Formulation and evaluation of fairness serum using polyherbal extracts

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Abstract

A face serum is a lightweight skincare product that contains a higher concentration of active ingredients compared to typical facial moisturizers. Serum has the property of rapid absorption and the ability to penetrate the deeper layers of the skin, together with its non-greasy finish and the intensive formula with a very high concentration of active substances. The fairness Serum has a super-special blend of active natural ingredients to penetrate the skin‟s epidermis and color cells, resulting in a fair complexion and skin tone. In addition, it has skin-smoothing ingredients to improve skin texture and leaves skin soft, fair, and silky smooth. The serum was prepared using extracts of *Glycyrrhiza glabra*, *Crocus sativus*, Rice bran oil, olive oil, and green tea extract. The various evaluation parameters like physical chemical and biological were performed and it is found that the optimized formulation has a good spreadability and antibacterial action against acne-causing bacteria. Skin irritation studies proved that it was non-sensitizing and free from any contamination.

Keywords: - Cosmetics serum, Glabridin, Rice bran, Green tea.

INTRODUCTION

The body's largest and most vital organ, the skin is steadily working to recover and maintain itself. The outermost layer of the skin is the epidermis and the innermost is the dermis. For several reasons, including UV radiation and pollutants, dry patches of skin can periodically form. Overnight wear of makeup can also irritate or trigger an allergic reaction. Skin care-protecting cosmetics are available all over the world in many spectrums such as gel, sunscreen lotion, face cleansers, skin serums, and anti-pigmentation creams [1]. Serum is a skin care product with a gel, light lotion, or hydrating consistency that can penetrate the skin more deeply to deliver active ingredients. A highly concentrated product based on water and oil is a cosmetic serum. It has an extremely high concentration of an active ingredient. The serum gives your skin a smoother, denser texture, decreases pore generation, moisturizes deeply, prevents wrinkles, and acts as an anti-aging skin product [2]. Many more natural herbs are advised by Ayurveda for a variety of skin problems. Skin-lightening products form a major segment of cosmetic products worldwide and carry with them the promise of flawless skin free from age spots, blemishes, and scars. The demand for "skin fairness products" is rooted in the need to eliminate localized hyperpigmentation as well as to lighten the general skin tone. In Western countries, people wish to eliminate or inhibit the development of irregular pigmentation including melisma (chloasma or localized discoloration), age spots (Lentigo senilis), or liver spots (associated with sun damage or aging sometimes appearing as raised spots or Seborrheickeratoses) and freckles (Lentigoaestiva) [3]. Up to 10% of skin cells in the innermost layer of the epidermis produce a dark pigment known as melanin. The type and amount of melanin synthesized by the melanocyte, and its distribution pattern in the surrounding keratinocytes, determines the actual color of the skin. Melanin forms through a series of oxidative reactions involving the amino acid tyrosine in the presence of the enzyme tyrosinase [4]. The roots and rhizomes of liquorice (Glycyrrhiza) species have long been used worldwide as herbal medicine and natural sweetener. Glabridin and isoliquiritigenin present in the liquorice extract inhibit the T1 and T3 tyrosinase isoenzyme activity and therefore serve as a skin-lightening agent for medicinal and cosmeceutical purposes [5].

Rice bran is a by-product from the milling process of Paddy rice to produce polished rice. It contains 12-20% of total kernel weight including pericarp, seed Coat, nucellar layer, aleurone layer, embryo, and Outer portion of the starchy endosperm. Rice bran is the most nutritious part of rice and a good source of bioactive phytochemicals such as γ-oryzanol, Tocopherols, and tocotrienols; which have health Beneficial properties and antioxidant activity. Rice Bran oil contains a little variable quantity of Tocotrienols and is naturally very rich in tocopherol.

The antioxidant activity of derivatives of rice Bran makes its presence in the cosmetic industry [6]. Olive oil is the fixed oil expressed from the fruits of the tree Olea europea. The major constituents are Triolein, tripalmitin, trilinolein, tristearate Monostearate, triarachidin, squalene, β-sitosterol, and tocopherol. It is used as a solvent, in skin and hair Conditioner, fatty acid penetration enhancer, oleaginous excipient in oral, topical, and parenteral Solutions.

The antioxidant property of olive oil Constitutes its part in cosmetic formulations [7, 8]. Saffron, Crocussati us Linn, (Iridaceae), a precious Spice that comprises yellow colored ‘Stigma‟ of the flowers. Three main chemical Compounds include the bright yellow coloring Carotenoids (water-soluble α-crocin); a bitter taste, Picrocrocin (A glycoside of safranal); a spice Aroma, safranal [9]. The antioxidant activity is mostly Due to the presence of crocin as it scavenges free Radicals, mainly the superoxide anions which make it a suitable ingredient in cosmeceuticals. Cosmetic Serum is a highly concentrated product based on water or oil. Serums, or concentrates, contain approximately ten times more biologically active substances than creams, therefore quicker and more effective coping with cosmetic problems. Serums act locally upon different body Parts: face, neck, decollete, and eyelids. They can be used irrespective of age [10].

Polyphenols are antioxidant molecules found in many foods including nuts, fruits, vegetables, chocolate, wine, and tea. Polyphenols have antimicrobial, anti-inflammatory, and antineoplastic properties. Recent studies suggest that tea polyphenols may be used for reducing sebum production in the skin and for the treatment of acne vulgaris. Green tea is produced from fresh leaves in such a way that prevents oxidation of polyphenolic components (mainly catechins), oolong tea polyphenols are partially oxidized, while polyphenols in black tea undergo a high degree of oxidation. Epigallocatechin gallate (EGCG) is the most abundant catechin found in green tea and has been shown to have antibacterial beneficial health effects on the skin. EGCG has a potential antibacterial action against various gram-positive and gram-negative bacteria like staphylococcus aureus and E. coli [11]. This study aimed to formulate a polyherbal serum by mixing the Extracts of liquorice, rice bran, saffron, and olive oil, which was intended to produce rapid fairness action.

MATERIALS AND METHODS

Materials

Samples of the dried roots and rhizomes of Glycyrrhiza glabra L., Crocus sativus L, and Camellia sinensis were collected from the local market, other chemicals required were procured from Loba Chemie. Mumbai.

Methods

Extraction of active constituents

Aqueous extract of liquorice: 50 g of the powdered dry roots of liquorice were placed in 300 ml of distilled water and macerated for two days, filtered, concentrated under reduced pressure, and stored in cold condition for further use [12].

Polymer extract of liquorice: 50 g of the powdered herb was placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the Soxhlet extractor. The Soxhlet Extractor is placed onto a flask containing the Extraction solvent i.e.; using 500 ml PEG + Water (100+400) until it gets exhausted. The extract is filtered, concentrated under reduced pressure, and stored in cold conditions for further use [12].

Aqueous extract of rice bran: 50 g of rice bran was placed in 300 ml of distilled water and macerated for two days, filtered, and stored in cold conditions [13].

Extraction of rice bran oil: 50 g of rice bran was Placed in 250 ml of hexane and macerated for two Days. It was filtered and kept for solvent removal in the Soxhlet extractor. The obtained oil is stored in cold conditions [14].

Aqueous extract of saffron: 1 g of the floral stigmas were placed in 25 ml of distilled water and percolated for two hours by applying heat, filtered, and stored in cold conditions for further use [15].

Aqueous extract of green tea

Defatting of tea Coarsely powdered air-dried leaves of green tea (250 g) was placed in a glass-stoppered conical flask, macerated with a sufficient quantity of petroleum ether shaking frequently, and allowed to stand for over two nights. The completion of the defatting process was confirmed by performing a spot test on ordinary filter paper. The solvent from the defatted tea powder was then removed by filtration and dried. Dried tea powder was stored in an air-tight container until subjected to further extraction process.

Maceration

About 100 g of tea powder defatted previously was macerated with 200 ml ethanol in an Erlenmeyer flask for 6, 12, 24, and 48 hours respectively [16].

Formulation of fairness serum:

Mechanical Homogenization methods: -The oil extracts of Vitamins E oil, rice bran oil, and polymer extract of liquorice were taken and size was reduced by mechanical homogenization. The different aqueous extracts of liquorice, rice bran, green tea, and saffron were mixed properly in sufficient quantity and were added little by little into the size-reduced oil extracts in the homogenizer and triturated until it forms a thick, clear liquid. The preservatives methyl paraben and propyl Paraben added in the formulation were in the proportion (1:1). Suitable quantity of perfume was added as a flavouring agent [17].

Table 1: Formulation of face serum.

Sr.no.	Ingredients	Quantity
1	Aqueous extract of liquorice	15 ml
2	Polymer extract of liquorice	10 ml
3	Aqueous extract of rice bran	26.6 ml
4	Rice bran oil	3.6 ml
5	Aqueous extract of saffron	15 ml
6	Green tea extract	2 ml
7	Vitamin E	19 ml
8	Methyl paraben & Propyl paraben	1%
9	Perfume	Qs.

Evaluation of fairness serum:

Physical evaluation

Color and appearance: The color and Appearance of the formulation were observed visually.

Homogeneity: The formulation produced a uniform distribution of extracts. This was confirmed by visual appearance and by touch.

Rheological studies: The viscosity of the formulation Was determined by Brookfield viscometer at 30 rpm, using spindle 2. The serum was taken in a beaker and the spindle was dipped in it then the readings were taken [18].

Spreadability: Spreadability denotes the extent of the area to which the serum readily spreads on application to the skin or the affected part. To simulate human skin, Fisher brand filter Paper was chosen. Each filter paper weighs within milligrams of any other sheet of that size and type. A Becton Dickinson & Co. (BD) 5ml latex syringe without the needle attached

was used. Liquid pushed out of the needle attachment end of the BD syringe formed very uniform drops. Each drop is approximately 0.03 grams in weight. Standard aluminum foil is used as a base to lay the filter paper for testing [19].

The Spreadability:

a. Begin the test by putting a new sheet of aluminum foil (that is larger than the filter paper) onto the lab surface bench.

b. Choose a filter paper type (P5 or P2) and weigh the sheet as accurately as possible. Record this weight as W1.

c. Measure and record the total area of the filter paper. Record this measurement as A1.

d. Carefully place the filter paper in the center of the aluminium foil sheet. Do not bend, fold, or alter the filter paper in any way. It must remain flat to prevent preferential spreading in folds or creases.

e. Choose the formulation to be tested and draw several milliliters into the BD 5mL syringe.

f. Holding the syringe over the center of the filter paper carefully push out exactly 20 drops.

g. When the 20^{th} drop hits the filter paper, start a timer or stopwatch to count down for exactly 10 minutes.

h. When 10 minutes have elapsed, remove the filter paper from the aluminium foil base and, using scissors, cut the saturated portion of the filter paper away from the remaining dry section. Be very careful to cut exactly on the line between saturated spread and dry filter paper. A single-edge razor blade could be used for a more precise cut. The better the cutting, the better the test results.

i. Weigh the remaining dry (unsaturated) filter paper. Record this weight as W2.

j. Measure the diameter of the saturated portion of filter paper. If the spread was not a perfect circle, then take several diameter readings around the spread area and determine an average diameter. Record this measurement as A2.

To determine the percent spread by area, calculate as follows:

% Spread by Area = (A2/A1)100

Redispersion test: This was done by using the micro centrifugation method. The formulations were centrifuged for 3 minutes at 2000 rpm. After centrifuging, the product was shaken and noted for redispersion. If it is redispersed, the formulation is found to be good.

Chemical evaluation:

pH of the serum: - The pH meter was calibrated using a standard buffer solution. About 1 ml of the serum was weighed and dissolved in 50.0 ml of distilled water and its pH was measured [20].

Biological evaluation:

Test for microbial growth in formulated serum: The formulated serum was inoculated on the plates of agar media by streak plate method and a control was prepared by omitting the cream. The plates were placed into the incubator and incubated at 37°C For 24 hours. After the incubation period, plates were Taken out, and check the microbial growth by comparing with the control [20].

Globule size determination: Serum was analyzed under a microscope to confirm the globule size. A drop of serum was placed on the glass slide and diluted with water and covered by a glass cover and was observed under the microscope [21].

RESULTS AND DISCUSSION

Physical appearance: Serum formulation was brownish yellow viscous liquid preparation with a smooth homogeneous texture and glossy appearance. Consistency was found to be good.



Figure 1. The physical appearance of prepared serum.

Physical evaluation: The formulation was redispersed within seconds after doing the redispersion test. The percentage spread by area was found to be 60.9%..

Chemical evaluation: The pH of the formulation was found to be 5.5. As the skin is having an acidic pH of around 4–6, this pH range of the formulation is suitable. The viscosity was in the range of 2304cps.



Figure 2: determination of pH.

Biological evaluation: The skin irritation studies revealed that the formulation was non-sensitizing and safe for use.

Test for microbial growth in formulated serum: The formulation was free from microbes as there was no growth after incubation in the agar medium.



Figure 3: Microbial growth result.

Stability studies: The formulation undertook Stability studies for physical and chemical change. No considerable variations in the properties of the Formulation were observed. The results are shown in the table [22].

Table 2: Stability Studies of prepared serum.

Temperature	Evaluation parameter		Observation (months)	
		0	1	2
	Visual appearance	Brownish-yellow	Brownish-yellow	Brownish-yellow
3-5°C	Phase separation	No	No	No
	Homogeneity	Good	Good	Good
	Visual appearance	Brownish-yellow	Brownish-yellow	Brownish-yellow

Room temp. (25°C RH=60)	Phase separation	No	No	No
	Homogeneity	Good	Good	Good
	Visual appearance	Brownish-yellow	Brownish-yellow	Brownish-yellow
40ºC±2 RH=75%.	Phase separation	No	No	No
	Homogenecity	Good	Good	Good

Globule size determination: The globule size was found to be in the range of 0.1- 0.2µm. This range of particles enhances the penetrating power of the formulation which results in a better and fast effect.

CONCLUSION

The study aimed to formulate and evaluate extracts of different herbals into a serum for fairness activity. The roots of liquorice, saffron, rice bran, and green tea were successfully extracted with hexane, acetone, chloroform, ethanol, and water and PEG. Stability studies revealed that there was no significant difference in the physical and chemical parameters. Thus, the formulation was found to be Stable for three months. A biological evaluation of the serum revealed that the formulation is non-sensitizing and safe for use. The spreadability was found to be good. No residues were formed and was easy to wash Out. The pharmacological evaluation of serum proved that it produces the fairness action within a week along with the antibacterial action.

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