"Nelumbo nucifera : From sacred roots to modern elegance"

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***Abstract*— The lotus plant, Nelumbo nucifera, is a significant member of the Nelumbonaceae family and is grown as a freshwater aquatic plant. The flower is regarded as sacred . Every plant is used for food, medicine, and cosmetics. Today, a growing trend is the use of herbal cosmetics. The morphology, chemical components, nutritional value and diverse plant parts—leaves, roots, and seeds—that have been utilized in cosmetics and to treat a range of skin conditions are highlighted in this paper. In anti-aging cosmetic preparations, lotus has been found to be a very efficient whitening and anti-aging ingredient. Numerous additional positive cosmetic advantages of lotus have also been documented. The purpose of this essay is to systematically bridge the gap between the scientific data that is currently available and Lotus applications.**

***Keywords:* :** Nelumbo nucifera, Envirnmental Requirment, improve skin elasticity, Anti viral property and chemical Contituents.

I. INTRODUCTION

The word "cosmetic" comes from the Greek word "kosmtikos," which means "possessing the ability and skill to decorate." According to their origins, cosmetics were connected to medicine, hunting, religion, combat, and superstition. A continuous narrative that spans the evolution of human kind is formed by the origins of cosmetics.

In prehistoric times, around 3000 BC, people employed color to entice animals, which led to attacks by humans. In 1961, chemist Raymon Reed, a founding member of the US Society of Cosmetics, coined the word "cosmeceuticals."Cosmeceuticals are pharmaceutical-cosmetic hybrids designed to enhance skin appearance and health by modifying texture of the skin. Cosmeceuticals, or cosmetics containing physiologically active ingredients derived from plants, are the category of personal care goods with the quickest rate of growth. Due to their non-toxic nature and moderate action, natural materials are becoming more and more popular in cosmetics.

Cosmetics - The term "cosmetics" refers to products that are meant to be poured, rubbed, sprayed, inserted into or applied to the human body in order to clean, smooth, beautify, promote attractiveness, or alert the face.

Herbal Cosmetics - The term "herbal cosmetic" refers to cosmetics made using natural ingredients. items that, thanks to herbal excipients, provide physiological actions like those that improve skin healing, attractiveness, smoothness, and beauty.[7,8]

Lotus: The water lily, an aquatic plant, is referred to as the queen flower since it is admired by both the general public and artists like Claude Monet. In addition to being common as ornamentals, plants in the genus Nymphaea are also used traditionally as cosmetics and medicines. Common names for the perennial aquatic flowering plant Nymphaea lotus L. include water lily, lotus, and Egyptian lotus. Widely distributed across Asia and Africa, N. lotus is considered a sacred plant that has spread and become naturalized outside of its original range.

For Centuries nearly every part of this plant from the rhizome and stolon to the leves,stalks,and flowers has been eaten either raw or cooked into meals. several nutritious menu options. Furthermore, its therapeutic ability to treat a wide range of illnesses has been the subject of numerous investigations, and its extracts are utilized in traditional medicine in many Asian and African nation. Additionally, its cosmetic potential has been documented. Its great propensity to accumulate flavonoids has been linked to each of these biological processes.

This study aims to present botanical data, traditional applications, flavonoid accumulation, antioxidant activity, and other pertinent possible biological activities, as well as future research difficulties in the manufacture of N. lotus extracts for use in cosmetics. [1]

II Specific name in various languages [3]

Languages	Names
Hindi	Kamal
English	Lotus
Sanskrit	Padma,Kamala or Ambuja
Kannada	Tavare or kamala
Telugu	Tamara
Tamil	Taamarai, Padma or Kamala
Malayalam	Tamara
Gujarati	Kamal
Assamese	Padam
Manipuri	Thambal
Marathi	Kamal
Odia	Padma or Padam
Punjabi	Kanwal
Kashmiri	Pampos
Spanish	Loto
Italian	Loto
Arabian	Kati Sunnail or Katilun hal
German	Indische lotoblume
Persian	Nilufer

III Taxonomical Classification of Lotus [2,3]

Kingdom - Plantae (Plant)

Sub Kingdom - Tracheobionta (Vascular)

Botanical Name - Nelumbo nucifera

Superdivision - Spermatophyta (Seed Plants)

Division - Magnoliopsida (Flowering Plants)

Class - Magnoliopsida

Subclass - Magnoliidae

Super Order - Protaenae

Order - Proteales

Family - Nelumbonaceae

Genus - Nelumbo

Species - Nelumbo nucifera

Parts utilized - Petals, Seeds, Leaves and Roots

III Habitat, Distribution, Environmental requirements and adaptations

Lotus plants thrive in shallow wetlands in warm temperate to tropical climates, including ponds, lakes, and floodplains. During the growing season, they need water that is atleast 30 cm (12 in) deep and has a temperature of 23–27 °C (73–81 °F). They are influenced by temperature, water depth, and light levels, and their seeds may endure extended periods of dormancy to re-establish colonies during dry spells or floods.

Habitat

- **Wetland Environments**: Ponds, lakes, lagoons, marshes, swamps, and the backwaters of reservoirs are just a few of the shallow freshwater habitats where lotus flourish.
- **Water Depth**: For growth and flowering, the minimum water depth is around 30 cm (12 inches).
- **Sediment:** Their roots are supported by the abundance of mud or sediment in the regions where they thrive.

Distribution

Geographical Range

The main habitats of lotuses are warm temperate to tropical climates.

- **Asian Lotus (Nelumbo nucifera):** The Asian Lotus is primarily found in Asia and the northern part of Oceania.
- **American Lotus(Nelumbo lutea)**:The American Lotus is primarily found in regions of South America and the eastern and southern United states.

Adaptability

The plant exhibits remarkable environmental tolerance, frequently through the lifespan and dormancy of its seeds.

Environmental Factors

Temperature

- **Germination:** At temperatures higher than 13 °C (55 °F), lotuses begin to germinate.
- **Growing Season:** 23 to 27 °C (73 to 81 °F) is the ideal daytime temperature for the growing season.

Dormancy and flooding

- **Seed Dormancy :** The ability of lotus seeds to stay dormant for long stretches of time enables them to endure and re-establish colonies under the right circumstances.
- **Flood Dynamics**: Flooding is a part of their life cycle because it breaks open sediments that contain dormant seeds, rehydrating them and promoting new growth.

Light and winter

- **Low-Light Dormancy:** The sacred lotus goes into a dormant state in areas with little winter light.
- **Cold Resistance:** Although not typically cold-hardy, the tubers can tolerate temperatures below 0 °C (32 °F) if they are shielded by soil or water.

III Morphology

1. Leaves

Both airborne and floating orbicular leaves, measuring 20 to 90 cm, are huge. Petiolate, whole glaucous, non-wettable, strong, and suddenly sharp in diameter to produce a short tip Brightly nerved, the fresh leaves are leathery, but as they dry, they become nearly membranous and brittle. The lower surface has more or less brownish red blotching, and the petioles of the aerial leaves are upright and sturdy white, while those of the floating leaves are not strong enough. Aerial leaves typically range in length from 24 to 33 cm, whereas floating leaves typically range from 23 to 30 cm. Petioles are smooth, greenish, or

The color is greenish brown with tiny brown spots that can occasionally be rough with tiny but identifiable particles; the smell is noticeable; and the fracture is fibrous. The petiole of a leaf stalk always displays four separate, sizable cavities in the middle and smaller ones around the edges when cut transversely. [4]

2. Fruits and Seeds

An accumulation of indehiscent nutlets is called fruit. The pericarp of ripe nutlets is hard, smooth, brownish or greyish black, and they are ovoid, roundish, or oblongish up to 1.0 cm long and 1.5 cm wide has a single seed, pedunculation, and a slight longitudinal striatization. Ripe carpels are filled with seeds. In fact, the proven longevity of N. nucifera seeds surpasses that of any known flowering plant species, and its fruits exhibit a remarkable capacity for dormancy. The first botany keeper at the British Museum, Robert Brown, experimented with Nelumbo fruits at several points between

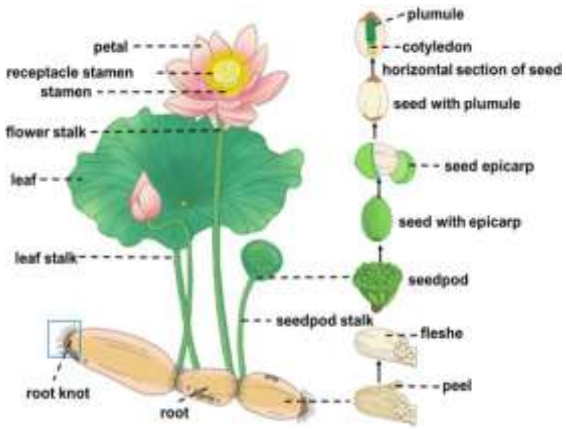
1843 and 1845 and demonstrated that they maintained their ability to germinate even after being kept in a glass-topped box for 150 years. [3]

3. Flower

In a spiral pattern, stamens, petals, and sepals progressively transition into one another. 1-2 cm long, green or blackish green, firm and sturdy, smooth or rough due to the presence of numerous tiny distributed prickles, solitary, huge, 10–25 cm in diameter, white pink or pinkish white fragrant peduncles emerging from the nodes of the rhizomes, sheathing at the base .[4]

4. Rhizome

The rhizomes are between 60 and 140 cm long and 0.5 to 2.5 cm in diameter. They have nodes and internodes and are smooth with dark patches and longitudinal striating. They have several larger cavities, are fibrous and strong, and range in color from yellowish white to yellowish own when first sliced. They also release a mucilaginous liquid. The smell is vague. [3]



III VARIOUS TYPES OF LOTUS

1.Blue Lotus: The smaller blue lotus bloom, Nymphaea caerulea, is native to the Nile. Often referred to as the Egyptian Blue Water Lily, lotuses have thin, pointed petals and smooth-edged, floating foliage. It closes at dusk and opens its flowers in the dawn .[6]

2. Pink or Red Lotus: The red or pink lotus (Nelumbo nucifera), commonly known as the Indian lotus or sacred lotus, is the national flower of India. The lotus flower originated in southern Asia and was introduced

to Egypt some 2,500 years ago. It is no longer found in the Nile valley, though. This plant typically yields blossoms on sturdy stalks that extend several centimeters above the water. [2]

3. Yellow Lotus : The eastern United States and Canada are home to the yellow lotus, which is native to California. It also goes by the names American lotus an Water-chinquapin. Compared to the sacred lotus, the fragrant, pale golden weaves are tiny. [2]

4.White Lotus: The Egyptian white lotus, or Nymphaea lotus, is a straightforward but austere flower. Also known as the Tiger Lotus or Egyptian White-Water Lily, this plant is grown all over Southeast Asia and East Africa. It has spherical petals and tooth-edged leaves, blooms at night, and is open till noon. It thrives in shallow waters. [2]

IV Chemical Constituents

Many different portions of the lotus contain a variety of chemical substances, such as terpenoids, polysaccharides, steroids, alkaloids (such liensinine and nuciferine), flavonoids (like quercetin and kaempferol), phenolic acids (like chlorogenic acid), and volatile oils. Some alkaloids are concentrated in the plumule and leaves, whereas flavonoids are numerous in the leaves and flowers. The precise composition varies depending on the portion of the plant. These substances support the lotus's numerous pharmacological properties, such as its anti-inflammatory, antioxidant, and anti-obesity properties.

Key Chemical Constituents

Flavonoids: Found in abundance, especially in the leaves and flowers, quercetin, kaempferol, rutin, and other flavonoids scavenge free radicals to produce strong antioxidant effects.

Alkaloids : These substances, which are present in different regions of the lotus and have been linked to impacts on the neurological system, cardiovascular system, and fat metabolism, include liensinine, isoliensinine, and nuciferine.

Phenolic Acids: The anti-inflammatory and antioxidant properties of lotuses are attributed to compounds such as ferulic acid, caffeic acid, and chlorogenic acid.

Terpenoids: These substances are present in considerable quantities and can be discovered in different plant parts.

Steroids: Located in the plumule and other regions of the lotus.

Polysaccharides: Found in the lotus, especially in the leaves, these are another significant class of bioactive substances.

Volatile Oils: These substances influence the lotus's general chemical makeup and possible health benefits.

Organic Acids: Found in lotus leaves and other sections as well.

Differences by Plant Section

Seeds : Carbohydrates, protein, and fat make up the majority of seeds, but they also contain flavonoids and some alkaloids.

Lotus Roots(Rhizome) : Polyphenols, fatty acids, and polysaccharides are found in the rhizome .

Plumule (Embryo): The embryo's plumule is made up of polysaccharides, steroids, alkaloids, and flavonoids.

Flowers: Store some alkaloids and flavonoids.

Leaves: Packed with polysaccharides, phenolic acids, alkaloids, and flavonoids

V Medicinal Importance of Lotus

Lotus has heart-protective, anti-inflammatory, and antioxidant qualities in all of its parts. It can also aid with digestive problems, blood sugar and fat breakdown, and some bleeding diseases. Many of the pharmacological and traditional medicine studies that suggest its benefits are based on research conducted

on animals or in test tubes, which emphasizes the necessity for more human clinical trials to confirm therapeutic effectiveness and comprehend safety profiles.

- **Heart health**: Protein, calcium, magnesium, potassium, and other vital nutrients are found in makhana and are helpful in preserving heart health.
- **Blood pressure control**: Due to its high magnesium content and low fat and sodium content, lotus is a beneficial food for blood pressure control and regulation, particularly for people with hypertension.
- **Healthy bone and tooth development**: Makhana is a great source of proteins, calcium, and magnesium—all of which are necessary for strong bone and tooth development.
- **Healthy digestive system:** Lotus seeds' high fiber content helps maintain a healthy digestive system and encourage bowel movements, which helps avoid constipation.
- **Maintenance of kidney function:** Lotus can cleanse the spleen and remove toxins from the body. This contributes to the maintenance of great kidney health because it balances blood flow and controls urine by eliminating toxins from the body.
- **Liver detoxification**: Makhana's nutritional advantages support liver health and improve metabolism.
- **Diabetes control**: Makhana is regarded as a good food for controlling blood sugar levels and diabetes because of its low glycaemic index and calorie composition.
- **Nerve function**: Thimine, which is also present in lotus seeds, improves cognitive function and plays a part in neurotransmission, which is crucial for preserving healthy nerve function.
- **Digestion:** Aids in the treatment of indigestion, diarrhea, and dysentery. Astringent qualities are also present in lotus leaves.
- **Skin and Inflammation**: Used as a paste to lessen skin irritation and fever.
- **Other Conditions: c**ontrol menstrual cycles and treats ailments like fever, sunstroke, and urinary issues. [3]

VI Cosmetics Benefits of Lotus Plants

Lotus flower extract for acne: With a variety of phytoconstituents, lotus flower extract significantly reduced the symptoms of acne vulgaris. The lotus's constituents' strong anti-sebum secretion and anti-acne properties also contribute to the plant's synergistic impact.

Antimicrobial characteristics: Shigella, Salmonella, Klebsiella, E. Coli, Shigella, and pseudomonas species are all inhibited by the antimicrobial activities of lotus seeds.

Bright skin: Lotus seed extract helps your skin feel even by preventing bumps. Additionally, it evens up skin tone and minimizes spots, making your skin look better overall.

Reduction of melanin: Palmitic acid, a saturated fatty acid, raises the amount of melanin in melanoma cells, while linoleic acid, an unsaturated fatty acid, decreases it. Hence, it might control the amount of melanin.

Anti-aging property: The enzyme L-isoaspartyl methyl transferase, which is naturally present in lotus seeds, delays the aging process by repairing broken proteins and damaged skin cells.

Fantastic hair: Lotus seeds are beneficial for hair. It works on your hair like a natural conditioner. It gives your hair more strength, elasticity, and volume, which makes it thicker and glossier. The inconvenience of split ends is also known to be lessened by lotus seeds. Additionally, it stops early graying, making you appear younger.

Decrease flaky skin: Lotus seed provides moisturizes to your skin rapidly, minimizing issues with dry and flaky skin.

Lowers skin inflammation: Kaempferol, a naturally occurring flavonoid included in lotus seeds, helps to lower inflammation and restore aged skin tissue.

Oil Balancing: Lotus helps control sebum (oil) production in oily or acne-prone skin without depriving the skin of its natural moisture, avoiding closed pores and outbreaks.

Increased Skin Elasticity: Lotus extract helps increase skin elasticity and encourage the creation of collagen, which keeps the skin tight and stops it from drooping.

Cooling and Calming: It helps to reduce the heat and stress that come with acne by having a cooling and relaxing impact on the skin.

Antioxidant properties: Strong antioxidants found in lotuses, such as flavonoids and polyphenols, fight free radicals, shield the skin from the elements, and lessen wrinkles and fine lines.

Hydration & Moisture: The skin is kept hydrated by the natural compounds in lotuses, which also prevent dryness and preserve the skin's moisture barrier, making the skin softer and smoother. [3]

VII Pharmaceutical Applications

Numerous pharmacological or pharmaceutical investigations have examined N.nucifera scientifically and demonstrated it’s anti viral, hypoglycemic, anti diarrheal, and antioxidant properties. Hepatoprotective, immunomodulatory, antipyretic, anticancer, psychopharmacological, anti-inflammatory, anti-ischemic, anti-fertility, anti-proliferative, anti-arrhythmic, diuretic, anti-fibrosis, aphrodisiac, aldose reductase inhibitory, cardiovascular, antibacterial, antiobesity, hypocholesterolemic, antiplatelet, and lipolytic properties. Numerous further contemporary pharmacological Studies have also demonstrated the sedative and other qualities of lotus seeds.

- **Anti Fertility action**

  Chauhan et al. investigated the lotus plant's impact on the male reproductive system, its operations, and fertility.

Male rats received oral dosages of 50, 100, and 200 mg/rat each day for around 60 days, which amounted to nearly 50% of the ethanolic extract of the seeds. As a result, when this medication was administered, the rats treated with N. nucifera showed results of around 100% decreased fertility. The serum testosterone level also showed a decrease. Therefore, in male rats, the ethanolic extract from lotus seeds exhibited an antispermatogenic activity [70]. Additionally, lotus extract has anti-estrogenic properties without impacting the female rats' typical physiology. Anju Mutreja et al .In 2008, a study was undertaken on this issue. Malaya Gupta et al. showed in 1996 how petroleum ether extracted from lotus seeds affected both immature female rats and mature male rats. Consequently, the study showed that steroidogenesis was assumed in the male and female rats' testicles and ovaries, respectively.

- **Immunomodulatory Activity**

  According to research by Singh Virendra Kumar et al. (2011), the hydroalcoholic extracts of seeds and rhizomes have immunomodulatory action. According to reports, the extracts stimulate the defense system by controlling immunological characteristics. In the event of immunomodulation, the lotus plant sections also offer sufficient therapeutic advantages. Lotus seeds support a number of biological processes and also have a range of active ingredients and glycoproteins that stimulate human T, B, and NK cells, generating cytokines and complement, and boosting immunity. The immunomodulatory effect of N. nucifera seed extract was assessed utilizing a variety of in vivo models, such as the differential and total leukocyte count (DLC and TLC), phagocytic response, delayed type hypersensitivity reaction (DTH), nitrobluephagocytic response, and neutrophil adhesion test. Liu et al. (2004) investigated the impact of lotus ethyl alcohol extracts on primary human peripheral blood mononuclear cells, or PBMC. PHA (Phytohemagglutinin), a particular mitogen for T lymphocytes, triggered the effect by preventing the generation of cytokines and cell division.

- **Analgesic activity**

  The analgesic effects of red and white lotus seeds on Albino rats were investigated by Vikrama Chakravarthy P et al. (2009). Six groups were separated, resulting in 48 mature Sprague Dawley rats. Following the trial, the findings showed that both types of lotus seed extracts have analgesic properties.The higher dose group, which received 600 mg/kg of white lotus seeds, demonstrated more noticeable action. Another way to assess the analgesic impact is to prevent cyclooxygenase from being produced of prostaglandin.

- **The anti-Parkinsonian effect**

  M. Vishnu Vardhan separated the methanolic seed extract of Nelumbo nucifera using chloroform and examined it.

  Reddy et al. (2014) examined a variety of biochemical and behavioral measures to assess the anticataleptic and antioxidant effects of haloperidol in a rat model of catalepsy.

- **Hypolipidemic and anti-obesity properties**

  The ethanolic extract of Nelumbo nucifera has demonstrated adipogenesis inhibition and a positive impact in

  Rats fed a high-fat diet showed a decrease in adipose tissue weights and a modulation of serum leptin levels. The blood lipid profile was also improved [45]. Ohkoshi et al. (2007) investigated the antiobesity effectiveness of active ingredients isolated from lotus leaves via induced lipolysis in mouse adipose tissue.

  In visceral adipose tissue, flavonoids such as catechin, astragalin, quercetin, hyperoside, and isoquercitrin shown lipolytic action.

- **Antiviral action**

  The inhibitory effects of lotus seed ethanolic extracts on herpes simplex type 1 (HSV-1) were investigated by Kuoetal. in 2005. One hundred

  HSV-1 replication was inhibited by mg/ml of ethanolic extract (IC50 for replication, 50.0 mg/ml) . Lotus leaves were used by Kashiwada et al. in 2005 to extract (-)-1(5)-norcoclaurine, quercetin 3-O-beta-Dglucuronide, and (+)-1(R)-coclaurine. With an EC50 of 2 mg/ml, the two latter compounds exhibit therapeutic action against HIV; hence, they were less effective.

- **Activity of neuropharmacology**

  Rats and mice demonstrated the neuropharmacological effects of N. nucifera Gaertner seed. The role of yhe extracts on Anxiolytic activity, locomotor activity, cerebral activator activity, phenobarbitone sodium motor coordination activity, and induced sleeping time and sleep delay were all investigated. Additionally, the extract significantly decreased common behavioral tests in a dose-dependent way.

- **Psychopharmacological action**

  The lotus seed embryo contains nervine, which may have antidepressant properties. It was assessed based on its anti-mobility. impacts of a forced swimming test on mice 94. One straight hydroxytryptamine (S-HT) is nervine. It is a receptor agonist that can either activate S-HT metabolism or block S-HT reuptake. Its effects are comparable to those of maprotiline and imipramine.

- **Antidermatophytic and antidiarrheal properties**

  When the antidiarrheal properties of lotus seed oil were investigated, bacteria like Escherichia coli were significantly suppressed.

  Salmonella, Shigella, Pseudomonas, Staphylococcus aureus, and Klebsiella using the disk diffusion method. Using a 25 mg/ml extract concentration, lotus seed oil was utilized to suppress dermatophytes such as Trichophyton mentagrophytes, Malassezia furfur, and Trichophyton rubrum.

- **Other actions**

  Other properties of lotus seeds include anti-ischemia and anti-arrhythmia,anti-cancer, antiproliferative, antiaging action , and atherosclerosis. Together with erectile dysfunction treatment. [4]

Conclusion: Lotus is a common herb used in cosmetics. It is said to have anti-acne, anti-wrinkle, cooling, whittler, and calming, relaxing properties. It has repeatedly proven to be a very beneficial and useful herb. You may find all the information you require about lotuses on this page. Despite its widespread use, its use is still encouraged and offers a variety of chances for study and discovery. A frequent herb used in cosmetics is lotus. It is reported to offer relaxing, relaxant, anti-acne, anti-wrinkle, cooling, and whitening qualities and packed with countless health benefits, it's your ultimate key to feeling energized, balanced and thriving every day.

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