

# Good News for Perfumers: Formulating With Naturals

Components, formulation advantages, technical challenges, new ingredients and more

Paul McGee, Seven Scent

Natural ingredients have always proved a major source of inspiration. They give life, diversity and depth to fragrances, whether formulated for use in fine fragrances or an everyday detergent. The reason lies in the fact that every natural ingredient could be described as a mini-fragrance in its own right, with a variety of individual chemicals in its makeup. These chemicals give natural ingredients sparkle, freshness, warmth and depth and so, by definition, provide top, middle and base notes in just one ingredient.

It was through research into these natural ingredients, carried out around 150 years ago, that perfumers found their original supply of aroma chemicals. These chemicals were obtained by a process of removal from plant material and later by synthetic production of the same molecules at a much reduced cost. Synthetic production further inspired the development of unique, high-performance or simply low-cost aroma chemicals. A significant body of research on the topic has been built up by highly regarded scientists over recent years, which has greatly deepened our knowledge and use of these natural materials.

## Using Naturals in Fragrance Creation

Taking geranium oil as an example, one can start to understand how these natural materials can be used in perfumery formulations. When simply looking at some of the components in geranium oil, one will recognize many as aroma chemicals that are used every day— $\alpha$ -pinene, myrcene, dimethyl sulfide, limonene, menthone, linalool, citronellol and geraniol (the main components and their esters). All are found in the oil with other components at varying percentages depending on factors such as seasonal variation, geography, age and plant variety.

These natural materials are well-known. Their individual odors are made up of molecules with citrus notes, floral rosy notes, fruity notes and minty notes. Geranium oil has all these characteristics, making it perfect for creations where freshness, herbal and floral characters are required. The odor is not overly feminine, so the oil lends itself to perfumes used by men or women or both. Also, from the collected knowledge of the natural oil and its main components, perfumers can attain a good understanding of its stability in the finished product. In



Paul McGee

One of the major technical challenges is tackling stability, which can vary enormously among naturals.

some cases, however, a simple test is performed that can be conducted by adding the oil at a reasonable dosage, but one which is still below the level of the final fragrance in the final product. Testing can then be carried out over three months with three to four assessment samples of the oil at the same dosage, but under different conditions—i.e. refrigeration, room temperature (RT), 37°C and, if the client's packaging is semi-porous, another sample at 37°C and a high level of humidity. These should be assessed at intervals of every two weeks for the first month and monthly thereafter for degradation of both odor and color.

## Fact vs Fiction: Naturals in the Balance

On the surface, natural ingredients seem perfect for use in fragrance oils, so why the debate? On a practical level, they are provided by nature and so are always at risk from a number of volatile factors including the elements, pests, soil erosion, the price of fertilizer, the availability of a natural substitute, lack of water, flooding and, of course, the labor market. For many perfumers, though, these complications just add to their interest. There are, however, a number of other considerations that influence the choices made when formulating with naturals.

One of the major technical challenges is tackling stability, which can vary enormously among naturals. This is clearly seen when working with natural lemon oil, as it degrades through oxidation. So to maintain a “lemon picture” within the product, the perfumer must select

certain complementary aroma chemicals and so create a longer-lasting fragrance, for instance by the addition of citronellyl nitrile.

In marketing terms, a natural claim on a product label has become immensely important to marketers and consumers alike, but this development is not without its own challenges. “Natural” is seen as a positive message by consumers who perceive products carrying these types of claims to be chemical-free and therefore safe. This is an oversimplification that ignores the fact that naturally occurring fragrance ingredients are, in fact, chemicals in composition and not necessarily any safer than their “chemical”/synthesized counterparts. Limonene, for example, is found in large quantities in citrus fruits, but when it oxidizes it is known to cause problems with the skin. So if a citrus fragrance is required in a range of personal care products, for example, one answer is to remove limonene or reformulate the citrus oils so that levels are reduced. This could be achieved by using a folded oil, which reduces the terpene content of the oil through a physical distillation process rather than a chemical treatment. The resulting concentrated oil has the required odor, but can be used at a much lower dosage.

This folded oil approach raises another issue of significant commercial relevance—cost. By removing the terpenes and producing a much more concentrated oil, the cost can escalate to many times higher than the original natural oil. This is on top of the fact that purely natural ingredients are already significantly more expensive than their synthetic counterparts. There are different cost bands within each fragrance family. Citrus oils, for example, tend to be the cheapest, but range from the cheaper orange oil to the more expensive mandarin and grapefruit. Among the higher cost florals, rose and jasmine are at the top end, with geranium more moderate. One solution is to use less of the naturally sourced ingredients so they are not the main cost factor. Alternatively, a nature-identical ingredient can be produced using the same naturally occurring molecule such as citronellol; this still delivers some interesting facets of the natural material but at a fraction of the cost.

With consumers turning to natural products in the belief that they are safer than the chemical alternative, it's easy to overlook the issue of allergens. There are 26 common allergens identified by dermatologists and set out in regulations by organizations such as the International Fragrance Association (IFRA) (more ingredients could be added to this list).

In the mind of the consumer, natural is safe but in reality many of the commonly used natural fragrance ingredients actually contain one or more of these 26



*Natural ingredients have always proved a major source of inspiration; they give life, diversity and depth to fragrances, whether formulated for use in fine fragrances or an everyday detergent.*



*In marketing terms, a natural claim on a product label has become immensely important to marketers and consumers alike, but this development is not without its own challenges.*

known allergens. In order to achieve allergen-free as a claim, perfumers are significantly restricted as to the number of natural ingredients they can use. Of course, it is possible to create a fragrance that is both allergen-free and natural, but it is extremely difficult and likely to require compromises in terms of the quality or longevity of the fragrance created. It should also be remembered that the fragrance generally makes up between 0.1% and 2.0% of the total product, meaning that its contribution to overall claims of either natural or allergen-free is comparatively small.

Clearer direction and universal definitions for product labeling is needed to help consumers understand this balance between natural and allergen-free. Consumer and industry organizations are starting to work together on the issue and need to keep pace with growing consumer demand.

### Sustainable Future

One of the most positive changes to come out of the drive for the use of natural ingredients is the introduction of programs to ensure sustainable supply. Commercial pressures have had a significant impact on the farming communities around the world. Lack of land resulting

Sustainability has to be one of the best developments of the past 20 years in terms of perfumery creation, founding a commitment to ensure the sustainable supply of natural ingredients such as sandalwood, tonka and ylang-ylang.

from cities expanding to cope with a surge in population growth, rural communities migrating to the cities in the hope of better opportunities, the increasing need to produce food crops, and the labor-intensive and costly harvesting required have all played a part.

By buying from local communities in regions such as Laos or Madagascar, and working closely with them to ensure their needs are met locally in terms of education and health provisions, fragrance houses are now able to source sustainable natural ingredients of the best quality. This opens a vibrant source of spices, woods, floral absolutes and oils, and resins. This has to be one of the best developments of the past 20 years in terms of perfumery creation, founding a commitment to ensure the sustainable supply of natural ingredients such as sandalwood, tonka and ylang-ylang.

It is a perfectly timed development, arriving at a time when major breakthroughs in aroma chemical research are generally restricted by REACH legislation, shrinking company resources, environmental concerns, or simply the huge amount of capital necessary to fund this type of activity.

### Natural Innovation

This is an exciting time. Supply and use of natural materials may have waned in the past, but this area has now come to the fore and looks set to thrive and ticks lots of boxes right along the supply chain. Consumer demand fueled by targeted marketing is providing strong momentum. Sustainable programs designed to ensure future supply and care for the environment are providing much needed support for the growers. Simultaneously, fragrance innovators are exploring the possibilities of natural materials previously overlooked to produce new oils and identifying molecules with potentially exciting new fragrances.

These developments provide fragrance formulators with the ideal opportunity to combine the complexity and sparkle of natural materials with the consistency and cost benefits of aroma chemicals. There has been a genuine shift away from many aroma chemicals, which 10 years ago accounted for around 90% of new fragrance ingredients, to a much stronger emphasis on fragrances created with natural ingredients. While the technical issues remain, with the quality, depth and increasing range of sustainably sourced natural ingredients now available for fragrance creation, this can only be good news for perfumers.

---

Address correspondence to Paul McGee; paul.mcgee@sevenscent.co.uk.

---

To purchase a copy of this article or others, visit [www.PerfumerFlavorist.com/magazine](http://www.PerfumerFlavorist.com/magazine). 