



Research Article

PHARMACOGNOSTIC EVALUATION AND PHYTOCHEMICAL SCREENING OF *NELUMBO NUCIFERA* (LOTUS) FLOWER EXTRACT

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ABSTRACT

Present study was conducted with an aim to prepare extracts *Nelumbo nucifera* (Lotus) flower (NNFE) using a suitable extraction technique to obtain maximum yield. It was followed by phytochemical screening, pharmacognostic and pharmacological evaluation of the obtained flower extract. The macroscopic study was carried out through sensory organs like size, shape, texture etc. Phytochemical screening included both qualitative as well as quantitative analysis of the obtained extract, which indicated the presence of carbohydrates, proteins, saponins, sterols, alkaloids, phenolic compounds, glycosides, flavonoids and tannins. The obtained results can serve as a valuable source of information for identification of this plant for future investigation and its applications.

Keywords: *Nelumbo nucifera* (Lotus); Phytochemical screening; Extraction; Pharmacognostic evaluation

INTRODUCTION

Nelumbo nucifera of mono-generic family Nymphaeaceae, commonly known as Indian lotus, Chinese water lily and sacred lotus and synonyms (*Nelumbium nelumbo*, *N. speciosa*, *N. speciosum* and *Nymphaea nelumbo*).¹ *N. nucifera* Gaertn., The Indian or sacred lotus, is found worldwide mainly in Asia and Australia, whereas *N. lutea*, commonly known as American lotus or water chinquapin, is found mainly in eastern and southern North America.^{2,3} There are only two common species of *Nelumbo*, worldwide: *N. lutea* Wild. (Synonyms: *N. pentapetala* (Walter) Fernald and *Nelumbium luteum* Wild.) and *N. nucifera* (synonyms: *N. speciosa* Wild, *Nelumbium speciosum* Wild, *Nelumbium N. Druce* and *Nymphaea N. L.*)^{4,5}

The use of herbs and herbal products for the treatment of various diseases has increased dramatically in recent years. The flowers are useful in treatment of Diarrhea, Cholera, Fever, gastric ulcers. Used in liver complaints and recommended as cardiac tonic; also used in menorrhagia and dysentery; also, in cough, Hepatopathy, Hyperdipsia and many bleeding disorders, abdominal cramps. The lotus honey is used as a tonic and for the treatment of eye infections.⁶⁻⁹ Aldose reductase inhibitory, Hypoglycemic, Antibacterial, Antioxidant, Anti-platelet, Antipyretic, Aphrodisiac activities have also been reported.¹⁰⁻¹⁶

Several flavonoids have been identified in the stamens of *N. nucifera*. These include kaempferol (1) and seven of its glycosides: kaempferol 3-O-β-D-galactopyranoside (2), kaempferol 3-O-β-D-glucopyranoside (3), kaempferol 7-O-β-D-glucopyranoside (4), kaempferol 3-O-a-L-rhamnopyranosyl-(1-6)-β-D-glucopyranoside (5), kaempferol 3-O-a-L-rhamnopyranosyl-(1-2)-β-D-glucopyranoside (6), kaempferol 3-O-a-L-rhamnopyranosyl -(1-2)-β-D-glucurono-pyranoside (7), kaempferol-3-O-β-D-glucurono-pyranoside (45), kaempferol 3-

O-β-D-glucuronopyranosylmethylester (8), myricetin 3-O, 5-O-dimethylether 3-O-β-D-glucopyranoside (9), quercetin 3-O-β-D-glucopyranoside (10), nelumboside A (11) and nelumboside B (12). Additionally it contains two isorhamnetin glycosides like isorhamnetin 3-O-β-D-glucopyranoside (13) and isorhamnetin 3-O-a-L-rhamnopyranosyl-(1→6)-β-D-glucopyranoside (14). Some non-flavonoid compounds, including adenine, myo-inositol, arbutin (15) and β-sitosterol glucopyranoside (16), have also been identified.^{16,18,19}

A Pharmacognostic study ensures plant identity, lays down standardization parameters which will help and prevents adulterations. Such studies will help in authentication of the plants and ensures reproducible quality of herbal products which will lead to safety and efficacy of natural products.¹⁷

However, the major drawback in promoting the use of medicinal plants is the lack of standardization as well as the confusion in the identification of the plant and their substitutes or adulterants.

The use of herbs and herbal products, in both developing and developed countries, for the treatment of various diseases has increased dramatically in recent years. However, the major drawback in promoting the use of medicinal plants is the lack of standardization as well as the confusion in the identification of the plant and their substitutes or adulterants. To ensure reproducible quality of herbal plants, authentication is invaluable. The pharmacognostical studies not only give the authentication but also quality and purity standards of the plant. According to the WHO, the macroscopical and microscopical description of a medicinal plant is the first step towards establishing the identity and degree of their purity.⁷

MATERIAL AND METHODS

Collection and Authentication

Fresh lotus flowers were procured from Flower market, Jamalpur, Ahmedabad. The flowers were authenticated by Department of Genetics and Plant Breeding, B.A College of Agriculture, Anand Agriculture University with authentication number BACA/GPB/652/14.

Macroscopic Study

The macroscopic observation of *Nelumbo nucifera* was carried out by organoleptic method. Organoleptic evaluation was done by means of sense organs, which provide the simplest as well as quickest means to establish the identity and purity to ensure quality of a particular drug. Organoleptic characters such as shape, size, colour, odor, taste and fracture of stem bark, leaf structure like margin, apex, base surface, venation and inflorescence, etc. were evaluated.

Microscopic Study

Powder Microscopy

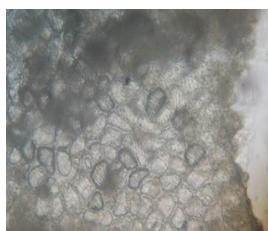
Flowers of *Nelumbo nucifera* were sun dried for 7 days and grounded using electric grinder. Powder of dried flower was used for the observation of the microscopic characters. A pinch of fine powder was taken on a glass slide treated with chloral hydrate solution and iodine solution, then observed under a microscope using different objective lenses for observation of different anatomical structures

Extraction

The flowers were dried and ground. Powder of dried flowers was made using Electric grinder. Powder is used for various extractions.

- Petroleum Ether extract
- Chloroform extract

Powder Microscopy



A: Parenchymatous cells of *Nelumbo nucifera*



C: Epidermis of *Nelumbo nucifera*



B: Lignified fiber of *Nelumbo nucifera*



D: Xylem vessel of *Nelumbo nucifera*

Figure 1: Powder microscopy of *Nelumbo nucifera* Gaertn

- Methanol extract
- Aqueous extract

The powdered drug of above-mentioned plant has been subjected to successive solvent extraction, with petroleum ether, chloroform, methanol and water. After complete extraction, the solvent was evaporated under vacuum at room temperature to yield semisolid. The percentage yield, color and consistency were determined. The extract was then preserved in a desiccator till further use.

Physicochemical and Preliminary Phytochemical Screening

Ash values are used to determine quality and purity of crude drug. It indicates presence of various impurities like carbonate, oxalate and silicate. The water-soluble ash is used to estimate the amount of inorganic compound present in drugs. The acid insoluble ash consist mainly silica and indicate contamination with earthy material. Moisture content of drugs should be at minimal level to discourage the growth of bacteria, yeast or fungi during storage. Estimation of extractive values determines the amount of the active constituents in a given amount of plant material when extracted with a particular solvent. NNFE was subjected to screening of phytochemicals using various chemical tests.

The tests were done to find the presence of the active chemical constituents such as alkaloids, glycosides, terpenoids and steroids, flavonoids, saponins and tannin in the extracts.²⁰

RESULT

Morphology

Shape: cone shaped central female reproductive structure.

Size: Wide range, varying in height from 18-60 inches

Colour: Pink or white

Features: The yellow prominent receptacle has the carpels, or ovaries, that develop into seeds embedded separately in round holes throughout the receptacle. The stigmas, which are the pollen-accepting organs, stick through these holes when the flower is fresh

Table 1: Moisture Content and Ash values of *Nelumbo nucifera* Gaertn

(Sample) <i>Nelumbo nucifera</i> Gaertn	Ash value (%w/w) ± SEM	Reference value (as per IP 2007 and Ayurvedic Pharmacopoeia)
Moisture content	6.967 ± 0.441	Not more than 15%
Ash values	5.933 ± 0.333	Total Ash Not more than 12 per cent
Acid insoluble ash value	0.933 ± 0.058	Acid-insoluble ash not more than 3 %
Water insoluble ash value	2.511 ± 0.033	

Values are mean of three independent replicates ± Standard deviations

Phytochemical Screening

Table 2: Phytochemical screening of different extracts *Nelumbo nucifera* Gaertn

Experiment	Test	Aqueous Extract	Alcoholic extract	Chloroform extract	Pet. Ether Extract	Inference	
Test for Carbohydrates	Molisch's test	+	+	+	-	Carbohydrate	
	Fehling's test	+	+	+	-	Reducing sugar	
	Benedict's test	+	-	-	-	Reducing sugar	
	Barford's test	+	-	-	-	Monosaccharide	
	Cobalt-chloride Test	+	-	-	-	Glucose	
	Tollen's Phloroglucinol test	+	-	-	-	Hexose sugar	
Test for Proteins and Amino Acid	Test for Starch (Cold Extract) (Hot Extract)	+	-	-	-	Starch	
	Ninhydrin test	+	-	-	-	Protein or amino acid	
	Biuret test	+	-	-	-	Polypeptide	
	Test with Tannic Acid	+	-	-	-	Protein	
Test for Fixed oils	Xanthoprotein test	+	-	-	-	Protein	
	Spot Test: (a)Benzene extract (b)Petroleum ether extract	-	-	-	+	Fixed oil	
Test for Phytosterols	(b)Petroleum ether extract	-	+	-	+	Fixed oil	
	Liebermann's test	-	+	-	+	Phytosterol	
	Liebermann-Burchard's test	-	-	-	+	Phytosterol	
Test for Glycosides	Salkowski's test	-	+	-	-	Phytosterol	
	Baljet test	+	+	-	-	Glycoside	
	Legal's test	+	-	-	-	Glycoside	
	Borntrager's test	-	-	-	-	Anthraquinone glycoside	
	Modified borntrager's test	-	-	-	-	Anthraquinone glycoside	
Test for Saponins	Kedde's test	-	-	-	-	Cardenolide	
	Keller Kiliani test	-	-	-	-	α-deoxy sugar	
	Foam test	+	-	-	-	Saponins	
	Test for Flavonoids	Ferric chloride test	-	-	-	-	Flavonoids
		Lead acetate test	-	-	-	-	Flavonoids
		Action of Alkali and Acid	-	+	-	-	Flavonoids
	Test for Tannins and Phenolic Compounds	Ferric chloride test	+	-	-	-	Phenolic compound
Nitric acid test		+	+	-	-	Tannins and Phenolic compound present	
Gelatin test		+	+	-	-	Tannins	
Match stick test		+	-	-	-	Tannins	
Chlorogenic acid Test		-	+	+	-	Tannins	
Test for Alkaloids	Mayer's test	+	+	+	-	Alkaloids	
	Dragendroff's test	+	+	+	-	Alkaloids	
	Wagner's test	+	+	+	-	Alkaloids	
	Hager's test	+	+	+	-	Alkaloids	

DISCUSSION

The results of the pharmacognostic evaluation like morphological studies, powder microscopy and phytochemical screening including various chemical tests of *Nelumbo nucifera* flower extracts indicated presence of enormous amount of phytoconstituents which confirms the literature serve and it can be utilized for various applications therapeutically. This can be achieved by future investigation by performing pharmacological studies of the same species.

CONCLUSION

The results of this study can serve as valuable source of information for identification of this plant for future investigation and applications. Thus, we conclude that this approach is an innovative way to screen and study the *Nelumbo nucifera* Gaertn which will give new direction for the establishment of newer compounds.

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