Pharmacognostical Standardization of *Nelumbo nucifera* Gaertn. (Seeds)

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Abstract

Nelumbo nucifera Gaertn. is equated to botanical source of 'Kamala'. This plant species is attributed for various medicinal properties and its different morphological parts viz. rhizome and seeds are edible. The present study is carried out on the pharmacognostical standardization of *Nelumbo nucifera* Gaertn. (seeds) along with Thin- Layer chromatographic profile which is aimed to develop quality standards for the drug.

Keywords: *Nelumbo nucifera* Gaertn., Pharmacognosy, Drug Standardization.

Introduction

Nelumbo nucifera Gaertn. (Family - Nymphaeaceae) is an aquatic perennial plant and its seeds are traded for various purposes. It is known as 'kamal beej' and also used as drug. Its flower has status of national flower of India and Vietnam. The drug obtained from different morphological parts is referred in common parlance as Kamala (flower and rhizome) in Ayurveda, Thamari (flower) and Tamaraik kilanku (rhizome) in Siddha and Tukhm Neelofar (seeds) in Unani.

All the parts are used medicinally for different physical disorders. The fresh rhizome eaten as vegetable for its nutritive and nourishing properties; fresh leaves paste with sandal wood used for burning heat of skin; flower is good tonic for heart and brain; seeds are good source of manganese, magnesium, phosphorus, thiamin, potassium and protein as well as low in saturated fat and cholesterol. Seed powder is used against cough and also form a cooling medicine for skin diseases (improves skin colour and complexion), spleen tonic, nervous disorders, leprosy, insomnia, high fevers (Anonymous, 1982). The Seeds are also ethno-botanically important and used to make rosary for spiritual prayers.

Methodology

Botanically identified genuine sample of seeds were subjected for macroscopic and microscopic study, powder analysis and Thin-layer-chromatography. Hand sections were stained and mounted in canada balsam for anatomical studies. Lignifications on smoothed cross-surface were studied with phloroglucinol-HCl. For studying powder, Jackson and Snowdon (1992) was followed. Standard prescribed procedures for histochemical studies (Johanson, 1940; Youngken, 1951; Cromwell, 1955; Trease and Evans, 1978) and Chromatography (Shellard, 1968; Stahl, 1969; Smith and Feinberg, 1972) were adopted. The informatics is complied by reviewing the available literature.

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Informatics

Drug Specification : The drug consists of dried seeds of *Nelumbo nucifera* Gaertn.

Systematics

Family : Nymphaeaceae.

Genus : *Nelumbo* Adans.

Synonyms : *Nelumbium nuciferum* Gaertn.; *Nelumbo caspica* (Fisch.) Schipcz.; *Nelumbo komarovii* Grossh.; *Nelumbium speciosum* Willd. ; *Nymphaea nelumbo* L.

Vernacular names : English- Indian Lotus, Sacred Lotus; Hindi- Kanval, Lalkamal, Padam, Ambuj, Kamal; Sanskrit- Siluka, Ambhoruha, Padnakanda; Tamil- Tamarai, Ambal; Telgu- Erratamara, Kalung, Tamara; Urdu- Nilofer.

An aquatic, 8 to 10 feet in height, perennial herb with submerged horizontal, stoloniferous rhizomes. Leaves are simple, green, large, deciduous, peltate, orbiculate with wavy smooth margin and 20 to 40 inches in length leaf blade (1 to 2 m long leaf-stalk attaching to the center), usually rising above the level of water. Flowers terminal on solitary scape, fragrant, 2-6 sepals, 15-30 petals in many whorls, pink or white in colour. Fruit is a spongy torus containing a few oblong-ovoid, brown in colour with hard-shelled seeds. The seeds remain viable for many years (Figure 1. A & B).

Flowering : August-September and Fruiting: October-November

Habitat : Grown in lakes and ponds throughout the warmer parts of the country ascending upto 1000m.

Chemical constituents : Nelumbine, nuciferine, nymphalin, nornuciferine, quercetin, kaempferol, apigenin and cardiac glucoside.

Therapeutic uses : Leucorrhoea, chronic diarrhoea, enteritis, spermatorrhoea, palpitation and leprosy.

Regulatory Status : The drug is official in various pharmacopoeias and formularies in India (Table-1).

Observations and Result

I. Macroscopic Characteristics

A: Drug seeds are pale brown in colour; very hard, nearly oval in shape about 13mm long; surface very smooth, non-endospermic; cotyledons 2 (connate sheathing the plumule); taste sweet and no characteristic odour Figure 1. (A & B).

Table 1: Status of Herbal drugs in different official compendium and Systems of Medicines

Botanical name	Part used	Official Name	Pharmacopoeia	Formulary
Nelumbo nucifera Gaertn.	Flower	Kamala	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-II	Ayurvedic Formulary of India, Part-I
	Rhizome	Kamala	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-III	–
	Flower	Tamarai malar	Siddha Pharmacopoeia of India, Part-I, Vol.-I	Siddha Formulary of India, Part-I
	Rhizome	Tamaraik kilanku		
	Seed	Maghz-e-Kanwal Gatta	—	National Formulary of Unani Medicine, Part-VI

B. Powdered Drug: The powdered drug is brownish cream.

II. Micro-Morphological Characteristics:

A: Drug

T.S. of seed circular in outline; outer testa consisting of epidermis of single layer of thick walled polygonal parenchyma cells filled with reddish brown contents followed by palisade like cells consisting of single layer of radially elongated cells (looks like double layer); inner testa consisting of sclerenchyma cells of polygonal non-lignified thick walled cells of upto 20 layers; inner testa consisting of parenchyma cells; vascular tissue present in this region followed by larger parenchyma cells in two layers and small narrowly elongated parenchyma cells; cotyledons consisting of parenchyma cells filled with abundant starch grains Figure 1. (C & D).

Powdered Drug: Cotyledonary parenchyma cells filled with abundant starch grains; each starch grains simple, round or oval, upto 20ì; spiral vessels upto 55ì; epidermal cells in surface view; sclerenchyma cells in surface view; palisade like cells in surface view upto 150 ì in height (single cells) Figure 1. (E).

III. Physico-Chemical Constants

The analytical values in respect of physico-chemical constant of drug were established and results are reported in Table - 2.

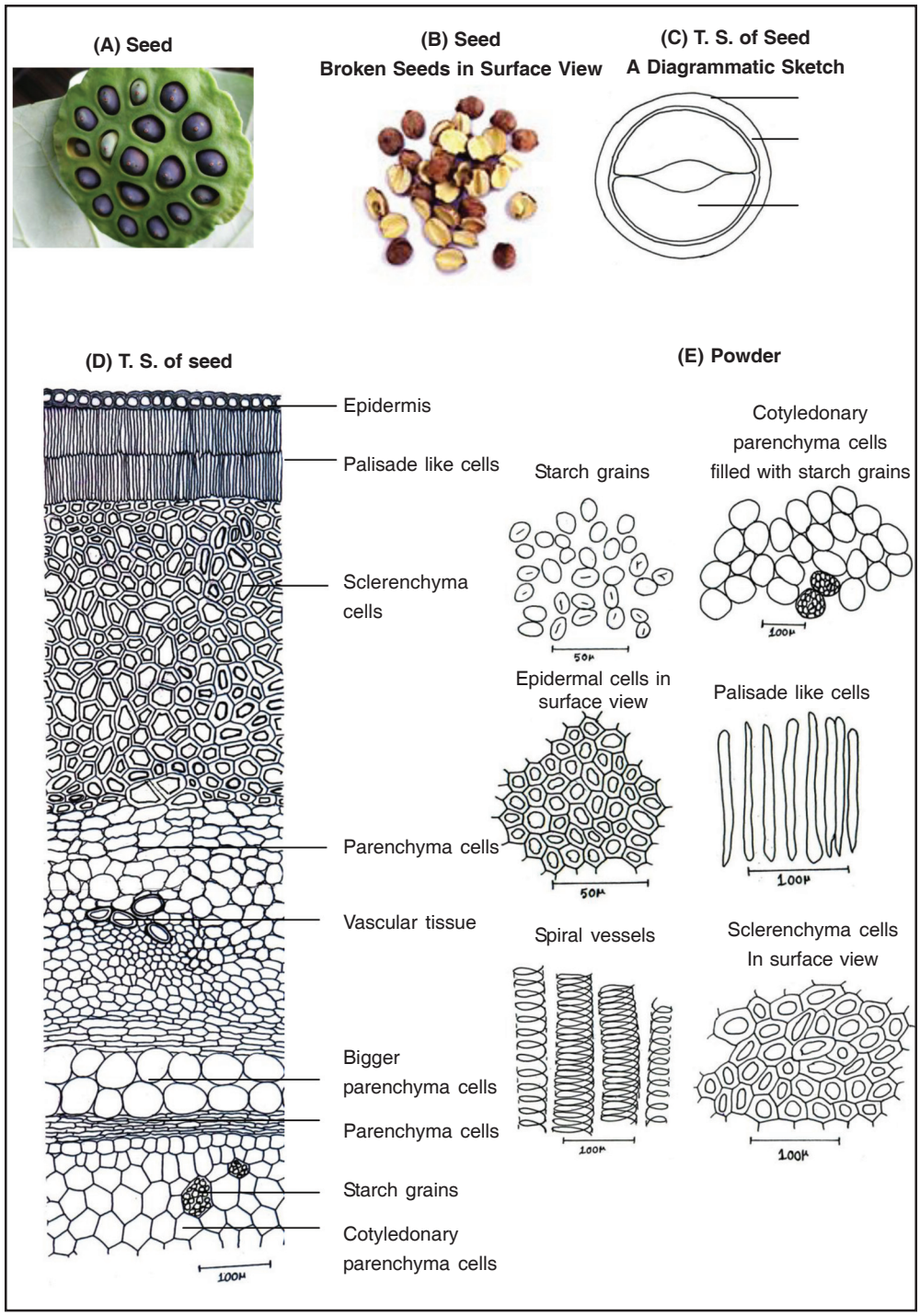


Figure 1: *Nelumbo nucifera* Gaertn. - Seed

IV. Thin-Layer Chromatography

Thin Layer Chromatography

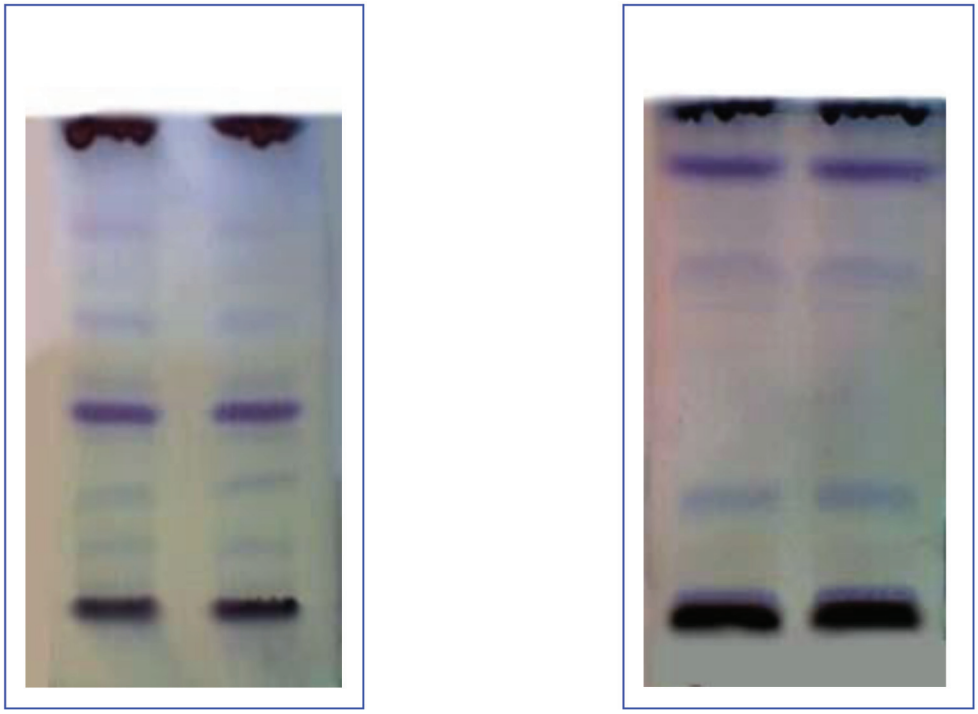
Extract 2 g of sample with 20 ml of chloroform and alcohol separately and reflux on a water bath for 30 min. Filter and concentrate to 5 ml and carry out the thin

Table 2: Analytical Values of Physico-chemical Constants-

Sl.No.	Physico-Chemical Constants	Analytical values
1.	Moisture content, % w/w	10.53 %
2.	Total Ash, % w/w	3.47 %
3.	Acid insoluble ash, % w/w	0.26 %
4.	Alcohol soluble extractive, % w/w	8.76 %
5.	Water soluble extractive, % w/w	9.48%

layer chromatography. Apply the chloroform extract on TLC plate. Develop the plate using Toluene: Ethyl acetate (9: 1) as mobile phase. After development the plates were allowed for drying in air and examined under UV (254nm) to record spots and R_f values. The plates were dipped in vanilline sulphuric acid reagent followed by heating at 110^0 for 5 min and observed under visible light and its shows different spots, Figure 2. (A). Inferences are tabulated below (Table 3.).

Thin Layer Chromatography



(A) Chloroform extract
Solvent system: Toluene:
Ethyl acetate
(9: 1)
Detector: V. S. Reagent

(B) Alcohol extract
Solvent system: Toluene:
Ethyl acetate
(1: 1)
Detector: V. S. Reagent

Figure 2: *Nelumbo nucifera* Gaertn. (Seed)

Table 3: TLC fingerprinting data-

Drug	Mobile Phase/ Solvent System	Derivatizing Reagents	Visualizations	No. of Spots	R_f Values of bands
Nelumbo nucifera Gaertn.	Toluene : Ethyl acetate (9 : 1)	1% vanillin-sulphuric acid reagent	Under UV 254nm	4	0.69 (Light pink), 0.57 (Pink), 0.28 (Light pink) and 0.11 (Yellowish green)
			Under UV 366 nm	3	0.57 (Violet), 0.53 (Pale blue) and 0.26 (Violet)
			After derivatization	6	0.75 (Violet), 0.57 (Grey), 0.43 (Blue), 0.39 (Violet), 0.26 and 0.12 (Blue)

Table 4: TLC fingerprinting data-

Drug	Mobile Phase/ Solvent System	Derivatizing Reagents	Visualizations	No. of Spots	R_f Values of bands
Nelumbo nucifera Gaertn.	Toluene: Ethyl acetate (1: 1)	1% vanillin-sulphuric acid reagent	Under UV 254nm	2	R_f 0.87 (Pink) and 0.61 (Light pink)
			Under UV 366 nm	1	0.86 (Blue)
			After derivatization	8	0.87 (Violet), 0.68, 0.61 (Blue), 0.42 (Light blue) and 0.24 (Violet).

The alcohol extract applied on TLC plate and developed by using Toluene: Ethyl acetate (1: 1) as mobile phase. After development, the plate was allowed to dry in air and examined under UV (254nm), Figure 2. (B).

Discussion

The present pharmacognostical studies on seeds of *Nelumbo nucifera* Gaertn. highlight macro and microscopical characters which can be employed for

authentication of drug. Physico-chemical data are useful in the assessment of purity and strength of drug. Thin-layer chromatographic profile is important parameters to identify and assessing the presence of active and other phyto constituent in the drug. The standards developed are easy, reliable and cost effective tool for proper identification and detection of adulteration in drug material claimed (seeds) to be medicinal plant material resourced from *Nelumbo nucifera* Gaertn.

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