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Formulation and Evaluation of Herbal Liposomal Face Serum Containing Vitamin C for Skin Repair

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ABSTRACT

The Herbal cosmetics is used to nourish the skin and enhance physical appearance. Among them, face serums are highly popular because they contain active constituents that target specific skin concerns and provide multiple benefits Skin problem such as hyper-pigmentation, dryness, and premature aging are common increasingly. These problems are primarily caused by excessive sun exposure, loss of moisture, and pigment imbalance to address these concerns, advanced delivery systems are being explored. For example, Herbal liposomes synthesized using the Thin Film Hydration (TFH) method have been formulated to improve the penetration and stability of Vitamin C. This enhances collagen production, reduces pigmentation, even skin tone, and enhance appearance. Marketed chemical face serum often Treat pre-exists issues such as acne, pigmentation, and dryness, or provide only temporary relief. Modern formulations are to directly target common concerns like dryness, uneven skin tone, and acne. This formulation is achieved by synergetic blend of active ingredients such as Vitamin C, Soya lecithin, Cholesterol, Sorbitol, Chloroform, Xanthan Gum, Hyaluronic acid, Glycerin, Witch hazel oil, Distilled water. The incorporation of liposomal technology further enhances skin penetration, stability, and effectiveness, offering a safer and more long-lasting solution to common skin problems. Formulation F1, F2, F3, F4, F5, F6 were prepared out of which formulation F2 was found to be best with their result. The Evaluation Parameter are Organoleptic evaluation of prepared serum, Determination of PH, Determination of spreadability, Viscosity, Safety and Tolerability, Drug loading and Entrapment efficiency were determined The Result of this research is prepared liposomal face serum showed desirable organoleptic properties, skin-compatible good spreadability, optimum viscosity, high entrapment efficiency and excellent safety profile, indicating improved stability and penetration of Vitamin C. Thus, the formulation offers a safer and more effective alternative for managing common skin problems such as hyper-pigmentation, dryness, and premature aging.

Keywords: vitamin c serum base. Herbal Face Serum, Hyper-pigmentation, Anti-Aging, Liposome.

1. Introduction

I. Skin

The skin is one of the largest and most important organs in the body and comprises approximately 16% of the human body weight. The skin is continuous with the membranes lining the body orifices and in certain areas contains accessory structures such as glands, hair and nails. It has a number of physiological functions that are essential to maintaining homeostasis, protection and social interaction. The skin protects the body by forming a waterproof layer which protects the deeper structures and prevents dehydration from loss of water. The need for skin care products has grown significantly in recent years. In order to look young and beautiful, plenty of items have been produced. Globally, the use of herbal compounds has increased. Herbal cosmetics are becoming more and more popular worldwide and are a priceless natural resource. It functions as a protective barrier and is essential for maintaining homeostasis by reducing water loss and aiding in the regulation of body temperature.[1,2,3]

II. Serum:

Serum are thin viscosity topical products that contain concentrated amount of active ingredients. Serum is a skin care product containing a gel or lightweight lotion or moisturizing consistency and have the ability to penetrate deeper to deliver active ingredient into the skin. A good skin serum can give your skin a stronger, smoother texture, make pores appear smaller and increase moisture levels. The popularity of facial serums has increased dramatically in recent years, as more and more people learn the benefits of including serums in their daily skincare regime.[6–7]

III. Liposomes:

Liposomes are microscopic, spherical vesicles composed of a lipid bilayer, typically made of phospholipids, which can encapsulate both hydrophilic and lipophilic substances, and are used as a delivery system for various therapeutic agents. They are classified into four categories based on size and number of bilayers small unilamellar vesicles (SUV), large unilamellar vesicles (LUV), multilamellar vesicle (MLV), and multivesicular vesicles (MVV). Liposomes have mono phospholipid bilayer in a unilamellar structure, while they have an onion-like structure in a multilamellar structure. (MVV) form a multilamellar arrangement with concentric phospholipid spheres as many unilamellar vesicles are produced within larger liposomes.[8,9,10,11]

IV. Liposomal Vitamin C Serum:

Using a Vitamin C liposomal face serum offers several benefits for the skin. The liposomal delivery system enhances absorption, allowing for better penetration of Vitamin C into the skin. As a potent antioxidant, Vitamin C neutralizes free radicals, reducing oxidative stress and protecting the skin from environmental damage. It also

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stimulates collagen production, improving skin elasticity and reducing fine lines and wrinkles. Additionally, Vitamin C helps to even out skin tone, reducing the appearance of dark spots and hyperpigmentation. The serum provides intense hydration, leaving the skin feeling smooth and supple. Regular use can lead to improved skin texture, making it look more radiant and youthful. Furthermore, Vitamin C's anti-inflammatory properties can help to soothe and calm irritated skin, while also shielding the skin from pollution, UV damage, and other environmental stressors.[12,13,14,15]

2. Materials and Methodology:

This formulation and development of facial serums using herbal and active ingredients to address various skin concerns. The formulation strategy and selection of excipients were based on established pharmaceutical and cosmetic principles.[16]

Materials:

Glycerin and preservatives were of analytical grade and were procured from institute 's laboratory xanthan gum, hyaluronic acid, witch hazel oil, chamomile oil, were procured from om.s intercontinental pvt.ltd.all the instruments and glassware's used were thoroughly cleaned using 70% ethanol to ensure sterility.[16]

I. Preparation of Vitamin C Liposomal Face serum:

Table No.1

S.no	Ingredients	Properties
1	Xanthan Gum	Emulsifier
2	Hyaluronic acid	Humectant
3	Glycerin	Humectant
4	Vitamin c	Active Ingredient
5	Witch hazel oil	Astringent & Anti-inflammatory
6	Preservatives	Preservative
7	Distilled water	Vehicle
8.	Soy lecithin	Lipid
9.	Cholesterol	Increases fluidity
10.	Sorbitol	Permeation enhancer
11.	Chloroform: Methanol	Organic solvent

Materials & Properties of Vitamin C Liposomal Face serum

Soya lecithin was purchased from Himedia laboratories Pvt.ltd.all. Mumbai, Xanthan gum. Cholesterol and other materials and solvents like Chloroform, Ethanol, Ascorbic acid, used were of analytical graded and procured from institutions laboratory. Rotary Evaporator instrument of, Centrifuge used for formulation and development of liposome. In vitro drug release study was performed using, UV Visible spectrophotometer Shimadzu UV-1700. The preparation of the liposome-containing vitamin C serum is a multi-step process using various ingredients and scientific techniques. The process first involved preparing the vitamin C serum base using skin-beneficial ingredients such as xanthan gum, hyaluronic acid, glycerin, and witch hazel oil. Liposomes

were then formed through the thin film hydration method. Finally, the formulated serum was incorporated into the liposomes to form a stable and effective product. The formulated liposome-containing serum was analyzed to ensure its size, stability, and effectiveness.[17]

II. Formulation of serum base:

S. No	Ingredients	F1	F2	F3	F4	F5	F6
1	Xanthan gum	0.3g	0.3g	0.3g	0.3g	0.3g	0.3g
2	Hyaluronic acid	0.5g	0.5g	0.5g	0.5g	0.5g	0.5g
3	Glycerin	3.0 ml	3.0 ml	3.0 ml	3.0 ml	3.0 ml	3.0 ml
4	Vitamin C	1.0g	1.0g	1.0g	2.0g	2.0g	2.0g
5	Witch hazel oil	1.0 ml	1.5 ml	1.0 ml	2.0 ml	1.5 ml	2.0 ml
6	Preservative	0.1g	0.1g	0.1g	0.1g	0.1g	0.1g
7	Distilled Water	94.1 ml	94.1 ml	94.1 ml	94.1 ml	94.1 ml	94.1 ml

Table no.2 Ingredients and Properties of Vitamin C Serum Base.

The process of preparing the Vitamin C serum base involved first carefully measuring and preparing the required ingredients. Xanthan gum and hyaluronic acid were used as thickening agents. Both of these were slowly added to 100 ml of distilled water to form a smooth solution. This mixture was stirred until it dissolved completely and obtained a smooth gel-like consistency. Next, glycerin and vitamin c solution were added to this gel. Witch hazel oil was also added for skin toning and anti-oxidant properties. The mixture was mixed well so that all the ingredients were evenly distributed. An appropriate amount of preservative was added to keep the serum safe. The prepared solution was allowed to set for at least 24 hours so that it could become completely stable and ready to be incorporated into the liposome.[18]

iii. Formulation of Liposomes:

S.no	Ingredients	Category
1.	Soy lecithin	Lipid
2.	Cholesterol	Increases fluidity
3.	Sorbitol	Permeation enhancer
4.	Chloroform: Methanol	Organic solvent

Table no.3 Formulation of Liposome

Thin Film Hydration (Bangham Method)

- Film Formation: The lipids (lecithin and cholesterol) and sorbitol are dissolved in the organic solvent. This solution is placed in a rotary evaporator at 40°C and 60–80 rpm under reduced pressure.
- Solvent Removal: As the solvent evaporates, a thin lipid film forms on the flask walls. Nitrogen gas and a vacuum are used to ensure all remaining solvent is removed.
- Hydration: The film is then hydrated with an aqueous buffer and vortexed to form liposomes.

Vitamin C Incorporation

- The prepared liposomes are heated slightly to make the membranes flexible.
- Vitamin C serum is added slowly while rotating at a balanced speed to allow even penetration.
- The mixture is cooled and left for 1 hour to ensure complete absorption before being stored in suitable containers.[19]

3. Evaluation parameters:

I. Organoleptic evaluation of prepared serum:

Organoleptic evaluation is a sensory analyzing method based on special features like colour, odor and state.

Table no.4

S.no	Parameters	Observation
1.	Color	White translucent
2.	Odor	Characteristics odor
3.	Texture	Smooth

Organoleptic evaluation

II. Determination of pH:

A pH meter was calibrated using a standard buffer solution. Nearly 1 ml of face serum was properly weighed and dissolve in 50 ml of distilled water and finely its pH was calculated. The skin has an acidic range and the pH of the skin serum should be in the range of 4.1 -6.7.

III. Determination of spreadability:

Spreadability of the serum was determined using the following procedure 0. 5 gm of serum was placed with in a circle of 1 cm diameter per-marked on a glass plate over which a second glass plate was placed. A weight of 500 gm was allowed to rest on the upper glass plate for 5 to 10 minutes the increase in the diameter due to spreading of the gel was noted.

IV. Viscosity:

Viscosity of the serum was determined using Brookfield viscometer in this system spindle number 4 of non newtanion spindle was used. Viscosity measured for exact time 2 minutes for 100 rpm.

V. Safety and tolerability skin irritation:

Conduct patch tests to evaluate the serum's potential for skin irritation. Allergic reactions: monitor for any allergic reactions or sensitization during clinical trials.

VI. Drug loading and Entrapment efficiency: Vitamin C liposomal serum

The amount of Vitamin C present in liposomes has been determined by taking the known number of liposomes in which 20mg amount of drug should be present theoretically. Then these liposomes were powdered as microspheres which was then taken and dissolved in 10ml of methanol and stirred for 15 minutes with an interval of 5 minutes, which is then allowed to keep for 24 hours then this solution was filtered by Whatman filter paper and the absorbance after appropriate dilution was measured by UV visible spectrophotometer at 225 nanometers.

Drug and entrapment efficiency (%) = (experimental

drug content / initial drug content in the formulation) × 100

Drug loading (%) = (Quantity of drug present in the liposomes / weight of liposomes) ×100

4. Result & Discussion

The prepared herbal face serums were evaluated using organoleptic, physicochemical, and safety parameters. Results are summarized in table no.2.

The Ph of 5.4 indicates the formulation is within the acceptable range (4.1–6.7) for skin products, minimizing the risk of irritation. Spreadability of 5–6 cm confirms good application and coverage. The viscosity value (13759 mpa·s) suggests a stable, non-runny consistency, ideal for topical serums. The non-irritant nature confirmed by patch testing and good washability further support its suitability for daily use. The addition of herbal actives like chamomile and witch hazel contributed to anti-inflammatory and calming effects, especially suitable for sensitive Indian skin types. Overall, the evaluation confirms the developed herbal serums are cosmetically acceptable, skin-compatible, and effective for hydration, brightening, and acne control.

Table no.5 physical evaluation parameters of formulated serums

S.no	Parameters	Result
1	Color	White translucent
2	Odor	Characteristics odor
3	Spreadability	5-6 cms
4	Texture	Smooth
5	Ph	5.4
6	Irritancy	Non irritant
7	Viscosity	13759 mpas
8	Homogeneity	Good
9	Washability	Washable2

5. Conclusion:

The study successfully formulated and evaluated a new herbal face serum containing Vitamin C delivered through a liposomal system. This innovative approach addresses common skin concerns like hyperpigmentation, dryness, and premature aging. The resulting serum was found to have desirable organoleptic properties, good spreadability, and optimal viscosity. It also showed an excellent safety profile, with a skin-compatible pH of 5.4 and no signs of irritation during patch testing. By improving the penetration and stability of Vitamin C, this liposome-based formulation provides a more effective and safer alternative to conventional chemical serums. The inclusion of herbal ingredients further contributes to its anti-inflammatory and calming effects, making it suitable for daily use.

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