Ingredient Insights: 29th Journées Internationales Huiles Essentielles & Extraits—Essential Oil and Extract Conference

Rose, clove nutmeg (*Ravensara aromatica*), Atlas cedar, oak tree extracts, rosewood, attars and agars, and contemporary naturals

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The 29th *Journées Internationales Huiles Essentielles & Extraits* essential oil and extract conference took place in Digne-les-Bains, France, addressing three key areas: natural perfumery raw materials; contemporary, or "reworked" naturals; and the history of the use of aromatic plant materials in perfumery and medicines.

P. Pellerin (vice president of the event's scientific and organizing committee); M. Nyegue (University of Yaoundé, Cameroon), one of the winners of the Best Poster Award; and C. Monin (Acphytaroma). Nyegue coauthored the poster—"Inhibitory activity of essential oils of three medicinal plants of Cameroon on four *Bacillus* species and the germination of their spores"—with C. Ndoye and F.-X. Etoa of University of Yaoundé, Cameroon, and C. Menut, ENSCM, Montpellier, France.

The Rose and its Perfume

Despite its emblematic image in perfumery, the rose flower still retains secrets about its fragrance, explained presenter S. Baudino-Cassard (J. Monet University, St. Etienne). The speaker considered two types: "China roses" (*Rosa gigantea*), which possess a tealike smell, and "European roses" (*Rosa gallica*), which possess a more traditional roselike smell. The tea impression in *R. gigantea* is due to 3,5-dimethoxytoluene (3-5-DMT; CAS# 4179-19-5); the "rose" smell in *R. gallica* is due to the presence of 2-phenoxyethanol (CAS# 122-99-6).

To date, Baudino-Cassard noted, only five genes that play a role in the secretion of fragrant molecules in the plants' petal epidermis have been identified. In *R. gigantea*, 3-5-DMT synthesis is controlled by two orcinol ortho methyl transferase (OOMT) genes: OOMT1 and OOMT2. A first step begins with orcinol to produce 3-methoxy 5-hydroxytoluene; a second step leads to the production of 3-5-DMT. Surprisingly, *R. gallica* expresses the OOMT2 gene, not the OOMT1. As a result, no 3-5-DMT is found in its flower. (The mechanism of synthesis for 2-phenyl ethanol is not yet elucidated.)

Baudino-Cassard concluded that the absence of odors in flowers developed for commercial uses are due to breeding practices that have increased disease resistance at the expense of olfactive character.

Speaking during the event's regulatory roundtable were J. Kaloustian (University Aix- Marseille), E. Vidal (FranceAgriMer), H. Groux (Immunosearch), J.J. Etienne (ATN Conseil), H.P. Bodifee (Prodarom) and F. Saltron (DGCCRF).

Ravensara aromatica: Characterization of Chemotypes

Ravensara aromatica (Malagasy: *hazomanitra*, smell-good-tree) must not be mistaken for *Ravintsara* (*Cinnamonum camphora*), explained C. Menut, University of Montpellier. The bark essential oil of *R. aromatica* is used to improve the flavor of local rum, while the leaf essential oil is used in traditional medicine for its febrifuge properties, and as a tonic and anti-stress product. The large confusion among existing products required a systematic study, noted Menut. This study comprised the identification and localization of trees, identification of materials—leaves, stems, bark, roots—distillation in standardized conditions, and submission of products to chemical analysis. All steps were defined with highly detailed protocols. Menut noted the identification of four classes of leaf essential oils:


C. Menut, University of Montpellier

- “Aromatic” type 1, containing methyl chavicol
- “Aromatic” type 2, containing methyl eugenol
- “Terpene” type 3, containing α-terpinene
- “Terpene” type 4, containing sabinene

These four types are also found for stem essential oils. On the other hand, bark and root essential oils are all “aromatic” type 1, containing methyl chavicol. Menut explained that, with some training, types can be identified via smell.

Atlas Cedar

Cedar of Moroccan Atlas (*Cedrus atlantica*) should not be mistaken with cedar of Lebanon (*Cedrus libani*), Cyprus (*Cedrus brevifolia*) or Himalaya (*Cedrus deodora*), explained P. Pellerin, who presented a paper for the absent S. Zrira (IAV Hassan II Maroc). Cedar of Atlas is a resinous tree with a straight trunk, reaching 30 m high, with a pyramidal summit and 2-cm-long leaves gathered in bunches of 20–40 needles.


Atlas Cedar, Morocco.

The wood essential oil is prepared from sawdust via hydrodistillation (yield 8%) and is characterized by high terpene levels:

- β-himachalene, 48%
- α-himachalene, 17%
- γ-himachalene, 10%
- α-cedrene, 1%

The essential oil also contains sesquiterpene ketones and α- and γ-atlantone. The oil from needles is poorer in himachalenes, but contains α-pinene (15%), which is nearly absent in the wood.

Wood oil production is about 20–25 tonnes/year, 95% of which is exported to Europe (70%, mainly France) and the United States (30%). The wood tar oil (“cade”) is used exclusively locally (10 tonnes/year).

The wood essential oil of cedar has a large number of uses in perfumery (ex: fine fragrances), cosmetology (ex: antidandruff), aromatherapy and insect repellent. Its antifungal and antibacterial activities (shown against salmonella, *E. coli* and *S. aureus*) can find therapeutic applications; it would be of interest, Zrira’s presentation noted, to better understand the material’s usefulness as a preservative in cosmetic formulations.

Aromatic Extracts of the Oak Tree

The oak, a unique symbol of western culture, has not already delivered all its secrets, explained presenter J-L. Matout (Aromax). Some have been recently revealed through the hydro alcoholic extraction of its wood, leading to new extracts of remarkable fragrances and valuable compositions.


J-L. Matout (Aromax).

A series of methodical studies have been performed, including the precise identification and selection of woods (French oaks, American oaks), their preliminary treatment (drying) and their preparation (toasted or not), followed by the extraction procedure.

Extracts of French oak express wood, resin, burnt sugar (caramel), licorice and flap mushroom notes, while extracts of American oak show a stronger wood note paired with brown sugar and maple syrup notes.

The complex composition of these extracts reveals:

- Compounds of the furfural family—2-furfural, 5-hydroxymethyl 2-furfural, 5-methyl furfural—comprising more than 55% of French oak extracts (and even 65% if previously “toasted”) and more than 40% in American oak extracts.
- A great number of phenols, syringol, guiacols, cresols, eugenol and isoeugenol, whisky lactones, and vanillin.

These extracts are soluble in alcohol and consequently of high interest in perfumery to provide new and unexpected notes, including wood, licorice, vanilla and coumarin. The antioxidant properties of phenols may impart antiradical/anti-aging actives of great interest in cosmetology.

Rosewood

C. Vial (Esteban) provided a general overview of rosewood essential oil (*pau rosa*, *Aniba rosaeodora* Ducke, Lauraceae), including historical, economic and political (sustainable development) aspects. Following the now complete extinction of Cayenne rosewood (Northern Amazonia), the cultivation of *pau rosa* continues in Central Amazonia in a difficult and strictly framed context.

Growing of the tree is very slow (3.8 mm per year for the trunk diameter), and its reproduction is difficult (only flowering every two years; young plants are very delicate) and time-consuming (25 years or more). Trees are cut when their diameter reaches 10 cm (would be preferable to cut at 20 cm) and yield essential oil at 0.7–1.0%. Annual production is nevertheless of 130 tonnes/year, compared with the annual production of synthetic linalool, which stands at around 5,000 tonnes/year.

The interest in this essential oil rests on the ratio between optical laevo/dextro isomers, together with some particular components recovered by the distillation. Other plants that yield natural linalool via extraction include petitgrain and *Cinnamonum camphora*. Yet these cannot stand as an alternative source, according to Vial.

The trade of rosewood remains possible, provided it satisfies the very recent requirements established by the Convention of International Trade in Endangered Species of Wild Fauna and Flora (June 2010).

This raw material deserves a more conscious interest by the fragrance industry, which must simultaneously satisfy its clients on two sides: no impact on the environment, and usage of natural (i.e. non-synthetic) raw materials. This is a particularly, interesting and significant example.

Attars and Agars

Western culture tends to explore the history of perfume by focusing almost exclusively on the region surrounding the Mediterranean Sea, said presenter M. Moisseeff (Asquali). This narrative posits that the very origin of fragrances stands in Ancient Egypt. Nevertheless, said Moisseeff, it is clear that, beginning at an even more ancient time, odorants were created, produced and used in the Eastern countries.

Attars, or essential oils, are produced with the help of archaic devices: a copper vessel placed in a primitive oven heated by burning cow dung. Botanical material is then placed in the copper vessel with a specific ratio of water. A long bamboo stem connects this vessel with another copper vessel that is immersed in a cold pool of water, allowing for condensation. Both copper vessels and the tube are traditionally sealed with a mixture of cotton and clay. The distillation process comprises several repeated operations providing various fractions until the botanical is exhausted. Moisseeff displayed two examples—vetiver attar and an unusual clay attar obtained by distillation of flat clay cakes, which resulted in an attar that smelled of humid earth and smoke.

M. Moisseeff (Asquali) presented a discussion of traditional attar and agar production (pictured)

Agars (agarwoods, or ouds) result from the hydrodistillation of the wood of *Aquilaria agallocha*, which is commonly grown in Laos. The wood is white with black veins; these veins are the result of the development of a kind of fungus inside the wood. To produce agars, trunks are cut and reduced to sawdust, which is submitted to hydrodistillation. To satisfy increasing demand for agars by markets in the Gulf States, particularly Dubai, *Aquilaria agallocha* groves have expanded and now cover several thousand hectares. Meanwhile, significant nurseries of young plants guarantee the replacement of harvested trees.

"Reworked" Naturals

D. Ropion (IFF).

A number of market requirements have surfaced over the last 10–15 years, spurring the development of "reworked" natural products, according to D. Ropion (IFF). Among these requirements are:

- Regulatory constraints targeting particular chemical components.
- A desire for light or no colors in commercial products, leading to decolored naturals.
- Better solubility of odorants.
- Fragrances with defined scents that require a level of refinement inaccessible with complex/whole natural raw materials.

The answer for the fragrance industry had been the production of cleverly fractionated distillation using molecular distillation. Here, Ropion presented a range of reworked naturals:

- Elimination of the earthy note of vetiver essential oil via molecular distillation.
- Narcissus concrete extracted via supercritical CO_2: the flower note is revealed, which is nearly absent in the classical product.
- Ylang ylang essential oil: elimination of the medicated segment, leading to a fresher and a lighter profile.

The elaboration of these "hearts" results from a sophisticated expertise of preparation and separation techniques and opens the way to a new field of naturals. However, can we still speak of "naturals" in light of the sophisticated treatments applied to them? The question may spur debate by some, but it is clear that this range of products is far more naturalistic than most synthetics.