

**PRELIMINARY PHYSICO – PHYTOCHEMICAL & PHYTO – COGNOSTICAL
EVALUATION OF THE LEAVES OF *NELUMBO NUCIFERA GAERTN***

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ABSTRACT

Nelumbo nucifera Gaertn (Family Nelumbonaceae) are broadly used in traditional system of medicine throughout different part of India, China & America. It is used in the treatment of of pharyngopathy, pectoralgia, spermatorrhoea, leukoderma, small pox, dysentery, cough, haematemesis, epistaxis, haemoptysis, haematuria, metrorrhagia, hyperlipidaemia, fever, cholera, hepatopathy and hyperdipsia. It is very important to standardize the plant part pharmacognostically for its utilization in different formulation. The current study deals with the determination of morphological character, determination of their physical values like total ash, acid insoluble ash, water soluble ash, loss on drying, foaming index, swelling index. Also determine the presence or absence of phytochemicals such as Alkaloids, flavonoids, phenolic compounds, tannins, glycosides & terpenoids.

KEYWORDS: *Nelumbo nucifera*, *Nelumbonaceae*, Indian lotus, fluorescence, tannins.

INTRODUCTION

Herbal plants are wonderful origin of traditional & modern medicine, useful for primary health care system. Herbal plants have ability for the formation of secondary metabolites such as steroids, phenolic substances, flavonoids, alkaloids, etc. These secondary metabolites are used to treatment of many diseases. *Nelumbo nucifera Gaertn* belonging to the family Nelumbonaceae brought its importance for its different traditional uses throughout India. Various species found in tropical and subtropical region of Asia, North America & China. It is used in the treatment of various diseases such as an antidote to poisons and to treat skin conditions, cancer, leprosy, and tissue inflammation^[1] *Nelumbo nucifera Gaertn* contains many chemical constituents like- Nuciferine, N-nornuciferine, Lotusin, Roemerine, Arnepane, Quercetin, Kaempferol, Myricetin, Isorhamnetin, Luteolin, Gallic acid, Catechin, Epicatechin, Chlorogenic acid, Ellagic acid, Hydrolyzable tannins, Flavonoid glycosides(Quercetin-3-O-glucuronide), Beta-amyrin, Lupeol, Phytol, Beta-sitosterol, Campesterol, Stigmasterol, Monoterpenes, Sesquiterpenes(linalool, geraniol), Various proteins and enzymes, Pectins, Hemicelluloses, Pectins, Hemicelluloses, Amino acids & Organic acids(malic acid, citric acid). Phytochemical analysis of different parts of *Nelumbo nucifera Gaertn* shows different classes of secondary metabolites which have therapeutic potential. It is known as Indian lotus or Lotus(English), Kamal(Hindi), Padma(Sanskrit) & Kamal(Unani). The

lotus (*Nelumbo nucifera Gaertn*) is a herbaceous aquatic plant. It has large, circular, floating or emergent leaves and showy, fragrant flowers. The plant grows from thick, underwater rhizomes (root-like stems) and thrives in water bodies. Lotus typically grows in freshwater ponds, lakes, slow-moving rivers, and wetlands. It prefers warm, sunny climates. There are several therapeutic applications for every portion of *N. nucifera*. Pharyngopathy, pectoralgia, spermatorrhoea, leukoderma, smallpox, dysentery, cough, haematemesis, epistaxis, haemoptysis, haematuria, metrorrhagia, hyperlipidaemia, fever, cholera, hepatopathy, and hyperdipsia are among the traditional ailments treated with the leaf, rhizome, seed, and flower.^[2] This plant is also used in Ayurveda to cure strangury, vomiting, leprosy, skin conditions, and nervous weariness. It is also used as an anthelmintic and diuretic.^[3] *N. nucifera* has been screened scientifically for various pharmacological activities like anti-ischaemic activity, antioxidant activity, hepatoprotective activity, anti-inflammatory activity, anti-fertility activity, anti-arrhythmic activity, anti-fibrosis activity, antiviral activity, antiproliferative activity, antidiarrhoeal activity, psychopharmacological activity, diuretic activity, antioxidant activity, antipyretic activity, immunomodulatory activity, hypoglycaemic activity, aldose reductase inhibitory activity, antibacterial, aphrodisiac activity, antiplatelet activity, cardiovascular activity, anti-obesity activity, lipolytic activity, hypocholesterolaemic activity, hepatoprotective activity, anticancer activity.

Standardization of herbal drugs are difficult because generally mixture of constituents and the active constituent in most cases is unknown. The aim of the

current study deal the standardize leaves parts of *Nelumbo nucifera Gaertn.*



Figure1: *Nelumbo nucifera Gaertn.* leaves.

MATERIALS AND METHODS

Fresh leaves parts of *Nelumbo nucifera Gaertn* were collected from fields of Chandeshwar, district of Azamgarh, Uttar Pradesh, India in the month of January 2024 and authenticated by Prof N.K Dubey, Taxonomist, Department of Botany Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India. A voucher specimen has been preserved in Department of Natural Product, Pharmacy college, Azamgarh, Uttar Pradesh, India for future reference (Vouchers pecimen no.Mimosa.2024/01). The leaves parts were dried under shade and powdered(40 mesh size) and stored in airtight containers. The macroscopic characters were studies as per given procedure in WHO guidelines on quality control methods for medicinal plants materials.^[4] Fluorescence analysis of powdered leaves carried out according to these method Kokoski et al and Prat Chase.^[6]

MACROSCOPICAL STUDIES

The leaves of the plant were studied for their macroscopic characters such as color, odour, taste, shape and size of the leaf.

POWDER MICROSCOPY

Powder microscopy study was done with the powdered leaves.^[7]

PHYSICOCHEMICAL STUDIES

The ash values (total ash, acid insoluble ash, water soluble ash), the loss of drying,^[8,10] extractive values (petroleum ether 60-80°C, ethyl acetate, methanol aqueous) were determined according to the official methods of Ayurvedic pharmacopoeia of India^[9,11-13]., Foaming index^[14]., swelling index^[15], were performed according to the official methods prescibed in Indian Herbal Pharmacopeia^[16] and WHO guidelines.^[4]

EXTRACTION METHOD AND PRELIMINARY PHYTOCHEMICAL SCREENING

For the phytochemical screening, the powdered leaves were extracted with petroleum ether(40°C), ethyl acetate, methanol, aqueous respectively in a series using cold maceration technique. All extract were concentrated in a rotary vacuum evaporator below 40°C and subsequently dried in high vacuum to get solid crude petroleum ether extract(PENN), ethyl acetate(EANN),methanol(MENN), aqueous(AENN) respectively. Phytochemical screening of the various extract of *Nelumbo nucifera Gaertn* leaves was performed for the detection of various phytoconstituents such as tannins, flavonoids, alkaloids and saponins as per standard procedure.^[17-19]

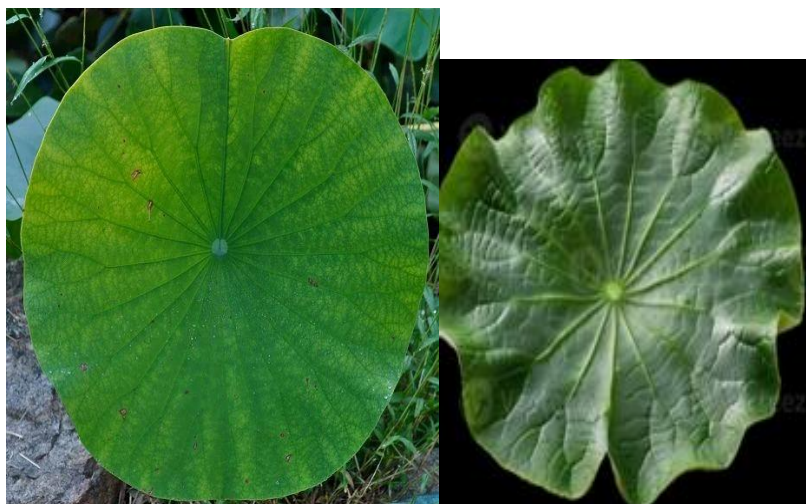
RESULT AND DISCUSSION

In literature survey it was found that the plant possesses several traditional and pharmacological uses. The macroscopical study of the leaves of *Nelumbo nucifera Gaertn* (L.) was done. The leaves were ever green in colour, Smooth, glabrous, water drops roll off average 30-60 cm long, Smooth and somewhat waxy, slightly sweet in taste. (Table-1). Pharmacognostical standardization was essential tool for proper utilization of the plant for pharmaceutical uses. The values of the physical constant like ash values, Loss on drying, extractive value were determined. Extractive value and color of extract was investigated(Table-2). Preliminary qualitative phytochemical screening shown that presence of alkaloids, flavonoids, phenolic compounds, tannins, & glycosides. Showed the leaves are rich sources of secondary metabolites responsible for different pharmacological activities. (Table-3). Swelling index contain powered drug 0.98cm. Fluorescence nature of the powder drug with different chemicals was analyze using short light wavelength and longer light wavelength and the observation were reported in (table no-4). The height of the foam in every test tube was less than 1cm, the foaming index were less than 100(<100).(table-6).

Nelumbo nucifera Gaertn Leaves powder microscopy showed trichome.,

Table 1: Macroscopical evaluation of *Nelumbo nucifera* Gaertn leaves.

S. No.	Feature	Observation
1.	Color	Green
2.	Odour	Characteristics(floral aroma)
3.	Taste	slightly sweet
4.	Size	Diameter 30-60 cm
5.	Texture	Smooth and somewhat waxy
6.	Surface	Smooth, glabrous, water drops roll off
7.	Veination	Radiating



Adaxial Abaxial
Figure2: *Nelumbo nucifera* Gaertn.leaves.

Table 2: Physiochemical Analysis of *Nelumbo nucifera* Gaertn Leaves.

S. No.	Solvent	Wt. of Plant material (gm)	%age of yield	Color of extract
1.	Pet. Ether	4	5.1%	Greenish Brown
2.	Ethyl acetate	4	4.70%	Pale green
3.	Methanol	4	7.9%	Deep green
4.	Aqueous	4	4.35%	Blackish Green

Table 3: Phytochemical screening of *Nelumbo nucifera* Gaertn.

S. No.	Test	Pet. Ether	Ethyl acetate	Methanol
1.	Alkaloids	+	+	+
2.	Flavonoids	—	+	+
3.	Tannins	+	+	+
4.	Glycosides	—	—	+
5.	Saponins	+	+	+

(+)- present, (-)-absent

Table 4: Fluorescence Analysis of *Nelumbo nucifera* Gaertn leaves powder.

S. No.	Treatment	Normal light	U.V. light (S. length)	U.V. light (L. length)
1.	Powder + Dil. HCl	Pale green	Light green	Dark green
2.	Powder + Con. HCl	Brown	Light green	Black
3.	Powder + Dil.H ₂ SO ₄	Green	Light green	Green
4.	Powder + Conc.H ₂ SO ₄	Black	green	Dark green
5.	Powder + Iodine	Light green	Pale green	Dark blackish green
6.	Powder + FeCl ₃	Yellowish green	Pale green	Dark grayish green
7.	Powder + Dist. H ₂ O	Green	Light green	Light green
8.	Powder + Butan-1-ol	Dark green	Light green	Dark green

9.	Powder + Propane-1-2-diol	Light green	Dark green	Light green
10.	Powder + Hydrogen peroxide	Light green	Dark green	Black
11.	Powder + N,N.dimethylformamide	Brown	Light green	Brown
12.	Powder + Benzene	Brown	Dark green	Black
13.	Powder + Liquid paraffin (Heavy)	Brown	Dark green	Brown
14.	Powder + Thioglycolic acid	Brown	Dark green	Black
15.	Powder + Methyl salicylate	Brown	Dark green	Light green
16.	Powder + HNO ₃	Brown	Dark green	Black
17.	Powder + Lactic acid	Light green	Light green	Light green

Table 5: Data showing the Physio- chemical standard values of *Nelumbo nucifera Gaertn* Leaves.

S. No.	Parameters	Values
1.	Tatal ash(mg/gm)	4.09
2.	Acid insoluble ash(mg/gm)	0.50
3.	Water soluble ash(mg/gm)	1.39
4.	Loss on drying(mg/gm)	6.9
5.	Swelling index(cm)	0.98
6.	Tapped density	0.1g\ml
7.	Bulk density	0.087g\ml
8.	Hausner's ratio	1.25
9.	Cann's Index	20%
10.	Angle of repose	26.91 ⁰

Table-6: Foaming index of *Nelumbo nucifera Gaertn* (L.) leaves Extract:

Treatment	sample number of the test tube									
	1	2	3	4	5	6	7	8	9	10
dilutions(drug extract + water)	1:9	2:8	3:7	4:6	5:5	6:4	7:3	8:2	9:1	10:0
height of foam(cm)	0.15	0.17	0.18	0.19	0.23	0.25	0.28	0.30	0.31	0.33



Figure 3: Powder microscopy of *Nelumbo nucifera Gaertn* (L.) Leaves.

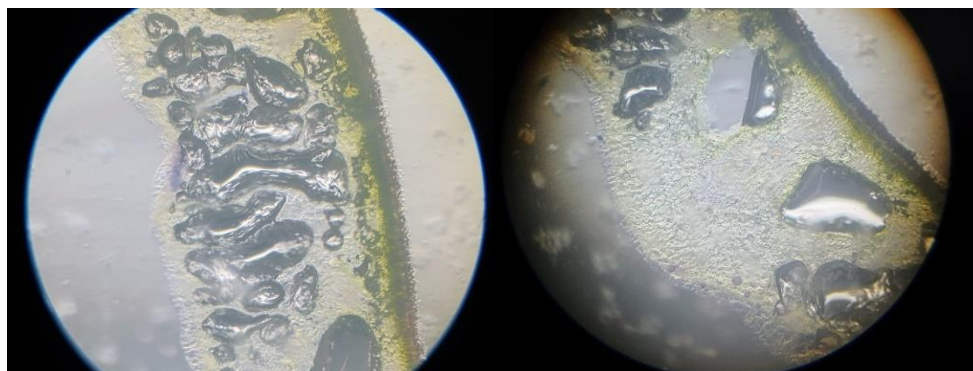


Figure 4: Powder microscopy of *Nelumbo nucifera Gaertn* (L.) Leaves

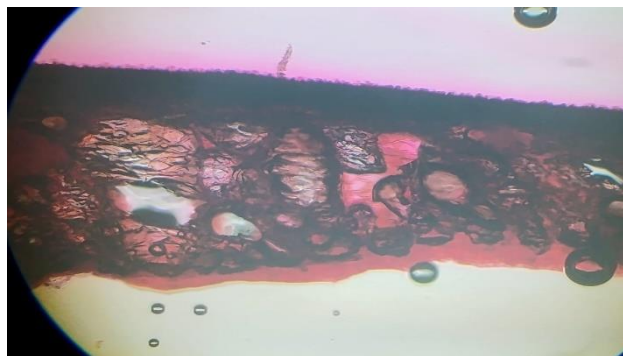


Figure 5: Powder microscopy (with phenolphthalein) of *Nelumbo nucifera Gaertn (L.)* Leaves

CONCLUSION

Preliminary physico-phytochemical study of the *Nelumbo nucifera Gaertn* Leaves study concluded to macroscopic, other physical values and parameters will help to identify the species of plant, phytochemical screening will help the presence of secondary metabolites, Microscopy is an important tool in the evaluation of crude drugs which is applicable at various levels such as the authentication of the crude drugs, study of powdered drugs, which is responsible for the medicinal & pharmacological importance of the plant. *Nelumbo nucifera Gaertn* Leaves is known as wide range of medicinal value, it helps to identification, authentication and standardization. It also require to research on phytochemical and pharmacological aspect. However research going on it would be easier to develop new drugs.

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