ESSENTIAL OIL EXTRACTION TECHNIQUES FOR LAVENDER: COMPARING TRADITIONAL AND MODERN METHODS

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Abstract. *The complex link between how lavender smells and how it is extracted is important for understanding both old and new ways of making essential oil. Lavender oil has typically been made using steam distillation and solvent extraction, methods that have been around for many years. These techniques show the cultural background of lavender farming and the slow changes in extraction methods due to new technology and growing scientific knowledge. On the other hand, modern methods like cold pressing and supercritical carbon dioxide extraction provide better efficiency and yield while keeping the oil's chemical makeup unchanged. Looking at these different methods reveals the problems and advantages of each, placing this study at the crossroads of tradition and new ideas. In the end, this comparison will clarify how extraction methods affect quality, sustainability, and the economic success of lavender oil production. Lavender is more than just a plant; it is important for aromatherapy due to its various health benefits. Well-known for its various uses, lavender (Lavandula angustifolia) is important to both the medicine and beauty industries. Its essential oil, full of components like linalool and linalyl acetate, is known for its healing benefits, such as reducing anxiety and fighting germs, which research has shown supports the use of essential oils as natural treatments (Bonaccorso et al.). Lavender has a long history, going back to ancient societies where it was used for health and as a scent. This plant remains important in modern aromatherapy, where it is used to help with mental and emotional health. Additionally, the ways lavender oil is extracted are very important for keeping its helpful qualities, leading to a complex mixture that can differ greatly between old and new methods. Therefore, knowing the importance of lavender is key to improving the extraction methods that maximise its healing benefits.*

Keywords: *lavender, essential oil, importance, extraction, environment.*

INTRODUCTION

In the field of aromatherapy and natural treatments, lavender essential oil is well-regarded due to its various uses and health benefits. Lavender has been valued throughout history, not just for its pleasant smell but also for its soothing properties, interesting both in traditional and modern settings. All the translated studies pointed out international vocabulary used in all research (PASCALAU ET ALL., 2020). This discussion looks at the different ways of extracting essential oil from lavender, highlighting the changing methods that show improvements in technology while keeping the essence of time-tested practices. Understanding the difference between old and new extraction methods is crucial to grasping how each affects the quality, amount, and chemical makeup of lavender oil. Traditional methods, like steam distillation and solvent extraction, have been used for a long time because they effectively keep the aromatic compounds intact. On the other hand, modern techniques such as supercritical CO2 extraction offer greater efficiency and sustainability, posing a challenge to traditional practices. By closely examining these methods, this research aims to clarify the advantages and drawbacks specific to each technique (VAOU ET ALL., 2021). By comparing historical relevance with modern advancements, this research intends to add to the

ongoing conversation about producing and using essential oils, ultimately guiding both practitioners and researchers on the best methods for extracting lavender oil. The outcome of this analysis will not only highlight the complexities involved in the extraction process but also place these findings within the larger context of the essential oil industry, as sustainability and quality become increasingly important to consumers and industry standards (OBISTOIU ET ALL., 2021).

MATERIAL AND METHODS

Comparing extraction methods is very important for figuring out the quality and effectiveness of essential oils, especially lavender. Traditional ways, like steam distillation, have been used for a long time because they are simple and dependable for getting fragrant oils. Yet, new methods, like supercritical carbon dioxide extraction, have clear benefits, such as better phytochemical profiles and higher extraction rates. Recognising these differences is crucial, as different techniques can change the chemical makeup of the oils, as shown by different research on essential oils, including lavender (MOHALE ET ALL., 2022). Moreover, the cosmetic industry's growing use of essential oils calls for a look into their specific properties, like antimicrobial and antioxidant effects (GUZMÁN ET ALL., 2021). Therefore, a thorough comparison of extraction methods not only improves the quality of lavender oil but also boosts the effectiveness of formulations in real-world uses.

The history of getting essential oils is key to knowing where traditional methods come from and how they are used. Methods like steam distillation, solvent extraction, and enfleurage have been used for many years, using simple and effective ways to take out aromatic substances from plants. These methods are not just old techniques; they were created because there was a need for effective and scalable ways to extract plant essences for healing and rituals. For instance, steam distillation is seen as the best way to extract essential oils as it increases the amount collected while keeping the delicate scents, which helps with their healing effects. Studies have shown that traditional extraction methods are effective, especially when paired with modern methods to fight against multidrug-resistant bacteria (ABUSHELAIBI ET ALL.,2019). Thus, even though new extraction technologies have been developed, the basic methods are still very important in the discussion of how essential oils are made, especially for plants like lavender that have important medicinal uses.

Steam distillation has come from old civilisations and is an important method for extracting essential oils like lavender. This technique uses the volatility of scents, using steam to help release them from plants. The history of steam distillation goes back to ancient Persia Egypt and Jordan, where it was used for medicine and rituals, recognising the healing qualities of essential oils (IHSAN, 2007). If we analyse the international aspect of all the methods used, one may notice that the translation of all the studies is very important because through these translations (PASCALAU ET ALL., 2024), methods are more or less, common in all areas, depending still on some particularities of the regions. Modern research shows that encasing these oils helps them last longer and be more available for use, which helps with issues like being hard to dissolve and easily evaporating. Although the health benefits of essential oils, such as their antioxidant and antibacterial effects, are well recorded, there are still concerns about their safety and possible toxicity, especially in detailed studies of their effects in living organisms. Knowing the historical importance of water in all processes (SMULEAC ET ALL., 2023), the steam distillation helps to understand its role and its continuing importance in today's medicine.

Solvent extraction methods are useful for a lot of things in essential oil extraction, especially for Lavandula angustifolia. Using different solvents helps researchers get the best

valuable compounds, improving yield and quality. For example, looking at extraction methods like Soxhlet extraction and agitation tank extraction shows that the effectiveness varies a lot based on the solvent used (OBISTOIU ET ALL., 2023). Research shows that ethanol is good for Soxhlet extraction, while water works better in agitation tank methods (SMULEAC ET ALL., 2022). This emphasises how important it is to choose the right extraction conditions for the compounds aimed for. Also, the increasing interest in natural antioxidants from plants relates to modern food industry uses, showing the economic benefits of using by-products from essential oil extraction for antioxidant purposes (ALVES ET ALL., 2019). Therefore, solvent extraction is still a key method for improving the sustainability and usefulness of lavender-based products.

In essential oil extraction, cold pressing is a method that works mechanically well to keep the plant's volatile compounds intact without using heat. This technique involves crushing the plant to let out its oils, which are then gathered through mechanical means. However, while cold pressing is praised for keeping the oil's quality, it has some drawbacks. The process can be not so effective for aromatic plants like lavender because it might not get the best yields due to the quick evaporation of oil parts. Also, cold pressing can produce a mix that has unwanted fatty acids and waxes, which can impact the final product's quality and purity. This is important because how well essential oils work in different uses depends on their molecular structure and amounts, showing that other extraction methods are needed to improve yield and effectiveness (BONACCORSO ET ALL., 2021).

The progress in extraction techniques has changed the area of producing essential oils, especially lavender (MISHRA ET ALL., 2021). Newer methods like supercritical CO2 extraction and microwave-assisted extraction are better than older methods such as steam distillation, mainly in efficiency and yield. For example, steam distillation is still liked because it is simple and cheap, but it may sometimes damage delicate compounds in the oil, which can impact its healing properties. On the other hand, supercritical CO2 extraction works under careful conditions that keep the balance of active compounds intact. Furthermore, using emulsification techniques, like Water in Oil emulsions, has been found to improve the stability and availability of essential oils in topical products (MOREIRA ET ALL., 2023). As a result, looking into new techniques not only boosts extraction efficiency but also helps keep essential oils of high quality, which is important for both healing and cosmetic uses.

RESULTS AND DISCUSSIONS

Extracting essential oils, especially from lavender, requires a good understanding of how old and new methods can affect both the amount and quality of the oils. Traditional ways, like steam distillation, have been respected for making oils that keep the rich smells of the plants. But new technologies, such as supercritical carbon dioxide extraction, can increase the amount of oil while usually keeping the quality high. Studies show that essential oils made with traditional methods might have differences in their ingredients, which could cause changes in strength and smell (MILOJEVIĆ ET ALL, 2013.). On the other hand, new methods provide a more controlled way to get the oils, which helps improve efficiency and maintain the sensitive components. Therefore, when choosing between these methods, it is important to focus not only on the amount but also on keeping the aromatic richness of the essential oils, which matches both what consumers want and what works commercially.

CONCLUSIONS

In looking at findings about how to extract essential oils from lavender, both old and new methods have their own benefits that should be thought about. Older methods like steam

distillation have been reliable, keeping the true and complex chemical makeup of essential oils, as mentioned in research on different plant oils. On the other hand, new extraction methods have brought about better efficiency and helped keep volatile compounds that might have been lost before, meeting today's consumer preferences for pure and natural ingredients in cosmetics. In summary, this analysis shows the need to choose the right extraction methods to improve how well lavender essential oil works and smells. As the trend grows for natural and safe scents, using a mix of both old and new extraction methods may be the best way to ensure that the quality and health benefits of lavender are fully achieved.

The effectiveness of methods for extracting essential oils greatly affects the yield and quality of the final product, which makes it necessary to compare these methods. Traditional techniques, like steam distillation, have been preferred for their capacity to produce high-quality oils, with studies showing that oil yields from fresh and dry Lavandula officinalis flowers are 1.35% and 3.8%, respectively. However, newer techniques, such as supercritical fluid extraction and microwave-assisted extraction, provide benefits like shorter extraction times and better preservation of volatile compounds. Research indicates that essential oils taken through supercritical carbon dioxide tend to have higher potency and a wider range of phytochemicals compared to those from traditional methods. A close examination of these methods indicates a complex relationship between older practices and new approaches, implying that a combined method could enhance both extraction efficiency and the quality characteristics of lavender essential oil, thus expanding its use in therapeutic and cosmetic applications.

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