

# Essential oils: the market and its issues analyzed

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It is important in the context of our business and in the personal care market as a whole to reconfirm that an essential oil is defined as a “natural volatile oil extracted from a specific botanical source and having the characteristic odor of the plant or other source from which it is extracted.”

Essential oils have become an important part of everyday life and their use continues to grow. They are multifunctional, used in many applications across a number of industries; as fragrances in personal care, household and industrial; as flavorings in food, beverage and pharmaceutical; for their therapeutic properties in aromatherapy, wellness, veterinary and animal healthcare; even for their antibacterial and antimicrobial actions.

With the ever-developing world and increasing consumer-led demand, essential oil requirements across all markets but especially in the personal care market are calculated to grow with a compound annual growth rate (CAGR) of between 9% - 10% for the period 2014 to 2022. For essential oils, this will see the market value reach US\$ 11.5 billion in 2022 from what was US\$ 5.5 billion in 2014 when annual production was calculated at 160,000 metric tons.

The rise in consumer-led demand for natural and organic ingredients in multi-functional personal care products that support a healthy life style is encouraging, for both the essential oil and personal care markets. New product development based on natural or organic themes are a core growth focus for both brand owners and manufacturers. However, in light of what may be seen as all-round positivity within the markets, the short-term scenario may be somewhat different and it is inevitable that essential oil production will fall significantly below that of demand. As a consequence, market drivers of volume and value will come into force as the supply / demand ratio becomes unbalanced. Limited availability with demand in excess of supply will force raw material prices in an upwards direction, the tendency also that while prices rise, they very rarely return to pre-rise levels. The tight supply and higher pricing will be a major



concern for manufacturers as natural and organic raw material shortages can then bring unintended consequences with quality.

With demand outstripping supply, there being seasonal harvests but year round demand, there is a risk that this situation will result in compromises in quality and continuity of supply. Nature is not consistent, natural variations from one harvest to another will produce variations in the essential oil and its composition. It may be climatic influences, changes in weather patterns, too much or too little rain, higher than average temperatures or frosts. It may be methods of cultivation, it may even be harvest timing or using a fresh or partially dried botanical starting material rather than it being fully dried. There may be natural disasters, earthquakes, floods, fires. In addition to natural influences, regulatory compliance is also having an impact. Implementation of new environmental protection regulations in major essential oil producing countries has forced producers to close their operations. The result of this being an immediate decrease in production.

As a result of lower oil yields and limited supply, a reputable producer / supplier relationship will increase raw material pricing on the market based on the true financial situation and in-line with their margin expectations and requirements. They will

also bring their natural material to market, compositionally declared at the point of production. Conversely, those unscrupulous producers / suppliers may well be tempted to manipulate and adjust the material composition to achieve what may be considered a ‘typical’ composition that they believe is more acceptable to the unknowing buyer. This raises a very important issue whereby a genuine essential oil with a naturally variable composition must be identified and in no way confused with one that has been ‘adulterated’. Consequently, the journey from grower to end user has never become more important.

## Adulteration

What is adulteration? The Oxford Dictionary defines this as “The action of making something poorer in quality by the addition of another substance.” Count noun defines further “these adulterations may harm the therapeutic use of the oils.” So why adulterate and how, or is it not as simple or as clear as that? Could it be the result of an unintentional action rather than an intentional one?

## Unintentional actions of adulteration

There has to be some explanation in that there is a possibility that certain actions are accidental and adulteration is unintentional.

That said, these are not to be excused and go some way to recognize the importance of a credible supply chain. Poor agricultural practice where weeds are not removed from the crop before harvest; collecting material from a different species when wild crafting through difficulty to separate similar looking plant material; poor housekeeping / manufacturing practice leading to contamination with other oils or other materials due to dirty distillation columns; use of fresh or dry botanical at the point of processing to produce oils with differing results in characteristic and composition; allowing oxidation to take place through poor storage which can change the material composition.

These examples do not detract from the fact that while accidental actions are a possibility and are not acceptable, it is the intentional actions that raise concerns within the industry.

#### Intentional actions of adulteration

Intentional adulteration is an unethical practice and fraudulent so why is it a process for some producers and suppliers? One would think that supplier motivation for adulteration can only be for commercial gain, for financial reasons to increase profitability. However, should the market conditions also share some responsibility? While essential oils as a product group and as raw materials for personal care formulations can be classified and considered as 'high value', as we have noted their demand is increasing so is intentional adulteration considered a response to this market characteristic? Or, is there a strong argument that the practice is the result of the customer motive, the customer driven by wanting lower pricing. Whatever the reasons, validated or not, there is opportunity for each stage in the supply chain to take unethical action; the grower, the distiller, the distributor or indeed the contract manufacturer.

Deliberate action can be the addition, substitution or dilution of components. Using natural oils from other parts of the same plant material, clove leaf oil having a greater production yield and being added to clove bud oil, both similar in composition. Using natural oils from related species of the same plant material, cananga being less expensive than ylang, compositionally different but similar in odor profile. Using natural oils from differing origins, the blending of Chinese and Australian tea tree oil. Using natural aroma chemicals, using nature identical / synthetic aroma chemicals, using one natural oil and marketing as another, cornmint oil *Mentha arvensis* as peppermint oil *Mentha piperita*. Using a compounded fragrance intended to mimic the composition of an essential oil, replacing a more expensive origin with a cheaper origin when origin is not declared. Is this commercial awareness? Collecting



material from different species when wild crafting as a deliberate act to increase yield.

Irrespective of actions being intentional or unintentional, the resultant material is altered, unnaturally rather than as a natural variation. Never has there been a more important time to ensure there is increased vigilance with continuity in both quality and supply.

#### Quality control: the role of standards

Awareness and understanding in ensuring material compliance to a quality is achieved through an agreed and approved material specification. The problem however is that every supplier creates a specification, their own specification for the oils they supply and they may be different from another supplier. There is little standardization, no real consistency from supplier to supplier, origins offered may differ and material composition will differ between origins. There is no official datum line to identify what a typical essential oil may look like. Standard works like Guenther's The Essential Oils are nearly 100 years old and we are aware that the composition of essential oils vary with each crop. There is no agreement on a standard method of distillation or any other method of production, each producer tries to get as much out of the crop as they can and in effect whatever is produced is the oil being supplied. That said, international standards do exist so how can they be applied and specified?

#### International Organization for Standardization (ISO) 9235:2013

Further to the definition in the opening line of this article, the International Organization for Standardization (ISO) 9235:2013 offers further clarity in its explanation:

Essential oil: Product obtained from a natural raw material of plant origin, by steam distillation, by mechanical processes

from the epicarp of citrus fruits, or by dry distillation, after separation of the aqueous phase—if any—by physical process.

Note 1 to entry: The essential oil can undergo physical treatments which do not result in any significant change in its composition (e.g. filtration, decantation, centrifugation).

These definitions and standards that do exist provide a framework which categorically determine the term "essential oil" and there should be no deviation from this. There should be no opportunity or indeed no reason for any unethical physical change to the material or "adulteration." Furthermore, ISO has also published standards for individual essential oils by common name, specifying certain characteristics of the oil; physical, chemical and chromatographic profile, intended to facilitate the assessment of its quality.

However, there is limitation in that essential oils are extracted from a seasonal crop and there is no way of knowing what the resultant oil will be like until it is harvested, processed and analyzed. So while we have an ISO definition for essential oils as a product category which is understandable and applied at the point of process, we also have ISO standards for individual oils but if the naturally produced oil does not comply with that standard, then what?

#### Specification

Quality is being fit for purpose and subject to a specification that defines fitness in its context of purpose. ISO 9000:2015, Quality management systems describes the fundamental concepts and principles required, defining quality as the "degree to which a set of inherent characteristics of an object fulfils requirements." Simply stated, quality is meeting customer requirements.

The formulator will therefore decide if the essential oil presented to them is suitable for their purpose, largely irrespective of the composition. While ISO standards exist for specific essential oils, specifying that the raw material meets the respective ISO standard is unheard of. Ironically, standardization of an essential oil will inevitably follow a given formulation and may well then become a compounded fragrance through the blending of the essential oil with aroma chemicals, natural and / or nature identical. While there is a place for such fragrance compounds, where correctly presented and marketed, they are not essential oils and where the project brief is organic or natural for example, raw material compliance to ISO 9235:2013 becomes very important. As a standard, unaware of its existence possibly as a formulator, fundamental in the quality management system of an ethical supplier, forgotten in the raw material stock and supply of an unscrupulous supplier.

Having an approved source, the raw material specification becomes the standard with quality control standards and quality control methods being measures in ensuring the continuity of supply of an approved material fit for purpose. Control of the essential oil on a batch for batch basis against a previous batch rather than a specific ISO standard is accepted as routine. Typical physical parameters like color, odor and appearance or physical wet analysis; specific gravity, refractive index and optical rotation, once specified to account of natural variation within a population of batches from the same source will identify the variations in composition that come outside of the normal range of accepted variation. However, it is far too blunt an instrument to be able to separate natural variation from adulteration.

Additional more sophisticated analysis is required in the form of Gas Chromatography (GC) using Flame Ionization Detector (FID) and / or Mass Spectrum (MS) Detectors, Isotope Analysis, Isomeric Analysis (chiral) or High Performance Liquid Chromatography (HPLC). However, these techniques cannot always detect complex intended adulteration and this may be why there is limited data available for how big a problem adulteration is.

The question is therefore just how damaging is an adulterated oil, to the brand owner or the end user? Apart from the cost and moral implications, there are implications with regulatory compliance. The safety of the finished product composition, self-regulating but applying the risk management and assessments of the globally accepted standards of The International Fragrance Association (IFRA). Equally as damaging are the requirements of the International Nomenclature of Cosmetic Ingredients (INCI) labeling. A finished product containing an essential oil that the formulator believes is genuine but which is not and is adulterated becomes non-compliant, the risks and consequences of such an act become serious and dangerous.

What therefore is the solution?

#### Quality assurance. Trusted source.

Raw material quality has to be designed into the product and it cannot be imposed once the production has taken place. The ISO standard 9235:2013 is one that can be adopted in ensuring the raw material meets the requirements for all those involved. The need for the shortest possible supply chain from grower to end user is key in ensuring control is maintained at all stages. Control of origin, harvest and production is achieved through working directly with source, with the growers, the farmers, the co-operatives, the local communities in

ensuring partnerships exist. Ethical practices, social responsibility, sustainability awareness and environmental respect are credible factors and allow the provenance of the raw material being brought to market. ProTec Botanica's position is assured as a trusted source. PC

#### References

- 1 Handbook of Essential Oils: Science, Technology, and Applications, 2nd edition (Taylor & Francis, 2016), Eds: Hüsni Can Başer K PhD, Buchbauer G.
- 2 Guenther E. The Essential Oils Vol II, 1948.
- 3 Arctander S. Perfume and Flavor Materials of Natural Origin, 1960.
- 4 <https://en.oxforddictionaries.com/definition/adulteration> Accessed March 29, 2018
- 5 <http://www.chompchomp.com/terms/countnoun.htm> Accessed March 29, 2018
- 6 <https://tinyurl.com/ycky8pph> Accessed March 29, 2018
- 7 <https://www.grandviewresearch.com/industry-analysis/essential-oils-market> Accessed March 29, 2018
- 8 <https://tinyurl.com/ybnv44wq> Accessed March 29, 2018
- 9 <https://tinyurl.com/ycjwj9jl>. Accessed March 29, 2018
- 10 <https://tinyurl.com/yajf4t9d> Accessed March 29, 2018
- 11 <http://www.intracen.org/itc/sectors/essential-oils/> Accessed March 29, 2018
- 12 <http://www.mintel.com/beauty-trends/> Accessed March 29, 2018
- 13 <https://www.cbi.eu/market-information/natural-ingredients-cosmetics/essential-oils-aromatherapy/> Accessed March 29, 2018
- 14 <http://asq.org/learn-about-quality/quality-assurance-quality-control/overview/overview.html> Accessed March 29, 2018