



The role of amla extract in enhancing the efficacy of vitamin C face serum: A research

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Abstract

Facial wrinkles and skin age are normally associated with the burning rays of the sun, the face serums produced are compounded with Aloe Vera, glycerin, Amla, and green tea extract. Aloe Vera for its healing, soothing, and hydrating properties for skin, with useful capabilities for burns, cuts, and irritation. Amla powder extracts are a naturally occurring compound, and limited studies are present, however, blood circulation and overall collagen production are considered good for the skin in limiting wrinkles/fine lines. Glycerin being a good moisturizing agent, proteins, and amino acids will assist the skin in remaining soft. The face serum was concerning pH, consistency, and droplet size and evaluated through a series of stability tests. The stability test conveyed the appearance, texture, viscosity, spreadability, globule size, stability, and efficacy of microorganisms. Being a lightweight face serum allowed the quick absorption and potential to penetrate deeper into the skin. This study shall focus on the development and evaluation of the herbal face serum from natural and marketed ingredients. This study has successfully developed a nourishing and absorbent anti-aging face serum, with hydration, wrinkle reduction, and skin renewal from all-natural ingredients [1]. The serum was obtained with the biphasic emulsion (oil-in-water) technique, and it contained Almond Oil and Jasmin Oil. Oil is good for sunburn, wrinkles, aging, and skin lightening due to its antioxidant, anti-acne and antibacterial properties, which are great for the skin. The preparation was found to have good stability, with no observable changes in appearance or texture. The present study produced an effective, stable, and well-spreadable Batch S-3 herbal face serum with promising skin applications [2].

Keywords: Herbal face serum, facial wrinkles, anti-aging, aloe vera, amla powder extract, glycerin, green tea extract, skincare

Introduction

Cosmetics is derived from the Greek word “kosmetikos” which means beauty. Definition of Cosmeceuticals: Products that are a combination of cosmetics and pharmaceuticals formulated to improve beauty and at the same time have specific Ingredients that are beneficial for health. These things are moisturizers, nail polish, lipstick, perfume, eyeliner and eye shadow, shampoo, hair color, permanent waves, toothpaste, deodorant, and everything else that one may use in a cosmetic. Cosmeceuticals are placed somewhere between cosmetics and pharmaceuticals and are designed to enhance the health and beauty of the skin [1]. Demand for cosmetics has risen, which has in turn brought about the expansion of many a cosmetic company in India. Mostly for the young and growing youth population. Over the last few years, not just in terms of achieving a flawless complexion, but also the need to reduce wrinkles and elasticity to keep radiant and youthful skin, the demand for skincare products has seen an upswing. Benefits of amla powder extract - Antioxidant, supports heart health, decreases bad cholesterol, strengthens immunity, and is great for energy, especially in a debilitated body. This may be the result of Coenzyme Q10 (CoQ10), Resveratrol, or even certain vitamins like Vitamin C and E, which aid not just in protecting your cells from damage but improving circulation and well-being overall [2]. Vitamin C is crucial for skin health, promoting collagen production and repair of sun damage. Vitamin C is a common ingredient in skincare products, where it helps brighten the skin, even out tone, and protect against environmental damage [3, 4]. Cosmetic antioxidant products exist to retard the oxidative rancidity of oils and lipids while chemically active antioxidants prevent oxidation such as metal chelating

agents or oxidation event limiting species. They're crucial for preserving the quality, reliability, and efficacy of skin care and beauty products. Typical antioxidants are amines, phenols, quinones, esters, organic acids, and alcohols which serve to prolong shelf life and to protect the formulation against damage, such as spoilage. A lot of those antioxidants have skin benefits too, helping to protect it against environmental damage and signs of aging [3, 5]. Skin aging and hyperpigmentation are very common issues. It drives your skin to wrinkle and lose elasticity as you age. To solve these problems, cosmetic products including natural ingredients having whitening and anti-aging effects are developed [6]. Vitamin C has evolved into one of the most potent antioxidants in the field of dermatology and skin care [7, 3]. Specifically, for its rich vitamin C and high antioxidant activity, amla is a commonly used ingredient in anti-aging formulations. Aloe Vera, which has soothing and hydrating properties, Liquorice extract also has skin brightening and anti-inflammatory properties and, thus, can be used in conjunction with Vitamin C to help treat hyperpigmentation and uneven skin tone [7]. Vitamin C is important for the stabilization of collagen; it is a co-factor for the enzymes lysyl hydroxylase and prolyl hydroxylase which serve to stabilize collagen. Also, it is critical for the repair of tissues, and in the absence of sufficient vitamin C, collagen produced by fibroblasts is poorly formed and unstable, making the healing process more challenging. Low vitamin C levels, which are associated with older adults, could be a factor in sluggish healing [8, 2]. In order to take advantage of the benefits of vitamin C for the health of the skin, we have prepared a vitamin C serum with the following ingredients: Amla (a natural source of vitamin C), Rosewater (for hydration and soothing effects), Vitamin E

capsule (an antioxidant that supports skin repair), Glycerin (to help retain moisture), Sodium benzoate (a preservative to maintain freshness). Together this blend promotes healthier skin and supports the natural healing process [8, 7]. Vitamin C serum is a topical treatment high in ascorbic acid that promotes collagen synthesis, diminishes the appearance of aging, evens skin tone, and protects against sun damage. Vitamin C, is unstable, deteriorating in the presence of light,

heat, and air, and it has also been shown that a low pH, below 3.5, is preferred for stability and absorption. The most effective concentration is 20%. To extract, quantify, and formulate a stable effective vitamin C serum is the goal of this project. It will evaluate stability and penetration into the skin under various conditions and will contribute towards informing the development of superior vitamin C products [8, 3].

TYPES OF HERBAL FACE SERUMS	
1 HYDRATING HERBAL SERUMS Active Ingredients: Aloe Vera, Rose Water, Cucumber Extract, Plant-Derived Hyaluronic Acid Mechanism of Action: Ameliorating skin hydration by enhancing moisture retention and preventing transepidermal water loss.	2 ANTI-AGING HERBAL SERUMS Active Ingredients: Ashwagandha, Ginseng, Gotu Kola (Tentella Asiatica) Bakuchiol (o plant-based retinol alternative) Mechanism of Action Stimulates collagen synthests, improves skin-plianticity and reduces oxidativestress Recommended for individualities with signs of skin aging, including fine lines and loss of firmness.
3 BRIGHTENING HERBAL SERUMS Turmeric, Saffron, Lquarice Extract, Papaya Extract Retain skin-brightening properties through melanin inhibition and antioxidant-activity. Suggested for dull skin anay-hyperpigmentation.	5 EXFOLIATING HERBAL SERUMS Fruit-derived AHAs (Pineapple, Papaya, Sugarcane), Green Tea, Hibiscus Extract Corsetvation promoote desquamotion of dead skin cells. Recommended for uneven skin texture and dull complexion.
4 ANTI-ACNE HERBAL SERUMS Neem, Tulsi (Holy Basil), Tea Tree Oil, Witch Hazel Targets acne-cousing bacteria, while Witch Hazel acts as as astirngent to minimize pores. Suggsted for sensitive and reactive skin types.	7 ANTI-POLLUTION HERBAL SERUMS Moringa, Green Tea, Tulsi, Spirulina Corcetixation neutralize free radicals and produce a defensive barrier against environmental pluton.
9 HERBAL OIL SERUMS Composition: Lightweight, fast-absorbing carmer ails. Benefits: Nourish the skin without feeling greasy	9 BENEFITS Nourish the skin without feeling greasy.. Hydrate and strengthen skin barrier.

[9]

Benefits of Face Serum

- 1 Soothers Irritated Skin
Aloe vera soothes and cools skin
- 2 Deep Hydration
Locks in moisture, balances hydration
- 3 Fights Acne & Fades Marks
Bael fruit reduces breakouts & marks
- 4 Reduces Dark Circles
Vitamin E fades dark circles & refreshes
- 5 Boosts Collagen Production
Removes dead cells; gives youthful glow
- 6 Rich in Antioxidants for Healthy Skin
Protects skin; keeps skin radiant

Advantages of Using Face Serum

- Improves skin texture
- Minimizes pores
- Deep hydration
- Prevents fine lines

Possible Disadvantages

- May irritate sensitive skin
- Too intense for weakened skin barrier

May irritate sensitive skin
 Too intense for weakened skin bar-

Source: Derived from the dried and fresh fruits of the plant [11]

Herbal ingredients

Amla - Indian Gooseberry (*Phyllanthus emblica* Linn. *Embelica officinalis*)-

Also Known as Emblica, Indian Gooseberry, Amalki

Family: Euphorbiaceae, **Species:** *Phyllanthus emblica* Linn. *Embelica officinalis*,

Content: Contains a minimum of 1.0% Gallic acid when dry. Where It Grows: Found on small to medium trees in the deciduous forests of India, Sri Lanka, and Myanmar. These trees have distinct greenish-grey smooth bark and feather-like leaves. Amla is a valuable crop in Ayurveda. It is recognized for its medicinal properties. fruit is an excellent source of Vitamin C packing 700 mg per 100 g.

In terms of health benefits- Amla helps prevent scurvy, acts as a diuretic (helps in urine production), laxative, antibiotic, and treats dysentery. Phyllemblin, a compound from the fruit pulp, has a gentle calming effect on the central nervous system, acts as a good liver tonic and as a natural treatment for wounds, burns, and skin infections [6, 10].

Aloe Vera: India Aloe (*Aloe barbadensis miller*)

Plantae Order: Asparagales, **Family:** Asphodelaceae,

Subfamily: Asphodeloideae, **Genus:** Aloe,

Species: Aloe vera,

Botanical Name: *Aloe barbadensis miller*,

Common Name: India Aloe. People have been using it as a natural fix for all sorts of things, like wounds, burns, and even skin infections, it hydrates, heals, and soothes the skin. It's got 20 amino acids that help with skin repair and renewal. You also get minerals like calcium, magnesium, and sodium—perfect for nourishing your skin. Plus, there are enzymes and vitamins in there that really boost skin hydration and elasticity. And let's not forget the polysaccharides and antioxidants [9, 10, 11].

Green Tea (*Camellia sinensis*)-

Scientific Name: *Camellia sinensis*,

Common Name: Green Tea,

Origin: Asia, Green tea is rich in powerful antioxidants, primarily polyphenolic catechins, beneficial for skin protection and nourishment. Notable catechins in green tea include:

- Epicatechin (EC), which shields skin from damage and oxidative stress.
- Epigallocatechin (EGC), supporting skin repair.
- Epicatechin-3-gallate (ECG), reducing inflammation and calming sensitive skin.
- Epigallocatechin-3-gallate (EGCG), the most robust

antioxidant known for anti-aging and skin-protective properties [9, 10].

Licorice (*Glycyrrhiza glabra*)

Biological Source: So, liquorice comes from the dried roots and stolons of a plant called *Glycyrrhiza glabra* Linn. It belongs to the Fabaceae family. You'll find this plant hanging out in various spots across Europe and Asia—especially around the Mediterranean, as well as in Russia, China and India. It's also known as Mulethi,

Kingdom: Plantae,

Order: Fabales.

Family: Fabaceae (Leguminosae).

Genus: *Glycyrrhiza*. **Species:** *Glycyrrhiza glabra*.

- **Active Chemical Constituents**
- **Glycyrrhizin (Glycyrrhizic Acid):** This is mainly responsible for that sweet flavor and has anti-inflammatory benefits.
- **Glycyrrhetic Acid:** Supports your adrenal function and acts as an anti-inflammatory agent. - Flavonoids (Liquiritin, Isoliquiritin, Glabridin): These guys are great for antioxidants and help lighten the skin.
- **Coumarins (Herniarin, Umbelliferone):** They provide anti-microbial and liver-protecting properties.
- **Polysaccharides & Tannins:** These support your immune system and keep your skin hydrated.

Medicinal Uses: Skin brightening: Helps to fade pigmentation and dark spots.

Anti-inflammatory: It calms redness, irritation, and even helps with acne, Sun protection: Offers some mild UV protection and helps in repairing sun damage. Plus, calming, anti-aging, and protective properties can also be found in face serums and moisturizers [3].

Glycerol (*Glycerin*)

Glycerin, or glycerol, is a natural compound derived from vegetable oils or animal fats. It's a clear, colorless, and odorless liquid, with just a hint of sweetness and a thick, syrupy feel. This stuff is a humectant, meaning it pulls moisture from deeper skin layers and even from the air, helping keep your skin hydrated

According to the American Academy of Dermatology Association, glycerin can: - Keep that outer layer of your skin, known as the stratum corneum, nice and hydrated. - Strengthen your skin's natural barrier. - Protect against irritants that might cause skin problems.

Soothe and relieve dry skin. Possibly help with conditions like psoriasis. Because of all these benefits, glycerin is a must-have in many skincare products. It really helps in keeping skin smooth, healthy, and well-hydrated [9].

Sodium Benzoate as A Preservative

Sodium benzoate is a popular preservative that stops the growth of mold, yeast, and bacteria in acidic foods and drinks. It's the sodium salt of benzoic acid and goes by E211 in Europe. This preservative doesn't have any taste or smell and dissolves easily in water, making it super handy for food, drinks, cosmetics, and even some meds. Thanks to

its antifungal and antibacterial properties, sodium benzoate is added to products in carefully measured amounts to keep them fresh longer.

Chemical Details: IUPAC Name: Sodium benzoate, **Molecular Formula:** $C_7H_5NaO_2$, **Molar Mass:** 144.105 g/mol, **Alternative Name:** Sodium benzoate [9].

Pre-Formulation Studies: Basically, it's all about getting a good grasp on the physical and chemical properties of the herbal ingredients we're planning to use in our formulation. Here's what we look at:

1. **pH:** The serum's pH typically hangs around 4.0 to 4.5.
2. **Spread ability:** This part focuses on how easily the serum can glide over the skin.
3. **Homogeneity:** Here, we're checking to see if the ointment is uniform and consistent throughout.
4. **Reactivity:** This looks at how the extract behaves under different conditions.
5. **Thermal effect:** We assess how the extract reacts to temperature changes in various environments.
6. **Particle size:** This study is all about the size of the particles in the extract, making sure we avoid any grittiness when applied.
7. **Wettability:** We check the extract's ability to wet surfaces, which is important. Understanding all this helps us design and create the dosage form while evaluating how effective, safe, and stable the product [10, 12, 13].

preparation of vitamin c face serum

Chemicals: Dried Amla powder, Aloe vera gel, Glycerin, Green tea extract, Sodium hydroxide, Xanthan gum, Almond oil, Vitamin E, Jasmine oil, Sodium benzoate, Citric acid, Distilled water, Liquorice extract.

Apparatus: Beaker, Filter paper, Dark glass bottle, pH paper, Glass rod, Burner, Weighing balance, Funnel. Now, we prepared three different formulations in three separate batches—let's call them A, B, and C. Well, it's crucial to figure out the optimal amounts of each ingredient. We followed the same preparation steps for each batch to make sure everything was consistent.



Fig :1

Table 1: Formulation Table

Sr.no.	Ingredients	Formulation A	Formulation B	Formulation C	Role
1	Distilled water	15ml	10ml	13ml	Solvent base
2	Aloe vera gel	3ml	3ml	4ml	Hydration, soothing
3	Glycerin	1.5ml	1.2ml	1.4ml	Humectant, Moisturizer
4	Amla extract	3ml	3ml	3.2ml	VitaminC source
5	Green-tea extract	1.5ml	1.0ml	1.3ml	Antioxidant
6	Aloe vera	1.5	1.5	1.5	Hydration
7	Xanthan gum	0.5ml	0.4ml	0.1ml	Thickener stabilizer
8	Almond oil	1.5ml	1.5ml	1.5ml	Skin protection
9	Vitamin E	0.3ml	0.3ml	0.3ml	Antioxidant stability
10	Jasmine oil	0.15ml	0.15ml	0.15ml	Fragrance
11	Sodium benzoate, potassium sorbate	0.15ml	0.10ml	0.13ml	Preservative
12	Citric-acid, sodium hydroxide	0.003ml	0.002ml	0.004ml	pH Balance
13	Liquorice Extract	5%	1.5 ml	1.5 ml	Anti-inflammatory

Formulation Procedure: So, when you're diving into making a face serum, one of the big things you gotta keep in mind is how it looks and whether it'll hold up over time. This directly affects how well the product works. Usually, a face serum is an emulsion, which is just a fancy term for a mix of two liquids that don't usually play nice together—like oil and water. To keep everything blended and prevent any separation, we often add emulsifiers and thickeners. Emulsifiers are crucial because they help lower the tension between the oil and water, making that blend a lot more stable. They also keep the oil and water from merging back into their separate selves. On the flip side, thickeners are like the texture wizards; they improve how the serum feels and flows, making application smoother and just better overall [14]. Now, let's talk about pH—it's a big deal. Our skin is super sensitive to changes in pH, and if it gets thrown off, it can mess with the skin barrier, leading to issues like acne or excess oil. Ideally, our skin likes a pH of about 4.0 to 4.5. If something has a pH of 8 or 9? Yikes, that can strip away the good stuff on our skin and cause problems. So, keeping that pH in check is essential for keeping our skin happy and healthy. Creating a serum isn't always a walk in the park. Traditional methods, like the One Factor at a Time (OFAT) technique, where you change one ingredient at a time while keeping everything else the same, can be super time-consuming and pricey. You end up running a lot of trials. But luckily, there are modern methods, like Design Expert software, that make things easier. D-optimal design, for example, is a popular choice in cosmetic formulation because it allows you to optimize several variables at once, which cuts down on the workload and leads to better results. A key step in making the serum is mixing the oil and water phases. These components tend to be unstable together, so emulsifiers are a must. They help bridge the gap between the two, creating a well-mixed and long-lasting blend, which is crucial for the product's performance and shelf life [15].

Method of Preparation: For this oil-in-water (O/W) emulsion, we followed a specific recipe. The oil phase, which included almond oil, coconut oil, and xanthan gum, was mixed thoroughly for about 10 minutes to get a nice, even blend. At the same time, we prepared the aqueous phase by combining aloe vera gel, amla, glycerin, and a splash of distilled water, making sure everything was mixed

well. Once both phases were ready to go, the oil was gradually added to the water phase, drop by drop, while stirring at 2500 rpm. This method helped us create a stable oil-in-water emulsion, ensuring both phases were evenly distributed [15, 6].



Evaluation of Face Serum

1. Physical Evaluation

We looked at the color and overall appearance of the formulation. We also checked the texture by touch to confirm everything was blended nicely.

2. pH Measurement

Using a calibrated pH meter, we measured about 1 mL of the serum, diluting it with 50 mL of distilled water. The pH

came out to 6.4, which is great—within the ideal range of 4.1 to 6.7 for skin health.

3. Spreadability Assessment

So, we took about 2 grams of the serum and sandwiched in between two glass slides. On top, we added a weight of 20 grams. Then, we timed how long it took for the upper slide to slide a certain distance. This helped us figure out just how easily the serum spreads. Turns out, the face serum spread about 5 to 6 cm, which is a pretty good sign that it applies nicely and allows for decent dosage control on the skin.

4. Viscosity Determination For our face serum, we measured the viscosity at 13,759 Pa·s. This number shows us that the texture is just right nice and comfortable for applying on the skin.

5. Microbial Testing

To make sure our product was free from any nasty microbes, so we conducted microbial testing using the pour plate method. We took a diluted sample of the serum (1 mL) and mixed it with 20 mL of nutrient agar at 45°C, poured it into sterile petri dishes, and then let it incubate. The result? No microbial growth at all, and we didn't see any zones of inhibition. That's a big thumbs-up for the formulation's sterility and safety.

6. Stability Testing

Understanding how stable a product is really matters, especially if we want it to be effective and safe over time. For our study, we did some short-term accelerated stability testing, keeping in line with ICH guidelines. We didn't notice any major changes in color, consistency, or pH during the observation period, which is great news—it shows the product holds up well physically and chemically.

8. Cyclic Temperature Test

We also put the product through a cyclic temperature test, which involved switching between room temperature and freezing conditions daily. This was meant to mimic what could happen during storage or shipping. The product stayed stable through all those ups and downs, showing no signs of degradation or changes. That's a solid indication of its strong temperature resilience [16, 17].

8. Phytoconstituents Test for Amala

- **Tannin Test (Ferric Chloride Test):** Add 1–2 drops of 5% FeCl₃ solution. A dark blue or green color indicates tannins.
- **Flavonoid Test (Shinoda Test):** Add small Mg turnings + few drops of concentrated HCl to the serum. Development of a red or pink color indicates flavonoids.
- **Vitamin C (DCPIP Test):** Add a few drops of serum to blue DCPIP (Dichlorophenolindophenol) solution. If Vitamin C is present, the blue color disappears.

Future Perspectives: Stability So, we really need to work on how long Vitamin C can stay effective. More Testing – Better We should run some studies to show those long-term benefits. Personalized Skincare – It'd be awesome to create formulas tailored to different skin types. Everyone's skin is unique. Eco-Friendly Packaging – Using biodegradable and

recyclable materials. Bigger Market & More Benefits – Let's look at expanding into more countries, once we get the right approvals, of course. Wouldn't it be great if the serum could also protect from the sun and keep the skin hydrated? Just a thought [15, 18].

Significance of Study: Natural Alternative – This serum is a great option compared to synthetic Vitamin C ones, and it has fewer side effects, which is always a plus.

Rich in Antioxidants – These little guys help promote collagen production and rejuvenate the skin. Safe & Effective – It's gentle enough to minimize irritation that you often see with chemical-based serums. Potential Market Growth – There's a lot of room for growth in the herbal and organic skincare market. Scientific Validation – We need solid proof that herbal Vitamin C really works for brightening skin and tackling aging [18, 19].

Observation and Results

In total, we evaluated three different formulations—A, B, and C. They went through a bunch of tests, like physical assessment, irritancy testing, phase separation, consistency checks, pH analysis, and washability testing. All these evaluations gave us some valuable insights into the characteristics, performance, and stability of the products.

Observations Table

Table 2: Observations

Sr.no.	Parameters	Formulation A	Formulation B	Formulation C
1	pH	5	5.4	5.5
2	Irritancy	Positive	Positive	Negative
3	Phase Separation	Yes	Nil	Nil
4	Washability	Positive	Positive	Positive
5	Consistency	Negative	Negative	Positive
6	Viscosity	High	Low	Medium
7	Freezer temperature	Unstable	Unstable	Stable
8	Room temperature	Unstable	Stable	Stable



Fig :2



Fig :3

Conclusion

So, the serum we've formulated looks great and smells nice too. Its pH level is friendly for the skin, which is fantastic for daily use. At night and do its magic while you sleep, it really boosts your skin's freshness. Most people can use it without any issues, but if you have sensitive skin, you might feel a little tingling at first. In that case, maybe ease into it—try using it every other night for the first couple of weeks until your skin gets used to it [15]. If you choose wisely, serums can really tackle issues like fine lines, wrinkles, dark spots, and dryness. And when you pair them with a solid skincare routine—moisturizer and sunscreen included—you're setting yourself up for success against aging and dehydration. Since different ingredients tackle different skin concerns, a well-crafted serum can work wonders. The report also gave a quick overview of various skincare brands that offer facial serums, showing just how many options are out there. In short, facial serums are now a must-have in modern skincare. They have this amazing ability to nourish, repair, and protect your skin, making them a fantastic addition to any routine and promoting long-term skin health and vitality [9].

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