Essential oils have been valued by many cultures for centuries. These volatile and complex hydrophobic compounds have been used for a wide variety of cosmetic and therapeutic purposes including traditional medicine, biocides, fragrances and food additives. The benefits of essential oils are centered on their health benefits in rural cultures, though there are natural variations in composition and quality due to growth conditions, climate, harvest conditions, and plant parts selected. Extraction methods and storage conditions, such as exposure to oxygen, temperature and light, can also affect the integrity of essential oils. There are established standards based on analytical monographs for some essential oils. For other oils without this standard, it is vital to understand and establish identity, purity, and potency to establish reliable quality and prevent adulteration or misidentifying the oils. In order to assess and maintain reliable quality of essential oils, the quality standards were developed utilizing different evaluation methods. One of the most utilized analytical methods for assessing the quality of essential oils is GC-MS (gas chromatography-mass spectrometry), which is used to identify different components present within samples. From the chromatographic profiles, key components were selectively analyzed further to identify compounds of interest. For example, in some samples of jasmine oil, citronellol was identified at the same retention time as methyl jasmonate. The presence of this compound in addition to the lack of other compounds demonstrated that those sample oils were of a lower quality. Methyl jasmonate is a key indicator found in high quality jasmine oils. In another example, the essence of lavender was analyzed for perils such as pesticides or pollutants. In addition to chemical analysis methods, additional safety and organoleptic assessments are fundamental to developing quality products. There are 6 key steps to developing quality products: selection, sourcing, structure, standardization, safety and substantiation. This stepwise process is great in enabling us to make our product safe and effective.

**ABSTRACT**

Essential oils are special extracts from plant parts. They are mixtures of volatile compounds that change depending on the environmental conditions and constituents of plants. Essential oils are produced by steam distillation and cold pressing, although there are some exceptions. In the case of jasmine, solvent extraction methods are used instead, due to damage caused by high-temperature steam distillation, which would be detrimental to the delicate jasmine flowers and oils. Selecting the right ingredients from trusted sources will yield quality and consistent raw materials (1).

Essential oils can be obtained from different parts of aromatic plants. For example, bark, stems, seeds, roots, flowers, as well as leaves, can be used to collect compounds such as pestis, or other compounds. The constituents of essential oils are divided into two groups: terpenes/terpenoids and aromatic/aphatic compounds, such as citronellol and eugenol (1). Within each oil, the amounts and specific constituents change based on climate conditions, soil type, or the harvesting conditions. Seasonal changes will affect the yield of essential oils. These volatile compounds are produced by the plants as part of signaling molecules, defensive mechanisms, or responses to environmental cues. There are standard methods to evaluate the quality of raw materials in dietary supplements (5). With different botanical extracts, we could follow similar guidelines to standardize botanical extracts used in cosmetic products as well. Safe and effective products begin with quality raw materials. Appropriate evaluation of raw materials on their quality will improve the efficacy and safety of finished products, in this case, essential oils.

**INTRODUCTION**

Botanical extracts have been used for various cosmetic and therapeutic purposes. For example, ginger extracts are used to treat stomach upset, or nausea as well as soothing and calming skin irritation. Even though there are many examples of use throughout the history, the effects of plants on human physiology are poorly understood. Plant extracts are complex mixture of different constituents with natural variations. The composition of botanical extracts could vary based on the growth conditions, climate and harvest conditions. In addition, extraction methods and storage conditions could alter the composition. It is important to set a standard for botanical extracts to maintain the quality and safety of the product.

Essential oils are special extracts from plant parts. They are mixtures of volatile compounds that produce distinct and characteristic smells. Traditionally, essential oils were used by indigenous people to improve their mood, alertness, or as medicine. There are many varieties of essential oils as well as different chemical constituents with various plant species. Most essential oils are produced by steam distillation and cold pressing, although there are some exceptions. In the case of jasmine, solvent extraction methods are used instead, due to damage caused by high-temperature steam distillation, which would be detrimental to the delicate jasmine flowers and oils. Selecting the right ingredients from trusted sources will yield quality and consistent raw materials (1).

Essential oils can be obtained from different parts of aromatic plants. For example, bark, stems, seeds, roots, flowers, as well as leaves, can be used to collect compounds such as pestis, or other compounds. The constituents of essential oils are divided into two groups: terpenes/terpenoids and aromatic/aphatic compounds, such as citronellol and eugenol (1). Within each oil, the amounts and specific constituents change based on climate conditions, soil type, or the harvesting conditions. Seasonal changes will affect the yield of essential oils. These volatile compounds are produced by the plants as part of signaling molecules, defensive mechanisms, or responses to environmental cues. There are standard methods to evaluate the quality of raw materials in dietary supplements (5). With different botanical extracts, we could follow similar guidelines to standardize botanical extracts used in cosmetic products as well. Safe and effective products begin with quality raw materials. Appropriate evaluation of raw materials on their quality will improve the efficacy and safety of finished products, in this case, essential oils.

**METHODS**

**Gas Chromatography-Mass Spectrometry (GC-MS)**

Gas chromatography is an analytical instrument to separate different chemical substances. Separate compounds are ionized further in the mass spectrometer to identify specific components of essential oils matching the structural information to library spectra. Various essential oils were obtained from suppliers, and diluted 1:20 in chloroform. GC-MS analysis were performed on an Agilent 7890a gas chromatograph (Santa Clara, CA), equipped with a 5975C mass selective detector. Inlet was in combination with an Agilent 7000C GC/MS triple quad. Compounds were identified by electron ionization (EI) to generate spectra, which is compared to library spectra using MassHunter Workstation (Agilent).

**RESULTS**

Jasmine officinalis is widespread in central Asia and jasmine essential oils are used in different skin care products for calming, hydrating, and for fragrance. The typical volatile components of jasmine essential oils include benzyl acetate, benzyl alcohol, citronellol and methyl jasmonate. Methyl jasmonate was first isolated from jasmine essential oils (3). There are several jasmine essential oils with different qualities available from various suppliers. After initial organoleptic evaluation, these samples were further analyzed using GC-MS. Examples of gas chromatograms are shown in Figure 2. Different jasmine essential oils exhibited altered chromatograms. Further fragmentation on mass spectrophotometry revealed that the peaks near 35.6 min retention time were identified as different molecules (Figure 3). While one area from the top was identified as methyl jasmonate, a critical component of jasmine essential oils, ones from the bottom two were identified as α-mentyl-cinnamaldehyde, also known as aryl cinnamaldehyde. Amyl cinnamaldehydes are not typically present in jasmine essential oils. In addition, amyl cinnamaldehydes are an allergen. These results suggest that the middle and bottom chromatograms are altered jasmine essential oils.

**CONCLUSIONS**

There are several different ways to substantiate the quality of essential oils. There are clinical studies to evaluate the efficacy of essential oil on the skin. There are several essential oils on skin that demonstrated improved skin structures (data not shown). In addition to above mentioned evaluations, there are other assays performed to evaluate the quality of these essential oils. One example is an organoleptic test, which is the most reliable throughout the quality control process. Organoleptic evaluation utilizes the human nose, and the smell is extremely important for essential oils. If peppermint essential oil passes all the quality control steps, but doesn’t smell like peppermint, would anyone think it’s a peppermint oil?