

Formulation and Evaluation of Strawberry Extract/Oil infused anti-aging and anti-pigmenting Face serum

Maria Khushnood¹, Freeha Hafeez^{1*}, Muhammad Suleman¹, Tayyaba Noor¹, Soha Siddique¹, Abu Bakar¹, Ruqaya Bano¹

¹Department of Chemistry, Riphah International University Faisalabad

Correspondence

Dr. Freeha Hafeez, PhD

1. ABSTRACT

Background: An array of cosmetics is the result of combining traditional medicine with modern beauty innovations. Herbal cosmeceuticals are becoming more and more popular as the usage of herbs for cosmetic purposes grows daily since they are very effective. The fruit *Fragaria ananassa*, known as strawberry, is used extensively in cosmetics, fragrance, and medicine. Our formulation's with strawberry extract has a high concentration of antioxidants and vitamin C. The herbal ingredients found in these products are what keep the skin healthy. One of them is facial serum, which is widely utilized for its many purposes.

Methods: The amalgamation of distinct stages, such as the oily and aqueous phases, amalgamates harmoniously to create an oil-

in-water emulsion via a dual emulsification process facilitated by controlled mechanical vibrations. Subsequently, the developed formulation underwent a comprehensive evaluation encompassing organoleptic, SPF contents, physicochemical, physical, phytochemical, irritancy characteristics, and photographic assessments.

Results: Due to its distinct method and oily texture, serum exhibits rapid absorption and penetration into the inner layers of the skin. They have a significant amount of active ingredients in their formulation. This anti-aging and anti-pigmenting serum stimulate collagen synthesis and rejuvenate the skin because aging of the skin is an intricate process brought on by a variety of causes. They also shield the skin from reactive oxygen species damage.

Conclusions: The basic purpose of this research is to assess the properties of anti-aging and anti-pigmenting face serums and optimize their formulation.

Keywords: Aloe vera, anti-ageing, anti-pigmented, cosmetic, face serum, herbal, strawberry.

2. INTRODUCTION

Throughout history, individuals have recognized the efficacy of harnessing botanical resources to fulfill their fundamental skincare needs, fostering a desire for products that yield an instantaneous enhancement in one's aesthetic appeal (Ichihashi & Ueda, 2003). The visage, serving as a reflective canvas of an individual's overall health, has been a focal point for maintaining a radiant and robust complexion, necessitating a diet abundant in carbohydrates, fats, and amino acids. In times past, women diligently adopted measures to preserve the distinctive traits of their skin types, displaying a keen interest in both their well-being and physical allure (Bahuguna, Bharadwaj, Chauhan, & Kang, 2020).

Cosmetics emerged as instrumental tools, employed not only to sustain but also to enhance and refine one's inherent attractiveness. The paramount advantage of incorporating herbal cosmetics lay in their organic and healthful approach, offering a natural remedy for enhancing appearance and addressing physical imperfections such as scars and acne (Soma et al., 2005). In the pursuit of crafting secure and efficacious cosmetic solutions, numerous studies have

delved into the exploration of bioactive compounds derived from plants. It is imperative for skincare products to possess the ability to permeate the skin with potent substances, ensuring the realization of the desired transformative effects (Buddeen, 2018).

In the course of our research, we have developed an herbal face serum designed to enhance skin elasticity, address pigmentation issues, improve skin texture, and bring about a radiant complexion. This face serum serves as a means to deliver valuable active ingredients to the skin, eliminating the need for harsh chemicals while providing rapid results (Sarin, 2016). It proves to be a beneficial method for administering a concentrated dose of hydrating and revitalizing skincare components (Huang & Lin, 2022).

Unlike traditional facial moisturizers, a face serum stands out for being lightweight as well as featuring an increased concentration of potent and advantageous components, such as hyaluronan or hyaronate, hydroxyacetic acid, vitamin B3, vitamin A, beta-hydroxy acid and ascorbic acid (Prausnitz, Schmuth, & Tsai, 2012). Renowned for their efficacy, face serums are commonly employed to address specific

skin concerns and types such as wrinkles, acne, dryness, and dullness. The diverse range of benefits includes brightening and moisturizing the skin (Babizhayev, 2017).

When incorporated into a regular skincare routine by applying a few drops to damp skin, face serums yield visible effects over time, typically within weeks. Their composition of small molecules allows them to be swiftly absorbed deep into the skin (Nilfroushzadeh, Salehi Moghaddam, & Zarrintaj, 2018). Notably, face serums contain abundant quantities of additional beneficial active ingredients and essential nutrients. This richness of components explains why face serums are often the most premium and sought-after products in a skincare regimen (Aburjai & Natsheh, 2003).

3. MATERIALS AND METHOD

3.1 Materials

The primary objective of this work is to harness the unique properties of each natural ingredient to create a potent and effective face serum. Strawberry extract brings its beneficial components, hyaluronic acid and niacinamide contribute to skin hydration and health, while cucumber extract and rose water offer refreshing and soothing qualities. Ethyl hexyl glycerin serves as a safe and

effective preservative, ensuring the longevity of the serum. The inclusion of different oils like almonds, vitamin E, aloe vera, tea tree, jojoba and rose hip aims to nourish and rejuvenate the skin, promoting a clear and glowing complexion. All these materials were purchased from Amazon.com and Daraz. All the used materials were of suitable analytical grades (Gamare & Yeole, 2022).

3.2 Method of Extraction

Strawberry extraction: 100 grams of fresh strawberry slices were used. Place the formulated herbal ingredients within a sterile glass jar to maintain cleanliness. Subsequently, carefully coat the strawberry slices uniformly with 90 grams of vegetable-derived glycerol, serving as a solvent. This step ensures that the glycerin effectively extracts and preserves the beneficial components from the strawberries, contributing to the overall potency and efficacy of the herbal face serum. Seal the jar airtight with a lid. Store the prepared mixture at room temperature for one month, ensuring to shake it every other day. This resting period allows for the infusion of the herbal ingredients and the extraction of their beneficial properties into the solvent, in this case, the vegetable glycerin. After the one-month duration, proceed to filter the

strawberry extract. Begin the filtration process by passing the mixture through a strainer with small holes, effectively separating the liquid from any solid remnants. Subsequently, conduct a secondary filtration using cheesecloth to refine the extract further. Finally, carefully pour the homemade strawberry extract into a clean glass jar bottle, ensuring proper sealing to preserve its freshness and efficacy (Aggnihotri, 2021).

Aloe Vera gel extraction: Fresh and clean aloe vera gel was collected from aloe vera plant.

Table 1: Composition of strawberry extract infused face serum

Sr. No	Ingredients	Percentage
1	Strawberry extract/oil	30
2	Cucumber extract	10
3	Hyaluronic acid	5
4	Niacinamide powder	5
5	Vitamin C powder	5
6	Rose hip oil	10
7	Aloe vera oil	10
8	Almond oil	5
9	Vitamin E oil	5
10	Tea tree oil	5
11	Glycerin	5
12	Rose water	5

3.3 Emulsion preparation

An emulsion was prepared according to the given formula below.

Oily phase: Tea tree essential oil, rose hip seed oil, aloe vera extract oil, almond oil, vitamin E oil as well as strawberry oil.

Aqueous phase: Strawberry extract, distilled water, hyaluronic acid powder, niacinamide powder, vitamin c powder, cucumber extract, aloe vera gel, glycerin and small amount of rose water.

Formulating an oil-in-water emulsion through a dual emulsion entails systematically introducing the oil component into the liquid phase in droplet format, this process known as emulsification. This is achieved by injecting the oil phase drop by drop into the liquid phase under the influence of mechanical vibration, typically at a rate of 1500 revolutions per minute (rpm) (Priani, Aprilia, Aryani, & Purwanti, 2019).

3.4 Evaluation of face serum

3.4.1 Organoleptic evaluation

Stability studies for the developed formulation adhere to the guidelines set forth by the ICH of Technical Requirements for Pharmaceuticals for Human Use (ICH). In the initial phase, a short-term accelerated stability study spanning a few months was

conducted to assess the robustness of the formulation under challenging conditions. The samples were subjected to varying temperatures, including storage at 4°C, at a temperature of 25°C accompanied by a relative humidity of 60%, and at 40°C with a relative humidity of 75% (Ghotkar et al., 2018).

3.4.2 Moisture content evaluation

To assess moisture content, the following procedure was employed: After thorough washing and drying of the hands, the initial moisture reading of the skin was recorded by touching the probe to the skin. Subsequently, on the following day, the product was applied to the skin, followed by washing. On the subsequent day, the moisture reading was once again recorded by placing the probe in contact with the particular area where the serum's moisturizing characteristic was being examined. This method allowed for the evaluation of the serum's impact on skin moisture levels over the course of the testing period (Eberlin et al., 2009).

3.4.3 Melanin determination

Melanin deterioration was assessed using a mexameter. Initially, the probe was applied to washed and dried hands to record baseline melanin levels. Subsequently, a serum was

consistently applied to the skin for seven days. After this period, the mexameter probe was used again to measure melanin levels in the area of application, providing insights into the serum's impact on melanin over the specified timeframe (Thakre, 2017).

3.4.4 Irritancy determination

In the study, a defined area was treated with a predetermined quantity of the formulated face serum, and the duration of application was recorded. The evaluation focused on assessing and analyzing any swelling or irritation that may have occurred as a result of the serum application (Kanlayavattanakul & Lourith, 2015).

3.4.5 pH determination

The pH meter calibration was conducted using a standard buffer solution. Subsequently, approximately 1 milliliter of the face serum was precisely measured and dissolved in 50 milliliters of purified water. Subsequently, the pH of the resultant blend was ascertained. It is noteworthy that the pH of the skin serum falls within the acidic range of 4.1 to 5.5, aligning with the natural acidic pH of the skin (Rokade, Vidhate, Kale, & Somani, 2024).

3.4.6 Viscosity determination

The rheological properties of the serum formulation were evaluated using a Brookfield Viscometer. Measurements were taken at 10-day intervals, covering the entire speed range. The assessment began at 10 revolutions per minute (rpm) and proceeded in a stepwise manner, decreasing speed after 30 seconds between each subsequent speed setting. This approach allowed for a comprehensive analysis of the formulation's rheological behavior over time and across various speeds (Gyawali & Paudel, 2022).

3.4.7 SPF determination

The SPF of the formulated face serum, enriched with strawberry oil, was assessed using a UV lamp. This process involves measuring the serum's ability to protect the skin from ultraviolet light, offering insights into its sun-blocking effectiveness (Gong, 2019).

3.4.8 Phytochemical evaluation

The concentration of several phytoconstituents was assessed in the herbal face serum aqueous extract using established protocols (Gao & Lv, 2021).

3.4.9 Photographic evaluation

A qualitative investigation has been carried out to determine the ultimate efficacy of the

depigmentation product. A human subject in this trial with a pigmented face was instructed to apply the recently developed strawberry face serum for 45 days. The subjects' side faces were photographed at the start and finish of the fifteen, thirty, and forty-five day anti-aging product use periods.

4. RESULT AND DISCUSSION

Following evaluation parameters were performed to ensure the superiority of strawberry extract/oil infused face serum.

4.1 Organoleptic evaluation

Visual scrutiny was utilized to appraise the created serums for uniformity and physical features like visual presentation, hue, fragrance, and consistency.

Table 2: Organoleptic evaluation

Sr. No	Parameters	Observation
1	Appearance	Cloudy
2	Color	Pink
3	Smell	Good
4	Texture	Gel like

4.2 Melanin and moisture content evaluation

Table 3 displays the melanin and moisture content on skin after using face serum.

Table 3: Melanin and moisture content evaluation

Sr. No	Parameters	Day 1 st	Day 8 th
1	Melanin	390%	220%
2	Moisture	102.6%	105.2%

4.3 Irritancy evaluation

Table 4 displays the irritancy test findings. In irritancy testing, the formulation exhibited no redness, swelling, or irritation. It is suitable to apply this serum to the skin.

Table 4: Irritancy evaluation

Sr. No	Parameters	Observation
1	Swelling	No
2	Redness	No
3	Irritation	No

4.4 pH and viscosity evaluation

Table 5 displays the results of pH and viscosity of formulated strawberry oil/extract infused face serum.

Table 5: pH and viscosity evaluation

Sr. No	Parameters	Day 1 st	Day 20 th
1	pH	4	3.8
2	Viscosity	15113	15567

4.5 SPF evaluation

The face serum infused with strawberry oil/extract exhibits a high level of sun protection, with an SPF of 40, indicating a strong UVB block of 98%. This underscores

the serum's effectiveness in providing substantial protection against the harmful effects of ultraviolet radiation.

4.6 Phytochemical evaluation

Strawberry oil/extract infused face serum was evaluated for phytochemical parameters as shown in table 6.

Table 6: Phytochemical evaluation

Sr. No	Phytoconstituents	Observation
1	Alkaloids	+
2	Phenols	+
3	Tannins	-
4	Flavonoids	+
5	Glycosides	+
6	Lipids	-

4.7 Evaluation through photography

Participants applied the recently formulated depigmented strawberry oil-infused facial serum for a period of 30 days. At both the onset and conclusion of this period, photographs of the subjects' side profiles were taken to document any observable effects or changes resulting from the use of the anti-aging product.



Figure 1: All five formulated face serums



Figure 2: Appearance of formulated face serums



Figure 3: Before using face serum

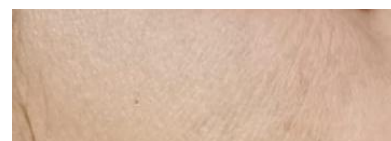


Figure 4: After using face serum



5. CONCLUSION

The study's objective was to create and assess a herbal strawberry extract serum with anti-aging and anti-pigmentation properties. With the use of glycerin and a Storing system, the antioxidant- and vitamin-rich strawberry fruits were successfully extracted. The aloe vera gel that is utilized has both calming and anti-aging qualities. Both formulas produce a uniform texture, a light pink color, and have oily qualities when the final serum composition is evaluated. Both formulations provided a pH value that was within the typical skin pH range without the need for any pH adjustments. In addition, the serum formulation in the cosmetic serum stability research remained stable at room temperature and showed SPF 40, that is a complete UVB block following the first week of use. It was discovered that the spread ability was good, that no residue formed, and that it was simple to wash off. The effectiveness and safety of the created cosmetic serum were demonstrated by every evaluation study.

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