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FORMULATION AND EVALUATION OF ANTI-AGEING FACE SERUM USING HIBISCUS FLOWER EXTRACT AND SANDALWOOD EXTRACT

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ABSTRACT : This study investigates the development and testing of an anti-aging face serum with extracts from Hibiscus flowers and Sandalwood. The skin, the body's largest organ, changes significantly as it ages, resulting in decreased elasticity, increased laxity, and the formation of wrinkles, owing to a decrease in collagen and elastin production, hormonal changes, and environmental stressors such as UV exposure and pollution. Hibiscus and Sandalwood extracts are chosen for their potential skin benefits, including antioxidant capabilities, hydration, and anti-inflammatory actions. The serum is intended to fight noticeable indications of aging by improving skin vitality and attractiveness. To determine the serum's efficiency, its physicochemical properties including pH, viscosity, spreadability, stability, and microbiological safety were thoroughly evaluated. This study emphasizes the importance of effective anti-aging remedies that use botanical elements while developing ways for determining their performance, so adding to the growing interest in herbal and natural alternatives for cosmetic formulation.

Key words:- Face serum, hibiscus, sandalwood, ageing, anti ageing.

INTRODUCTION

Skin

The skin, also known as the integumentary system, is the biggest organ in the body, covering up to 2m² and weighing around 4.5kg in an average adult (or about 12-15% of total adult body weight). Skin is the initial physical barrier that shields us from the outside world. Skin consists of three layers: the epidermis, the dermis, and the subcutaneous tissue. Each layer's anatomy, structure, and composition vary based on its function and role.[1]

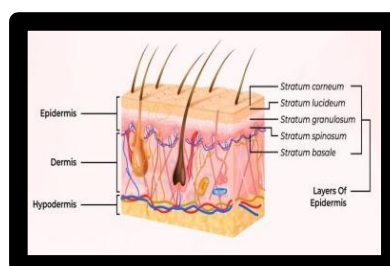


Fig 1:-Structure and layers of skin[2]

Ageing

Skin aging is the process in which skin quality degrades with age due to the synergistic impacts of chronological ageing, photo-ageing, hormone insufficiency, and environmental variables. Skin ageing causes a decrease in the number of fibroblasts that create collagen and vessels that supply the skin, which leads to an increase in laxity and so forms wrinkles.[3]

Cause of skin ageing

Skin aging happens as a person gets older, influenced by aging, sun exposure, hormones, and the environment. Key reasons include genetics, hormonal changes like decreased estrogen during menopause, and cellular senescence, causing poor cell renewal. From about age 20, collagen and elastin production decreases, leading to sagging and wrinkles. Sun, pollution, and smoking also harm skin by creating free radicals. Antioxidants like vitamins C and E can help protect the skin.[4]

Herbal Cosmetics

Herbal cosmetics are products made with accepted cosmetic ingredients that also include herbal compounds to provide specific benefits. The term "cosmetic" comes from the Greek word "kosmetikos," meaning skill in decoration. Originally, cosmetics were linked to hunting, fighting, religion, and later medicine. Herbal extracts have been used since ancient times, and they complement allopathic medicine due to their effectiveness and minimal side effects. Common herbal cosmetics include shampoos, conditioners, soaps, and facials, all of which aim to heal, improve appearance, and offer conditioning benefits.[5]

Face Serum

Face serums are concentrated solutions made from water or oil, similar to creams. They have ten times more active ingredients than creams, making them more effective for skin issues. Serums target various skin conditions with their mix of active components, addressing multiple related concerns. Their formulas are lighter than those of moisturizers. [6]

Types of face serum

1. Oil serum
2. Gel serum
3. Water based serum
4. Emulsion serum
5. Pressed balm emulsion

MATERIAL AND METHODS

METHODOLOGY

- A. Selection of active ingredients
- B. Collection of active ingredients
- C. Method of extraction of hibiscus flower, sandalwood and aloe vera
- D. Formulation of face serum
- E. Method of preparation
- F. Result and Discussion

A. Selection of active ingredients

I. Hibiscus

Hibiscus or red hibiscus, is derived from the dried flower of the *Hibiscus rosa-sinensis* plant. It contains various compounds like flavonoids and organic acids. This flower extract benefits the skin by acting as an anti-acne and anti-aging agent, maintaining moisture, treating uneven skin tone, and reducing hyperpigmentation. Its antioxidant properties protect against aging, gently exfoliate, and promote a brighter complexion. Additionally, hibiscus boosts collagen production, improves skin elasticity, and reduces fine lines [6]



Fig 2: Hibiscus Powder [7]

II. Sandalwood

Sandalwood, also known as yellow sandalwood or chandan, comes from the dried heartwood of *Santalum album*. It belongs to the Santalaceae family and contains a high percentage of Sesquiterpenoids, including santalols. Sandalwood is beneficial for the skin as it reduces wrinkles, accelerates wound healing, and lightens dark spots. The extract has soothing, brightening, and anti-aging effects, fights inflammation, provides hydration, and contains antioxidants that help prevent aging. Its antibacterial properties combat acne, and its cooling effect revitalizes the skin for a youthful look. [8]



Fig 3: Sandalwood Powder[9]

III. Aloe Vera

Aloe Vera, also known as *Aloe barbadensis* Mill and Burn Aloe, comes from the dried latex of its leaves and belongs to the Asphodelaceae family. It contains various substances, including proteins, amino acids, vitamins, enzymes, and carbohydrates. Aloe Vera benefits the skin by soothing dermatitis, treating wounds and infections, and providing moisturizing and anti-aging effects. It helps protect the skin from UV radiation and gamma rays, reduces skin damage, and enhances hydration. Additionally, it promotes the production of collagen and elastin, improving skin elasticity and reducing wrinkles.[10]

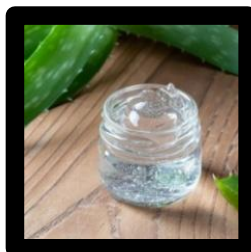


Fig 4: Aloe Vera gel [11]

IV. Coconut oil

It has linoleic acid and nourishing fatty acids that help retain skin moisture and protect and hydrate your skin.[12]



Fig 5: Coconut Oil[13]

V. Almond oil

Almond oil, or Oleum amygdalae, has a nutty taste and slight odor. It moisturizes skin, acts as an emollient, and has anti-inflammatory properties that soothe irritated skin. [10]



Fig 6: Almond oil [14]

VI. Tween 20

Gentle and skin-friendly, Tween 20 prevents ingredient separation and is ideal for sensitive skin. It is used in face serums to blend water- and oil-based ingredients, ensuring a smooth and stable formulation. It also improves the serum's texture, making it lightweight and non-greasy while improving the absorption of active ingredients.[15]



Fig 7: Tween 20 [16]

VII. Sodium benzoate

In order to ensure the safety and lifespan of face serums, sodium benzoate is used as a preservative to stop the growth of bacteria, mold, and yeast. Without changing the texture or efficacy of the serum, it aids in preserving its stability. It is frequently utilized in natural and water-based formulations since it is mild and non-irritating, making it appropriate for a variety of skin[17]



Fig 8: Sodium Benzoate

VIII. Rose water

Rose water has pH-balancing qualities and is a natural skin toner. Everyday skincare benefits like as hydration, anti-inflammatory qualities, skin nourishing, moisturizing, and pH-balancing effects can be obtained by combining rose water, glycerin, and almond oil.[10]



Fig 9: Rose Water[18]

IX. Glycerin

Scientific study has shown that glycerin is a safe and beneficial material to use on the face. It helps the skin retain moisture by acting as a humectant, which can increase skin hydration, alleviate dryness, and revitalize the skin's surface.[10]



Fig 10: Glycerin [19]

B. Collection of active ingredients

The chosen plant components were shade-dried and ground into coarse particles to create the face serum, and the extraction process was carried out using this powder.

Table 1: Source of formulation ingredients

Sr No.	Name of Ingredients	Brand/label
1	Hibiscus flower powder	Yogesh Pharmacy, Nanded
2	Sandalwood powder	Sadaf, Raj industries, Nagpur
3	Aloevera	-
4	Coconut oil	Marico ltd
5	Almond oil	Hamdard laboratories, Gaziabaad
6	Tween 20	Oxford fine lab chem LLP
7	Sodium benzoate	Loba chemie Pvt. Ltd
8	Rose water	Dabur India Ltd, Sonitpur
9	Glycerin	Bharat chemicals, Nagpur

C. Method of Extraction

- i. **Hibiscus flower:-**For hibiscus water extraction, The dried flowers (1.1 g) were mixed with 100 ml of distilled water and heated for 10 minutes with stirring. Next, filter paper was used to separate the extraction.[6]



Fig 11: Extraction of hibiscus flower powder



Fig 12: Filtration of hibiscus extract

- ii. **Sandalwood:-** For sandalwood Cold infusion method was used, sandalwood powder was soak in distilled water for 12-24hours and then filter paper was used to separate the extraction.[20]



Fig 13: Filtration of sandalwood extract

- iii. **Aloe Vera:-** The leaves were collected and rinsed with distilled water. A sterilized scalpel was used to cut the leaf outlet lengthwise. The colorless parenchymatous tissue of the aloevera plant was then removed with a clean scalpel. The fibers and impurities are subsequently removed using a muslin cloth. A filter or filter product, which is a transparent aloevera gel, was then used in the preparation.[10]

D. Formulation of face serum

Table 2: Formulation of face serum[8]

Sr No.	Ingredients	F1	F2	F3
1	Hibiscus flower extract	5ml	3ml	5.5ml
2	Sandalwood extract	5ml	4.5ml	3.6
3	Aloevera	11ml	9.8	9ml
4	Coconut oil	0.6ml	0.8ml	1ml
5	Almond oil	1.8ml	2.2ml	2ml
6	Tween 20	0.2ml	0.4ml	0.2ml
7	Sodium benzoate	0.0001gm	0.0002gm	0.0002gm
8	Rose water	1ml	2ml	2ml
9	Glycerin	5ml	6.5ml	6.5ml

E. Method of preparation

The emulsion (o/w) was made using the formula. The oil component, which consists of coconut oil, almond oil, and Tween 20, is combined in a mortar for 10 minutes to produce a homogenous solution. The aqueous phase was made by combining aloevera gel, sandalwood extract, hibiscus extract, glycerin, and rose water in equal parts. Continuous titration introduces the oil phase dropwise into the aqueous phase. After each addition, rub vigorously and continuously until a click is heard. The preparation is put to the bottle's lid.[8]



Fig 15: Formulated F1,F2 and F3 face serum



Fig 14: Formulation of face serum

F. Result and Discussion

i. Physical Evaluation:-

The formulation's color and appearance were visually assessed. The formulation technique ensures consistent distribution of extracts. This test was confirmed by the visual appearance and touch.[21]

Table 3: Physical evaluation

Parameter	F1	F2	F3
Color	Light brown	Light brown	Light brown
Odor	Characteristics	Characteristics	Characteristics
Texture	Smooth	Smooth	Smooth

ii. Homogeneity:-

The homogeneity of the preparation was confirmed visually by the absence of particle matter and by touching the product. [22]

The prepared formulation F1, F2 and F3 was homogenous.

iii. Determination of pH Value:-

A pH meter was calibrated using a standard buffer solution. The pH of the mixture was determined after precisely measuring and dissolving almost 1 ml of the facial serum in 50 ml of pure water. The pH of the skin serum should be between 4.1 and 6.7 because the skin has an acidic pH range.[23]

It was found that the pH of the formulation F1,F2 and F4 was 5.5,5and 5.2 respectively .Given that the pH range of skin is between 4.1 to 6.7, this range of formulations is suitable for skin

iv. Cyclic temperature:-

These tests are not carried out at any specific temperature or humidity level. The temperature was changed on a daily basis during this test. To stimulate temperature variations, use room, frizzing temperatures.[24]

Table 4: Cyclic temperature

Srno	Parameter	F1	F2	F3
1	Room temperature	Stable	Stable	Stable
2	Freezing temperature	Stable	Unstable	Unstable

v. Phase Separation:

The preparation was stored in a closed container at ambient temperature (25-1000 °C) and shielded from light. After 24 hours, the phase separation was tested. Changes in phase separation were noted.[25]

The serum formulation F1,F2 and F3 was observed after 24 hours, and there was no phase separation.

vi. Viscosity:

It can be determined by Oswald viscometer. 10ml solution filled in Oswald viscometer. Flow of solution is observed in time A to B point in viscometer. At least 3 reading taken. These readings taken against water viscosity.[26]

The viscosity of serum formulation F1, F2 and F3 was found to be 205cp,250cp and 200cp respectively.

vii. **Globule size determination:**

To determine globule size, a drop of serum was diluted with water, placed on a glass slide, covered with a coverslip, and examined under a microscope using a stage micrometer[27]

The globule size of serum formulation F1, F2 and F3 ranged from 0.1-0.2 μ m. This spectrum of particles improves the formulation's penetrating capability, leading to faster and more effective result

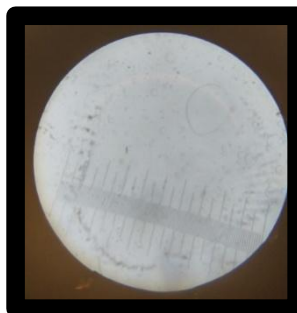


Fig 16: Globule size determination

viii. **Microbial contamination:**

The serum was inoculated on agar plates using the streak plate method, and a control was prepared by omitting the cream. The plates were then placed in an incubator and incubated at 37°C for 24 hours. The microbial growth was then compared to the control.[5]

The formulation was free of microorganisms, as they did not develop on the agar medium.

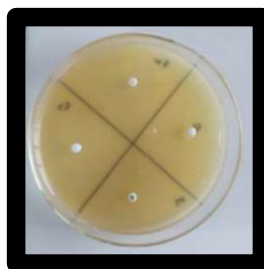


Fig 17: Microbial growth determination

CONCLUSION

The study explored an anti-aging face serum made from Hibiscus flower extract and Sandalwood extract, showing it as a promising natural alternative to traditional anti-aging treatments. Three different formulations were tested, with the first one proving to be the most stable and suitable for cosmetic use. The serum contains high levels of antioxidants that help fight oxidative stress, a major factor in skin aging. Tests confirmed its stability, appropriate pH for skin, and microbiological safety. These results indicate the serum could effectively reduce signs of aging like fine lines and wrinkles, meeting the rising demand for herbal skin care. The research emphasizes the benefits of Hibiscus and Sandalwood and suggests further exploration into herbal formulations in skincare. Future studies could look into combining other plant extracts and improving the serum's properties for better skincare solutions.

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