

## NUTRITIONAL AND THERAPEUTIC IMPORTANCE OF NELUMBO NUCIFERA (SACRED LOTUS)

Aamena Zaidi, Arvind Kumar Srivastava

Department of Food and Nutrition

Era's Lucknow Medical College & Hospital, Sarfarazganj Lucknow, U.P., India-226003

Received on : 15-11-2019

Accepted on : 27-12-2019

### ABSTRACT

Nelumbonucifera is grown in many parts of the world as well as in India for its curative and nutritional value. Studies have shown that it has many therapeutic benefits. It holds anti-analgesic, anti-dermatophytic, anti-perkinsonian, hepato-protective, hypoglycemic, immunomodulatory, and many more pharmacological properties. Numerous bioactive compounds like alkaloids, flavonoids, glycosides, triterpenoid, and vitamins etc., have been isolated from N. nucifera which have their own therapeutic importance. In forthcoming times it can be used as a low cost protein and energy supplement. This review article intends to envelop all the obtainable literature on N. nucifera with reference to its uses, chemical and phyto-constituents, physical and chemical properties and in addition to its therapeutic benefits.

**KEYWORDS:** Nelumbonucifera, medicinal plant, immunomodulatory, anti perkinsonian, hepato-protective, hypoglycemic, pharmacological properties.

### INTRODUCTION

N. nucifera is a water flowering plant which belongs to the family Nelumbonaceae. It is cultivated in many Asian countries like Thailand, China, Sri Lanka, India, Nepal, New Guinea and Japan. This plant is widely recognized for the beauty of its flowers, and has also been considered a godly figure for in many religions like Buddhists, Hindus, and Egyptians from an early age. It is also the national flower of India and Vietnam. In addition to these considerations, there are also a lot of benefits gained by this plant such as it is used as an ingredient in the preparation of a variety of dishes, as well as a vital component of many traditional medicines and herbal medicines and herbal drugs.

*N. nucifera* is known by diverse names in many languages for example:

#### Commonly known name of lotus

Tamil:	Ambal, Thamarai, Padma, Pankaja, Kamala
German:	Indischelotosblume
Gujrat:	Suriyakamal
Malayalam:	Tamara
Bengal:	Padma
French:	Nelumbo
Sanskrit:	Ambuja
Hindi:	Kanwal, Kamal
Persian:	Nilufer (1, 2)

#### Address for correspondence

**Dr. Aamena Zaidi**

Department of Food and Nutrition  
Era's Lucknow Medical College &  
Hospital, Lucknow

Email: aamenazaidi@gmail.com

Contact no: +91-9807524958

In China it is known as Chinese water lily. The two species of Nelumbo are most usually consumed throughout the world i.e. *N. lutea* wild and *N. nucifera* [3]. It is not only a delicate and eye-catching flower but also possess antipyretic, chilling, astringent properties. (4,5) All parts of the lotus plant are used: rhizome is used as food, seeds are used as medicine, thalamus as fruit, leaves for plate or thali, stalks are used for making pickle, petals of lotus flower are utilized for extraction of colour. (6)

<b>Kingdom:</b>	Plantae –Plants
<b>Sub Kingdom:</b>	Tracheobionta – Vascular Plants
<b>Super Sub-Division:</b>	Spermatophyta – Seed Plants
<b>Division:</b>	Magnoliophyta – Flowering Plants
<b>Class:</b>	Magnoliopsida;
<b>Subclass:</b>	Magnoliidae;
<b>Super order:</b>	Protaenae
<b>Order:</b>	Proteales
<b>Family:</b>	Nymphaeaceae – Lotus Family
<b>Genus:</b>	Nelumbo Adans – Lotus
<b>Species:</b>	<i>Nelumbonucifera</i> Gaen. – Sacred lotus

**Table 1: Taxonomic Classification of *N. nucifera* (7)**

## History

*N. nucifera* is considered as a symbol of purity and honour. In very old times it has been grown for 5000-7000 years in Far East. Moreover it has been planted for 3000 year as a food, medicine and for divine and heavenly purpose.

## Habitat And Morphology

It requires humid-temperate to tropical climates, wetland habitats, as well as flood plains, ponds, lakes, pools, lagoons, marshes, swamps and the backwaters of reservoirs. The plant grows up to about 1.5 meters in height and up to 3 meters in horizontal length.

Its roots stay fixed inside the muddy base of the water bodies and the leaves as big as 60 cm in diameter glide over the surface of water. Flowers are capable of growing up to 20 cm in diameter.

The seeds are about 1 cm in diameter and are housed in the woody receptacle which looks like a showerhead (8). The lotus plant grows by spreading a creeping rhizome at the bottom of the water body over anaerobic sediments.

Rhizome bear nodes, which produces a leaf. The petioles and the rhizome bear gas canals which channel air from the leaves throughout the petioles and rhizomes. The petiole has two pairs of canals and there are three pairs of canals in the rhizome. Air from a leaf flows through one of two pairs of petiolar canals into a rhizome. (9) The plant has some exclusive features such as its capability to control the temperature of its flowers within a narrow range [10], its long-lived seeds [11] and, in addition, leaves display the effect of self-cleaning properties. Sacred Lotus is consumed as food for about 7,000 years in Asia and is cultivated for its edible parts like rhizomes, seeds and leaves. Various sections of the lotus plant like anthers buds, fruits, flowers, leaves, stamens, stalks, roots and rhizomes have been used as herbal medicines to cure many diseases, including anxiety, cancer, diarrhea, heart problems, hypertension and insomnia (12, 13).

Lotus contains a number of important bioactive compounds such as alkaloids, flavonoids, steroids, triterpenoids, glycosides and polyphenols (14). The *Nelumbo* gene is expressed by only two species, *Nelumbo nucifera* and *Nelumbo lutea*.

*N. nucifera* is widely distributed in South East Asia. Across our country India, from Kashmir in the north to Kanyakumari in the south, there is a large phenotypic diversity with various shades, shapes and sizes of pink and white coloured flowers having 16-160 petals (15) and is the national flower of the country. *N. lutea*, commonly referred to as American lotus, is distributed in North and South America (16). Lotus is considered holy in many religions. It is seen as a sign of innocence, spiritual grace, rebirth and enlightenment.

In this review article, latest medicinal, phytochemical and pharmacological data on this well-known plant species is compiled and collected from different research articles.

## OBJECTIVES

- To review the scientific literature on *N. nucifera*.
- To gather information on the medicinal properties of *N. nucifera*.
- To incorporate the physiological and therapeutic effects of *N. nucifera* in a systematic manner.
- To gather information on the dietary components and bioactive phyto-chemicals found in *N. nucifera*.
- Enlisting its pharmacological and industrial use.

## Review Of Literature

### Pharmacological Activities

Lotus is used as an important component in traditional medicine for its tremendous health benefits in many parts of the globe. It is used in the treatment of diarrhoea, dysentery, dizziness, haemorrhoids, sunstroke, promotion of pregnancy, treatment of burning sensation, skin improvement, control of infection, cough, high BP, vomiting of blood, uterine bleeding disorders, nausea, urinary problems, haematemesis, haematuria, epistaxis, haemoptysis, and metrorrhagia etc (17-18). Numerous pharmacological studies performed on sacred lotus have confirmed its anti-diarrhoeal, anti-inflammatory, antipyretic, hypoglycemic, immunomodulator, psychopharmacological, antioxidant, lipo-lytic, antiviral, anticancer and hepato-protective properties (19).

S. No.	Activity	Part of plant Used
1.	Aldose-reductase inhibitory	Flower
2.	Anti-inflammatory	Rhizome, Seed
3.	Anti-arrhythmic	Seed
4.	Diuretic activity	Rhizome
5.	Anti-obesity	Leaf
6.	Anti-bacterial	Flower
7.	Pharmacological	Rhizome
8.	Anti-proliferative	Seed
9.	Anti-oxidant	Flower, Leaves, Rhizome
10.	Anti-diarrhoeal	Rhizome
11.	Hepato-protective	Leaf, Seed

**Table 2: Showing Important Pharmacological Properties Of *N. nucifera***

12.	Anti-platelet	Flower
13.	Lipolytic	Leaves
14.	Anti-fertility	Seed
15.	Hypocholesterolaemic	Leaves
16.	Anti-pyretic activity	Rhizome, Flower
17.	Anti-fibrosis	Flower
18.	Hypoglycemic	Seed
19.	Aphrodisiac	Leaves
20.	Anti-ischaemic	Seed
21.	Cardiovascular activity	Leaves
22.	Anti-viral	Leaves, Seed
23.	Immunomodulatory	Rhizome, Seed

**Cont. Table 2: Showing Important Pharmacological Properties Of *N.nucifera***

Flowers, fruits, leaves, roots of rhizomes and seeds of *N.nucifera* have many medicinal properties which are discussed below:

#### **Leaves**

In traditional drugs lotus leaves are used against diarrhoea, hemoptysis, haematemesis, hematuria, hemorrhoids, high fever, leprosy (20-21) inflammation of the skin and body heat imbalance, epistaxis, and metrorrhagia and weakness.[19] Lipolytic, anti-obesity, cardiovascular and hypo-cholesterolaemic property of the lotus leaves has been reported. (22-25) Extract of lotus leaf have been reported to have analgesic, anthelmintic, anti-obese and hypolipidemic activity. (26-28) Lotus liquor prepared from flowers and leaves has been confirmed to possess antioxidant activity and is helpful in reducing oxidative stress.

#### **Rhizomes**

New rhizomes are consumed after roasting, while dried slices are utilized in curry, as chips or as pickles. Rhizomes are 60-140 cm long, 0.5-2.5 cm in diameter, yellowish white to yellowish brown in colour, are smooth with black spots and nodes. The odour is indistinguishable. A number of starch grains are found in the tissue. Alkaloids sterols and reducing sugars have been discovered from rhizome extracts.

Its extracts have revealed diuretic, psychopharmacological, anti-diabetic, anti-obesity, hypo-glycemic, antipyretic and antioxidant activities (29).

Rhizomes in pounded form are prescribed in the treatment of various diseases such as chronic dyspepsia, piles as well as dysentery. External application of lotus in the form of paste is beneficial in curing many skin

infections like scabies and ring worms infections. Children suffering from diarrhoea and dysentery are given rhizomes of lotus as it is reported to have a sort of nutritious arrowroot (22-23).

#### **Fruits And Seeds**

The fruit of lotus is ovoid, round or oblong, up to 1.0 cm long and 1.5 cm wide, with a hard smooth, brown or grey black pericarp that is longitudinally striated. Seeds are filled in ripe carpel. Fruits of *N.nucifera* have amazing power of latency and indeed proved durability of its seeds. Robert Brown, in the British museum, performed experiments with fruits of lotus and proved that after 150 years of isolation in a glass-top box, they retain the power of germination (30).

Huge amounts of glutathione are present in the lotus plumules and cotyledons. The quantity of reduced form of glutathione in unripe fruit is drastically reduced after one year storage. In addition, the speed of germination of the stored seed appears to be very much related to the amount of reduced glutathione (31).

Lotus embryo alkaloids hold hypo-tensive effect (32). The seeds are also used to stimulate diarrhoea, used as a diuretic, refrigerant and for curing skin diseases and leprosy. It is considered to be an antidote to poisons (33).

#### **Flowers**

Flowers are wide, 10-25 cm in diameter, white, pink or pinkish white in colour and are formed by the nodes of the rhizomes. Plentiful small, scattered stings, sepals, petals and stamens are found (34).

Sun-dried powdered flowers of *N.nucifera* developed hypoglycaemia in fasting healthy albino rabbit. The sun-dried flower extracts reduced hyperglycaemia by injection of adrenaline hydrochloride 0.5 mg / kg at a dose of 1000 mg / kg. In vitro studies with rat hemidiaphragms have shown that the test drug (sun-dried flowers powdered) appreciably boosted the effect of insulin (35).

Flowers have a cooling effect and are used as in the treatment of cholera, fever, diarrhoea, and liver related diseases. Flowers of *N.nucifera* are also used as attractive ornaments as well as temple offerings. They're used as perfumes. Honey derived from lotus flowers contain tonic properties and is known to be beneficial for the treatment of eye infections.

#### **CONCLUSION**

It can therefore be inferred that *N.nucifera* or sacred lotus is edible and is being consumed, used in cookery as well as in traditional Ayurveda medicines since ages. It is also used as a medicine to treat some diseases such as tissue inflammation, skin disease, diarrhoea, cholera, liver disease and poisoning, etc. All Parts of many tree like its bark, flowers, leaves, twigs, fruits, roots, seeds, sap and



gum are employed in customary native medication as a source of numerous therapeutic agents (36). Numerous studies have been conducted on leaves, bulbs, and seeds, fruit rhizomes, with reference to its nutritional, phytochemical, pharmacological and microbiological elements of the various parts of the plant.

### Future Prospects

The need for the hour is therefore to further assess the medicinal value of *N. nucifera*, in view of its extensive use in traditional drugs and the newly identified pharmacological activities, and also to determine the protocols for the efficient extraction and validation of active principles for their use in the battle against various diseases of human beings. Stress should therefore be put on bulky-scale farming of lotus so that the general population can consume lotus as a low-price nutritious food and use it as a low-cost medicine or drug for the treatment of several diseases and disorders.

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