

Design, Development, and Evaluation of a Topical Vitamin C Facial Serum for Skin-Aging Management

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ABSTRACT

The goal of this study project is to create and assess herbal face serum that contains vitamin C to prevent wrinkles and fine lines from appearing on the skin. Natural herbal compounds were used, such as vitamin C powder that was derived from orange peels using an aqueous extraction process, aloe vera gel, olive oil, neem oil, coconut oil, and glycol. After being removed, the vitamin C powder was ground up and sieved through 80 and 100 mesh. Vitamin C powder was added to a main w/o emulsion to produce a homogeneous serum. Organoleptic, phytochemical, phase separation, spreadability, irritancy, stability, and washability were among the criteria used to assess the developed product. The formulation was supplied in a dropper-containing bottle and had good rheological properties. Using herbal face serum with anti-aging properties helps minimize wrinkles and fine lines while hydrating and moisturizing the skin to give it a smooth, nourished appearance.

Keywords: Face Serum, Cosmetics, Natural, Standardization, Skin care.

INTRODUCTION

Cosmetics are products used to cleanse, beautify, enhance beauty, or change one's look. Different herbs have been utilized for cleaning, beautifying, and managing them since ancient times. One of the most common cosmetic concerns among women is the aging of their facial skin. Wrinkles, sagging, uneven skin tone, and dry, dull skin are just a few of the obvious symptoms that can have a big influence on social interactions and self-esteem. Skin aging is caused by both intrinsic and extrinsic factors, but photoaging is a sign of a significant cumulative influence. These days, there are numerous approaches that can treat the underlying causes of cellular and molecular damage and improve the state of aging skin. Topical antioxidant therapy is a non-invasive method of treating the underlying processes of oxidative free radical-induced cellular and molecular damage. In addition to more invasive procedures like chemical peeling, ablative and non-ablative laser photo rejuvenation, radiofrequency (RF) therapy, dermal fillers, and botulinum toxin, other agents include topical cell growth regulators and retinoids. Both lipid-soluble and water-soluble sections of human skin contain bioactive antioxidants. Many of these, such as vitamins C and E, must be obtained externally or through diet because they cannot be made endogenously. L-ascorbic acid, the physiologically active version of vitamin C, is the most prevalent antioxidant in the skin. Topical L-ascorbic acid can be absorbed via the skin at a maximum concentration of 20%. In addition to being a strong antioxidant and a mediator of photo-damage and melanogenesis, vitamin C also supports collagen production and stability, which promotes renewal and has anti-inflammatory properties (1). Aloe vera gel and vitamin C both include unique anti-aging and antioxidant components that can maintain the appearance of youthful, healthy skin. The polysaccharides in aloe vera gel are very hydrating. Ayurveda recommends aloe vera for a variety of skin ailments because of its relaxing and

revitalizing qualities. Aloe vera's antibacterial and antifungal qualities may also be helpful in treating minor skin conditions. One skin care product that you can use to your skin after cleaning but before moisturizing is skin serum. Serum is particularly well suited for this function since it is made of a tiny molecule that can penetrate the skin deeply and deliver a very high concentration of active ingredients. These days, they can be used to identify specific skin care problems, like signs of aging and colour. One of the most concentrated cosmetics on the market, serum's main ingredient provides a deep, nurturing layer of skin (2). Numerous beneficial active ingredients and nutrients, including antioxidants, ceramides, amino acids, and others, are abundant in serum. This explains why the most expensive component in a skin care set is always face serum. Whether it is a moisturizer, an anti-aging or anti-wrinkle product, or skin-identical ingredients³. Cosmetic serums were divided into groups according to how well they absorbed and penetrated the skin's deeper layers. Cosmetics are quite necessary in today's world, and a lot of individuals use them (2).

MATERIALS AND METHODS

Materials

Vitamin-C powder and aloe vera gel were prepared in laboratory, olive oil, coconut oil and neem oil were purchased from the market and glycerol from laboratory.

Methods

ALOE VERA³



Fig. 1. Aloe Vera

Biological source: Dried juice collected by incision from the bases of the leaves of various species of Aloe. *Aloe bardadensis* (Curacao aloes), *Aloe spicata* (Cape aloes), *Aloe perryi* (Socotrine aloes), *Aloe ferox*.

Family: Liliaceace

Chemical Constituents

- Anthraceneglycoside(11 to 40%)
- Barbaloin or aloin
- Isobarbaloin, aloe-emodin and aloesone
- Aloinsides A and B
- Resins (resinotannol +cinnamic acid)
- Aloetic acid, homonataloin

Extraction Method

Aloe vera leaves that were fresh, mature, and healthy were first cleaned under running water, then distilled water, and last allowed to air dry for three days. After that, the leaf's outer layer was cut lengthwise with a sterile knife to remove the gel, or colourless parenchymatous tissue. Using a magnetic stirrer, 15g of aloe vera inner juice was heated to a steady 800°C for an hour using a 1:3 solvent ratio for both aqueous and ethanolic extract. Next, Whatmann filter paper number one is used to filter the mixture. The recipe made use of the filtered product, which is clear aloe vera gel.

Uses:

- Moisturizes dry skin
- Anti- aging
- Skin healing
- Anti inflammatory
- Antiseptic
- Skin lightening

ORANGE PEEL (VIT C)⁴



Fig. 2. Orange Peel Powder

Biological source: The orange peel is the fresh or dried outer part of the pericarp of *Citrus aurantium* Linn.

Family: Rutaceae

Chemical constituents:

- Fiber
- Vitamin C
- Folate
- Vitamin B6
- Calcium And Other Essential Nutrients.
- Ascorbic Acid
- Tartaric Acid
- Malic Acid

Method of Extraction

Aqueous extraction

Orange peel powder was extracted aqueously using a slightly modified version of the method. Twenty grams of powdered orange peel were steeped in 250 ml of distilled water for twenty-four hours at room temperature while being constantly stirred. After filtering the extract, the orange powder was concentrated using a water bath under continuous stirring. After filtering the extract, the orange was concentrated in a water bath at 4°C in a refrigerator for later use.

Uses:

- It helps to lighten and brighten the skin naturally
- It aids in cleansing your skin and fighting acne.
- It can hydrate and moisturize your skin.
- It helps in toning your skin.
- It prevents oxidative stress on your skin cells and keeps signs of ageing at bay.

OLIVE OIL⁵



Fig. 3. Olive Oil

Biological Source: Oil extracted from the part of the ripened fruit of the olive tree, *Olea europaea*.

Family: Oleaceae

Chemical constituents:

- Oleic acid
- Monosaturated omega-9 fatty acid
- Linoleic acid
- Palmitic acid
- Sterols
- Aliphatic alcohols
- Hydrocarbons

Uses:

- Provide deep hydration
- Natural cleanser
- Moisturizer
- Reduce inflammation
- Helps soothe dry or irritated skin.
- Skin protection
- Anti-aging property
- Enhance healing

COCONUT OIL⁶



Fig. 4. Coconut Oil

Biological Source: Coconut oil is the oil expressed from the dried solid part of endosperm of coconut, *Cocos nucifera* L.

Family: Palmae

Chemical constituents:

- Fatty acids
- Caprylic acid
- Capric acid
- Lauric acid
- Myristic acid
- Palmitic acid
- Oleic acid
- Linoleic acid
- Stearic acid

Uses:

- Defending skin from damaging microorganisms
- Help to treat acne
- Support healing
- Contributes to more even skin tone
- Antioxidant
- Prevent skin infection
- Cleanser
- Anti inflammatory

NEEM OIL⁷



Fig. 5. Neem Oil

Biological Source: It consists of leaves and others aerial parts of *Azadirachta Indica*.

Family: Meliaceae

Chemical constituent:

- Stearic acid
- Palmitic acid
- Loeic acid
- Linoleic acid
- Arachidic acid
- Phytochemicals such as azadirachtin, gedunin
- Nimbidin, nimbin, nimbolide, salanni

Uses:

- Anti-aging
- Treats fine line caused by dry skin
- Reduce dark spots
- Reduce hyperpigmentation
- Helping premature aging
- Antioxidant
- Reduce melanin production
- Fight wrinkles
- Treats acne

GLYCEROL⁸



Fig. 6. Glycerol

Biological source: It is produced from hydrolysis of fats and oils. It can be obtained from animal fats or botanical sources such as palm or soyabean oil.

Chemical constituent:

- Glycerides
- Phospholipids
- Fatty acids
- Triglyceride

Uses:

- Act as a humectant

- Preservative
- Act as solvent
- Retain moisture
- Protect skin
- Hydrated skin

LAVENDER OIL⁹



Fig. 7. Lavender Oil

Biological Source: It is obtained from the flowers of *Lavandula angustifolia* by steam distillation.

Family: Lamiaceae.

Chemical Constituents:

- Linalyl acetate
- Linalool
- Lavandulol
- 1,8-cineole, lavandulyl acetate

Uses:

- Aromatherapy
- Glowing Skin
- Heals Acne
- Treating Eczema
- Wound Healing
- Heals Sunburns

- Insect Repellent
- Reduces Anxiety
- Cures Insomnia

Extraction Of Vitamin-C From Orange Peel Powder Using Aqueous Extraction Method

For a full day at room temperature, 20 grams of orange peel powder were soaked in 250 ml of distilled water while being constantly stirred. After filtering the extract, the orange peel extract was concentrated using a water bath. Throughout the procedure, the water bath was kept at 75°C. For later usage, the concentrated extract was weighed and kept in a refrigerator at 4°C (4).

Vitamin C Confirmation Test

Add a few drops of starch indicator and an iodine tincture that has been mixed in water to a tiny amount of vitamin C solution. Count the drips carefully until the mixture takes on a blue-black hue that does not go away when stirred (4).

Formulation of Anti-Aging Face Serum Containing Vitamin-C

In order to create vitamin-C face serum, a main w/o emulsion was made utilizing the wet gum method. The ratio was 4:2:1, meaning that there were 4 parts oil, 2 parts water, and 1 part gm. Add the oils, such as neem, coconut, and olive oil, to the mortar after dissolving 2 grams of gum (acacia) in 6 milliliters of water with constant trituration. Once the primary emulsion has formed, use a magnetic stirrer to add the remaining active ingredient (aloe vera extract, glycerol, and orange-peel extract, or vitamin C).

The result was a uniform face serum. (4)

Evaluation

Organoleptic Evaluation¹⁰

Organoleptic characteristics were assessed for herbal face serum. The formulation had a cream white hue. The developed compositions had a pleasant and acceptable Odor, which is ideal for cosmetic formulations. According to the requirements of cosmetic formulations, smoothness was acceptable.

Phytochemical Evaluation⁴

The phytochemical characteristics of herbal face serum were assessed. Phytoconstituents that are effective skin nourishers, such as flavonoids, tannins, terpenoids, and saponins, were discovered to be present.

Test for Tannin⁴

In a test tube, about 0.5 g of the extract was heated in 10 ml of water before being filtered. Three to four drops of 0.1% ferric chloride were then added, and the mixture was allowed to turn brownish green or blue-black.

Test for Terpenoids⁴

In a test tube, about 0.5 g of the extract was heated in 10 ml of water before being filtered. Three to four drops of 0.1% ferric chloride were then added, and the mixture was allowed to turn brownish green or blue-black.

Test for Flavonoids⁴

A fraction of the filtrate was mixed with a few drops of 1% aluminium solution. Flavonoids are indicated by a yellow colour.

Test For Saponins⁴

Twenty milliliters of water were combined with two grams of orange peel extract, heated, and then filtered. Ten milliliters of this filtrate were mixed with five milliliters of distilled water, and the mixture was violently agitated to create a stable, long-lasting foam. The presence of saponins in the extract is demonstrated by the development of foam.

Spreadability¹¹

A surface was covered with two grams of the serum sample. A 20-gram weight was added to a pan that had a slide attached to it. Spreadability was measured as the amount of time (in seconds) needed to separate the upper slide from the surface.

$$S = \frac{M \times L}{T}$$

where, M = Weight tied to upper slide,

L = Length moved on glass slide

T = Time taken to separate the slide completely from each other

Ph Determination¹²

pH paper is used to measure pH. The pH of the skin serum should be between 4.1 and 6.7 because the skin has an acidic range.

Viscosity¹³

The most crucial factor in assessing a cosmetic product is its viscosity. Viscosity controls a variety of characteristics, including the product's spreadability and pourability from the container. Viscosity is influenced by a variety of factors, including temperature changes, production conditions, and raw material quality. Therefore, measuring the product's viscosity is crucial. After determining the serum's viscosity using spindle number 64 and a Brookfield viscometer, all operating parameters were established. The final reading will be the average of the two readings that were taken. Viscosity was measured in cps at 50 rpm.

Phase Separation¹⁴

The prepared serum was stored at room temperature and out of direct sunlight in a covered container. Phase separation was then examined for 24 hours throughout the course of 30 days. Any alteration in the phase separation was noted and verified.

Irritancy¹⁵

The serum was applied to that area and the time was noted. Then it is checked for irritancy, erythema, edema if any for an interval up to 24hr.

Washability¹⁶

A little bit of the formulation was applied to the hand, and it was subsequently cleaned with tap water to conduct the washability test.

Stability Testing¹⁷

Stability investigations for physical and chemical changes were conducted on the formulation.

RESULT AND DISCUSSION

Organoleptic Evaluation

The organoleptic properties of herbal face serum were assessed and reported in table 01. The formulation's colour was "white." The developed product had a pleasant and acceptable Odor, which is ideal for cosmetic compositions. According, to the requirements of the cosmetic formulation, texture and smoothness were acceptable.

Parameters	F1	F2
Color	Cream white	cream white
Oduor	Pleasant	Pleasant
Texture	Smooth	Smooth
State	semi solid	semi solid

Table No 1: Organoleptic Evaluation.

Phytochemical Evaluation

The phytochemical characteristics of herbal face serum were assessed and mentioned in table 02. It was discovered to have phytoconstituents that work well as skin moisturizers, including tannins, saponins, flavonoids, and terpenoids.

TEST	OBSERVATION	INFERENCE
Test for Tannins:	Brownish green color	Present
Ferric chloride test:		
Test for Terpenoids:	Reddish-brown color	Present
Salkowski test		
Test for Flavonoids:	Yellow coloration	Present
Test for Saponins:	Stable persistent froth	Present
Frothing test		

Table No 2: Phytochemical test for extract

Spreadability

The numerous experiments were carried out to ascertain the herbal face serum's potential to spread. The spreadability numbers show that after the herbal face serum was applied to the skin, it spread easily. Spreadability of face serum has been reported in table 03.

Viscosity

The "Brookfield Viscometer" was used to measure the viscosity of the prepared serum using spindle number 64 at 50 rpm. For a 4% concentration, cPs 3480 (29%)–2770 (23.1%) were measured reported in table 03.

Ph Of Serum

A "pH meter" is used to measure the pH of serum. The pH of the serum should be between 4 and 6 because the skin has an acidic range. The formulation's pH was determined to be "5 as reported in table 03.

Phase Separation

Prepared face serum was maintained in a covered container at room temperature away from light. Phase separation was then monitored for a whole day. The results of table 03 showed that neither of the two formulations had any phase separation.

Stability Testing

Stability tests for chemical and physical alterations were conducted on the formulation. There was no discernible change in the formulation's characteristics and reported in table 03.

	PARAMETERS				
FORMULATION CODE	Spreadability In gm.cm/sec.	Viscosity in cPs	p H	Phase Separation	Stability Studies
F1	50	4220-	5	No phase	Stable
		3200		separation	
F2	35.7	3480-	5	No phase	Stable
		2770		separation	

Table No 3: Spreadability, Viscosity, pH, Phase separation, Stability studies.

Washability

This is the standard procedure for determining whether a formulation is washable by applying it to the skin and then manually assessing the degree and ease of washing with water. One liter of water is used to remove all of the formulation's content from the skin.

Irritancy Test

Table 04 displayed the irritancy test findings. During irritancy tests, the formulation exhibited no signs of swelling, redness, or irritation. You can use this product on your skin without risk.

Parameter	F1	F2
Irritation	No	No
Redness	No	No
Swelling	No	No

Table No 4: Irritancy test

CONCLUSION

The purpose of the study was to develop a face serum that has antiaging properties and balances skin texture. Several varieties of Citrus sinesis were used to create a herbal facial serum that contained vitamin C. The

serum formulations' pH fell between 4 and 6, which is within the skin's typical pH range. Phase separation was not seen, and all of the formulations were confirmed to be homogeneous. Compared to F2, the F1 serum formulation had better viscosity and could stay at the application site for a longer period of time. The spreadability ratings show that a tiny amount of the serum might be applied to the skin with ease. Due to the F2 formulation's increased viscosity, the F1 serum formulation demonstrated better drop-wise flow via the dropper than the F2 formulation. It was easy to remove and left no trace.

Ethical Approval

No Human volunteers are involved. Not Applicable.

Conflict Of Interest

Authors declares that there is no conflict of interest.

Data Availability

The data generated and analysed during the current study are available from the corresponding author upon reasonable request.

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