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Research Article

Quality Control Outprints of Kamala (*Nelumbo nucifera* Gaertn.): An Aquatic Medicinal Plant

Lachita CV¹, Mallya Suma V^{2*}, Naik Thejaswi³, Prabhu Suchitra⁴¹ PG Scholar, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Kuthpady, Udupi, 574 118² Associate Professor, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Kuthpady, Udupi, 574 118³ Assistant Professor, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Kuthpady, Udupi, 574 118⁴ Research Officer, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Kuthpady, Udupi, 574 118

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Abstract



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*Address for Correspondence:

Mallya Suma V, Associate professor, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Kuthpady, Udupi, 574 118

Introduction: Kamala(*Nelumbo nucifera*Gaertn.) is an emergent perennial aquatic plant, having diverse medicinal properties. Many parts of this plant like petals, stamens, seeds are used in medicine. **Materials and methods:** Fresh flowers of *Kamala*(*N. nucifera* Gaertn.) were procured from their natural habitat macro-microscopy, physicochemical standards, phytochemical study, HPTLC were carried out as per standard protocol. **Results:** Histological study on drug shows air sacs and pollen grains of varied shape and size. The drug found to contain high amounts of carbohydrates, flavanoids, tannins. HPTLC, has given different peaks at short and long UV. **Conclusion:** Pharmacognostic standards of test drug recorded represent quality out prints of this drug.

(**Key words:** *Kamala*(*Nelumbo nucifera* Gaertn.), Pharmacognosy, Standardisation)

INTRODUCTION

Plants have been an exemplary source of therapeutics and many of the currently available medicines are directly or indirectly derived from them. Recently there is an irresistible response on plant-based medicine, due to their lesser side effects, easy availability¹. *Kamala*(*Nelumbo nucifera*Gaertn.) is an aquatic plant used in wide range of therapeutics, in Indian system of medicine, since time immemorial. Floral parts, stamens, sepals, rhizomes, seeds of this plant are mainly used in medicine². These are said to be blood purifier, intellectual promoter, cooling, skin tonner. Various classical preparations like *Aravindasava*, *Pancharavindaghrita*, *Lakshyaditaila* are prepared out of this. Seeds of this plant are used as nutritional supplements³. Major chemical constituents among plant are quercetin, luteolin, glycosides, kaempferol nelumbine, metarbine⁴. Various pharmacological studies have been conducted on this drug and are said to be astringent, neuroleptic, haemostatic, diuretic, antipyretic, hypoglycaemic and anticonvulsant⁵.

Due to increased demand on herbal drugs, authenticity of herb used or its part are always apprehensive. Hence quality standards of natural products are necessary for referral, in drug research. *Kamala*(*N. nucifera* Gaertn.) though used widely in medicine, due to habitat loss and other factors, authentication of its botanical identity and ascertaining its

genuineness are of prime factor. Hence present study is planned to portrait pharmacognostic parameters of this herb as per standard protocol.

MATERIALS AND METHODS

Drug source

Matured whole plant including the flower and rhizome of *kamala*(*N. nucifera*Gaertn.) were procured from their natural habitat. Plant authenticated and a voucher specimen deposited at Department of Pharmaceutical Chemistry and Pharmacognosy, SDM Centre for Research and Allied sciences, Udupi. Few samples were preserved in FAA solution for microscopy. Rest of the sample shade dried and used for further study⁶.

Macroscopic evaluation

The external features of the drug documented digitally using Canon IXUS camera and organoleptic characters like colour, smell, size, texture noted⁷.

Microscopic evaluation

Few plants sample like petals, stalk, sepal was preserved in fixative solution. The fixative used was FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml). The materials were left in FAA for more than 48 hours. The preserved

specimens were cut into thin transverse section using a sharp blade and the sections were stained with saffranine to get lignified cells identified or for identification of lignified cells. Transverse sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss Axio Cam camera under bright field light. Rest of the sample shade dried and powdered and used for further study⁸.

Powder microscopy

A pinch of powdered drug was taken on a glass slide and added with 2 drops of chloral-hydrate solution. The cover slip was placed over the slide and warmed over a low flame for short time⁸.

Physico-chemical standards:

Powder of the sample tested for physico-chemical standards like loss on drying, total ash, acid insoluble ash, water soluble ash, alcohol soluble extractive value, water soluble extractive value as per standard guidelines⁹.

Phytochemical study:

Aqueous and alcoholic extract of the sample powder tested for the presence of secondary metabolites like, alkaloid, steroid, carbohydrate, tannin, flavonoids, saponins,

terpenoids, coumarins, phenols, carboxylic acid, amino acid, resin and quinone as per scientific protocol¹⁰.

HPTLC

One gram of powdered sample suspended in 10 ml ethanol (99.9%) and kept for cold percolation for 24h and filtered. 4, 8 and 12 μ l of the above samples were applied on a pre-coated silica gel F₂₅₄ on aluminum plates to a band width of 7 mm using Linomat 5 TLC applicator. The plate was developed in Toluene: Ethyl Acetate: Formic acid (5.0: 5.0: 1.0). The developed plates were visualized in short UV long UV and then derivatised with Anisaldehyde sulphuric acid reagent and scanned under UV 254nm, 366nm and 620nm. R_f, colour of the spots and densitometric scan were recorded¹¹.

RESULTS:

Macroscopy:

Petals are numerous, elliptic, obtuse & membranous. Sepals are leafy, broad and thick centrally and narrow at the margins. Stamens are numerous, filament is erect. Gynoecium-Apocarpous, stigma terminal and dilated, ovary single-celled. Taste of plant powder sweet, floral parts pink and rhizome brown and slimy in texture with no characteristic odour. (Figure 1)



Flower with stalk



Floral parts enlarged



Corolla (Petals), Stamen. Pollens

Figure 1: Macroscopic features of *Nelumbo nucifera* Gaertn.

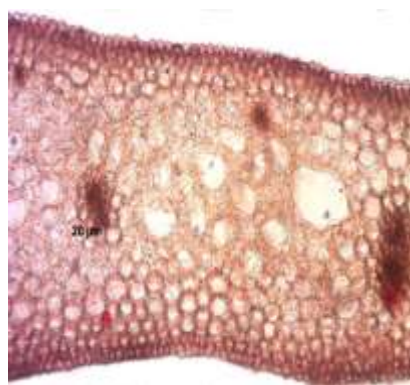
Microscopy:

TS of pedicel exhibited two layered epidermises, consisting of radially elongated cells. Below this pear-shaped air cavities were seen. Small air cavities found traverse throughout the phloem tissue of vascular bundles. Simple starch grains, prismatic and cluster crystals of calcium oxalate found

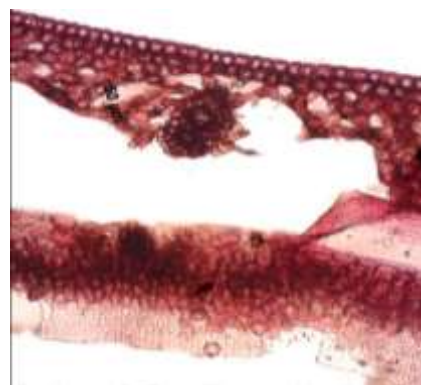
running through the parenchymatous cells. TS of Sepals reveal collateral meristemes traversed along with the loosely arranged spongy parenchymatous tissue of the mesophyll. TS of petals were similar to sepals except the cells of upper and lower epidermis which was highly papillose, thick-walled, bearing sunken stomata -an important characteristic of plants from aquatic habitat. (Figure 2)



Stamen



Rhizome (Stalk)



Petal

Figure 2: Microscopic features of *Nelumbo nucifera* Gaertn.

Powder microscopy

Shows fragments of petals and sepals in surface view.
Papillose cells of epidermis, prismatic and cluster crystals of

calcium oxalate found in microscopy. Fragments of the fibrous layer of the anthers composed of elongated cells, which exhibit characteristic beaded thickening in surface view and abundant pollen grains. (Figure 3)

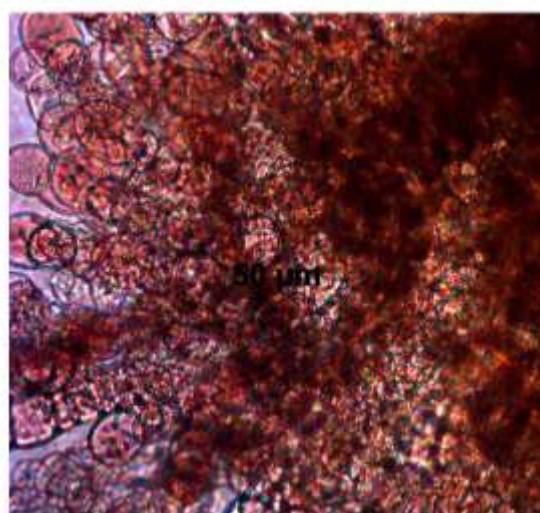
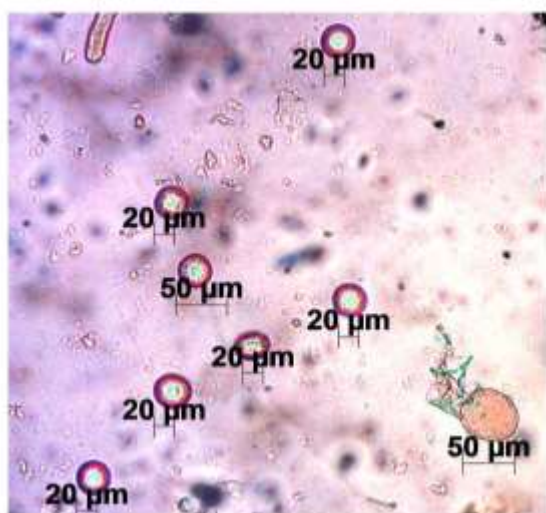
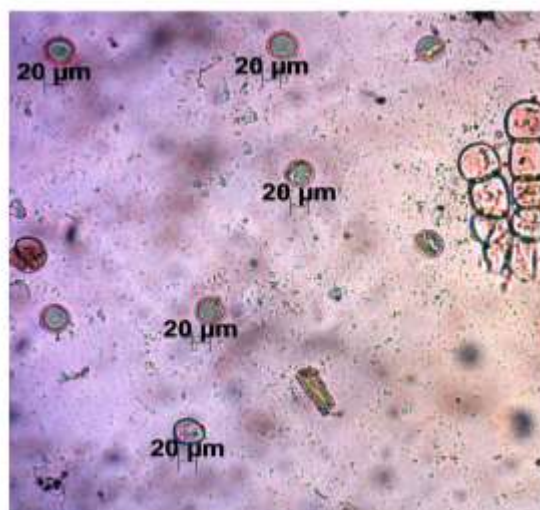
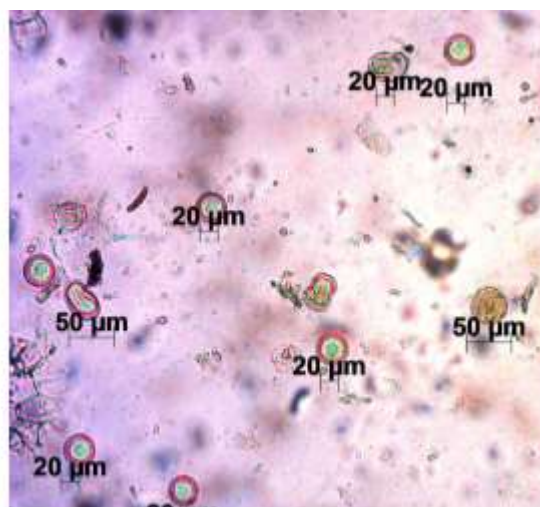
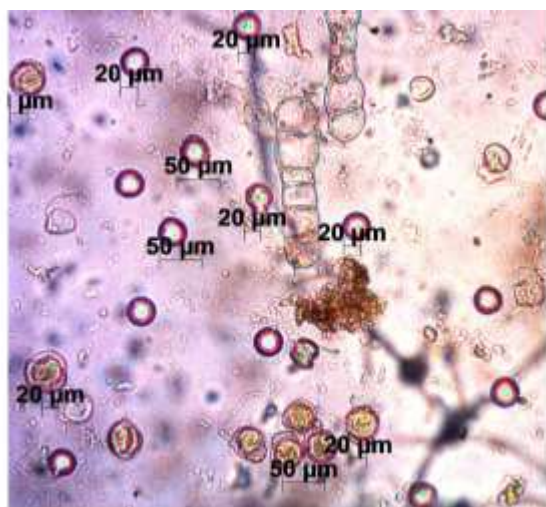


Figure 3a. pollens isolated and groups

Figure 3c. Fibre

Figure 3e. Pollens

Figure 3b. Pollen grains in different shapes

Figure 3d. Pollen grains

Figure 3f. Pollen sacs

Figure 3: Powder Microscopy of Kamala (*Nelumbo nucifera* Gaertn.)

Physico-chemical standards:Table 1: Results of standardization parameters of flower of *Nelumbo nucifera* Gaertn.

Parameter	Results n = 3 %w/w Avg $\pm$ SEM
Loss on drying	6.80 $\pm$ 0.01
Total Ash	18.58 $\pm$ 3.72
Acid Insoluble Ash	1.69 $\pm$ 0.01
Water soluble Ash	13.87 $\pm$ 0.01
Alcohol soluble extractive value	7.77 $\pm$ 0.01
Water soluble extractive value	68.11 $\pm$ 0.01

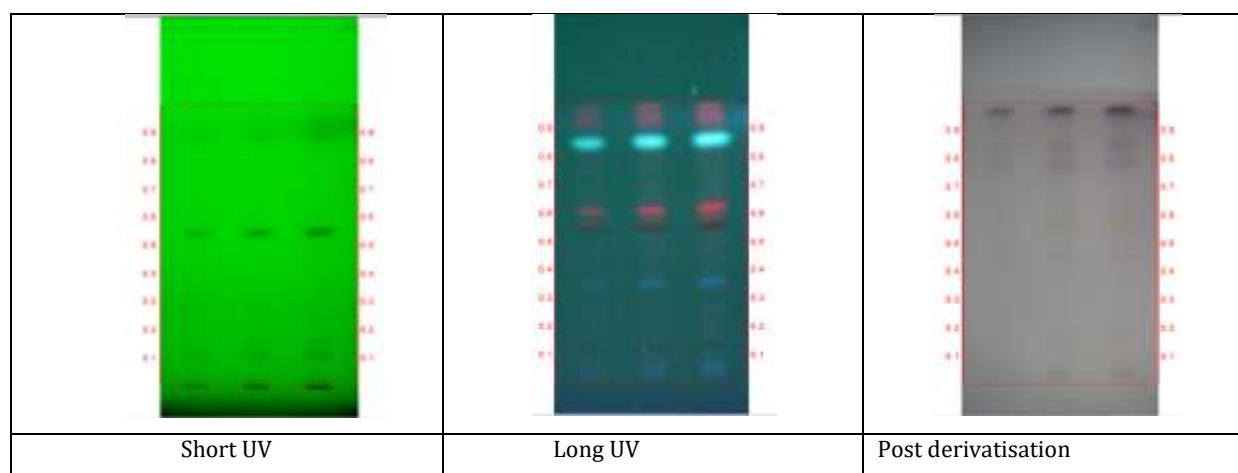
Phytochemical study:Table 2: Results of preliminary phytochemical screening of officinale parts of *Nelumbo nucifera* Gaertn.

Test	Inference
Alkaloid	+
Steroid	-
Carbohydrate	+
Tannin	+
Flavanoids	+
Saponins	-
Terpenoid	-
Coumarins	+
Phenols	-
Carboxylic acid	-
Amino acids	-
Resin	+
Quinone	-

(+) – Present; (-) – Negative

HPTLC:Table 3: R_f values of *Nelumbo nucifera* Gaertn.

Short UV	Long UV	Post derivatisation
-	0.04 (F. blue)	0.04 (Purple)
-	0.07 (F. blue)	0.07 (Purple)
0.11 (Green)	-	-
-	0.14 (F. blue)	0.14 (Yellow)
0.16 (Green)	-	-
-	-	0.19 (Purple)
-	0.27 (F. blue)	-
-	0.36 (F. blue)	-
0.55 (Green)	0.55 (F. blue)	-
-	-	0.58 (Yellow)
0.62 (Green)	0.62 (F. red)	0.62 (Purple)
-	0.68 (F. blue)	-
-	0.73 (F. blue)	-
-	-	0.78 (Purple)
-	0.85 (F. aqua blue)	0.85 (Purple)
0.89 (Green)	-	-
-	0.94 (Pink)	-



Solvent system - Toluene: Ethyl Acetate: Formic acid (5.0: 5.0: 1.0)

Track 1 – *Nelumbo nucifera*– 4 μ l

Track 2 – *Nelumbo nucifera* – 8 μ l

Track 3 – *Nelumbo nucifera*– 12 μ l

Figure 4: HPTLC photo documentation of methanolic extract of *Nelumbo nucifera* Gaertn.**DISCUSSION:**

Kamala (Nelumbo nucifera Gaertn.) is a popular aquatic medicinal plant used since vedicera. All parts of this plant are used in Indian system of medicine; like rhizome, flowers, stamens, seeds etc. *Aravindasava*, *Pancharavinda*, *Chaushkuvalayarasayana* are few popular preparations

prepared out of this drug. Quality standard parameters are very essential measures to prevent adulteration or admixture in herbal drug practice¹².

Cell inclusions are specific to particular species, and also specific to plant parts¹³. Histological study on drug shows air sacs and pollen grains of varied shape and size. Simple starch

grains, prismatic and cluster crystals of calcium oxalate were found within parenchymatous cells. Pollens, calcium oxalate crystals are characteristic features of powder study. Physicochemical standards represent growth character, mineral inclusions, contamination etc¹⁴. Drug has shown loss on drying (6.80), total ash (18.58), acid Insoluble Ash (1.69), water soluble ash (13.87), alcohol soluble extractive (7.77) and water soluble extractive as (68.11).

Total ash value (18.58) represents the carbonaceous matter, whereas water soluble extractive (68.11) was on upper limit showing presence of carbohydrates. Acid insoluble ash reveal about trace elements present in herbal drug¹⁵. Phytochemical tests indicate the presence of high amount of carbohydrates along with other chemical constituents like flavonoids, tannins, alkaloids, coumarins, resins.

Test drug sample when developed on aluminum plates having media as Toluene: Ethyl Acetate: Formic acid (5.0: 5.0: 1.0) has shown the presence of 5 peaks at short UV, 11 peaks at long UV whereas after post derivatisation has shown 8 peaks.

CONCLUSION:

Kamala -*Nelumbo nucifera* Gaertn, belonging to the family *Nymphaeaceae* is a perennial aquatic basal eudicot. It is an important plant, with its uses ranging from ornamental, nutritional to medicinal values. Pharmacognostic standards recorded in this paper represent quality out prints of this drug.

REFERENCES:

1. Mukharjee Pulok K, Quality Control of Herbal Drugs; New Delhi: Business Horizons; 2002; p68
2. Nishteshwar K. Text Book of Dravyaguna. Chaukamabha Surabharati Prakashana, Varanasi, 2007, 541.
3. Vaidya Bapalal G, Nighantu Adarsha. Chaukamba Bharati Academy. 1998; 2(2):667-8
4. Khare CP. Indian Medicinal Plants an illustrated Dictionary, New Delhi, Springer, 2007, pp 76 <https://doi.org/10.1007/978-0-387-70638-2>
5. Kirtikar KR and Basu BD, Indian Medicinal plants Vol-3, Dehradun; International Book Distributors, 1996 pp 1896
6. Mallya Suma V, Suchitra Prabhu, Vishwanatha U, KN Sunilkumar; Anatomical atlas of Panchavalkala- Effective healing of five bark drugs used in gynaecological disorder; Journal of Ayurvedic and herbal medicine 2018; 4(1):6-13 <https://doi.org/10.31254/jahm.2018.4102>
7. Mallya Suma V, Nesari Tanuja; Antibacterial activity profile and quality standards of Cymbopogon citratus Stapf- an aromatic grass used in Indian system of medicine; Journal of Ayurvedic and Herbal Medicine 2016; 2(3): 63-66 <https://doi.org/10.31254/jahm.2016.2302>
8. Hima Shashidharan, Suma V Mallya, Prabhu Suchitra, KN Sunilkumar; Identity parameters on traditionally used antiulcer herb Scoparia dulcis Linn.; Journal of Ayurveda and Integrated Medical Science, Nov- Dec 2017; (6):70-76
9. Bani Shashikala, Mallya Suma V, Prabhu Suchitra, Quality control constraints of Guozotia abyssynica Cass. Source of medicinally used edible oil seeds; The Journal of Phytopharmacology 2018; 7(5):431-436 <https://doi.org/10.31254/phyto.2018.7505>
10. Mallya et al., Anatomical and Chemical recordings of Vataghni (Justicia gendarussa Burm F.) herb used in traditional practices; WJPR, Vol8(2); pp xxx-xxx
11. Rajmohan, Mallya Suma V, Mohammed Faisal, Sunilkumar KN, b Ravishankar; Traditional method of preparation and development of quality standards for an edible vegetable fat Malbar tallow (Vateria indica L., seed butter); Indian Journal of Natural Products and Resources March 2018, pp 60-66
12. Gokhale S B, Kokate CH, Purohit AP, A textbook of Pharmacognosy, 34th ed. Pune: Nirali prakashan: 2013; p.112
13. Wallis TE, Text book of Pharmacognosy, New Delhi, CBS Publisher and Distributors, 1985, pp527.
14. Satish Bn, Mallya Suma V, Prabhu Suchitra; Authentication parameters of Habenaria longicorniculata J. Graham; medicinal orchid used in Ayurveda; Arya vaidyan, 2018; XXXI(3):31-40