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Formulation and Evaluation of Solid Perfume based on Bees Wax

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Abstract: *Solid perfume based on beeswax is a unique and natural fragrance product that provides a long-lasting scent while being gentle on the skin. This type of perfume is made from a combination of natural ingredients, including beeswax, carrier oils, and essential oils. The beeswax acts as a natural emulsifier, which helps to blend the other ingredients and create a solid, compact texture. The carrier oils and essential oils provide the fragrance, which is released slowly and subtly throughout the day. Solid perfume based on beeswax is an excellent alternative to traditional liquid perfumes, as it is more portable, easy to apply, and environmentally friendly. It is also a perfect choice for those with sensitive skin, it contains no alcohol or synthetic ingredients that can irritate the skin. To ensure the success of the presented collection, several quality factors have been established, which will be the same for all four perfumes in the collection, as well as the evaluation indexes of these factors. Quality factors have been classified as sensory, with factors such as the applicability of the product to the skin, and physicochemical, establishing the melting point and stability of the product.mm/second, melting point 90°C and pH value 4.*

Keywords: Product development, formulated products, personal care, perfumery, solid perfumes, quality factors, formulation, process synthesis.

I. INTRODUCTION

Solid perfumes have been gaining popularity in recent years as a more sustainable and eco-friendly alternative to traditional liquid perfumes. Unlike liquid perfumes, which are often packaged in plastic or glass bottles and contain high amounts of synthetic fragrances, solid perfumes use natural waxes and carrier oils as a base, and are typically scented with essential oils or herbal extracts. This project aims to develop a beeswax and almond carrier oil-based solid perfume that is scented with rose oil. The goal is to create a natural and sustainable solid perfume that provides a delightful floral fragrance, while also offering therapeutic benefits through the use of essential oils[1]. The formulation of the solid perfume will be based on a blend of natural ingredients, including beeswax and almond carrier oil. Beeswax is a natural wax produced by honey bees, and has unique emollient and protective properties, making it an excellent natural alternative to synthetic waxes and petroleum- based ingredients commonly found in cosmetics. Almond carrier oil, on the other hand, is a light, non-greasy oil that is easily absorbed by the skin, providing nourishing and moisturizing properties. The fragrance of the solid perfume will be provided by rose oil, a natural essential oil extracted from rose petals. Rose oil has a delicate and pleasant floral fragrance, and is known for its calming and relaxing properties[2]. We will be using a variety of essential oils to create our unique fragrance. Essential oils are concentrated plant extracts that are derived from flowers, leaves, and other parts of plants. They have a wide range of therapeutic benefits and can be used to create beautiful and complex fragrances.

Here are the essential oils we will be using in solid perfume[3]:

1. Lavender essential oil - known for its calming and soothing properties.
2. Rose essential oil a romantic and uplifting scent.
3. Ylang-ylang essential oil - a sweet and floral fragrance.
4. Cedarwood essential oil - a woody and grounding scent.
5. Bergamot essential oil - a citrusy and refreshing fragrance.

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Together, these essential oils will create a beautiful and balanced fragrance that will be perfect for creating beeswax solid perfume, we will need a few additional ingredients. In addition to the essential oils mentioned earlier, we will be using carrier oils to help dilute the essential oils and create a smooth and spreadable texture.

Here are the carrier oils we will be using[4]:

1. Sweet almond oil - a light and nourishing oil that is easily absorbed by the skin.
2. Jojoba oil a versatile and moisturizing oil that is similar in composition to our skin's natural oils.
3. Coconut oil - a soothing and hydrating oil that is solid at room temperature, making it ideal for a solid perfume.

This project will involve selecting appropriate ingredients, formulating the perfume, testing and evaluating the product, and designing eco-friendly packaging. The final product will be a natural and sustainable alternative to traditional liquid perfumes, offering a delightful floral fragrance with therapeutic benefits.

Overall, this project represents an exciting opportunity to explore the potential of natural ingredients in creating sustainable and eco-friendly cosmetics, while also providing a delightful fragrance experience.

II. OBJECTIVE OF THE RESEARCH

The objective of the research on Beeswax-based solid perfume is to develop and evaluate a natural and sustainable alternative to traditional liquid perfumes. The project aims to create a solid perfume that provides a pleasant fragrance and therapeutic benefits by using Beeswax as a base ingredient, carrier oils like almond oil and essential oils like rose oil. The research also seeks to design eco- friendly packaging options to further enhance the product's sustainability.

The specific objectives of the research project are:

1) To select appropriate ingredients for the formulation of Beeswax-based solid perfume.
2) To formulate the Beeswax-based solid perfume using appropriate methods and techniques.
3) To test and evaluate the product for fragrance strength, longevity, and texture.
4) To compare the Beeswax-based solid perfume with traditional liquid perfumes.
5) To design and evaluate eco-friendly packaging options.
6) To determine the therapeutic benefits of the Beeswax-based solid perfume by analyzing the essential oils used in the formulation.
7) To assess the feasibility of producing and marketing Beeswax-based solid perfume as a sustainable and eco-friendly product.
8) To provide recommendations for future research and development of Beeswax-based solid perfume.

Overall, the objective of the research project is to create a natural and sustainable product that offers a delightful fragrance with therapeutic benefits while reducing the environmental impact of traditional liquid perfumes.

III. SCOPE OF THE RESEARCH

Formulation: The research will focus on the formulation of solid perfumes using beeswax as a key ingredient. This will involve exploring the different types of waxes, oils, and fragrances that can be used in the formulation process, as well as determining the ideal ratios and melting points required to achieve a high-quality solid perfume product.

Evolution: The research will also examine the evolution of solid perfumes, tracing their history from ancient times to the present day. This will include exploring the various materials and ingredients that have been used in the past, as well as the advances in technology and sustainable practices that have made solid perfumes a popular and eco-friendly alternative to traditional liquid perfumes.

Case study: The research will include a case study of a popular beeswax-based solid perfume brand, examining their production processes, marketing strategies, and consumer feedback. This will provide insights into the challenges and opportunities facing the solid perfume industry, as well as best practices for producing and promoting high-quality solid perfume products.

Environmental impact: The research will evaluate the environmental impact of solid perfumes compared to liquid perfumes, taking into account factors such as packaging, transportation, and waste disposal. This will include a comparison of the carbon footprint and ecological impact of each type of product, as well as the potential benefits of using natural and sustainable ingredients such as beeswax.

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Consumer behavior: The research will also explore consumer behavior and preferences related to solid perfumes, including their attitudes towards eco-friendly products, their purchasing habits, and their satisfaction with the quality and performance of different types of solid perfume products. This will help to identify opportunities for innovation and improvement in the solid perfume industry, as well as areas where further research is needed to meet consumer demand.

IV. MATERIALS AND METHODS

A) Materials

1) Bees Wax

Beeswax is a food grade wax with a white color when it is freshly prepared. Later the color changes into yellow because of the presence of propolis and pollen colorants. The typical odor of beeswax depends on the honey, bees, propolis, and pollen. Beeswax is crystalline in form and it mainly depends on the storage. Along with the crystallization, the elasticity and stiffness of the wax also increases during storage. The important quality of beeswax is its hardness. At low temperatures the beeswax exhibits higher rates of elasticity.

The heating process changes the physical properties of beeswax. Shrinkage of heated beeswax occurs by 10% upon cooling. When the beeswax is heated at the temperature of 30-35°C, it attains the properties of plastics. Beeswax is insoluble in water and soluble in organic solvents, such as ether, acetone, xylol, benzene, chloroform, and tetrachloromethane. In order to completely dissolve the beeswax, the temperature must be increased beyond its melting point. The edible coating made up of beeswax, coconut oil, and sunflower oil has been used on strawberries and apricot fruits. This coating showed a positive effect on the moisture loss, appearance, texture, and firmness. The coconut oil containing monolauric acid showed antifungal effect on the coated fruit samples (Irina, 2012). The edible coating of hydroxypropyl methylcellulose, beeswax, and antifungal components, such as sodium methyl paraben, sodium benzoate, and sodium ethyl paraben has been studied on cherry tomatoes. It was found that the coating of hydroxypropyl methyl cellulose-beeswax containing sdium benzoate (2%) showed a decreased rate of change in the weight or moisture loss, firmness, and respiration[5].

2) Carrier oils.

What are carrier oils?

Carrier oils and essential oils are made from plants. Carrier oils are used to dilute essential oils and "carry" them to your skin. That's because essential oils are potent and can cause irritation when applied directly to your skin.

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Most carrier oils are unscented or lightly scented and don't interfere with an essential oil's therapeutic properties. They may be used alone or with other oils to nourish your skin[6].

Figure No-2 Almond oil[7]

Combining with other carrier oils. Almond oil can help lighten heavier carrier oils, helping them absorb more easily Bath oil. Almond oil is a great choice as a carrier oil for essential oil-based bath oils. This helps to increase moisturizing properties while maximizing the benefits of the essential oils. Skin moisturizers. Because it is easily absorbed and moisturizing, almond oil can make a great carrier oil for natural essential oil-based lotions, lotion bars, balms or moisturizing scrubs. Topical application. Because it has a subtle scent and doesn't leave a greasy residue, almond oil is a great choice as a carrier oil for basic topical essential oil application, for example - massage oils.

3) Essential Oil

An essential oil is a concentrated hydrophobic liquid containing volatile (easily evaporated at normal temperatures) chemical compounds from plants. Essential oils are also known as volatile oils, ethereal oils, aetheroleum, or simply as the oil of the plant from which they were extracted, such as oil of clove. An essential oil is essential in the sense that it contains the essence of the plant's fragrance the characteristic fragrance of the plant from which it is derived[8]. The term "essential" used here does not mean indispensable or usable by the human body, as with the terms essential amino acid or essential fatty acid, which are so called because they are nutritionally required by a living organism[9].

Essential oils are generally extracted by distillation, often by using steam. Other processes include expression, solvent extraction, sfumatura, absolute oil extraction, resin tapping, wax embedding, and cold pressing. They are used in perfumes, cosmetics, soaps, air fresheners and other products, for flavoring food and drink, and for adding scents to incense and household cleaning products. essential oils are often used for aromatherapy, a form of alternative medicine in which healing effects are ascribed to aromatic compounds. Aromatherapy may be useful to induce relaxation, but there is not sufficient evidence that essential oils can effectively treat any condition. Improper use of essential oils may cause harm including allergic reactions, inflammation and skin irritation. Children may be particularly susceptible to the toxic effects of improper use. Essential oils can be poisonous if ingested or absorbed through the skin[10].

Rose oil

Rose oil is a fragrant essential oil that is extracted from the petals of various species of roses, most commonly Rosa damascena and Rosa centifolia. It is a highly prized and valuable oil in the perfume industry due to its complex and rich floral scent, as well as its therapeutic properties.

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Figure No-3 Rose Oil

Rose oil is obtained through a process of steam distillation, which involves placing the petals in a still and passing steam through them to release the oil. The resulting oil is highly concentrated and potent, with a deep, rich aroma that is prized in perfumery.

Rose oil has a number of therapeutic benefits, and is often used in aromatherapy and natural health remedies. It is believed to have a calming effect on the nervous system, and is often used to reduce stress and anxiety. It is also used as a skin care ingredient, as it has moisturizing and anti- inflammatory properties that can help to soothe and hydrate the skin[11].

B) Method of Preparation[12]

Sr	Ingredients	Quantity
1	Bees wax	10 gm
2	Carrier oil	30 gm
3	Essential oil or etheral oil.	20 drops
4	Oil soluble color	qs.

Table No 01. Formula

The Process of Making Solid Perfume, beeswax were melted at 90°C. Rose oil as fragrance was mixed with Almond oil and then added to wax compound. After that, Rose oil was added gradually. The mixture was stirred until homogeneous for 30 minutes then cooled and allowed to harden at room temperature. The composition of solid perfume is shown in

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i) Melt together the wax with the jojoba or sweet almond oil. You can either microwave the ingredients for a few seconds in a microwave-safe container or else you can heat the mixture over a double-boiler.
ii) Once this mixture has liquefied, remove it from heat. Stir in the essential oils. You can use a toothpick, straw or even a spoon. Expect your perfume to coat the stirrer, so either use something disposable or else something you can wash (i.e., don't use a wooden spoon, unless you want it to smell pretty forever).
iii) Pour the liquid into your final container. Set the lid on top of the container, but leave it ajar. This will help prevent condensation inside your container while minimizing the chance of microbial contamination of the product.
iv) Apply the perfume by rubbing a finger on the product to liquefy it, then rub your finger on the area you want to be scented.

V. EVALUATION

Assessment of prepared perfume Organoleptic assessment Done for color, odor, appearance, pearlescence, roughness, texture grade, etc.
A) Chemical assessment
Saponification value It is defined as the number of milligrams of KOH required to hydrolyze Igram of wax. It is expressed as mg KOH/g.
SAPONIFICATION VALUE = 56.1 × (B-S) × N × W……1
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.
Acid value it is defined as the number of milligrams of KOH required to neutralize Igram of the wax. It is expressed as mg KOH/g.
ACID VALUE=56.1xVxNxW.....2
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.
Ester value It is defined as the difference between the acid value and saponification value.
Ester Value = Saponification Value - Acid Value.....3
Ester to acid ratio It is defined as the number obtained by dividing the ester value by the acid value (Sahu et al., 2016).
B) Physical assessment
1) Determination of homogeneity- The formulations were tested for homogeneity by by touch and visual appearance.
2) Determination of spreadability - Spreadability may be expressed by area extent to which the topical application spreads when applied to the parts of the skin that is affected. Sample of known weight was applied on a known area and spreadability factor was determined.
3) Determination of solubility- The solubility of the formulation was checked in different mediums.
4) Determination of absorption -The amount of formulation absorbed in a given area was observed.
5) Determination of the type of smear - It was determined by applying the solid perfume on the skin surface of a human volunteer. After applying solid perfume, the type of smear or film formed on the skin was checked
6) Determination of Emolliency - Slipperiness, emolliency and amount of residue left after the applying fixed amounts of cream was checked.
7) Determination of Physical appearance-The physical appearance of solid perfume was inspected visually against a dark background.
8) After feel-The nature of the skin texture on the applied area was assessed after the application of the formulation.
9) Ease of Removal - The ease of removal of the cream applied was determined by washing the applied part with tap water.

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C) Essential Oil Refractive Index

Refractive index is one of the parameters of quality analysis of essential oil based on SNI 06-2385- 2006. Refractive index of Jasmine oil was about 1.47028-1.47038. This value was similar to Ginting 2019 with refractive index of Jasmine oil 1,478 whereas in general the value of Jasmine oil refractive index was about 1470-1492.[13]

D) pH Test of Solid Perfume

Formulation pH standard for topical preparation in contact with skin was about 4-8.[14]The pH value was expected not to be too acidic because it can cause irritation and not too alkaline because it can cause scaly skin. The resulting solid perfume was tested using universal pH paper and had pH value of 4. This pH value was considered safe for topical preparation for human skin application. Moreover, the content of this solid perfume was cocoa butter which contained fatty acids that similar to fatty acids composition on the skin.[15]

E) Homogeneity of Solid Perfume Formulations

Homogeneity test of solid perfume was conducted by applying the samples to a flat glass surface. The results of this test showed there were no coarse grains on the surface of the glass. According to Nurany et al (2018) homogeneous product had no coarse grain on the glass surface that had been smeared by the product.[16]

F) Antimicrobial Test[17]

To perform an antimicrobial test for a rose oil, you will need the following materials:

Rose oil sample

a) Sterile swabs or a sterile loop

b) Agar plates

c) Incubator

d) Microbial culture (such as Escherichia coli or Staphylococcus aureus)

Here are the steps to perform the antimicrobial test:

1. Prepare the agar plates by following the manufacturer's instructions. Allow the plates to cool and solidify.
2. Using sterile swabs or a sterile loop, streak the microbial culture onto the agar plates. This can be done in a pattern such as the streak method, spread plate method, or spot inoculation.
3. Allow the microbial culture to dry on the agar plates.
4. Apply a small amount of the solid perfume sample onto a sterile swab.
5. Use the swab to apply the solid perfume sample onto the microbial culture on the agar plates.
6. Incubate the agar plates at an appropriate temperature for the microbial culture being used.
7. After incubation, observe the agar plates for any inhibition of microbial growth around the solid perfume sample. If the growth is inhibited, the solid perfume has antimicrobial properties.

G) Melting Point of Solid Perfume Formulation

The melting point is one of quality testing for solid perfume products. This test represents the stability of product quality during manufacture, storage, and usage processes.[18] Melting point results for all solid perfume variations are shown in Table No-5.

Sample	Melting point (°C)
A1	90
A2	80
A3	100
A4	80
A5	96
A6	87
A7	95
A8	100
A9	93
A10	85

Table No-5. Melting Point for Solid Perfume Products.

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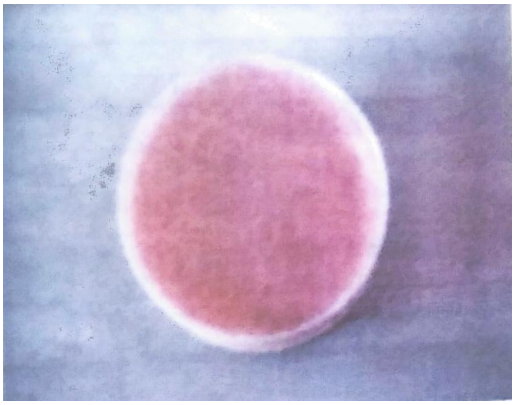
Melting point from solid perfume products generally ranged above 70°C. Solid perfume with the highest melting point was the formulation with the lowest bees wax concentration by value 10%. The increased of melting point proportional with the increased of product hardness[19]. This corresponded to the decreased of rheological properties along with increased bees wax concentration. It caused a decrease in the solid perfume products' melting point at high bees wax concentration.

VI. RESULTS AND DISCUSSION



Prepared Solid Perfume

Organoleptic evalution performed, revealed the details regarding the colour, odour, appearance, texture etc of the prepared formulation, which as depicted in Table 1, was found to be pleasant, smooth and acceptable (Septiyanti et al., 2021)

Table 1. Organoleptic Assessment

Sr	properties	Observation	Inference
1	Color	Pink	Off-pink
2	Odor	Rose scent	Rose smell
3	Appearance	Uniform appearance	Formulation has uniformity
4	Pearlescence	Present	Formulation is lustrous
5	Roughness	Absent	Formulation is smooth
6	Texture Grade	Uniform	Formulation is uniform and smooth

Chemical evaluation for the lipid based formulation, confirmed the values as depicted in Table 2, which are confirmatory standards for quality of wax incorporated.

Table 2. Acid Number and Saponification Number.

Sr	Chemical Tests	Results
1	Saponification value	98.5 mg KOH/g
2	Acid value	20.35 mg KOH/g
3	Ester value	77.15 mg KOH/g
4	Ester to Acid Ratio	3.66

Acid Number and Saponification Number of Bees wax Characterization of acid number and saponification number of Bees wax raw material was carried out to determine the quality of the material compared with the SNI 3748:2009 quality standard. Characterization of acid number and saponification number the presence of excess free fatty acids in Bees wax products were undesirable because it indicated low quality product due to moist and unclean storage.[20]The saponification number indicates the amount of fatty acids.[21]

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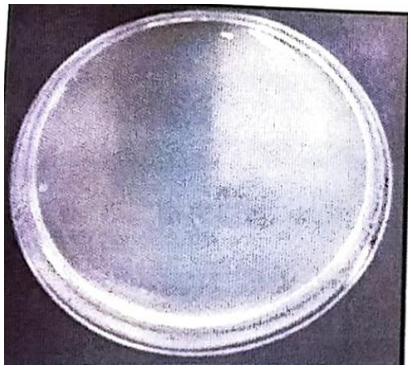
Table 3. Physical Assessment

Sr	Properties	Observation	Inference
1	Homogeneity	Smooth and consistent mixture	Formulation is homogenous
2	Spreadability	Consistent	Formulation has good spreading ability
3	Solubility	Insoluble in water partially soluble in lipid medium	The formulation is is hydrophobic & lipophilic
4	Absorption	Most of the formation was observed	The formulation is easy to get absorbed on the skin
5	Wetness	Moisturizes the skin area	Formulation moisturizes the skin
6	Type of smear	Greasy	The formulation is oil in nature
7	Emolliency	No residue observed	The formulation uniform and consistent
8	Physical Appearance	Uniform and no passing of light	The formulation is opaque
9	After Feel	The skin was smooth and soft	The formulation is smooth
10	Ease of Removal	Cannot be removed by tap water requires soap/detergent	The formulation has an oily base
11	Antimicrobial test	Microbial colonies are not observed	Not contamination

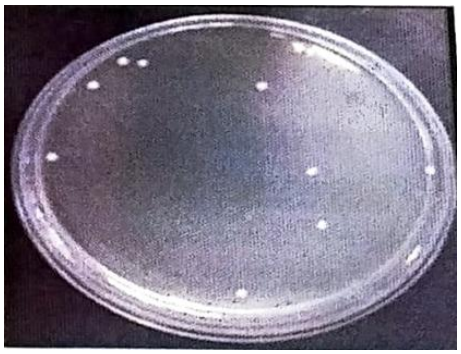
Physical evaluation, disclosed the details as mentioned in Table No 3, regarding the physical properties of the formulation, which are essential for its applicability and stability aspect. The formulation was found to be homogenous, witheven spreadibility, absorbability, uniform and consistent in nature.wetness, An emollient is a liquid or cream which you put on your skin to make it softer Physical Appearance of formulation is uniform. After applied the formulation Feel The skin was smooth and soft while performing we observed there was no microbial growth on medium microbial colonies are not observed.

Control

2) Bacterial Growth



Standard



Test-1

As per result we observed that there is no growth of microbes as compare with standard

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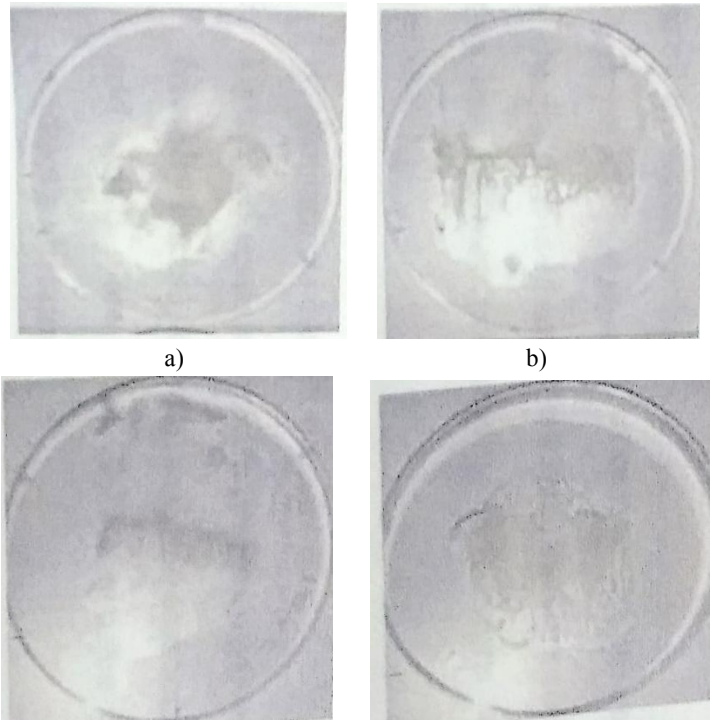
Homogeneity Test



a) b) c) d)

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7) Packaging[22]

The packaging of Beeswax-based solid perfume is an essential aspect of the product's sustainability and eco-friendliness. As a natural and sustainable alternative to traditional liquid perfumes, it is crucial to design packaging that aligns with the product's ethos.

Here are some ideas for eco-friendly packaging options for Beeswax-based solid perfume:

1. Metal tins: Metal tins are a popular choice for solid perfumes as they are reusable, recyclable, and lightweight. They also offer a sleek and minimalist look, which can be customized with labels or designs.
2. Glass jars: Glass jars are another eco-friendly option for solid perfumes. They are recyclable, reusable, and can be airtight, which helps preserve the fragrance. They also have an elegant look that can be customized with labels or etching.
3. Bamboo containers: Bamboo is a sustainable and eco-friendly material that can be used to make containers for solid perfumes. It is a renewable resource that grows quickly, and its production has a lower carbon footprint than other materials. Bamboo containers also offer a unique and natural look that can be customized with labels or engraving.
4. Recyclable paper packaging: Paper packaging is an eco-friendly option for solid perfumes. It is recyclable, biodegradable, and compostable. It can also be printed with eco-friendly ink, and the design can be customized to match the brand's ethos.
5. Upcycled containers: Upcycling containers can be an innovative way to create unique and eco- friendly packaging for Beeswax-based solid perfume. Containers like tea tins, vintage compacts, and small glass bottles can be repurposed to create unique packaging that aligns with the product's sustainable ethos.

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VII. CONCLUSION

In conclusion, the development of a herbal solid perfume is a project that requires careful consideration of various factors, including the selection of appropriate ingredients, formulation, production process, and packaging. The aim of this project was to create a natural and sustainable solid perfume that is free from synthetic fragrances, while also providing therapeutic benefits through the use of herbal ingredients.

The formulation of the herbal solid perfume was based on beeswax, rose oil, and a blend of essential oils. Beeswax was chosen as the main ingredient because of its ability to provide a stable and smooth texture, while also offering emollient and protective properties for the skin. Almond oil was added for its nourishing and moisturizing properties, and its ability to mimic the skin's natural sebum. The essential oils was carefully selected based on their therapeutic benefits, such as their ability to promote relaxation, improve mood, and enhance mental clarity.

The production process of the herbal solid perfume involved melting the beeswax and almond oil together in a double boiler, then adding the essential oils and herbal extracts. The mixture was then poured into a small tin and allowed to cool and solidify. The final product had a pleasant and natural fragrance, and was easy to apply and absorb into the skin.

The packaging of the herbal solid perfume was designed to be simple, yet aesthetically pleasing and functional. The small tin container was convenient and portable, allowing users to carry the solid perfume with them wherever they go. The packaging was also eco-friendly, using minimal materials and avoiding unnecessary plastic or synthetic components.

In terms of the evaluation of the herbal solid perfume, several tests were performed to assess its fragrance, texture, longevity, packaging, and antimicrobial properties. The fragrance of the solid perfume was found to be pleasant and long-lasting, while the texture was smooth and easy to apply. The packaging was deemed convenient and eco-friendly, while the antimicrobial properties of the essential oils were found to provide some level of protection against harmful microorganisms.

Overall, the development of the herbal solid perfume was a successful project that demonstrated the feasibility of creating a natural and sustainable alternative to traditional liquid perfumes. The use of beeswax and herbal ingredients provided a stable and effective formulation that was gentle on the in, while also providing therapeutic benefits. The project also highlighted the importance of considering the environmental impact of product packaging and choosing eco-friendly options whenever possible.

In conclusion, the herbal solid perfume project represents an exciting opportunity for further research and development in the area of natural and sustainable cosmetics. With the growing demand for environmentally friendly and health-conscious products, the herbal solid perfume provides a promising alternative to traditional perfumes that aligns with these values.

The packaging of Beeswax-based solid perfume should be designed with sustainability in mind. Eco- friendly options like metal tins, glass jars, bamboo containers, recyclable paper packaging, and upcycled containers can all be used to create packaging that aligns with the product's natural and sustainable ethos. The packaging should be customizable to match the brand's ethos and provide a unique and memorable experience for customers.

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