

Formulation and Evaluation of Face Serum Using *Lagenaria Siceraria* and *Morus Nigra*

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ABSTRACT

Face serums are getting more popularity now a days. Their demand is increasing tremendously. It is very useful for delivering active ingredients directly into skin therefore it can be used for targeting major skin problems like acne, skin aging, wrinkles, fine lines, dark spots etc. Face serum contains minimal chemical ingredients its consistency can be made with natural ingredients that are non-toxic to skin. It can be used for antiaging, antioxidant properties.

Bottle gourd and mulberry leaves contain phenols and flavonoids which are having antioxidant activity used in serum formulation, these antioxidant act against the free radicals.

The formulation is water based so glycerin and hyaluronic acid are used to seal moisture and help penetration of actives. The aim is to formulate face serum using bottle gourd fruit extract and mulberry leaf extract and determine antioxidant activity of the serum. Face serum was tested for colour, appearance, homogeneity, viscosity, absorbance, spreadability, pH, microbial study and stability.

KEYWORDS: *Lagenaria siceraria*, *Morus nigra*, Herbal face serum, Organic skincare, Natural, Plant-based, Anti-aging, Radiance revitalizer, Antioxidant, Botanical.

I. INTRODUCTION

Serum is a highly concentrated skincare product that has become a staple in the field of cosmetology. Its name is widely recognized in professional skincare due to its potent formulation. Unlike traditional creams, serums are either water- or oil-based and are formulated to deliver a significantly higher concentration of active ingredients. In fact, serums often contain up to ten times more active compounds than standard creams, making them a powerful solution for addressing skin concerns more

efficiently. Facial serums are available in both water-based and oil-based formulations, providing options tailored to different skin types. These products are designed with small molecules that penetrate deeply into the skin, ensuring that the active ingredients are absorbed quickly and effectively. By incorporating just a few drops of serum into a daily skincare routine, users can often see visible improvements in their skin's appearance within a month or less. Serums are typically packed with a wide variety of beneficial ingredients, such as antioxidants, ceramides, amino acids, and other nutrients. These components work together to nourish the skin, promote hydration, and target specific concerns such as fine lines, uneven tone, or dullness. Their concentrated nature makes them an essential addition to modern skincare regimens.[1]

The study focuses on the collection of *Lagenaria siceraria* fruit and *Morus nigra* leaves, which are widely recognized for their therapeutic and cosmetic applications. These plants are particularly valued for their potent antioxidant, anti-inflammatory, and skin-soothing properties, making them ideal for use in skincare formulations. To ensure the authenticity of the collected plant materials, their identity was confirmed through a detailed authentication process. This involved comparing the specimens with herbarium samples and analyzing their morphological characteristics to verify that the correct species were selected. Following authentication, extracts were prepared from the plant materials. Flavonoids and phenolic compounds, which are well-documented for their strong antioxidant capabilities, were identified as the primary bioactive constituents of the extracts. Specific tests were conducted to detect the presence of these phytochemicals, confirming their suitability for use in antioxidant-based formulations. The plant extract was subsequently incorporated into a serum designed for topical

application. The antioxidant activity of the serum was then assessed using the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay, a widely used method for measuring free radical scavenging activity. This assay provided insights into the serum's ability to neutralize oxidative stress, highlighting its potential for protecting the skin against damage caused by free radical

II. PLANT PROFILE

Lagenaria siceraria (Molina) Standley (commonly abbreviated as LS) belongs to the Cucurbitaceae family and is an annual herbaceous climbing plant widely cultivated in tropical and subtropical regions. This plant has a long-standing reputation in traditional medicine, where it has been used to treat a variety of ailments, including skin conditions. Historical records and ethnobotanical studies highlight its therapeutic potential, making it an important plant in natural remedies.[2] The fruit of *Lagenaria siceraria* is nutritionally rich, containing an array of bioactive compounds such as ascorbic acid, triterpenes, flavonoids, sterols, and carbohydrates. It is also known to include cucurbitacin derivatives (B, D, H, G, and 22-deoxy cucurbitacin) and other beneficial components like choline, amino acids, vitamin B complex, and β -glycosidase-elastase. These phytochemicals contribute to the plant's antioxidant and medicinal properties.

Morus nigra, a genus within the Moraceae family, encompasses several species such as black mulberry (*M. nigra*), red mulberry (*M. rubra*), and white mulberry (*M. alba*). The leaves of mulberry plants are recognized for their high concentration of antioxidant compounds, including vitamins A, C, E, and riboflavin. These vitamins play a significant role in skin health by promoting hydration, reducing oxidative stress, and supporting overall radiance. In addition to their antioxidant properties, extracts from mulberry leaves are known for their ability to improve skin tone. They are frequently used in formulations designed to reduce pigmentation issues, such as dark spots and discoloration caused by sun exposure or the natural aging process.[3] *Morus nigra* are known to contain a diverse array of bioactive compounds, which contribute to their

notable pharmacological properties. These leaves are an abundant source of essential nutrients, including organic acids, macronutrients, and micronutrients. Among the key phytochemicals responsible for their bioactivity are flavonol, glycosides, phenolic acids, alkaloids, chalcones, γ -aminobutyric acid (GABA), coumarins, prenylated stilbenes, iminosugars, and aryl benzofuran derivatives. In addition to these compounds, mulberry leaves contain other beneficial substances such as polysaccharides, volatile oils, plant sterols, and proteins. They also offer a range of essential vitamins, minerals, dietary fibers, and amino acids, which further enhance their nutritional and therapeutic potential.[4]

III. MATERIALS AND METHODS.

Preparation of *Lagenaria siceraria* Extract:

Fresh, round-shaped *Lagenaria siceraria* fruits were sourced from a local market. The fruits were first rinsed thoroughly with distilled water to remove surface contaminants. After washing, the outer peel was carefully removed, and the peeled fruit was chopped into smaller pieces using a knife. The chopped pieces were blended into a paste-like consistency using a kitchen blender. A total of 100 grams of the blended fruit was filtered using muslin cloth to separate the solid residue from the liquid portion. The resulting filtered pulp was collected as the extract, which was subsequently used in the preparation of serum.[5] Chemical analyses were conducted on this extract to confirm the presence of flavonoids and phenolic compounds.

Preparation of *Morus nigra* Extract:

Fresh *Morus nigra* leaves were handpicked from a plant and washed to remove dirt and debris. The clean leaves were dried in an oven at 50°C for one hour until completely dehydrated. Once dried, the leaves were ground into a fine powder using a milling machine. Two grams of the powdered leaves were extracted by boiling in water at 90°C for six minutes. The resulting mixture was filtered to remove solids, and the liquid extract was collected and stored for further use. [6] Chemical tests were performed on the extract to identify flavonoids and phenols.

Formulation table

INGREDIENTS	FORMULA
Lagenaria siceraria extract	25ml

Morus nigra extract	25ml
Glycerin	3gm
Xanthan gum	0.5gm
Hyaluronic acid	0.2gm
Phenoxyethanol	1%
Distilled water	46ml/qs



Face serum

Cleaning all glassware to ensure it is free of contaminants and allow the glassware to dry completely before use. Accurately measure the required quantities of mulberry leaf extract, bottle gourd extract, and 47 mL of distilled water. Combine these ingredients in a mixing beaker and stir the mixture until it is uniform. In a separate small beaker, weigh the appropriate amount of glycerin, then add xanthan gum and hyaluronic acid to it. Stir the mixture thoroughly to create a homogeneous gum blend. Gradually incorporate the gum blend into the water-based solution in portions, mixing thoroughly after each addition. Allow the mixture to sit for a few minutes to enable the gum and hyaluronic acid to swell. Stir the solution again to ensure uniform consistency. If any undissolved particles remain, filter the solution to achieve clarity. Once the blend is clear and free of visible particles, add the appropriate preservative to

the mixture. Measure the pH of the solution and adjust it to a range of 5.0 to 5.5 if necessary, using a pH adjuster. Finally, measure 30 mL of the prepared solution and transfer it into a clean, sterile container for storage or further use.[7]

IV. EVALUATION STUDIES

a) Colour and Appearance:

The visual inspection of the formulation allows for the detection of color variations, which may indicate poor distribution of particles or differences in their size. A change in color can also be a sign of chemical instability.[8]

b) Homogeneity:

Homogeneity is often initially evaluated visually, as precipitation in a solution or phase separation in an emulsion can be easily observed. The formulation showed uniform distribution,

confirmed both by its appearance and texture. A clarity test apparatus can be used to perform the homogeneity test.[8]

c) Determination of pH

Serum formulations intended for topical use should have a pH level that is compatible with the skin's natural pH. The pH is measured using a pH meter. [8]

d) Determination of viscosity

Viscosity is a crucial parameter in assessing cosmetic products. The formulation's viscosity is measured using an Ostwald viscometer.[8]

f) Absorbance time

The serum begins absorbing immediately upon application to the skin and is completely absorbed within 1-2 minutes.[9]

g) Washability

The formula's washability was tested on the face. After removal, the skin felt fresh, radiant, and hydrated.[9]

h) Microbial Examination of the Product

Microbial study is performed on agar plate method

i) Determination of DPPH radical scavenging activity

The free radical scavenging activity was determined by this method. The extract was dissolved in methanol in various concentration, then each extract solution was mixed with 1.5 ml of DPPH solution. After incubation at room temperature for 30 mins the absorbance measured at 517nm. The negative and positive controls were

run in parallel. Scavenging activity was calculated using formula.

$$\% \text{Scavenging} = \left[\frac{(A_{517} \text{ control} - A_{517} \text{ sample})}{A_{517} \text{ control}} \right] \times 100$$

j) Stability Studies

Formulation and development of a pharmaceutical product is not complete without proper stability analysis carried out on it to determine physical and chemical stability and thus safety of the product. Stability study was carried out for the period of one months for the prepared formulation. The samples were stored at room temperature.

V. RESULTS AND DISCUSSION

1. PREPARATION OF EXTRACT:



Lagenaria siceraria extract



Morus nigra extract

2. **CHEMICAL TEST** :The chemical test of flavanoid, phenol of both Lagenariasiceraria and Morus nigra was performed and presence of flavanoid, phenol in the prepared extract was confirmed.

Chemical test for Flavonoid :

Test	Inference	
	Lagenaria siceraria	Morus nigra
To 1 ml of crude extract, a few drops of dil. NaOH was added. An intense yellow colour appeared in the crude plant extract.	+ve	+ve

Chemical test for Phenol :

Test	Inference
Litmus test	+ve
Ferric chloride	+ve
Lead acetate	+ve

3. COLOUR AND APPEARANCE

SI no.	Parameter	Results
1.	Colour	Yellow
2.	Odour	Natural
3.	Texture	Smooth
4.	Clarity	Clear
5.	Consistency	Slightly viscous

4. HOMOGENEITY:

The product has uniform appearance and free from agglomerates, particles and lumps.

SI NO	EXPERIMENT	OBSERVATION
1	Clarity Test	Absence of white and black particles

5.DETERMINATION OF pH:

The pH of the formulation was found to be 5, which is close to expected value.

formulation was free of microorganisms and safe to use.

6.VISCOSITY:

The viscosity of the serum was assessed using Oswald viscometer and it was found to be 1050 cps which is close to the expected value.

8.ABSORBANCE TIME:

The serum starts to absorb as soon as it is applied to the skin and is fully absorbed in 120 seconds, which is closed to the expected value.

7. MICROBIOLOGICAL STUDY:

The results of antimicrobial studies indicate the agar plate of test inoculum doesn't has any growth of microorganism after 24 hours of incubation. The result indicating that the

9. WASHABILITY:

The washability of the serum was evaluated. The skin felt fresh and moist after its simple removal.

10. DETERMINATION OF ANTIOXIDANT TACTIVITY

Report: The antioxidant activity of face serum was found to be 8.12%

IC50 Value (ppm)	Category Antioxidant Activity
<50	Very strong
50-100	Strong
100-150	Moderate
150-200	Weak

11. STABILITY STUDY:

Throughout the stability study, the product's quality, safety, and efficacy was maintained.

SL.NO	TEMPERATURE	PARAMETER	INFERENCE	
			During preparation	After one month of preparation
1.	ROOM TEMPERATURE	APPEARANCE ABSORBANCE pH HOMOGENESITY	Greenish yellow colour 2-3 minutes 5 Uniform appearance	Greenish yellow colour 2-3minutes 5 Uniform appearance

VI. CONCLUSION

Lagenaria siceraria and Morus nigra both contains better antioxidants that are beneficial for skin. It is the free radicals that cause skin damage, premature aging of skin, uneven skin tone like problems. The antioxidant presents in the bottle gourd and mulberry leaves can alleviates these to a certain extend. Additionally mulberry leaves have certain chemicals are having tyrosinase inhibitory activity tyrosinase is the enzyme that is responsible for pigment melanin production excess production of melanin leads to hyperpigmentation. Bottle gourd has cooling properties that soothes the skin. The antioxidant activity of bottle gourd and mulberry leaves are due the presence of phenols and flavonoids.

The formulation and evaluation of a face serum using Lagenaria siceraria and Morus nigra demonstrated the potential of these natural ingredients in enhancing skin health. The phenolic and flavonoid-rich antioxidants present in both components effectively combat free radicals, which

are known to cause early signs of aging, skin discoloration and other skin-related issues.

The serum, prepared using Lagenaria siceraria fruit pulp and a water-based extract of Morus nigra leaves, offers a simple, natural, and convenient skincare solution. Evaluation results showed that the formulation is both effective and safe for topical application, making it a promising addition to natural skincare products aimed at maintaining healthy, radiant, and even-toned skin.

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