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A Comprehensive Review of Herbal Facial Serum Containing Lotus Leaf (*Nelumbo Nucifera*) and Lodhra Oil (*Symplocos Racemosa*) for Pore Refinement

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Abstract: Enlarged facial pores are a common cosmetic concern associated with excessive sebum production, aging, acne, ultraviolet (UV) exposure, and reduced skin elasticity. Herbal skincare products have gained attention as safer alternatives to synthetic formulations. lotus leaf (*Nelumbo nucifera*) and lodhra (*Symplocos racemosa*) possess antioxidant, anti-inflammatory, antimicrobial, and astringent properties that make them promising ingredients for pore-refining facial serums. Lotus leaf helps regulate excess sebum and protects the skin from oxidative stress, while Lodhra's tannin-rich composition temporarily tightens the skin, reducing the appearance of enlarged pores. This review discusses the causes and types of enlarged pores, the phytochemical constituents and therapeutic properties of lotus leaf and Lodhra, different types of facial serums, and the rationale for combining these botanicals in a single formulation. The combination has the potential to improve skin texture, support acne-prone skin, and promote a smoother, healthier-looking complexion, although further clinical studies are needed to confirm its efficacy.

Key Words: Open pores, Herbal Serum, Lotus Leaf (*Nelumbo Nucifera*), Lodhra oil (*Symplocos Racemosa),* Lodhra:Astringent, Rationale for combination, pore refining, sebum control

INTRODUCTION

Facial pores, also known as funnel-shaped structures, are microtopographic depressions at the skin's surface that correspond to enlarged pilosebaceous follicles.People frequently have noticeable pores, especially in the cheeks, forehead, and nose. Although noticeable pores are harmless, they are a sign of aging skin and a detrimental factor in the perception of skin quality and beauty worldwide.[1]

Fig 1: Open Pores

People frequently have visible pores, especially on their cheeks, forehead, and nose. although noticeable pores are harmless, this cosmetic problem is a sign of aging skin and a detrimental factor in the global perception of skin quality and beauty. Seborrhea, genetic susceptibility, UV exposure, acne, and aging are some of the endogenous and exogenous factors that are thought to be linked to pores.[2]

Types of Pores

The morphological subtypes of skin pores were divided into three categories."visible skin pores“ (0.1–0.6 mm2), "enlarged skin pores" (0.3–0.6 mm2), and "blackhead embedded skin pores."[3]

Fig 2: Types of Open Pores

O-Shaped Pores[3]

Appearance: Round and circular.

Cause: Excess sebum (oil) production and enlarged sebaceous glands.

Common in: Young individuals with oily skin.

Location: Mainly on the nose, forehead, and cheeks.

U-Shaped Pores[3]

Appearance: Oval or U-shaped (cup-like) pores.

Cause: Mild loss of skin elasticity with increasing age and reduced collagen support around the pore.

Common in: Normal to dry skin, especially middle-aged adults.

Location: Mostly on the cheeks.

Y-Shaped Pores[3]

Appearance: Elongated or Y-shaped pores.

Cause: Advanced skin aging, collagen degradation, loss of elasticity, and chronic UV exposure. The skin surrounding the pore sags, stretching the pore into a Y-like shape.

Common in: Older adults and sun-damaged skin.

Location: Primarily on the cheeks.

Causes of Open Pores

Acne, chronic photodamage, chronic radiodermatitis, vitamin A insufficiency, seborrhea, and loss of skin elasticity and tension are some of the possible causes of the pathophysiology underlying this illness. Hormonal influences have a significant impact on pore size. For example, high levels of sebum production in men are caused by testosterone, and in women, pore size increases significantly during the ovulatory phase of the menstrual cycle due to progesterone's effect on sebaceous gland activity. Additionally, many people exhibit a correlation between acne and pore enlargements, as well as a variety of pore density and size ranges.[4]

Fig 3: Causes of Open Pores

PLANT PROFILE

1. Lotus Leaf (Nelumbo nucifera)

Fig 4: Lotus Leaf

Kingdom: Plantae

Group: Angiosperm

Family: Nelumbonaceae

Species: Nelumbo nucifera

Synonyms: Indian lotus/Sacred lotus

CHEMICAL CONSTITUENTS

Alkaloids: Nuciferine N-nornuciderine, roemerine
Flavonoids: quercetin, kaempferol, isoquercitrin
Polyphenols: catechins, phenolic acids
Tannis: Gallic acid and gallotannins, Ellagic acid and ellagitannins
Nelumbo nucifera (family Nelumbonaceae), commonly known as the sacred or Indian lotus, is an aquatic perennial herb widely used across Ayurvedic and Traditional Chinese Medicine systems. Different parts of the plant — leaf, flower, seed and rhizome — have long been valued for antioxidant, anti-inflammatory and astringent properties, which eventually drew the attention of the cosmetic industry toward its incorporation in skin-care formulations[5]

Relevance to Pore Refinement:

Extracts of *N. nucifera* flower have been reported to modulate lipogenesis in sebocytes, and this sebum-regulating action, combined with an inherent mild astringency, is described as helping to visually refine pore appearance and reduce inflammatory acne lesions without the dryness[6] . Cosmetic-ingredient reviews further note that lotus leaf extract carries a low comedogenicity rating, making it generally suitable for oily, acne-prone or pore-congested skin[7]

2. Lodhra Oil (Symplocos racemosa)

Fig 5: Lodhra

Kingdom: plantae

Group: Angiosperm

Family: Symplocaceae

Species: Symplocos racemosa

Synonyms: Lodra, lodh, rodhra, Symplocos bark

CHEMICAL CONSTITUENTS:

Alkaloids -loturine, Loturidine, colloturine

Glycoside –Symplocoside & lodhrin

Tannins - catechol tannin

Lodhra, is a small evergreen tree widely used in the Ayurvedic system of medicine, most commonly through its stem bark. Classical and ethnobotanical literature describes the bark as astringent, anti-inflammatory, and skin disorders including acne and pimples[8]

Relevance To Pore Refinement

Tannins and polyphenolic substances with astringent, anti-inflammatory, and antioxidant properties are abundant in the bark of the lodhra plant (*Symplocos racemosa).* By reducing excess surface oil and increasing skin firmness, the astringent effect helps temporarily tighten the skin and lessen the appearance of enlarged pores. Its antimicrobial and anti-inflammatory qualities may also aid in lowering inflammation linked to acne, improving the appearance of pores and promoting clearer skin. These characteristics justify the use of pore refinement in formulations meant for oily and acne-prone skin.[9]

SERUM

A facial serum is a topical skincare product that is lightweight and quickly absorbs. It contains a high concentration of active ingredients that are intended to penetrate the skin and provide specific benefits like hydration, antioxidant protection, anti-aging effects, skin brightening, acne control, or pore refinement. [10]

Fig 6: Serum

Advantage of Face Serum[11]

- Natural components: Natural ingredients, which are kinder to skin, are frequently used in herbal face serums.
- Fewer adverse effects: Herbal serums may have fewer adverse effects than chemical-based solutions.
- Holistic approach: Herbal serums frequently emphasize the general health and well-being of the skin.
- Rich in antioxidants: A lot of the herbs used in face serums are high in antioxidants, which can aid in skin protection.

Disadvantages of Face Serum[12]

- **Potential for Allergic Reactions**: Despite being natural, herbal serums may still irritate or trigger skin allergies in certain people, particularly those with sensitive skin or allergies to pollen.
- **Shorter Shelf Life:** Natural substances typically break down faster than synthetic ones, especially if improperly kept. This may result in a shorter shelf life, necessitating refrigeration or the addition of weak preservatives such sodium benzoate.
- **Variation in Potency**: Seasonal harvests, extraction techniques, and storage conditions can all affect the strength of herbal extracts, which can lead to uneven product efficacy.
- **Slower Results:** Unlike chemical-based serums that may produce instant or faster results, herbal serums work gradually and require longer periods of consistent use to show visible effects.

Ideal Quality of Serum [13]

1. Natural and Non-Toxic Components Plant-based, chemical-free substances that are suitable for long-term usage should make up the serum.
2. A pH balance between 4.5 and 6.5 is necessary to preserve skin compatibility and avoid inflammation.
3. The right amount of viscosity and spreadability guarantees uniform application and efficient absorption without obstructing pores.
4. Microbial Stability Over the course of its shelf life, the formulation should be able to withstand microbial growth.
5. Anti-inflammatory and Antioxidant Properties should include potent herbal extracts that are recognized to guard against inflammation and oxidative stress.
6. Good Aesthetic Appeal Appealing appearance, pleasant smell, and non-greasy feel.
7. Non-Comedogenic shouldn't clog pores or result in acne

Types of Face Serum

1. Water-Based Serum: While they may contain very little or no gums and thickeners, water-based serums are similar to gel serums. You would use a water-based face serum to apply high-performance hydrophilic plant extracts that are trapped against the skin beneath lotion or cream. The best way to encourage more penetration of water-based compounds into the skin and deliver their high-performance ingredients somewhat deeper into the layers of skin is to layer an anti-aging face mist under an emulsion and then under an oil. Higher component penetration will be encouraged by the oils' occlusive barrier formation.[14]

Fig 7: Water Based Serum

2. Oil-Based Serum: Among all the facial serums, the oil serum is the easiest to prepare. Usually, it begins with a base of just high-quality, quickly absorbing carrier oils—also known as "dry" oils. The premium oils included in the serum contain polyphenols, essential fatty acids, and other compounds that the skin may break down in addition to their moisturizing and barrier-repairing qualities.[14]

Fig 8: Oil Based Serum

3. Gel-Based Serum: Gel serums provide your customer the appearance that their skin is temporarily lifted or tightened in specific areas of their face by creating a "tightening" sensation. Because this formulation is water-based, the gel serum gives you the opportunity to incorporate some amazing water-based (hydrophilic) plant extracts.[14]

Fig 9: Gel Based Serum

4. Emulsion-Based Serum: An emulsion-based face serum is a moisturizer that provides the skin with high-performance ingredients and fortifies the skin's barrier function. An emulsion is made up of two "immiscible" phases, such as water and oil, which don't want to mix. Water and oil are bound together and kept in a stable form by an emulsifier. An emulsion has the best potential of delivering high-performance actives deeply into the skin's tissues. It is quite difficult for any cosmetic component to penetrate the dermis given the skin's barrier function, yet an oil and water mixture works best to achieve this amazing accomplishment.[15]

Fig 10: Emulsion Based Serum

5. Pressed Balm Serum – A balm serum contains active ingredients that are oil-soluble (lipophilic) and may benefit the skin in addition to the traditional balm base of butters, waxes, and oils. The active ingredients in the pressed serum are able to work while the butters and waxes create an occlusive barrier that hydrates and nourishes the skin. Thousands of beautiful plant oils can be mixed with dozens of fascinating, unusual butters and waxes to create a balm serum.[15]

Fig 11: Pressed Balm Serum

Combining of Lotus Leaf and Lodhra oil in a Single Serum:

The two botanicals offer complementary, rather than overlapping, mechanisms relevant to pore refinement. Lotus leaf principally contributes antioxidant flavonoids and a mild sebum-modulating, low-comedogenic profile suited to lightweight leave-on formulations, while Lodhra bark contributes classical tannin-based astringency along with reported antimicrobial action against common skin flora[16]. In combination, the pair is expected to

i. Tighten the visual appearance of pores through polyphenol/tannin-mediated surface protein precipitation.
ii. Moderate excess sebum and oxidative stress at the follicular opening.
iii. Provide mild antimicrobial support relevant to acne-prone, pore-congested skin.

Effect of Serum

The goal of the serum is to enhance the skin's general health and attractiveness. Its astringent activity may lessen the appearance of enlarged pores, while its antioxidant qualities aid in shielding the skin from oxidative stress. Additionally, the serum nourishes the skin, helps control excess sebum, reduces skin irritation, offers mild antibacterial assistance for acne-prone skin, and, with consistent application, encourages a smoother, healthier-looking complexion.[17]

Selection of Serum Base According To Skin Type and Climate Condition:

The season and climate in a person's permanent residence also affect how much serum is used. concentrations are based on water for normal, dry skin in hot climates, or they are combined with antimicrobial concentrations for oily skin since they have a minor drying effect. In this situation, using oily bases is not advised since it could cause pore bridging. Because of this, oil bases for all cosmetics—whether they be creams or concentrates—are advised in cold or unpredictable climates during the winter.[18]

How To Use Face Serum[19]

Fig 12: Steps to Apply Serum

1. Cleanse your skin: First, wash your face. Use a gentle cleanser that is appropriate for your skin type to remove any debris, oil, and pollutants from your skin. Use a clean towel to pat dry your skin.

2. **Tone (optional):** If you use a toner as part of your skincare routine, apply it only after cleansing. Toners can help restore the pH balance of the skin and prepare it for improved absorption of upcoming skincare products.

3. Apply serum: Apply a pea-sized amount of face serum with your fingertips. As you may remember, a little goes a long way, so you don't need to use a lot of serum.

4. Apply to face: Gently pat the serum onto your skin, starting in the center of your face and working your way outward. Avoid straining or pulling at the skin surrounding the delicate eye area.

5. Use light, upward strokes to massage the serum into your skin. Focus on trouble spots or regions where you want to treat specific skincare issues, such fine lines, wrinkles, or dark patches.

6. Permit absorption: Give the serum a few minutes to fully seep into the skin before applying any further skincare products. This makes it easier for the active substances to penetrate deeply and function effectively.

7. Moisturizes The Skin: Apply a moisturizer to the skin to seal in moisture and provide it more nourishment once the serum has been absorbed.

8. **Sunscreen (during the day):** If you apply the serum in the morning, use a broad-spectrum sunscreen at the conclusion of your skincare regimen to protect your skin from harmful UV rays.

9. Night time regimen (optional): You can use any other skincare products, including face oil or eye cream, after applying the serum at night in place of the sunscreen.

10. Consistency is the key to excellent outcomes. Every day, incorporate the face serum into your morning or evening skincare routine. As recommended by a dermatologist or skincare specialist, incorporate it into your daily routine.

Benefits of serum[20]

- **Reduces the appearance of enlarged pores:** The natural astringent tannins in Lodhra temporarily tighten the skin's surface, making pores appear smaller.
- **Regulates excess sebum (oil):** Lotus leaf has been shown to have sebum-regulating qualities, making it appropriate for oily and acne-prone smaller

- **Offers antioxidant defense:** The polyphenols and flavonoids found in lotus leaves help scavenge free radicals and shield the skin from oxidative damage.
- **Helps acne-prone skin:** Lotus leaf has shown antibacterial activity against acne-causing skin microbes and may lessen outbreaks.
- **Improves skin texture:** By regulating oil and bolstering the skin barrier, consistent use may result in smoother, softer, and more refined-looking skin.
- **Reduces skin inflammation:** Lodhra and lotus leaf both have anti-inflammatory properties that may lessen irritation and redness.

CONCLUSION

The combination of Nelumbo nucifera leaf extract and Symplocos racemosa (Lodhra) bark extract in a herbal pore-refining serum is justified by available phytochemical and traditional-use evidence; the former contributes antioxidant, low-comedogenic, and mild sebum-regulating properties, while the latter contributes classical astringent and antimicrobial action. Such a serum represents a consumer-relevant and scientifically reasonable natural alternative to synthetic pore-refining cosmeceuticals when formulated with an appropriate hydrophilic base and assessed against standard physicochemical, stability, and safety parameters. This calls for additional experimental formulation and clinical evaluation.

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