vanilla planifolia*, while still recognizing *V. pompona* as a commercial vanilla with lower vanillin content and a different sensory profile. These classifications did not remove *V. pompona* from commerce, but they did place it along with *V. tahitensis* within an emerging quality hierarchy defined by vanillin levels, sensory character and market value.

Part of *V. pompona*’s commercial reputation may have been shaped by its broad geographic distribution and variable post-harvest handling. Rolfe (1896) described the species as occurring throughout Mexico, Central America, northern South America, and the French West Indies. Contemporary accounts characterized its fruits as larger and fleshier than those of *V. planifolia* and more difficult to cure, while Ferguson (1905) emphasized that bean quality depended heavily on maturity and curing practices and varied substantially among producing regions. Vanillons may therefore have entered commerce with greater variability in flavor, appearance and extract performance than Bourbon vanilla.

Tahitian vanilla offers an instructive comparison. Like vanillons, it was long regarded as distinct in sensory profile and often lower in value than Mexican and Bourbon vanilla (Doty, 1904; Ridley, 1912; Kevorkian, 1964; Brunschwig et al., 2012; Lubinsky et al., 2008). Early U.S. consular reporting described “unsatisfactory conditions” surrounding Tahitian vanilla and efforts to reassure American importers regarding quality (Doty, 1904), while Henry Ridley later remarked that Tahitian vanilla resembled vanillons in its heliotrope-like character and was less suitable for high-grade confectionery (Ridley, 1912). In Tahitian vanilla’s case, a lower market rank and a distinct sensory profile did not preclude later inclusion within the U.S. vanilla standard.

Market perceptions and preferences also shifted over time. Nineteenth-century trade manuals frequently regarded Mexican vanilla as the finest grade, while Bourbon vanilla was initially described as less aromatic and valued below Mexican beans (Harrison, 1870; Simmonds, 1877; McCormick & Company, 1915; Leach & Winton, 1920). Over time, improved curing practices, expanding production in Madagascar, and the increasing availability of lower-priced, standardized Bourbon vanilla strengthened its position within U.S. supply chains. After World War II, these trends accelerated, while cheaper synthetic vanillin added further pressure to natural vanilla producers (Correll, 1953). In the same period, cultivation of vanillons in the French West Indies declined, reducing the market presence of *V. pompona* in the United States (Correll, 1953). The USDA report by Childers and Cibes (1948) reflected the resulting hierarchy: although it described *V. pompona* as more tolerant of adverse moisture and soil conditions, more resistant to root-rot disease, and useful in breeding work, it also characterized the species as lower in market value, and therefore unlikely to justify cultivation under Puerto Rico’s high production costs. By the 1950s, Bourbon vanilla had become the dominant commercial reference standard in the United States, available at lower cost than other origins (Vanilla Bean Association of America, 1955).

In this context, U.S. vanilla standards of identity appear to have reflected the species that remained commercially represented in the supply chains serving the United States rather than the full historical range of materials once traded as vanilla. Although *V. pompona* had circulated widely in 19th- and early 20th-century trade and remained commercially visible through the federal food-law regimes established after 1906 and 1938, its presence had largely declined by the time the standards of identity were developed. The proposed rule, published in the *Federal Register* on July 19, 1960, originated in petitions submitted by flavor manufacturers that already defined vanilla beans as the properly cured and dried fruit pods of *Vanilla planifolia* Andrews and *Vanilla tahitensis* Moore. The final rule was published on September 1, 1962 (Food and Drug Administration, 1960, 1962). The proposed and final *Federal Register* notices do not state a scientific, safety-based or sensory rationale for excluding *V. pompona*, and the species does not appear in the industry petitions that framed the rulemaking process.

On the available record, *V. pompona* appears to have fallen outside the U.S. standard during a period of declining market representation relative to the other two commercial vanilla species. This historical context remains relevant because *V. pompona* has attracted renewed interest in agronomic and sensory

characteristics that distinguish it from other cultivated vanilla species, including greater tolerance to water stress and disease and an aroma profile characterized by floral, fruity and anise-like notes (Dean, 2025; Pérez-Silva et al., 2021; Tran et al., 2024; Galeas, 2015).

Recent technical assessments also treat *V. pompona* as part of the broader vanilla natural flavor complex, while noting that it is not specified in the current U.S. standard of identity for vanilla extract (Guengerich et al., 2026). As interest grows in sustainable strategies for diversifying vanilla supply and strengthening crop resilience through the use of related vanilla diversity (Sustainable Vanilla Initiative, 2025; Chambers et al., 2021; Barreda-Castillo et al., 2023), the historical record provides useful context for understanding the former commercial role of *V. pompona* and its absence from U.S. standard for vanilla products.

Conclusion

Historical records demonstrate that *Vanilla pompona* was a recognized commercial vanilla that participated in international trade and supplied food, flavor and extract applications in the United States. Although *V. pompona*, like *V. tahitensis*, generally ranked below Mexican and later Bourbon vanilla, its lower commercial position did not exclude it from trade. During the decades preceding development of the standards of identity, however, the commercial prominence of *V. pompona* declined as Bourbon vanilla became increasingly standardized, widely available and economically competitive within U.S. supply chains.

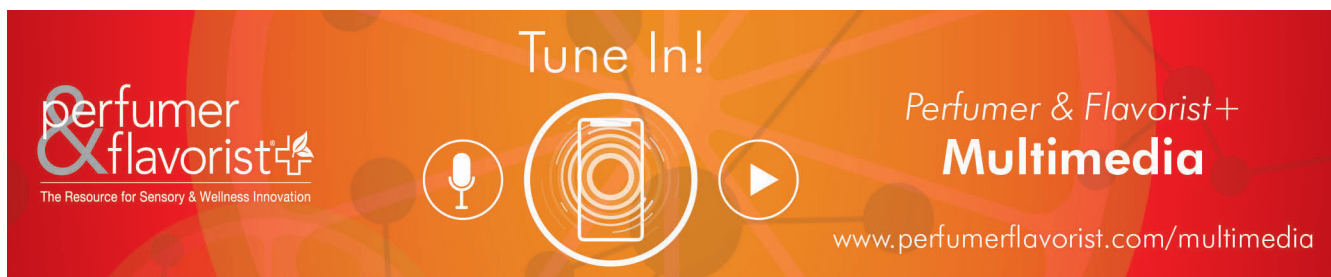
The evidence suggests that the omission of *V. pompona* from the U.S. vanilla standards reflected two historical circumstances: its declining commercial representation in the U.S. market and its absence from the petitions submitted during the rulemaking process. No documented scientific, safety-based, or sensory rationale for excluding *V. pompona* has been identified.

That history still matters. As interest grows in diversifying vanilla supply, strengthening crop resilience and exploring a wider range of sensory profiles, *V. pompona* may merit renewed consideration for possible inclusion among the species recognized under U.S. standards for vanilla products.

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"We're currently experiencing an oversupplied vanilla market with Madagascar having year-to-year bumper crops and with a forecast of a third good crop coming up this year which have driven prices down," says Eduardo Villagómez, VP of vanilla products at Virginia Dare.

Vanilla's Next Chapter: Diversification Without Losing the Flavor

While sourcing has reached beyond Madagascar, the region's traditional practices result in a flavor profile that is difficult to replace.

Madagascar remains the benchmark for natural vanilla, but today's market is defined by a striking contradiction: abundant crops and low prices on one hand, and a supply chain exposed to weather, policy shifts and geographic concentration on the other. As Uganda and other origins gain traction, climate patterns disrupt curing practices and researchers explore new varieties, the question is how the industry can diversify risk without sacrificing the distinctive sensory profile that makes Madagascar vanilla so prized. In this Q&A, Eduardo Villagómez, VP of vanilla products at Virginia Dare looks at what is changing, what isn't, and why Uganda could emerge as a critical piece of vanilla's supply strategy through 2030.

How would you characterize the stability of the vanilla supply chain today, and what are the biggest vulnerabilities that flavor companies should be planning around over the next five years?

Villagómez: We're currently experiencing an oversupplied vanilla market with Madagascar having year-to-year bumper crops and with a forecast of a third good crop coming up this year which have driven prices down.

Based on this, we can expect stable pricing and a steady supply for at least the two-three



Eduardo Villagómez, VP of vanilla products at Virginia Dare.



"Indonesian farmers follow different agricultural and curing practices than the ones we typically see in Madagascar so I wouldn't consider this origin to be a replacement for the characteristic flavor profile we see coming out of the Bourbon region," says Eduardo Villagómez, VP of vanilla products at Virginia Dare. "However, it provides a good alternative when labeling is the priority and not flavor."

years to come. The biggest risks for flavor companies could come from major weather events damaging the crop and in-county inventories and from policy changes at the local level affecting prices more than availability.

Climate change is an obvious long-term concern for a crop as geographically concentrated and labor-intensive as vanilla. What climate-related changes are you already seeing in the major growing regions, and which interventions—agronomic practices, genetics, crop diversification, infrastructure—are most promising for making vanilla production more resilient?

Villagómez: As you correctly mention, vanilla is grown in a very concentrated region, mostly in the North East of Madagascar known as the SAVA. In the past few years, we have already seen changes in weather patterns that have required producers to draw on their creativity to minimize the impact of these on the vanilla supply chain.

The most noticeable change has been an increase of rain during the months of September to November making average temperatures to be lower. This change mostly affects the curing and drying steps as vanilla beans require to reach high temperatures and dry weather to go through these processes in an efficient manner.

In order to mitigate the impact of the changes in weather conditions, vanilla curers have resorted to transporting their vanilla beans to warmer and dryer areas of the country for the initial phases of curing

to then move those beans back to the SAVA region to finalize the curing and go through the sorting and selection processes.

Up to today, we haven't seen major climate changes that could affect vanilla while it is still on the vine so there hasn't been a need for major agronomic practices shifts.

Uganda, Indonesia and other producing regions are attracting greater attention as companies look to diversify beyond Madagascar. Are these emerging origins capable of becoming meaningful components of the global vanilla supply, or are they more realistically complementary sources that can provide strategic insurance when Madagascar has a difficult crop?

Villagómez: I wouldn't really call them emerging origins as they have been producing vanilla for many years and they have proven that when needed, they can increase their output significantly.

Indonesian farmers follow different agricultural and curing practices than the ones we typically see in Madagascar, so I wouldn't consider this origin to be a replacement for the characteristic flavor profile we see coming out of the Bourbon region; however, it provides a good alternative when labeling is the priority and not flavor.

Uganda on the other hand does tend to follow the more traditional vanilla processing practices; in the most recent years, exporters have organized and started working together to position their crop as an alternative to Madagascar, and the quality of the vanilla beans has been very high comparable in vanillin content and flavor profile to extraction grade Madagascan beans. If they manage to get through the current low-price cycle, they can definitely become a meaningful global supplier.

The main challenge that both Indonesia and Uganda face is competing with the lower cost scheme that Madagascar benefits from, especially when prices are where the current market stands.

How much room is there for new vanilla varieties or improved planting material to change the economics of the category? Could breeding or selection ultimately deliver varieties that are more climate-resilient, higher-yielding or less labor-intensive without sacrificing the sensory complexity that formulators value in natural vanilla?



Shifting rain patterns and accompanying lower temperatures have impacted the vanilla curing and drying steps in Madagascar. Local producers are changing their processes in response.

Villagómez: Yes, cross-breeding and other agronomical research around vanilla has already delivered varieties that are more climate resilient. There has even been talk about “self-pollinating” varieties which would be game-changing.

Additionally, there are already other varieties such as *Vanilla pompona* which are commercially available. The flavor profile of these varieties is not necessarily less complex than the typical vanilla we are so familiar with. However, the standard of identity for vanilla extract in the United States only allows the use of *Vanilla planifolia* and *Vanilla tahitensis*, limiting enormously the scope for these potential new varieties hence discouraging additional exploration.

Cost is another important element to consider; research is expensive and if the varieties resulting of agronomical investigation are more expensive, it would be an uphill battle to have them widely implemented even if they provide a certain benefit such as a higher yield.

As supply becomes more geographically diverse, how should flavorists, perfumers and procurement teams think about managing—and potentially exploiting—those differences in terroir and chemical profile rather than simply trying to make every source taste the same?

Villagómez: Vanilla extract is not only used as a stand-alone ingredient, but also as an ingredient in other flavors, as well as a background note in products such as confectionery and bakery. Identifying the difference in flavor profile that each of the growing regions and



“The way vanilla is grown and cured in Madagascar has remained mostly unchanged since the early 1840s,” says Eduardo Villagómez, VP of vanilla products at Virginia Dare. “The methods and practices followed in that geographical region result in the beloved flavor profile appreciated all around the world.”

species have can become a tool for flavorists to tweak their creations and gear them toward a specific profile.

Age is another factor that contributes to flavor profile and enhances different descriptors such as rummy and alcoholic notes, so being aware and cataloguing these differences allows for the use of vanilla extract as a versatile instrument. By sourcing from different regions, procurement teams can enable their creative counterparts to have a broader palette to innovate with.

Looking toward 2030, what do you think the vanilla market will look like that is materially different from today? Will the winning strategy be greater diversification of growing regions, more sophisticated agricultural science, better supply-chain intelligence, new varieties—or some combination of natural vanilla with other approaches to achieve the sensory profile consumers expect?

Villagómez: The way vanilla is grown and cured in Madagascar has remained mostly unchanged since the early 1840s. The methods and practices followed in that geographical region result in the beloved flavor profile appreciated all around the world.

Other regions have implemented changes such as harvesting early or quick curing to accelerate the crop cycle, but these don't come without compromising taste and quality, so it is hard to imagine that in three-and-a-half years we will see a market that is much different from what we see today when we haven't seen significant changes in the past 150-plus years.

But the one aspect I see the industry paying more attention to is the diversification of sourcing risk by encouraging the use of other regions, mainly Uganda which is less prone to inclement weather. 



*Varieties such as *Vanilla pompona* are commercially available, but are inconsistent with the U.S. vanilla standard of identity.*

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