INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Eco-Friendly Elegance: A Natural Solid Perfume with Lavender and Lemongrass Oils

Unnati Varshney, Meenu Chaudhary*, Ashutosh Badola

Shri Guru Ram Rai University, Patel Nagar, Dehradun-248001, Uttarakhand, India.

ARTICLE INFO

Published: 13 May 2025
Keywords:
Aromatherapy, Eco-friendly fragrance, Essential oils, Herbal formulation, Lavender oil, Lemongrass oil, Natural fragrance, Skin-friendly cosmetics, Solid perfume, Wax-based perfume.
DOI:
10.5281/zenodo.15393690

ABSTRACT

Herbal solid perfumes have become a safe and environmentally responsible substitute for synthetic fragrances as consumer demand for natural and skin-friendly personal care products has increased. The creation and assessment of a herbal solid perfume with natural base ingredients and essential oils is the main objective of this study. Herbal solid fragrances, in contrast to chemical-based ones, have modest antibacterial and medicinal properties in addition to their attractive scents. Beeswax, shea butter, and coconut oil were used as basis components in the creation of the perfume since they are emollients and improve skin hydration. Essential oils of lemongrass (Cymbopogon citratus) and lavender (Lavandula angustifolia) were chosen for their sweet, reviving scents as well as their antibacterial and relaxing qualities. To guarantee uniform blending and a stable, solid consistency appropriate for direct skin application, the fusion method was used. The product's quality and safety were assessed using physicochemical parameters such as pH, color, Spreadability, melting point, acid value, saponification value, and ester value. Favorable properties of the resultant solid perfume included a pH of 5.7 that is suitable for skin, smooth spreadability, a steady melting point that makes it perfect for topical application, and a persistent floral-citrus scent. Chemical analysis showed a high ester value (8.891 mg KOH/g), which improves aroma retention and aids in emollient benefits, and a low acid value (0.429 mg KOH/g), suggesting little possibility for irritation. The product's safety and efficacy are further supported by the ester-to-acid ratio (20.72), which emphasizes the predominance of advantageous esters. All things considered, the developed herbal solid perfume is a viable, sustainable substitute for artificial scents; it provides both skin advantages and a pleasing sensory experience, making it the perfect choice for customers looking for clean and natural beauty products.

INTRODUCTION

***Corresponding Author:** Meenu Chaudhary
Address: Shri Guru Ram Rai University, Patel Nagar, Dehradun-248001, Uttarakhand, India.
Email ✉: 1979mchaudhary@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Although natural fragrances and scents have been around since antiquity, synthetic flavors and scents are much sought after because of the scarcity of natural ones. Just 5% of the more than 10,000 that are accessible come from natural sources. The creation of chemical synthesis pathways is required due to the increasing demand for these chemicals. Essential oils, fixatives, and solvents combine to create synthetic fragrances and flavors that provide a variety of items including the human body pleasing scents. By 2024, it is anticipated that the demand for perfumes, aromas, and flavors would reach USD 64.6-92 billion on a global scale. [1] With so many flavors and scents present in food, drinks, candies, personal care items, perfumes, cosmetics, and medication formulations, fragrance is a universal human phenomenon. These fragrances are used to cover up offensive odors or enhance the appearance of products. The rise of "naturals" and green consumerism has sped up the creation of plant-based products, especially in the wellness and cosmetics sectors. Since pleasant scents affect comfort, effect, and overall evaluation, fragrances are essential to making cosmetics more aesthetically pleasing. When choosing cosmetics, consumers sense and anticipate the scent in addition to the container's shape and design. [2] With the rise in popularity of tailored chemicals or less concentrated aroma forms, perfumes are now being created and used in novel ways. As a result, scents are less expensive and can be used more frequently. In order to stimulate the brain's sexual excitation receptors and create human perfume, which is utilized to either attract or repel people, more study is being done. [3] Innumerable flavors and fragrances have been incorporated into foods, drinks, and confections, as well as into pharmaceutical formulations, personal care products (such as toothpaste, mouthwash, deodorants, shampoos, and bath lotions), perfumes, and other cosmetics. Fragrances can be added to these products to make them more appealing or to cover up the taste or smell of less appealing ones. [4] The former Hermès master perfumer Jean-Claude Ellena has stated that "the art of perfumery is closely connected to [synthetic] chemistry" nowadays. In actuality, the creation of novel odorants with unheard-of fragrances or exceptional physical qualities is a major factor in the development of cosmetics and perfumes. Even the designer of Chanel No. 5, Ernest Beaux, asserted that "chemistry holds the key to the future of perfumery." [5]

1.1 Perfume

• The Egyptians were the first to use fragrance for personal fulfillment, but the creation of fragrance was reserved for clerics, who used it for religious purposes.
• The Greeks used a remarkable amount of fragrance, and they used a different aroma for each part of the body to keep it clean.
• Craftsmanship and science have been combined throughout Middle Eastern history.
• The perfume industry was founded by two talented Middle Eastern chemists, Jābiribn Hayyān and Al-Kind.
• Fragrance was a part of luxury for the Romans.
• The oldest fragrance was discovered 4,000 years ago on the island of Cyprus, proving that the process of creating scents was mechanical.
• The Hungarians introduced the first modern fragrance, which was created by combining scented oils with alcohol.
• The solution at the direction of Hungarian ruler Elizabeth.
• Modern perfumery originated in France. France was given the task of creating aromatic plants using raw materials for the scent business. In fact, France continues to be at the center of the European aroma trade and plan today.
• Germany and England also made significant contributions to the modernization of perfumery.

[3]**.** The Latin term "perfume," which means "through smoke," is where the word perfume first appeared. Its presence was demonstrated by the incense ritual in Mesopotamia 4,000 years ago. [6] Perfume is a complex blend of art and science, crafted by perfumers using natural essential oils, aroma chemicals, and fixatives to evoke powerful emotions, memories, and desires. The chemical composition of perfumes is a fascinating yet poorly understood field, with thousands of fragrance molecules interacting in complex ways to produce the characteristic scent. [7] Chemistry is the science behind perfume, and creativity is the scented outcome. Perfumery's philological aspects reveal its innate artistic features. [6]

Perfume Types

➢ **Fragrance Wheel**

A fragrance wheel, sometimes referred to as an aroma wheel, fragrance circle, or scent wheel, is a circular design used to classify and visualize various perfume fragrances. The current scent wheel was created in 1992 by perfume expert Michael Edwards. (Figure 1)

➢ **Perfume Strengths**

- **Parfum:** Expensive and powerful (15% to 30% of chemicals are aromatic).
- **Eau de Parfum:** Although not as potent as parfum, Eau de Parfum is nonetheless strong (Between 8% to 15% of chemicals are aromatic).
- **Eau de Cologne:** Citrusy, light, and invigorating (2% to 5% of chemicals that are aromatic).
- **Eau Fraîche:** Not long-lasting, yet quite light and refreshing.
- **Eau de Toilette:** Compared to Eau de Parfum, Eau de Toilette is lighter (4% to 8% of chemicals that are aromatic).

➢ **Scent families**

Citrus, Gourmand, Fougère, Floral, Oriental, Chypre, and Marine/Ozononic.

➢ **Subtypes of the scent family**

Fruity, amber, spicy, woody, animalistic, aldehyde, and fresh.

➢ **Perfume classes**

- **Vibrant floral:** The scent of one or more flowers. For instance, Estee Lauder's Beautiful
- **Green:** The scent of freshly cut grass or leaves. For instance, Calvin Klein's Eternity
- **Aquatic:** A fresh scent evoking the sea. For instance, Davidoff Chilled Water
- **Citrus:** Has a revitalizing impact. For instance, Faberge Brut
- **Fruity:** Fragrances of non-citrus fruits. For instance, Ginestet Botrytis
- **Gourmand:** A fragrance that has desert-like or appetizing characteristics. For instance, Ange by Thierry Mugler

➢ **Sources of aroma**

The following sources provide the fragrances used in perfumes....

- **Plant source:** forests, bark, flowers, roots, fruit, resins, and leaves.
- **Animal sources:** honeycomb, castorium, and ambergrist.
- **Artificial sources:** Linaloon and Calone

➢ **Fragrances Composition**

- **Top Notes:** The scent you get when you put the perfume on for the first time (10-30%).
- **Middle Notes:** The scent released following the fading of the top notes (40-60%).
- **Base Notes:** The perfume's most enduring scent (10-30%).
- **Fixatives:** Substances that aid in maintaining the aroma and halting its premature fading.

As per Jean Carles, a perfume is a liquid blend of base notes (long-lasting), middle notes (primary perfume character), and top notes (initial impact, fresh) in solvents 2 of 23 (ethanol, water, matrix). The figure depicts Carles' pyramid, which represents the structure of a scent. (Figure 2)

➢ **Other Types of Perfumes**

• **Natural Perfumes:** Fragrances derived from natural components.

• **Liquid Perfumes**: These are fragrances that are applied topically or used in aromatherapy. It is a concoction of aromatic chemicals, fixatives, solvents, and fragrant essential oils that are typically employed in liquid form to give living environments, food, animals, and human bodies a pleasant scent. A combination of alcohol, water, and molecules that evaporate at room temperature is known as a liquid perfume. For example, Deo, room freshener, and perfume spray.

• **Solid Perfumes:** These are solid perfumes that are applied topically. Solid fragrances are those that have a solid foundation instead of a liquid one, like alcohol or water. That mole is usually found in the solid base compounds. At room temperature, it is simple to combine with solidifier and fragrances. Cream perfumes are another name for solid perfumes. Petroleum jelly and Vaseline are two examples of base utilization. [6-9]

1.3. Solid Perfume (Figure 3)

In ancient Egypt, solid perfume was created using natural components like myrrh and resin, frequently for religious or private purposes. Balms and unguents, which combined oils and plants for aroma, were used by the Greeks and Romans. During the Middle Ages, pomanders—scented spheres packed with herbs and spices—were frequently used to carry solid fragrances. Solid fragrances were popular among the elite during the Renaissance and Victorian periods, and they were frequently displayed in ornate containers. Although liquid fragrances dominated the market in the 20th century, solid perfumes have recently returned because of their mobility and natural components, making them fashionable and environmentally responsible choices today. [10] In recent years, solid fragrances have gained appeal as an environmentally friendly and sustainable substitute for conventional liquid perfumes. [11] The growing demand for personal care and fragrance goods is expected to propel the solid perfume market, which was valued at USD 1.65 billion in 2023, to USD 4.7 billion by 2032. Technological developments in perfumery and cosmetics have changed how consumers view and use aroma products. These straightforward yet inventive fragrances have drawn in customers from all around the world, marking a creative shift in the fragrance sector. Despite being a relatively contemporary product, solid fragrance has historical roots that go all the way back to ancient Egypt. Despite its historical origins, its appeal has recently increased. [12] Solid perfumes, cream perfumes, or solid colognes are perfumes made with natural wax, like beeswax or shea butter, as the fragrance medium. These scents are portable, impervious to spills, and simple to reapply in public. Expensive perfume brands use solid perfume formulas to deliver their distinctive scents. The solid perfume market is projected to increase at a compound annual growth rate of 11.1% from 2024 to 2032, from its 2023 valuation of USD 1.65 billion to USD 4.7 billion. The global solid perfume market is expanding due to consumers' increasing interest in personal care and scent products. Consumer attitudes and usage of fragrance products have changed as a result of technological developments in cosmetics and perfumery. Acclaimed for their portability and simplicity, these fragrances are a creative invention in the fragrance market that are gaining a lot of attention. [13]

In general, solid fragrances are those that are in a solid foundation rather than a liquid, such as alcohol or water. The materials used for the solid basis are waxes that are quickly melted to combine fragrances and readily solidified at room temperature. Petroleum jelly, Vaseline, beeswax, and other similar products are examples of bases. Using a cotton swab or fingertips, it is administered to the skin. Only the potency of the essential oils employed determines how strong a solid perfume smells. Solid perfumes are small and portable, making them easy to transport from one location to another. The skin is the largest organ in terms of weight and covers the body's outside. It is around two square meters in size. The epidermis and dermis are the two primary components of the skin. Water-soluble chemicals are seldom absorbed by the skin; however, some lipid-soluble molecules can pass through the layers of the skin. These include medications, fat-soluble vitamins, and gasses like oxygen and carbon dioxide. Since topical steroids are lipid-soluble, they can readily penetrate the dermal papillary zone. The transdermal route of medication administration was also made possible via absorption through the skin. [6]

Benefits & Importance of Solid Perfume

Solid perfumes may not necessarily last as long as typical alcohol-based scents, but they can outlast mists. Over time, they provide a mild and steady faint scent since they are manufactured with oils and waxes, which release fragrance more slowly. They are therefore ideal for those who like a softer, less overbearing scent.

For several reasons, solid perfume may be significant, such as:

1. **Devoid of Alcohol:** Alcohol is a common ingredient in liquid perfumes to aid in their evaporation after spraying. The alcohol in liquid perfumes causes them to dissolve onto your skin. However, avoiding them is the wisest course of action because we know they are harsh on the skin. A solid perfume, on the other hand, is gentle on the skin, doesn't need to be dried, and is probably free of irritants like alcohol.

2. **No leakage:** If we carry a solid perfume with us or just store it in a cupboard at home, it won't spill and cause a mess.

3. **Long Lasting:** We won't have any problems reapplying solid fragrances because they are so easy to use. They endure a long time since they stick to the skin layer.

4. **Nourishing and moisturizing:** These fragrances keep your skin hydrated by including oils and other moisturizers. Applying the balm-like texture to your wrists is easy, and it will hydrate your skin in addition to keeping you feeling fresh. Those who have dry skin will benefit greatly from it. Those with dry skin will greatly benefit from it.

5. **Petite Dimensions:** Solid perfumes are incredibly easy to transport because they come in tiny, portable, and indestructible canisters. They are small enough to fit in a pocket or purse. Therefore, it is preferable to carry a solid perfume bottle rather than a breakable glass one.

6. **Perfect for on-the-go use:** We are all aware that when we travel, we are subject to liquid limits at the airport and must leave our perfumes at home. Solid smells, however, are exempt from these limitations and allow for easy international travel.

7. **Being considerate of others:** Being considerate means opting for lighter, more

subtle scents or applying a smaller amount to avoid overwhelming others with strong or potentially irritating fragrances.

8. **Aroma:** Compared to liquid perfume, solid perfume may emit its aroma more subtly, which makes it perfect for intimate settings or delicate settings. Over time, a consistent scent is produced by the fragrance's slower release.

9. **Sturdiness:** Compared to liquid perfume, solid perfume may linger longer on the skin, requiring less frequent reapplication.

10. **Impact on the environment:** Solid fragrances are frequently refillable and biodegradable.

11. **Pocket Friendly:** Purchasing several bottles of liquid perfume over time may be more costly than purchasing solid perfume.

12. Gentle on the skin: The likelihood of experiencing any skin reactions is extremely low because solid fragrances are typically composed of a blend of natural oils. [4,8,10,12]

How to utilize

Wipe the top of the solid perfume with a clean finger or Q-tip to apply it on wrists and other pulse points. As needed, repeat. Then, a tiny bit of the solid perfume is usually rubbed onto the body's pulse points, such the neck or wrists. They are applied directly to the skin with a cotton swab or fingers. [8] (Table 1)

Solid Wax Perfume Types:

There are a few varieties of solid perfume, and each has advantages of its own, i.e.,

1. Traditional Solid Perfume: This kind of solid perfume is scented with fragrance oils or essential oils after being manufactured with a base of beeswax or other natural waxes. It is the most traditional type of solid perfume and typically has a powerful, lingering aroma.

2. Solid Perfume Based on Alcohol: This kind of solid perfume is created using alcohol as a base, which rapidly dissipates on your skin. It tends to smell lighter and is ideal for people who dislike the way typical wax-based perfumes feel. This is frequently found in applications that resemble roller balls.

3. Oil-Based Solid Perfume: Unlike alcohol-based perfumes, which evaporate more quickly, this kind of solid perfume is manufactured using an oil base. For people who prefer a perfume that lasts and doesn't soon fade, this is ideal. [8]

2. MATERIALS AND METHODS

2.1. MATERIALS

All of the materials used in this project came from natural sources. Three main components are needed to make a solid perfume:

• Beeswax

• Carrier oils

• Essential oils**.** [8]

❖ **Beeswax: A Multifunctional Ingredient in Solid Perfume Formulations** [4,6,8,10-12] (Figure 4)

Beeswax, chemically known as *Cera alba*, is a natural wax derived from the wax portion of honeycombs produced by bees of the *Apis* genus (Order: Hymenoptera, Family: Apidae). It plays a dual functional role in solid perfume formulations by acting as both a solidifying agent and a protective barrier that enhances fragrance longevity. When combined with carrier oils,

beeswax transitions the formulation from a liquid to a semi-solid state while simultaneously encapsulating volatile essential oils to slow their evaporation, thereby extending the perfume's wear time. Its composition includes approximately 80% myricyl palmitate and myricyl stearate, 15% free cerotic acid, along with cerolein, hydrocarbons, lactones, cholesterol esters, and pollen pigments. Freshly secreted beeswax is nearly white, but contact with pollen and propolis imparts a yellow to light brown color and a distinctive honey-like odor. Physically, beeswax is non-crystalline, water-insoluble, but soluble in organic solvents such as chloroform, acetone, and benzene. Its elasticity and hardness increase during storage due to gradual crystallization. Notably, when heated to 30–35°C[1], beeswax exhibits thermoplastic properties, though it undergoes approximately 10% shrinkage upon cooling. In addition to its cosmetic applications, beeswax has been explored for its role in edible coatings, where its combination with oils like coconut or antifungal agents has demonstrated benefits in moisture retention and microbial resistance on fruits such as strawberries, apricots, and tomatoes. These diverse chemical and physical attributes establish beeswax as an essential base material in natural product formulations, particularly in solid perfumes and balms.

❖ **Carrier Oils: Essential Vehicles in Aromatic & Therapeutic Formulations** [4,8,11-12,14-15]

Carrier oils—also known as fixed, base, or vegetable oils—are crucial ingredients in topical cosmetic formulations and aromatherapy. Carrier oils, which are mostly used to dilute concentrated essential oils and enable their safe application to the skin, do not evaporate like volatile essential oils do. Common carrier oils include coconut oil (*Cocos nucifera*), almond oil (*Prunus dulcis*), jojoba oil, avocado oil, and grapeseed oil, which are extracted from the fatty portions of plants like seeds, kernels, or nuts. These oils, which are lipids by nature and fall within the larger category of lipids chemically, provide a number of dermatological and therapeutic advantages, including nourishing, moisturizing, and improving the function of the skin barrier. Carrier oils contribute their own bioactive substances, such as vitamins, minerals, and essential fatty acids, that support skin health in addition to helping to carry essential oils into the skin. They are regarded as perfect transporters in cosmetic and fragrance applications because of their light texture, subtle or neutral scent, and non-irritating qualities. Fixed oils are very different from essential oils in terms of their chemical makeup. Because fixed oils are lubricating and non-volatile, they leave a lasting oily stain on absorbent paper, whereas essential oils usually don't, unless colorants are used. Moreover, fixed oils are generally extracted using cold expression techniques, have a faint natural scent, and are insoluble in alcohol. Essential oils, on the other hand, are usually extracted through distillation, have a strong aroma, and are soluble in alcohol. Carrier oils make up around 98% of a normal aromatherapy preparation, despite essential oils being perceived as being more important. They are necessary for preserving compositions' safety, effectiveness, and sensory balance. They are vital in the creation of solid fragrances, creams, and balms due to their stability and compatibility with essential oils.

- **Almond Oil: A Multifunctional Carrier Oil with Moisturizing & Therapeutic Benefits** [4,6,8,12-13,16-17]

[1] °C: Celsius

Prunus dulcis (family Rosaceae) seeds are the source of almond oil, a common carrier oil in medicinal, cosmetic, and aromatherapy applications. The light, non-greasy texture and excellent skin absorption capacity of almond oil, which is golden yellow and usually odorless, make it the perfect foundation for essential oil applications. There are roughly 40–55% fixed oils, 20% proteins, mucilage, emulsions, and 2.5–4% amygdalins in it chemically. Additionally, it contains oleic and linoleic fatty acids, which support its moisturizing, emollient, and skin-rejuvenating properties. Because of these characteristics, almond oil works well as a carrier for essential oils in topical products including lotion bars, massage oils, balms, bath oils, and hydrating scrubs. It is well-known for its potential medicinal properties, which include immunomodulatory, antibacterial, antifungal, anti-inflammatory, and antioxidant activities, in addition to its formulation advantages. It has long been used in complementary medicine for its alleged hepatoprotective and immunity-boosting qualities, but further empirical research is required. Its nourishing effect on the skin is highly valued in the aromatherapy and cosmetic sectors, particularly for improving suppleness and softness without leaving a greasy residue. Additionally, heavier carrier oils can be lightened with almond oil to improve their tactile appeal and absorption in cosmetic applications. Its rich bioactive profile and adaptability make it stand out among other carrier oils like jojoba, avocado, coconut, and grapeseed oils, especially in products that need to hydrate and penetrate the skin gently but effectively.

- **Coconut Oil: A Stable, Antimicrobial, & Multifunctional Carrier Oil** [4,8,18-19,22,24]

Coconut oil, sometimes referred to as copra oil or coconut butter, is a multipurpose carrier oil made from the endosperm of the Palmae family species *Cocos nucifera L*. The coconut palm, which is widely grown in more than 80 countries and is traditionally regarded as the "tree of life," provides millions of families with essential food and income. Medium-chain saturated fatty acids, particularly lauric acid (about 47.5%), capric acid (50–80%), caprylic acid (2%), and myristic acid (1%), are abundant in coconut oil chemically. These substances have a major impact on the oil's antioxidant profile, physicochemical stability, and therapeutic potential. Coconut oil is perfect for compositions that need a long shelf life without refrigeration because of its high percentage of saturated fatty acids, which make it extremely resistant to oxidative rancidity. At temperatures below 25°C, coconut oil appears physically as a white solid fat; at higher temperatures, it transforms into a transparent, thin liquid. It is valued for its hydrating, antibacterial, antifungal, anti-inflammatory, and antioxidant qualities in aromatherapy and cosmetic preparations. It is a useful component of skin care products including lotions, balms, and solid perfumes since it has been shown to be effective in wound healing, calming dry skin, and lowering microbial burden. Furthermore, coconut oil is a great diluent for essential oils, improving skin absorption and offering a delicate, organic scent. It also serves as a dietary fat in many tropical climates and as a nonaqueous medium for oral medications in the food and pharmaceutical industries. Given its high saturated fat level, dietary vigilance is suggested despite its health benefits.

❖ **Essential Oils: Composition, Extraction, & Therapeutic Importance** [2,6,12-13,15-16,20]

The volatile, fragrant compounds known as essential oils (EOs) are taken from specific cells or glands found in a variety of plant components, such as roots, bark, leaves, flowers, and fruits. Essential oils (EOs) are used extensively in alternative medicine, food preservation, medicines, perfume creation, and cosmetics to represent the distinct flavor or aroma of its source. Due to their natural origin and variety of bioactivities, essential oils are becoming more and more popular worldwide. Low molecular weight chemicals, principally terpenoids (monoterpenes and sesquiterpenes), phenylpropanoids, and their oxygenated derivatives, make up these oils' complex combinations. The synergistic interaction of one or two primary ingredients, bolstered by lesser molecules, is frequently responsible for the medicinal efficacy of essential oils. Numerous biotic and abiotic factors, including plant genetics, variety, geographic origin, ambient conditions, seasonal fluctuations, plant stress during growth, and the extraction method, have a significant impact on the chemical composition and output of essential oils. Steam distillation is still the most widely used extraction process on a commercial basis, followed by solvent extraction and hydro-distillation. The technique selection affects the oil's overall efficacy and chemical composition. Essential oils are extremely potent and, when applied undiluted, can cause skin irritation or sensitization despite their wide range of applications. To improve safety and provide regulated topical distribution, they are therefore frequently mixed with carrier oils.

- **Lavender Essential Oil: Composition, Extraction, & Therapeutic Benefits** [2,8,12-13,18,21-22]

The blooming tops of *Lavandula angustifolia Mill.* (family: Lamiaceae) are used to make lavender essential oil, which is well known for its medicinal qualities and calming scent. Usually obtained by steam distillation, the oil has a pleasant floral aroma and is a colorless to pale yellow liquid. Its main components include camphor (≤1.5%), limonene (≤1%), terpinen-4-ol (up to 8%), linalyl acetate (25–47%), linalool (up to 45%), and 1,8-cineole (≤3%). β-ocimene, lavandulyl acetate, geraniol, and β-caryophyllene are other noteworthy chemicals that are present in lavender oil and contribute to its diverse range of pharmacological actions. Because of its antibacterial, antifungal, antiseptic, anti-inflammatory, analgesic, and soothing qualities, lavender essential oil has a long history of use in herbal medicine and aromatherapy. It is frequently used to treat small burns, skin irritations, migraines, sleeplessness, anxiety, and muscle aches. Clinical and animal studies indicate that inhaling lavender oil can stimulate olfactory receptors, sending signals to the hypothalamus and producing a calming effect. Scientific examinations have validated its potential as an anxiolytic drug. Additionally, one double-blind, randomized clinical trial showed that it was effective in treating primary dysmenorrhea. Additionally, lavender oil provides antibacterial protection against microorganisms that cause odor and effectively neutralizes body odor by breaking down sweat components. Its main constituents, namely linalool and linalyl acetate, are largely responsible for its capacity to regulate mood and physiological reactions. Even with its long history of use, further study is required to pinpoint the precise processes by which lavender affects the central nervous system.

- **Lemongrass Essential Oil: Composition, Characteristics, & Therapeutic Potential** [2,13,23-24]

The perennial aromatic herb *Cymbopogon citratus (DC.) Stapf*, a member of the Gramineae (Poaceae)

family, yields lemongrass essential oil (LEO) from its grass leaves. It is a native of tropical and subtropical areas, especially Southeast Asia, is distinguished by its blue-green linear leaves and a potent lemon-like scent brought on by its high citral content (70–80%). The leaves are mostly steam-distilled to extract the essential oil, which has a characteristic sweet, lemony aroma and is yellow to pale sherry in color. Citral (including geranial and neral), myrcene, dipentene, linalool, geraniol, nerol, citronellol, farnesol, sesquiterpenes, methyl heptenone, esters, and organic acids are the main components of LEO. Lemongrass oil is known for its antibacterial, antifungal, analgesic, antiseptic, antispasmodic, antirheumatic, anticonvulsant, and antiemetic qualities. It is also chemically rich and biologically active. Because of its astringent properties and refreshing scent, it is frequently used in cosmetics, perfumes, and personal care items including lotions, bath salts, and soaps. Lemongrass oil is used in aromatherapy to tighten, refine, and revitalize greasy, sluggish skin by acting as a tissue toner and circulatory stimulant. In terms of medicine, LEO has shown promise in treating ailments like fevers, psychological tensions, hypotension, and gastrointestinal issues. It is a useful addition to food preservation and natural health treatments because of its high citral concentration, which also contributes to its citrus scent and antimicrobial effectiveness. Additionally, lemongrass oil's ability to reduce stress and improve mood is supported by citral, a cyclic monoterpene that has a mildly depressive effect on the central nervous system. LEO is becoming more and more well-known in the food, pharmaceutical, and cosmetic sectors because of its bioactive ingredients and multipurpose nature.

2.2. Technique of Preparation [13]

1. Weigh five grams of beeswax using a weighing balance.
2. Weigh 3 milliliters of coconut oil, 2 milliliters of almond oil, 5 milliliters of lavender oil, and 5 milliliters of lemongrass oil using a measuring cylinder.
3. The components of beeswax, coconut oil, and almond oil were heated in a 50 ml[2] beaker over a water bath until they melted.
4. Five milliliters of lavender oil and five milliliters of lemongrass oil were simultaneously mixed in a second fifty milliliter beaker.
5. Pour the beeswax, coconut oil, and almond oil combination into the storage container.
6. Stir slowly and add the essential oil mixture once the liquid has cooled for a minute.
7. After the lid was closed, the perfume was left to cool before being used. (Figure 5) (Figure 6)

2.3. Apparatus and instruments required (Table 2)

2.4. Ingredients used in solid perfume & their role (Table 3)

2.5. Evaluation Parameters [3-4,6,12-13]

2.5.1. Organoleptic Evaluation

The following guidelines should be followed when evaluating a solid perfume organoleptically. (Figure 7)

1. **Color** [3-4,6,10-14,18,20]
2. **Odor** [3-4,6,10-14,18,20]
3. **Appearance** [3-4,6,11-14]

[2] mL: Millilitre

4. **Roughness** [4,6,11-14]

5. **Texture grade** [4,6,10-14]

6. **Consistency** [14,18,20]

2.5.2. Physical Evaluation

1. Homogeneity determination [4,6,10-14,18,20]

The uniformity of the formulations was assessed through visual appearance and touch.

2. Determination of Spreadability [4,11-13,18]

Excess sample was placed between two glass slides and squeezed to a consistent thickness using a pan filled with 25 grams of weight in order to determine the spreadability. It was measured by the amount of time needed to separate two slides, or the amount of time it took for the upper glass slide to pass over the lower plate.

The formula is **[S = m x 1/t]**

Where, S= Spreadability

m= weight attached to the top slide

t= Time taken

l= Length moved on the glass slide

3. Determination of solubility [4,6,11-13]

The formulation's solubility was examined in a variety of mediums, including water, inorganic solvents, and organic solvents.

4. Determination of Emolliency [4,6,11-13]

Following the application of predetermined amounts of cream, the amount of residue, emolliency, and slipperiness were assessed.

5. Determination of Physical appearance [4,6,11-13]

Solid perfume's physical attributes were examined visually on a black backdrop.

6. After feel [4,6,12-13]

Following formulation application, the kind of skin texture on the applied area was evaluated.

7. Ease of Removal [4,6,11-13]

Washing the area where the cream was administered with tap water was used to gauge how easy it was to remove.

8. Melting point [4,6,12-14,20] (Figure 8)

Consider the solid perfume's melting point. A two-gram sample of solid perfume was put in a glass tube. This tube was submerged in a plate of warm water using a water bath. The melting point of a material was defined as the temperature at which a liquid drop formed.

9. pH[3] Test of Solid Perfume Formulation [3-4,6,10-14,18,25] (Figure 9)

The pH of the formulation was determined by the use of pH Meter or pH strips.

10. Hedonic test [3,13,26]

The Hedonic rating test is used to measure the consumer acceptability and preference. The panelist is asked to rate the acceptability of the

[3] pH: Power of Hydrogen

product on a scale. of 9 points, ranging from "like extremely" to "dislike extremely".

11. Wetness test [6,12-13]

Applying the formulation on the skin surface and see whether it moisturizes the skin or not.

2.5.3. Chemical Evaluation

1. Saponification value [4,6,12-14]

It is defined as the number of milligrams of KOH[4] required to hydrolyze 1gram of wax. It is expressed as mg[5] KOH/g[6].

[Saponification Value = 56.1 × (B − S) × N × W]

Where; B = volume in ml of the standard hydrochloric acid required for the blank,

S = volume in ml of standard hydrochloric acid required for the wax,

N = normality of standard hydrochloric acid, and

M = mass in gms of the wax taken for the test. (Figure 10) (Figure 11)

2. Acid value [4,6,12-14]

It is defined as the number of milligrams of KOH required to neutralize 1gram of the wax. It is expressed as mg KOH/g.

[ACID VALUE = 56.1 × V × N × W]

Where; V = volume in ml of standard potassium hydroxide solution used

N = normality of standard potassium hydroxide solution,

M = mass in grams of the wax taken for the test. (Figure 12)

3. Ester value [4,6,12-13]

It is defined as the difference between the acid value and saponification value.

[Ester Value = Saponification Value – Acid Value]

4. Ester to acid ratio [4,6,12-13]

It is defined as the number obtained by dividing the ester value by the acid value.

3. RESULT AND DISCUSSION

The goal of the current study was to develop a sustainable and environmentally beneficial substitute for synthetic perfumes by creating a herbal solid perfume with natural, skin-friendly materials like beeswax, coconut oil, almond oil, lavender oil, and lemongrass oil. By producing a product that is stable, aesthetically pleasing, and functionally competent, the formulation effectively achieved its goals. According to the results of the organoleptic evaluation given in the below (Table 4), the perfume had a smooth, semi-solid consistency, a nice lemony scent, and an off-white color—all of which are traits of premium solid fragrances. The hedonic test found that the texture and odor were acceptable, suggesting that the product will be well received by consumers. (Table 4) The formulation's compatibility with skin was confirmed by physicochemical properties. Given that the pH (5.7) was nearly

[4] KOH: Potassium Hydroxide

[5] mg: Milligram

[6] g: Gram

identical to that of human skin, there was little chance of irritation. The perfume left no oily residues and had good emollient and spreadability properties. As is common with formulations based on lipids, it was soluble in organic solvents but insoluble in water. The melting temperature (48°C) is stable under typical storage settings and is in line with values anticipated for solid formulations based on beeswax. The results for the physical evaluation are given below (Table 5). (Table 5) The stability and aromatic potential of the formulation were shown by the chemical analysis. A low acid value (0.429 mg KOH/g) indicates the existence of few free fatty acids, which lowers the risk of rancidity and skin irritation. Both the saponification (9.32 mg KOH/g) and ester (8.891 mg KOH/g) values are high, indicating a balanced ester content, which is essential for long-lasting scent and mild moisturizing benefits. In addition, the ester-to-acid ratio of 20.72 indicates effective esterification, which improves skin compatibility and scent retention. The results for the chemical evaluation are given below (Table 6). (Table 6) These findings are consistent with and support earlier research that highlighted the contribution of waxes, carrier oils, and essential oils in offering not just scent but also medicinal qualities like relaxing, antibacterial, and anti-inflammatory actions. In addition to providing a revitalizing aroma, the effective blend of lavender and lemongrass oils also provided antibacterial and mood-boosting properties. In summary, the study confirms that, when properly made, herbal solid perfumes provide a safe, eco-friendly, and efficient substitute for alcohol-based fragrances. In the changing personal care industry, the current formulation shows great promise for commercialization as a natural, consumer-preferred product.

4. CONCLUSION

The goal of the current study was to create and assess a herbal solid perfume with natural elements that offer both additional medicinal advantages and an appealing scent. Natural waxes like beeswax, carrier oils like coconut oil and shea butter, and essential oils of lavender (*Lavandula angustifolia*) and lemongrass (*Cymbopogon citratus*) were all used to successfully create the solid scent. These ingredients were chosen because of their potential antibacterial, anti-inflammatory, and calming actions, as well as their pleasant scent and skin-friendly qualities. The product that was created via the fusion approach was consistent, stable, and simple to use. The formulation's quality and safety were evaluated using a variety of physicochemical techniques. The perfume was perfect for direct skin application without irritating the skin since it had a pH value that was similar to that of human skin, good spreadability, and an acceptable melting point. After usage, the solid perfume left no oily residue and had a pleasant, lemony-floral aroma. Additionally, chemical analysis revealed a high ester value, which suggested strong scent retention and moisturizing properties, and a low acid value, which ensured minimum danger of skin irritation. The stability of the formulation is strengthened by the high ester-to-acid ratio (20.72), which also emphasizes the predominance of esters, which are recognized for their aromatic and antibacterial properties. In summary, the herbal solid perfume shows great promise as a sustainable, natural, and skin-safe substitute for traditional synthetic fragrances. Its pleasant scent, along with the added advantages of moisturizing and moderate antibacterial action, make it appropriate for daily use, particularly for people looking for greener and cleaner personal care products. In addition to satisfying the growing demand from consumers for natural cosmetics, this formulation creates opportunities for additional study and advancement in herbal scent goods.

REFERENCES

1. Malkar RS, Yadav GD. Development of green and clean processes for perfumes and flavors using heterogeneous chemical catalysis. Current Catalysis. 2020 Apr 1;9(1):32-58. http://dx.doi.org/10.2174/2211544708666190613163523
2. Sharmeen JB, Mahomoodally FM, Zengin G, Maggi F. Essential oils as natural sources of fragrance compounds for cosmetics and cosmeceuticals. Molecules. 2021 Jan 27;26(3):666. http://dx.doi.org/10.3390/molecules26030666
3. Dhandge PD, Deshmukh SP. Formulation and evaluation of perfume from locally available flowers. GSC Biological and Pharmaceutical Sciences.;28(2). http://dx.doi.org/10.30574/gscbps.2014.28.2.0251
4. Gawande AS, Bajad NE, et al. Review on Formulation, Evaluation and Comparative Study of Herbal Solid Perfume Stick. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT). 2023 January;3(3):340-48. http://dx.doi.org/10.48175/IJARSCT-14342
5. Kleoff M, Kiler P, Heretsch P. Synthesis of odorants in flow and their applications in perfumery. Beilstein Journal of Organic Chemistry. 2022 Jun 27;18(1):754-68. http://dx.doi.org/10.3762/bjoc.18.76
6. Pal RS, Wal P, Kumar P, Pal Y, Sheetal S. Herbal Solid Perfume: A Turkish Concept-Based Synthesis and Quality Valuation. World Journal of Environmental Biosciences. 2021;10(2-2021):37-41. http://dx.doi.org/10.51847/aIXaFnrrir
7. Kadam S, Shahi Sadhana et al. Fragrance Forensics: Decoding the Chemistry of Perfume! INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES. 2025 February 28; 3(2): 2087-94. http://dx.doi.org/10.5281/zenodo.14944746
8. Kohle KS, Chaudhari BG, et al. Review on Formulation and Evaluation of Herbal Solid Perfumes. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT). 2024 December;4(2): 555- 67. http://dx.doi.org/10.48175/568
9. Rodrigues AE, Nogueira I, Faria RP. Perfume and flavor engineering: A chemical engineering perspective. Molecules. 2021 May 22;26(11):3095. http://dx.doi.org/10.3390/molecules26113095
10. Todkar AA, Rawat S. Formulation Of Essential Oil Based On Solid Perfume. Epra International Journal of Multidisciplinary Research (IJMR). 2024 November; 10(11): 504-9. http://dx.doi.org/10.36713/epra2013
11. Rathod VD, Satpute Shivaji, et al. Formulation and Evaluation of Solid Perfume based on Bees Wax. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT). 2024 August; 4(1): 409- 20. http://dx.doi.org/10.48175/IJARSCT-19352
12. Hatwar P, Dandge P, Jagtap P, Gaikwad S, Jadhav P, Sonawane V, Sanap G. Formulation and Evaluation Of Solid Perfume. http://dx.doi.org/10.20959/wjpr202413-33085
13. Benan RY, Pedro SM, Ba-Oy RG, Pilay TM, Sacramento CY, Litusquen BA, Dimatulac HK, Bannawi AF. Formulation Of Solid Perfume from Locally Available Chrysanthemum X Morifolium (Garden Chrysanthemum) And Theobroma Oil. International Journal of Innovation and Industrial Revolution. 2024;6(16):110-23. http://dx.doi.org/10.35631/IJIREV.616008

14. Oji A, Vivian IC. Extraction and characterization of selected carrier oils. Chemical Science International Journal. 2020;29(2):48-54. http://dx.doi.org/10.9734/CSJI/2020/v29i230163
15. Price S, Price L. Carrier oils. Aromatherapy for Health Professionals Revised Reprint E-Book. Amsterdam, The Netherlands: Elsevier Limited. 2021 Feb 16:151.
16. Pal SK, Tiwari S, Jaiswal P. Formulation And Evaluation Of Perfume Lotion. http://dx.doi.org/10.5281/zenodo.13330103
17. Ahmad Z. The uses and properties of almond oil. Complementary therapies in clinical practice. 2010 Feb 1;16(1):10-2. http://dx.doi.org/10.1016/j.ctcp.2009.06.015
18. Pakhare SA, Jaju SO, Khendke AD. Cocoa Butter, Corn Starch and Sodium Bicarbonate Infused Roll-On Deodorant: A Novel Approach To Odor Control. Epra International Journal of Research and Development (IJRD). 2024 May;9(5):94-104. http://dx.doi.org/10.36713/epra2016
19. Deen A, Visvanathan R, Wickramarachchi D, Marikkar N, Nammi S, Jayawardana BC, Liyanage R. Chemical composition and health benefits of coconut oil: an overview. Journal of the Science of Food and Agriculture. 2021 Apr;101(6):2182-93. http://dx.doi.org/10.1002/jsfa.10870
20. Maysarah H, Sari I, Faradilla M, Elfia Rosa E. Stick Perfume Formulation from Jeumpa Flowers (Magnolia champaca (L) Baill Ex. Pierre). InProceedings of the 2nd International Conference of Essential Oils (ICEO 2019), L 2020 (pp. 47-53). http://dx.doi.org/10.5220/0009956100470053
21. Cavanagh HM, Wilkinson JM. Lavender essential oil: a review. Australian infection control. 2005 Mar 1;10(1):35-7. http://dx.doi.org/10.1071/hi05035
22. Grunebaum LD, Murdock J, Castanedo-Tardan MP, Baumann LS. Effects of lavender olfactory input on cosmetic procedures. Journal of cosmetic dermatology. 2011 Jun;10(2):89-93. http://dx.doi.org/10.1111/j.1473-2165.2011.00554.x
23. Tran TH, Tran TK, Ngo TC, Pham TN, Bach LG, Phan NQ, Le TH. Color and composition of beauty products formulated with lemongrass essential oil: Cosmetics formulation with lemongrass essential oil. Open Chemistry. 2021 Jul 13;19(1):820-9. http://dx.doi.org/10.1515/chem-2021-0066
24. Ameh OE, Achika JI, Bello NM, Owolaja AJ. Extraction and formulation of perfume from Cymbopogon citratus (lemongrass). Journal of Applied Sciences and Environmental Management. 2021 Nov 30;25(8):1461-3. http://dx.doi.org/10.4314/jasem.v25i8.27
25. Tanaji GM, Chinchane PP, Deshmane SS, Rathi GM. Review Article Comprehensive on Perfume. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT). 2024 May;4(7):629-33. http://dx.doi.org/10.48175/IJARSCT-18693
26. Maulana F, Amilia A, Jovial CA, Desky AS, Heriana N, Zakaria DN. Formulation Tests for The Production of Solid Perfume Based on Patchouli Oil. Journal of Patchouli and Essential Oil Products. 2023 Dec 19;2(2):29-32. http://dx.doi.org/10.24815/jpeop.v2i2.32263.

HOW TO CITE: Unnati Varshney, Meenu Chaudhary*, Ashutosh Badola, Eco-Friendly Elegance: A Natural Solid Perfume with Lavender and Lemongrass Oils, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 5, 2044-2058 https://doi.org/10.5281/zenodo.15393690