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FORMULATION AND CHARACTERIZATION OF NOVEL DE-PIGMENTING HERBAL FACIAL SERUM INCORPORATED WITH SAFFRON AND LEMON OIL

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ABSTRACT

Cosmetics nowadays are in high demand. Out of these cosmetics, herbal cosmetics are most preferred due to their lesser extent of side effects. Herbal cosmetics are widely used due to the infinite number of uses for daily purposes. Several different types of cosmetics formulations are available in the market like serums, face creams, lotions, etc. In this article, we have described herbal face serum which is formulated using various active herbal ingredients. Herbal formulated serum was an oil-in-water emulsion type. The goal of the development of this formulation was for its various applications like depigmentation, anti-aging, skin brightening, skin tightening, nourishing and soothing, and many more. This formulation is very effective due to the combination of active ingredients in this formulation. The key ingredients used for the formulation are Saffron, aloe Vera, olive oia, and lemon oil. These ingredients have numerous positive impacts on the skin. The evaluation parameters performed for this formulated product were physical tests, pH tests, Spreadability, microbial count tests, and penetration test. All the tests were positive and the formulated serum was safe to use and stable on storage.

KEYWORDS: Face serum, Saffron, Depigmentation, Herbal, Lemon Oil, Aloe Vera.

INTRODUCTION

According to the Drugs and Cosmetics Act of 1940 and its Regulations of 1945, cosmetics are defined as any article aimed at cleaning, beautifying, promoting attractiveness, or changing the appearance of any part of the human body, or to be used as a component of cosmetics. The skin is the most distant and superficial part of the body. It accounts for about15–20% of the body mass. The largest body organs that fight for healing and repair themselves are our skin, but sometimes skin can develop many skin problems such as dryness, dark spots, pigmentation, acne, wrinkles, etc. due to UV rays, pollutants, dust and dirt, excessive use of harmful chemicals, makeup that remains overnight, etc. In the present work, it has been done to develop and evaluate such treatments to combat these skin conditions. Skin serums are a cosmetic preparation that brings therapeutic active ingredients into the skin to eliminate the use of harmful chemicals and protect the skin by bringing immediate results. Cosmetic serums are as concentrated as other creams, based on water or oil. Serum is defined as a concentrated product that contains 10 times more organic substances than cream. A good facial serum can provide your skin with a luminous and soft texture, reduce pore size, hydrate the skin and maintain moisture. Whether it is a moisturizer, anti-aging, it should contain. antioxidants, and cell compatible components. Herbal cosmetics are also known as natural cosmetics or organic cosmetics. They contain biological active principles and ingredients from herbs or any part of herbs. In recent years, the demand for herbal cosmetics has grown worldwide due to their light effect and non-toxic nature. Herbal or organic extracts are preferably used to formulate safe cosmetics. Herbal extracts are herbs extracted, which play an important role in moderation. It is now increasingly used as a substitute in cosmetics, foods and alternative drugs. An increase in interest in herbs is part of the movement to improve health conditions. The purpose of this study was to formulate natural face serums with the help of saffron, aloe vera, rose water and other beneficial ingredients to produce depigmentation, anti-aging, fairness and other beneficial effects. Aloe vera plants have been widely used for centuries for their health, beauty, medicinal, and skin-care properties. It acts as an astringent to seal pores. Its moisturizing effect is also studied in the treatment of dry skin. It reduces the appearance of fine wrinkles and has anti-acne effect. Other ingredient is saffron is known for their use as cosmetics because it is beneficial to human skin. Saffron can produce a variety of skin applications such as antioxidants, de-tanning, inflammation, aging, dark spots, face toner, etc. The next important active substance used is rose water. Roses have been used for cosmetics for centuries and have evolved into modern skin care products. It has beneficial effects such as anti-aging, anti-inflammatory, skin whitening, anti-aging, skin

moisturizing and much more. It also treats acne, rash, clears pores caused by eczema and helps it to heal. The objective of this research is to provide a cost-effective herbal face serum that has numerous therapeutic applications to avoid side effects for all types of skin. Moreover, dermatologists and subsequent studies have shown that serum provides real skin illumination. Serums are an excellent way to instantly improve the signs of aging of the mature skin and provide glowing effects on the skin.

Type of serum

The type of serum used in our formulation is a face serum based on emulsion. Emulsion is a preparation that mixes two insoluble liquid phases using emulsifiers such as gums. The emulsifier used in the formula functions to combine water and oil and maintain its stable state. The prepared emulsion is an oil-water (O/W) emulsion. This emulsion serum preparation is intended to produce long-term effects. This is done by injecting high-performance active ingredients into the skin. This serum preparation is designed to be suitable for all types of skin, i.e. oily, dry, and rough, etc. This herbal serum is prepared keeping in mind the motives of user care and provides a moisturizing effect and strengthens the skin. This herbal serum helps to seal the hydration of the skin and maintain the moisture of the skin. Unlike face creams, this herbal face serum does not leave layers on the skin, so it absorbs into the skin and performs the desired functions.

Ideal qualities of Herbal face serum

- It improves and enhance skin tone.
- Hydrates skin
- Prevents acne.
- Prevents skin ageing.
- Moisturizes skin.
- Control skin inflammation.
- Keeps skin healthy.
- Treats pigmentation, blemishes, scars, dark circles, and puffy eyes.
- Enhance skin glow.
- Soothes irritated skin.
- Brightens skin and exfoliate it.

Pros of face serum

- It brightens the skin tone and enhance the glow of skin.
- Minimizes skin pores.
- It hydrates all types of skin.
- It is cost effective.
- Easy to use.
- Does not leave any thick or sticky layer on the skin.

Cons of face serum

- It may not be suitable for the person suffering from certain skin disorders like psoriasis, eczema, etc.

MATERIAL AND METHOD

Saffron

The English word saffron may have originated from the old French word Safran from the 12th century, from the Latin word *safranum*. Saffron and its main chemical components have traditionally been used as pharmaceuticals. Although it plays an important role in cosmetics. Saffron is the most expensive herb in the world and is obtained from the stigma of the flower of ***Crocus sativus L***. belonging to the ***Iridaceae*** family. The dried stigma of the saffron species is known for its importance in the pharmaceutical, cosmetics, textiles, perfumery, food and dyeing industries. The active chemical ingredient of saffron is safranal, which produces aroma.

The saffron also contains non-volatile phytochemicals, including the most biologically active components of - and -carotene zeaxanthin, lycopene, -carotene and -carotene. The yellow- orange colour of saffron is the main result of -crocin. Saffron loses its flavour within six months if it is not stored in an air-tight, cold and dark place. The storage of the freezer can preserve the taste for up to two years.

Aloe Vera gel

Aloe Vera gel is extracted from the leaves of aloe vera. The health, beauty, medicinal and skin care properties of the Aloe Vera plant have been known for centuries. The Arabic word "Alloeh" means "a shining bitter substance" and the Latin word "Vera" means "truth". In 2000, Greek scientists considered Aloe Vera to be the universal cure. The botanical name of Aloe Vera is ***Aloe barbadensis miller***. It belongs to the ***Asphodelaceae*** (***Liliaceae***) family, and is a shrub or tree, perennial, xerophytic, succulent, green-pea-coloured plant. It is mainly cultivated in dry areas in Africa, Asia, Europe and the United States. It is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu. The plant has triangular fleshy leaves with serrated edges, yellow tubular flowers and fruits, including many seeds. Aloe Vera contains 75 potentially active components: vitamins, enzymes, minerals, sugars, amino acids, lignin, Saponin, salty acids, and amino acids.

Rose Water

Roses are used in medicine, nutrition and perfumery. These perfumes are made from rose oil, a mixture of volatile oils and essential oils obtained from steam distillation of rose petals. Roses are one of the most important groups of ornamental plants, representing inspiration, purity, love, happiness and beauty, known as the “gift of angles” or “queen of flowers.” Rose petals, oils and water are used for health, beauty, medical, nutritional and skin care properties. Most rose flower varieties are grown in Asia and Europe some of the species are ***Rosa centifolia, Rosa chinensis, Rosa rugosa, Rosa Alba L. Rosa damascena Mill. Var. Alba,*** etc. Its composition is high in terpene alcohol, most of which are citronellol and geraniol, nerol, and linalool. It

has vital role in aroma therapy and recent studies says that it has anti-viral and anti- bacterial properties. Rose extracts act as antioxidant.

Lemon oil

Lemon tree is one of the small evergreen trees which grows up too few meters. It generally grows in southern regions of India. Lemon oil is an essential oil obtained from natural extracts of peels of lemon fruit. The biological source of lemon is ***Citrus Limon*** belonging to family ***Rutaceae***. Lemon oil is extracted from the peels and rind of the lemon fruit by method like steam distillation. The oil generally yellowish green in color with intense lemon aroma which is used for aromatherapies. Citrus oils contain various chemical constituents like limonene, monoterpenes, hydrocarbons, volatile oil, and coumarin. These chemicals play vital role in photosensitization of skin. It is termed to be essential oil due to presence of high amount of antioxidants. Thus it has wide range of applications in cosmetic products, food and aromatherapy. Lemon oil produces antiviral and antibacterial properties and hence it is also used as a preservative. Lemon oil is extracted from the peels and rind of the lemon fruit by method like steam distillation.

Olive oil

Olive oil obtained from whole olives of the fruit ***Olea europaea*** has its uses in food and cosmetics. It is also being used in several pharmaceuticals. Olive oil is used for its soothing and moisturizing effect. It has its own effects like hydrating skin, reduce dryness of skin, etc. It also contains vitamins and antioxidants. In this formulation olive oil is used as a carrier oil along with lemon oil.

Glycerine: It is used as humectant. It is a substance which allows skin to retain moisture. It prevents skin dehydration, overcomes dryness, refresh skin surface. Glycerine removes the impurities from the clogged pore of skin. Thus, it also de-tans the skin.

Emulsifier: For the skin cosmetics containing aqueous phase and oily phase gums are the essential components used for preparation of homogenous mixture. In present formulation xanthan gum is used as an emulsifying agent.

Vitamin E: It is used as an antioxidant which prevents the formulation from oxidation. It also reduces the action of free radicals caused by sun rays and action of pollutants.

Material and collection

Sr. No	Ingredients	Collection
1.	Saffron	Local market
2.	Aloe Vera gel	S.N.D. college of agriculture
3.	Olive oil	S.N.D. college of pharmacy
4.	Lemon oil	S.N.D. college of pharmacy
5.	Glycerine	S.N.D. college of pharmacy
6.	Rose water	Local market
7.	Vitamin E	Local market
8.	Xanthan gum	S.N.D. college of pharmacy

Method of extraction

- **Preparation of saffron extract**

Extract of saffron with rose water: 10g of dried floral stigmas were roast lightly for two minutes and triturated to form a powder. The powder was added in 25ml of fresh rose water and percolated for two hours by applying heat, filtered and stored in cool place for further use.

- **Preparation of aloe Vera gel**

Fresh leaves of aloe vera was washed by keeping in hot water for half hour. Then aloe vera was peeled out and gel was extracted from leaves. The extract was blended for an hour by electric shaker and strained. For 85gm of aloe vera gel 1.28gm of xanthan gum was mixed and blended again for 5 minutes. It was stored in cool and dry place for further use.

Formulation of trial batches using different concentration of excipients.

Ingredients	Category	Batch code for 30ml					Measure of unit
		F1	F2	F3	F4	F5	
Saffron	De-pigmenting agent	5	5	**10**	10	15	gm
Aloe Vera gel	Moisturizer	10	10	**10**	15	25	gm
Olive oil	Anti-oxidant	5	2	**1.2**	2	1	ml
Lemon oil	Aromatic	5	2	**1**	3	2	ml
Xanthan gum	Emulsifier	0.2	0.5	**0.2**	0.2	0.5	gm
Glycerine	Humectant	5	15	**5**	10	10	ml

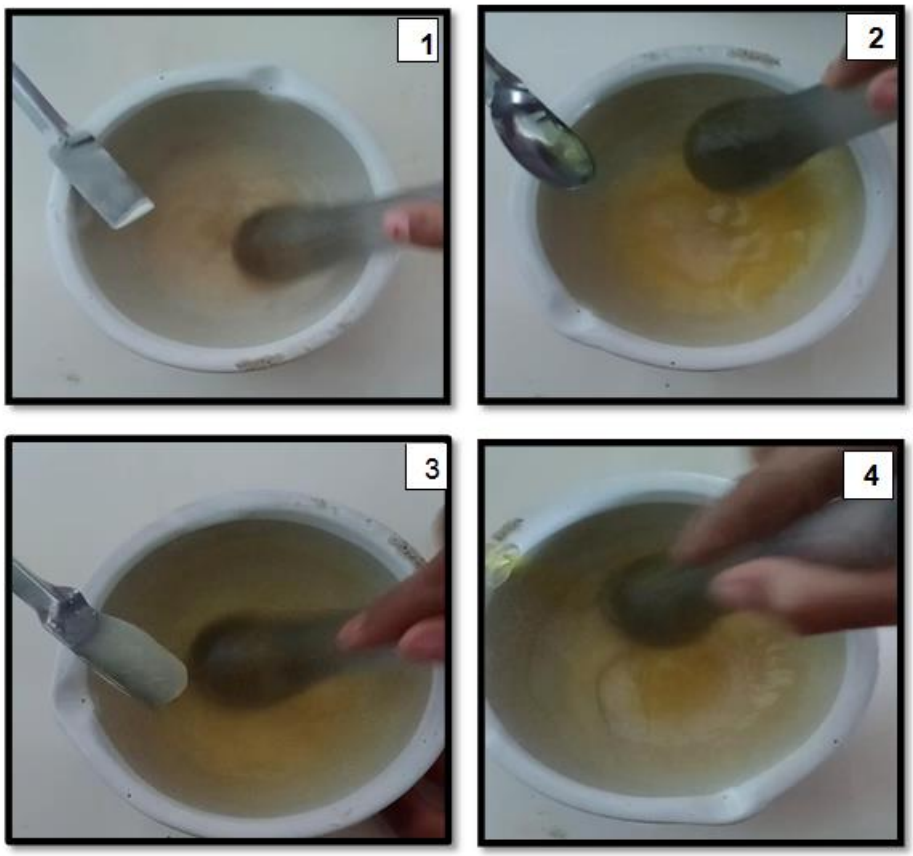
Rose water	Anti- inflammatory	q.s	q.s	**q.s**	q.s	q.s	ml
Vitamin E	Preservative	0.4	0.5	**0.4**	0.5	0.2	ml

Method of preparation

Sr. No.	Ingredients	Collection
1.	Saffron	Local market
2.	Aloe Vera gel	S.N.D. college of agriculture
3.	Olive oil	S.N.D. college of pharmacy
4.	Lemon oil	S.N.D. college of pharmacy
5.	Glycerine	S.N.D. college of pharmacy
6.	Rose water	Local market
7.	Vitamin E	Local market
8.	Xanthan gum	S.N.D. college of pharmacy

- Procedure for face serum

1. The formulation was prepared according to formula by wet gum method.
2. Firstly, emulsion was prepared by mixing rose water in two parts. In the first part of rose water, emulsifier was triturated.
3. Later on, aloe vera gel, extracted saffron solution with rose water and glycerine was mixed uniformly and added in prepared mixture.
4. Then oils were added to this phase slowly with continuous trituration.
5. Vitamin E was added as a preservative in above mixture.
6. Then the volume was made up with sufficient quantity of rose water under mechanical stirring to 2500 rpm.
7. Then formulation was being evaluated, filled in container, labelled and packed.



Impact of active ingredients on skin

Saffron

Saffron has a variety of applications and uses in various applications. However, in the case of cosmetic herbal serums, saffron improves the tone of the skin. It smoothens the texture of the skin. Saffron cures pigmentation and skin imperfections. It heals burns and promotes bright skin complexity. Saffron is also used to treat acne and scars. It acts as an anti-inflammatory and anti-aging agent.

1. **Anti-aging action:** - Since saffron contains crocin and saffron which acts as an antioxidant that protects the skin from damage that neutralizes free radicals and keeps the skin looking young and bright.
2. **Skin brightening:** - Saffron also contains vitamin C that helps brighten the skin tone by suppressing tyrosinase enzymes and reducing the formation of melanin.
3. **Improve skin texture:** - Saffron contains vitamin B that helps to improve skin texture. It promotes the revitalization of skin cells. It helps to remove dead skin cells and smooth and brighten the skin. Reduces dullness, uneven skin tone and roughness.
4. **Treat skin inflammation:** - Saffron has anti-inflammatory effects. It is used to treat skin conditions such as psoriasis and eczema.
5. **Reduce dark circles:** - Saffron reduces eye puffiness and dark circles under the eyes.

Aloe Vera gel

Chemical constituents that are present in aloe Vera with their beneficial properties. Vitamins include A (beta-carotene), C, and E, antioxidants. Vitamin B12, folic acid and choline are also included. Antioxidants present in vitamins neutralize free radicals. It contains 8 enzymes in which bradykinase helps reduce excessive inflammation when applied topically to the skin, while others help in the decomposition of sugar and fat. It contains 12 anthraquinones, a traditional phenol compound known as a laxative. Aloin and emodin are antimicrobials, antibacterial, and antivirals. Aloe fatty acids have anti-inflammatory properties, and lupeol also has anti-septic and analgesic properties. Hormones such as Auxins and Gibberellins help to heal wounds and have anti-inflammatory effects. Lignin, an inert substance, is incorporated into the skin and increases the penetration effect of other ingredients. Saponin, which is soapy substance, account for about 3% of the gel and have a cleansing and anti-septic properties.

Rose Water

Rosewater is obtained from fresh rose petals by hydro distillation. Its major role is to combat inflammation. It is used to reduce pores by shrinking.

It is used to brighten the skin and enhance the glow of the skin. Softening and tightening the skin. It is used to relieve itch skin. Also suitable for oily skin.

It produces a cooling effect on the skin after application rose water Can helps balance the pH level of the skin.

Rose water is refreshing to the skin and helps keep it hydrated.

Rose water contains rose oil, which can help to reduce acne and maintain skin health.

Lemon oil

Lemon has numerous applications for skin, against sunburn, wrinkles, acne, improve complexion. It has astringent property thus used for oily skin. it is also one of the major cosmeceuticals as it produces anti-fungal, anti-viral, anti-bacterial, anti-oxidant and as a preservative. Lemon oil is also used for premature skin ageing. All these properties make skin clearer, bright and reduce unevenness. Along with all these actions it is used as fragrance in current formulation. It is light in weight and easy to apply on face and neck.

EVALUATION PARAMETER

1. Physical Characteristics

Colour	Lemon yellow
Appearance	Opaque
Odour	Lemon like
Texture	Smooth

Colour, appearance and texture of preparation was observed visually and by touch. Odour was confirmed by sniffing.

2. Penetration Test

This test was performed by taking 5 gm. of sample and applied on skin topically. After 10 minutes the surface of skin was scrapped and the sample remained on scrapper was weighed. The difference between before application and after application of 10 minutes was determined.

3. Microbial examination of the product

In microbial examination formulation was analysed by determining a total yeast and mold count. It was performed by suspending 15 gm. agar powder in 500 ml distilled water and heated to dissolve completely. Then 100 g of glycerol added and re-hydrated 1 vial of chloramphenicol in 3 ml of acetone and the supplement was added to Sterilise by autoclaving at 121°C for 15 min. Cooled to 50°C. Mixed well and poured into sterile petri dishes. 1 g of the product weighed out aseptically. Distributed the sample equally into 4 petri dishes already prepared with agar powder. Then incubated the plates at 25°C. Yeast and mould colonies counted after 5 days of incubation. The total count = cfu/g of sample. The individual mould species (on above medium) can be identified directly by experienced analysts with low power magnification by revealing the number of colony forming units/gm. or ml.

4. PH

The PH of formulation was found to be 5.3. Skin having PH around 4.7-5.7 for face. Skin PH is acidic thus this range of preparation is suitable for skin.

5. Stability testing

Stability testing of any formulation is necessary. Stability study of pharmaceutical product is carried out to determine chemical and physical stability of product and its safety. The stability studies were done for the formulation as per ICH guidelines. It is performed by keeping sample at different storage conditions of temperature and humidity. Accelerated stability was determined for the 3 months of period for formulation at storage condition 40°C ± 2°C/ NMT 25% RH.

6. Uniformity test

It is performed by spreading 5ml of serum sample on transparent glass and observed it.

7. Globule size

Determination of globule size of formulated serum is very important factor. Stability of any formulation depends on its globule size. The lesser the globule size greater the stability of product. Hence, for the given formulation globule size was determines by examined under electron microscope by using 100X of magnification lens. Globules was measured by using stage micrometre and eyepiece micrometre.

RESULT AND DISCUSSION

Evaluation Parameters	**Observations**				
	F1	F2	**F3**	F4	F5
Physical Parameters					
Colour	White	White	**Lemon Yellow**	Lemon Yellow	Yellow Occur
Odour	Lemon Like	Characteristic	**Lemon Like**	Lemon Like	Characteristic
Consistency	Semi-liquid	Semi-solid	**Semi-liquid**	Semi-liquid	Semi-liquid
Appearance	Cloudy	Cloudy	**Opaque**	Opaque	Cloudy

Texture	Oily	Hard	**Smooth**	Smooth	Thick
Uniformity	Uniform	Uniform	**Uniform**	Not Uniform	Uniform
pH	3.2	5.2	**5.3**	6.1	5.7
Spreadability	Spreadable	Not Easily Spreadable	**Easily Spreadable**	Spreadable	Spreadable
Penetration	40%	20%	**90%**	50%	70%
Washability	Not Easily Washable	Not Easily Washable	**Easily Washable**	Washable	Washable
Globule Size	0.2-0.5	0.5-0.8	**0.02-0.05**	0.02-0.08	0.02-0.08
Microbial Contamination	No	No	**No**	No	No
Stability:					
1. Appearance	Cloudy	Cloudy	**Opaque**	Cloudy	Cloudy
2. Phase Separation	Two Phases Separated	No	**No**	No	No
3. Uniformity	No Uniformity	Uniform	**Uniform**	Uniform	Uniform

APPLICATIONS

The face serum has the following applications.

- Manages the wrinkles, acne, dry skin, and dullness of the skin.
- They brighten the skin.
- Reduces skin dryness and increase skin softness.
- The hydrating serum repairs and replenish normal to mature skin with critical hydration.
- Disappearance of fine lines and wrinkles.
- Even skin tone and youthful glow.
- Brightens skin complexion.
- Eliminates skin discolouration caused due to acne.
- Increases skin protection from free radical damage.
- Reduces melanin generation.
- Produce moisturized, healthy and glowing skin.
- Promotes antioxidant activity.

CONCLUSION

At present consumers are giving special attention towards cosmetic selection due to wide variety of cosmetic products in market. To develop standard formula, a new herbal Saffron aloe vera face serum is being formulated by incorporating active ingredients solely and also in combination with other ingredients to produce the desired effects. The aim of the study was to formulate and produce different herbals and natural ingredients into a serum for anti-ageing, de-tanning, moisturizing and glowing activity on the skin. In this formulation of serum different herbals like aloe vera, rose water, saffron and other were used. The fresh inner central part of the leaf of the aloe vera often has very good applications for acne prone skin, pimples, eczema and other skin problems, burns and wounds, sun exposure, injury, etc. It also contains varied vitamins and minerals that produce moisturizing effect and anti-ageing effects on skin which maintains the health of skin. The aloe vera gel stimulates cell growth and enhances the damaged skin restoration. The other active ingredient saffron has various activities as an antioxidant, anti-UV, anti-inflammatory, perfume, face tonner, anti-wrinkle, anti-aging, and as colour pigment. Rose water has been widely used as a traditional remedial plant in China ad several tropical countries. All of its part are been used in the treatment of inflammation, bacterial infections, fungal infections, dermatological conditions, etc. for the preparation all feasible evaluation parameters were performed such as physical characteristics which were determined visually. Homogeneity results in uniformity of formulation. Washability and Spreadability was found easily washable and spreadable respectively. In microbial examination there were no microbial contamination was found. Stability testing performed by following ICH guidelines for accelerated stability testing in which formulation was stable for more than three months at different storage conditions. In addition, further studies are necessary to prove the safety and effectiveness of formulated cosmetic serums and to extend the formulation to lotion and cream formulations.

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