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Research Article

Formulation And Evaluation of Face Serum

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ABSTRACT

The need for skin care products and treatments has grown significantly in recent years. A lot of emphasis has been placed on maintaining a proper appearance and a standard of their attractiveness. As a result, people and just companies in general are leaning more and more towards taking care of their skin. A typical skin care routine consists of a cleanser, a serum, a moisturizer and a sunscreen. Among these, it has been seen that the serums are the new go to when it comes to building an excellent skin routine. Serums are made for a variety of skin types, including dry, oily, and everything in between. The goal of this literature review is to highlight the correct serum formulation for numerous skin and what results majority of the people can expect. The focus on serums, known for their concentrated ingredients and deep skin penetration, aligns with the demand for effective skincare products. The growing emphasis on skincare reflects a societal shift towards prioritizing personal appearance and beauty standards. Serums containing different concentrated vitamins and acids have demonstrated amazing effects, despite the fact that there are currently no effective methods for slowing down the aging conditions of the skin. The pH, physical appearance, viscosity, Spore ability, microbiological testing, cyclic temperature test, and other characteristics of facial serum were evaluated. The stability study's findings demonstrate that visual acuity and homogeneity remain constant.

INTRODUCTION

Study of human skin represents an important area of research and development in dermatology, toxicology, pharmacology, and cosmetology, in order to assess the effects of exogenous agents,

their interaction, their toxicity to the various cutaneous structures and/or their mode of absorption. [1] The Greek term "cosmetic" means "to adorn," meaning to add something ornamental to a person or something. The study and practice of cosmetic treatments is known as cosmetology.

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It is the study of cosmetics and how they are applied, as well as the art or science of enhancing and beautifying the skin, hair, and nails. For a skin care product to achieve its intended goal, the potent ingredient must be able to penetrate the skin. In order to provide immediate benefits without using dangerous chemicals, face serum is the solution for delivering the valuable active ingredient into the skin. [2] A concentrated product that is frequently used in cosmetics is serum. In professional cosmetology, the name speaks for itself. The water or oil concentration of the cosmetic serum is the same as that of any other cream. A concentrated preparation with ten times as much organic stuff as a cream is called a serum. As a result, it swiftly and efficiently resolves the aesthetic issue. [3] Face serum comes in both water-based and oil-based forms and is a highly concentrated emulsion. Because serums, also known as concentrates, contain roughly 10 times as many biologically active ingredients as creams, they can be used to treat skin issues more effectively. [5] Within a month or less, adding a few drops of face serum to your daily skin care routine will show effects. This is because the tiny molecules that make up face serums enable them to swiftly and deeply permeate the skin. Antioxidants, ceramides, amino acids, and other nutrients are among the many beneficial active ingredients and nutrients found in serum. This explains why the most expensive product in a skin care kit is always face serum. [2]. These elements are necessary for all skin types to be as healthy as possible. For oily and combination skin, gel and liquid preparations work best; for normal to dry skin, serums and light lotions work best; and for dry to extremely dry skin, more emollient lotions and moisturizing creams work best. [4] Regardless of product, texture, or personal choice, everyone has the same amazing ingredients for healthy skin. Texture is all about skin type. Although the skin is the body's largest and most

protective organ, it can occasionally develop dry patches for a variety of causes, such as exposure to UV radiation, pollution, or makeup that can irritate or trigger allergic reactions if left on overnight. [2] The face serum contains a number of substances, including a neuropeptide, linked to improved barrier function and the appearance of fine lines and wrinkles. Green tea, vitamin C&E formulations, sodium hyaluronate, a humectant and precursor to extracellular matrix, beta-glucan, a cell turnover and regenerative extract thought to support healthy immunosurveillance, and AP-8, a neuropeptide linked to muscle contraction, are also included in the facial serum. [4]. The main distinction between a serum and a cream or lotion is what is not included in the formulation. Additionally, they have fewer thickening and lubricating substances like seed or nut oils. The majority of serums are water-based and completely remove oils. [19]

ADVANTAGE

- Improve skin texture
- Minimizes the skin pores.
- Hydrates and nourishes the skin.
- Improve skin elasticity

DISADVANTAGES

- The gel or liquid like serum texture is an unsuitable for people who have skin condition that are chronic like eczema or rosacea, that weakens the skin barrier.
- For this people, serum may penetrate too quickly, causing irritation [6]

History Of Facial Serums

It should come as no surprise that the ancestors of modern serums were derived from horse blood, egg albumin, and bovine placenta. According to the dictionary, a serum is the clear, yellowish fluid



that is obtained after whole blood has been allowed to clot and separated into its solid and liquid components. These products were made commercially available by packaging them in sterile ampoules maintained with oxyquinoline (and later, the development of parabens). Since the early days of short product shelf life, when small batches had to be produced and consumed rapidly before the product rotted, this practice has persisted. [31] In the 1800s, skincare, cleanliness, and exercise were all highly valued. In terms of easily accessible skincare products for ladies, the 1900s saw a boom. In 1937, Carmex was created, and in 1944, sunscreen. After launching their cosmetics line in New York City in 1946, Estee Lauder also introduced Clearasil, Ponds, Oil of Olay, and Clinique in the 1950s. All-natural skincare products became more popular in the 1980s. Burt's Bees and Dr. Howard Murad's lines were introduced in the 1980s and 1989, respectively. The FDA authorized Botox for facial frown lines in 2002. A portable, battery-powered gadget called The Zeno was introduced in 2007. It applies heat to a blemish, destroying the bacteria and causing it to vanish after just a few treatments. [32] These serums were typically based on albumin, the tightening agent found in egg whites, which have long been utilized as a face mask by women worldwide. [32]. After whisking up the egg whites and yolks, they were applied to the face and neck for 15 to 20 minutes before being rinsed off with cold water. This has the same tightening and lifting effect as a serum. Typically, a serum's molecules are rather tiny and distribute the chemicals to every layer of the skin without clogging the pores with glycerin, oil, or other comedogenic fillers. [31]

Formulation Of Facial Serums

In essence, a face serum formulation is an emulsion made up of two liquids that are

incompatible. The pH value is a chemical characteristic that is thought to be significant when formulating. The skin's natural microbiology and function will be disrupted if the pH level is altered. Acne, skin flakiness, excessive sebum production, and other severe conditions are among the many skin issues that result from this. Enhancing the function of the skin barrier can be achieved by creating a face serum with an appropriate pH range. [2] It can be difficult to create a face serum or any other kind of product. This is due to the fact that the old-fashioned One Factor at a Time (OFAT) approach was very time-consuming and could lead to pointless experiments that cost money. One factor at a time was changed while the other remained fixed in order to complete OFAT. Numerous tests are necessary. [7] To establish a stable system over time or a longer product shelf life, it is essential to blend the water and oil phases while creating a face serum. The water and oil systems are thermodynamically unstable, of course. Emulsifiers can be added to the system to mix it by reducing the interfacial difference between the water and oil phases. [2]

Type Of Face Serum

1.The Oil Serum

The easiest kind of face serum to prepare is an oil serum. Usually, it is composed of high-quality, quickly absorbed carrier oils with moisturizing and barrier-repairing qualities. Polyphenols, essential fatty acids, and other compounds that are readily absorbed by the skin are also included in these oils¹².





Figure 1: Oil based serum

2. Gel Serum

Certain areas of the face feel tighter or more lifted because gel serums give the skin a "tightening" sensation. Because it allows for the incorporation of water-based plant extracts, this type of serum is a water-based formulation¹³.



Figure 2: Gel based face serum

3. Water-based serum

Water-based serums are similar to gel serums, however they will contain less gum and thickeners. You would use a water-based face serum to provide high-performance hydrophilic plant extracts that are then trapped against the skin under

a cream or lotion. Water-based compounds known as hydrosols, which can have balancing, skin-toning, and soothing benefits, form the basis of a face serum. You would then add skin-feeling ingredients, such as humectants, which contribute to the skin-stickiness of the serum ¹⁴.



Figure 3: Water based face serum

4. The emulsion serum

An emulsion-based face serum is a kind of moisturizer that delivers high-performance skin components while reinforcing the skin's barrier. It joins two "immiscible" phases, such water and oil, and uses an emulsifier to keep them together and in a stable form. The finest way to transfer high-performance actives into the skin's tissues is with this serum¹⁵.



Figure 4: Emulsion based face serum

Selection Of a Facial Serum

Now, this can be a problem because there are numerous options available in the market, and all of them promise beautiful and healthy skin. These are the factors taken into consideration before selecting a Facial serum: Either you want to get rid of fine lines or dark patches around mouth or reduce the random dark spot on your face or any other Facial blemishes, one should always know what they are exactly looking for.

1. Hydrating Serums

Packed with humectants like Glycerine, sodium PCA, Hyaluronic acid, these serums attract and maintain moisture within the skin, keeping it smooth and plump. Hydrating serums are advised for everyday use, but for best effects, they should be applied once a week. Depending on your preferences, you may decide to use these serums in the morning or at night.

2. Brightening Serums & Hyperpigmentation

By avoiding discolouration and dullness, brightening serums aim to improve skin tone and clarity. Natural skin tone, heredity, prolonged sun exposure, stress, and environmental changes are

some of the causes of uneven pigmentation. Pigmentation problems are frequently found under the eyes, around the mouth, and even on the cheeks. Serums containing vitamin C and niacinamide are essential for resolving these issues. The multipurpose active component niacinamide is a flexible substance that works well for all skin types. It's an excellent choice for people who are new to skincare routines because it's beginner-friendly. For example, niacinamide incorporation into your regimen to combat Hyperpigmentation, brightens skin, strengthens the skin barrier, Acne-prone skin effectively.[19]

Method Of Preparation:

• Active Ingredient Used

1) Glycerine

Glycerine is well known for drawing and holding onto moisture in the skin, keeping it supple and remarkably silky. These characteristics help one look younger and reduce ageing symptoms. Glycerine serves various functions, act as a denaturant, fragrance ingredient, hair conditioning agent, humectants, oral care agent, oral health-care drug, skin protectant, skin conditioning agent (humectants), and viscosity decreasing agent [18]

2) Panthenol

Pantothenic acid, sometimes referred to as vitamin B5, is the chemical source of panthenol. Its moisturising, calming, and anti-inflammatory qualities make it a popular ingredient in a variety of skin care and personal care products. A reliable and widely utilised source is pantothenic acid, which is the alcohol derivative known as pantothenol. The Greek word "pantothén," which meaning "everywhere," is the source of the name "pantothenic." This alludes to the abundance of pantothenic acid, which may be found in both

plant and animal sources. After being absorbed by the body, panthenol transforms into vitamin B5, which is involved in numerous vital biological processes. This includes having a beneficial effect on the skin, which is why many producers frequently incorporate it into topical cosmetics. The reasons why panthenol is a prevalent ingredient in many goods, along with its safety, dangers, and other factors, are covered in this page.

3) Salicylic acid

a) Exfoliation:

Salicylic acid's remarkable ability to gently exfoliate your skin can reveal the youthful, glowing skin beneath the surface.

b) Acne:

Salicylic acid dissolves the debris that Salicylic acid dissolves the debris that might cause bothersome acne by penetrating deeply into your pores.

c) Oil Control:

People with oily skin can benefit greatly from salicylic acid. By controlling sebum production, it assists you in achieving the desired matte look.

d) Anti- Inflammatory: -

Salicylic acid has anti-inflammatory qualities that help reduce redness, irritation, and irritated skin.

4) Niacinamide

One form of vitamin B3 is nicotinamide, often known as niacinamide. Although further research is required, niacinamide supplementation may help enhance skin suppleness, reduce inflammation, and more. Because B3 deficiency can result in skin, renal, and brain issues, it is crucial to prevent it. However, niacinamide has

many other uses, particularly in relation to overall skin health. By lowering inflammation, niacinamide may lessen redness or discolouration. This may be useful in treating inflammatory skin diseases like:

- psoriasis
- atopic dermatitis
- contact dermatitis

5) Tea Tree Oil

Botanical name: Melaleuca alternifolia

Common names: Tea Tree, Narrow-leaved paperbark, Melaleuca

Kingdom: Plantae

Family: Myrtaceae

Genus: Melaleuca

Morphology:

Melaleuca alternifolia, commonly known as the tea tree, is a small evergreen tree or shrub that typically grows 4 to 7 meters tall with a bushy crown and distinctive papery bark that peels off in thin layers. The leaves are narrow, linear, and alternately arranged along the stems, measuring about 10–35 mm in length and around 1 mm in width. They are rich in essential oil glands, which release a strong, characteristic aroma when crushed. The flowers are small, creamy-white to pale yellow, and appear in dense, cylindrical spikes at the ends of branches. Each flower has five small petals and numerous long stamens, giving the inflorescence a soft, fluffy look. The fruit is a tiny, woody capsule that contains numerous seeds and remains attached to the plant. This species is well adapted to sandy, well-drained soils and is valued for its aromatic leaves, which



are the source of tea tree oil with known antimicrobial and anti-inflammatory properties.

Chemical Constituents:

Melaleuca alternifolia, commonly known as tea tree, contains a variety of essential oil components responsible for its therapeutic properties. The primary active constituent is terpinen-4-ol, which is largely responsible for its antimicrobial and anti-inflammatory effects. Other major compounds include γ -terpinene, α -terpinene, 1,8-cineole (eucalyptol), α -terpineol, p-cymene, limonene, and sabinene. Among these, terpinen-4-ol, α -terpineol, and α -pinene contribute significantly to the oil's antibacterial, antifungal, and antiviral activities. While 1,8-cineole also has therapeutic effects, its content is usually kept low Fig 5: Tea Tree Oil Final Year B. Pharm, Sem. VIII Project, 2024-25 10 "Formulation and Evaluation of a Polyherbal Soap: Assessing the Combined Antimicrobial Effect Against Skin Pathogens" in medicinal-grade tea tree oil to reduce potential skin irritation. These volatile constituents are found in the oil glands of the leaves and are extracted through steam distillation.

Material And Collection

Materials	Collection
Active ingredients	<ul style="list-style-type: none"> Shivajirao. S. Jondhle college of pharmacy Chemistry Lab (Glycerin, Salicylic Acid, Propylene glycol, Sodium Benzoate, Rose oil, Xanthan gum, NAOH) Chemical Market Niacinamide (Vitamin B3), Panthenol (Provitamin B5), Tea tree oil.

Beakers, Test tubes.	Shivajirao. S. Jondhle college of pharmacy
Measuring Cylinder (5ml, 50ml)	Shivajirao. S. Jondhle college of pharmacy
PH Meter	Shivajirao. S. Jondhle college of pharmacy
Ostwald viscometer	Shivajirao. S. Jondhle college of pharmacy
Glass stirrer rod, Spatula, Etc...	Shivajirao. S. Jondhle college of pharmacy

Procedure

1. In a container Niacinamide dissolve in small amt of distilled water or add Glycerin with continuously stirring.
2. Then slowly sprinkle xanthan gum into the above mixture while stirring continuously to avoid clumping.
3. In a separate container, dissolve salicylic acid in propylene glycol.
4. Combine both the mixture with the continuously stirring
5. Add Sodium benzoate as preservative.
6. Introduce essential oils such as tea tree oil and rose oil into the mixture.
7. And make the final volume with distilled water.
8. Measure the PH of the serum, add sodium hydroxide (if needed) for adjust the PH of serum.
9. Transfer the serum into sterilized container, store in cool and dark place.

Formulation Table

Ingredient	(F1) Batch	(F2) Batch
Glycerine	1 ml	2ml
Salicylic Acid	0.3g	0.6g



Niacinamide	0.7g	1.5g
Panthenol	0.3ml	0.6ml
Propylene Glycol	0.5ml	1ml
Tea Tree Oil	0.03ml	0.06ml
Rose Oil	0.03ml	0.06ml
Xanthan Gum	0.04g	0.09g
Sodium Benzoate	0.07g	0.15g
Distilled Water/ Rose water	11.4 ml	23.8ml

Application Of Face Serum

It is an essential water-based skincare product that is lightweight and treats a variety of skin issues. These serums have cutting-edge components that can do wonders for your skin, such as niacinamide, hyaluronic acid, vitamin C, AHAs, and BHAs. Choosing a face serum that works for your skin type and issues is essential if you want to get the most out of it. Given the wide variety of serums on the market, selecting the best one is really appreciated. In your routine, how many serums are actually necessary? When and how should you use them? To apply a serum effectively: 1. Cleanse

your face and gently pat it semi-dry. 2. Apply the serum while your skin is still damp as it enhances penetration due to increased permeability. 3. Use upward sweeping motions to apply the serum from your décolletage and neck to your face. 4. Allow the serum to fully absorb into your skin before applying eye cream, moisturizer, and sunscreen. 5. Unlike thick creams that are massaged into the skin, serums should be applied with gentle tapping motions using fingertips or palms. 6. Avoid excessive rubbing; let the serum absorb naturally into your skin²¹. 7. By following these steps, you can maximize the benefits of your facial serum and achieve healthier, glowing skin.

1. Begin with a fresh, clean face:

Before applying a serum, it is crucial to cleanse and exfoliate your skin to eliminate excess sebum, dirt, or toxins that may hinder the serum's absorption.



2. Apply a small amount:

Applying serum less is more on the application of serum. Take a small amount on your palm or use a dropper, then gently massage it onto your skin.



3. Use gentle circular motions:

When applying a natural face serum, use gentle circular motions to ensure even absorption of the

ingredients into your skin. You can also try the tapping method²².



4. Avoid the eye area:

The delicate area of skin around your eyes should be avoided when applying serum to prevent irritation. Serum is allowed to absorb for a few minutes before makeup or moisturizer is applied.

to prevent light and heat from degrading its ingredients

5. Absorption Allow time:

After applying the face serum, it is for absorption into skin at least for 5 minutes before proceeding with moisturizer or makeup application.

7. Use within six months:

For optimal effectiveness, use your face serum within six months of opening it. After this period, the ingredients may lose their potency.

6. Store properly:

To maintain the efficacy of your face serum, it is stored in a cool, dark area like a cabinet or drawer

8. Replace every 3-4 months:

Face serums possess a shelf life and will eventually expire. To maximize the benefits of your product, replace it every 3-4 months. High-quality serums should absorb quickly and no stickiness is left or oily residue on your skin. It's essential to start using face serums in late 20s or early 30s when they can provide significant

benefits without being too active for younger skin²³.

Benefits Of Face Serum

Your skin can benefit greatly from face serum. From hydrating the skin to reduce fine lines and wrinkles, to minimizing dark spots and refining skin texture, serums are versatile products that can address various skin concerns. A good serum containing antioxidants can protect the skin from environmental stressors, providing value that justifies the cost and effort of incorporating it into your skincare routine. Depending on your individual skincare objectives, serums can help exfoliate, firm, and smooth the skin. Regular usage of serums can increase the production of collagen, which can greatly improve the firmness and texture of your skin and leave it appearing smooth and young. Serums containing vitamin C are crucial for skin renewal since they efficiently lighten dark spots, scars, and pimple marks. In addition to preventing the need for harsh treatments like chemical peels, which can increase the skin's susceptibility to sun damage, serums with high plant-based concentrations help lighten dark spots. Furthermore, coffee and vitamin C-containing serums help shrink open pores, preventing and treating whiteheads and blackheads while also moisturising and nourishing the skin²⁴. Although they are sometimes disregarded, under-eye serums can aid all skin types by repairing and protecting the sensitive under-eye area while addressing problems like wrinkles and dark circles. You may rapidly brighten your eyes and rejuvenate your appearance with an anti-inflammatory, detoxifying under-eye serum. Applying serums with anti-inflammatory qualities can benefit people with sensitive skin who are prone to inflammation by reducing redness and dryness and halting more damage, leaving their skin feeling hydrated and youthful.

Dermatological elasticity, wrinkles, uneven skin tone, spots, blemishes, hydration, and nourishment can all be effectively treated using moisturising serums that contain chemicals like retinol. Adding serum to your skincare regimen will help your skin retain moisture and look plumper and younger. Vitamins and essential oils are important components that help keep skin looking healthy throughout time. Accepting the advantages of face serums can contribute to the development of healthy, glowing skin that seems youthful by nature.

Marketed Face Serum

1 Boutique Dandelion Anti-Ageing Serum

This skin whitening serum is the best since it contains genuine dandelion and nutmeg oil, which are abundant in vitamins E and minerals. It is safe for regular usage, brightens dark spots, and makes the skin look radiant. Among the best face serums in India, this one removes wrinkles and other skin imperfections to leave your skin looking flawlessly glowing.



Boutique Dandelion Anti-Ageing Serum

2. TruSkin Naturals Vitamin C Serum for Face

The serum has a potent anti-ageing composition best suited for eradicating wrinkles, fine lines, and

other facial symptoms. You will have bright, clean, smooth skin with science that encourages collagen production. Even the most sensitive skin types can benefit from this face serum's natural and organic ingredients, which soothe the skin and minimise breakouts, acne, and age scars.



Truskin Naturals Vitamin C Serum for Face

3. Radha Beauty Vitamin C Serum

Use the vitamin C serum from Radha Beauty for a younger and healthier face. This anti-ageing product also reduces fine lines and wrinkles, leaving your skin smooth, clean, and soft. To successfully treat acne, age spots, or skin irritation, apply it all over your face and neck. This well-known antioxidant serum in India helps shield your skin from the sun's rays and leaves it looking refreshed and young.

4 O3+ Radiant Oxygenating Facial Serum

Your skin will be exceptionally bright thanks to this OZ+ Radiant Serum, which contains oxygen molecules that work as effectively as skin varies. In India, it's the greatest serum. It is a strong antioxidant that encourages skin radiance. Additionally, this serum improves the skin's inherent glow. It works great as a foundation for normal to oily skin types before applying makeup.

This paraben-free product efficiently whitens the skin on the face, leaving you with bright, uniformly toned skin that is also lighter.



O3+ Radiant Oxygenating Facial Serum

5. Minimalist 10% Niacinamide Face Serum

Try the Minimalist Niacinamide 10%+ Zinc serum for blemish-free skin. When combined with aloe vera, niacinamide promotes protein synthesis, balances skin tone, and inhibits the production of melanin. Zinc is added to help smooth the skin, lower inflammation, and control sebum. Oily, acne-prone, and blemish-prone skin types can use this pH-balancing serum safely in their daily skincare regimes.



Minimalist 10% Niacinamide Face Serum

6. St Botanica Retinol 2.5% + Hyaluronic Acid

Face Serum The St. Botanica Retinol 2.5% E & Hyaluronic Acid Professional Facial Serum is intended to lessen dryness and protect your skin from damage and ageing by UV exposure aggressors. It contains 2.5% retinol, which promotes cell regeneration and repair while also halting premature ageing for skin that appears younger. This serum's hyaluronic acid draws and retains moisture in the skin.



St Botanica Retinol 2.5% + Hyaluronic Acid

7. L'Oréal Paris Revitalift 1.5% Hyaluronic Acid Face Serum

Dermatologists prescribe this L'Oréal Paris hyaluronic acid serum as a treatment for skin that is supple, glowing, and plump. It is powered by 1.5% hyaluronic acid, a strong humectant that seals moisture into the skin and may retain up to 1000 times its weight in water. It deeply enters the skin to leave it feeling hydrated, smooth, and supple. [29]

CONCLUSION

This study explores the history, importance, and appropriate administration methods of face serums. Knowing one's individual needs is crucial

when choosing a serum because the market is overflowing with options that address a wide range of skin types and issues. Positive results can be achieved by carefully selecting a serum that targets certain skin concerns. Overall health is greatly influenced by the condition of the skin, and using the correct serum in a skin care regimen helps prevent environmental damage and fight ageing. Each component addresses a distinct skin issue, and when used skilfully, they can provide amazing effects. The paper also covers the different skincare brands that sell serums, highlighting the essential function that face serums play in contemporary skincare regimens.

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