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Research Article

PHARMACOGNOSTIC STUDY OF *MORINGA CONCANENSIS NIMMO* BARK

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ABSTRACT

The present article reveals the pharmacogstic study of Moringa concanensis Nimmo. This plant species belongs to the family Moringaceae. In the view of its medicinal importance and taxonomic confusion, pharmacognostic studies, morphological characteristics, and microscopic studies was carried out to supplement the necessary information for the systematic identification and authentication of this plant, as per WHO guidelines. With this aspect, pharmacognostic investigations of the plant were carried out and reported. This study may help in acceptable identification of this plant among several species for future references.
Keywords: Moringa concanensis Nimmo, Pharmacogstic Study, Taxonomic Classification, Microscopic Evaluation.

INTRODUCTION

People used to prefer herbal medicines since the ancient times. These drugs are less expensive and have negligible side effects. They eliminate the disease from the patient's body and also enhance the vigor and immunity besides playing an appreciable role towards suppressing untoward immune reactions.[1]

Substances derived from the plants remain the basis for a large proportion of the commercial medications used today for the treatment of heart disease, high blood pressure, body pain, asthma, and other problems. The extensive advances and development of science of phytopharmaceuticals and hopes for remedies in chronic diseases generated new enthusiasm in the research workers to develop herbal medicines and remedies continue to be demanded by the public.[2]

The natural plant products often serve as chemical models or prototypes for the design and total synthesis of new drug entities. The concept of drug design of some of the synthetic molecules has emerged out of their quantitative structural activity relationship (QSAR) in terms of biodynamic constituents. For example, the Belladonna alkaloids (atropine), quinine, cocaine, opiates (morphine and codeine) and salicylic acid have been served as models for design and synthesis of anticholinergics, antimalarials, benezocaine, procaine and other local anesthetics and aspirin, respectively.

Botanical Information[3]

Name of the plant: *Moringa concanensis* Nimmo
Family : Moringaceae
Vernacular names: Tamil - Kattumurungai

Hindi	-	Sajana
Sanskrit	-	Sueta shjgru
Telugu	-	Kondamungaga
Sindi	-	Mooah

Table 1: Vernacular name in other countries

Sr. No.	Name of the Country	Local Name
1.	Cameroon	Paizlava, Chabana, Naa-nko
2.	Chad	Kag n'dongue
3.	Ethopia	Shelagda
4.	Kenya	Mronga, Mronge.
5.	Senegal	Neverday
6.	Zimbabwe	Mupulanga, Zakalanda
7.	Burma	Dandsalonbin

Taxonomic Classification

Class	:	Phanerogram or seed plants
Sub Class	:	Dicotyledones
Division	:	Polypetalae
Series	:	Disciflorae
Order	:	Brasicales
Family	:	Moringaceae
Binomial	:	Moringa concanensis

Botanical Characters

Habit	:	It is a small tree, with thin downy branches, with a height of 6 to 12 meters
Stem	:	Circular in nature, erect and small branches, with yellowish and bark is rough.
Root	:	Tape root system.
Leaves	:	2 Pinnate, 5 to 8 pair opposite leaflet, add pinnate 4 to 6 pair opposite, broad ovate, elliptic, 1 to 2 cm width, 1 to 3 cm length.
Inflorescence	:	Panicle.
Flower	:	Petals, white with purple streaks, oblong, obovate 1.5 x 0.5 cm, unequal; fertile-stamen5; staminodes declinant; ovary stipitate; ovules.
Fruits	:	Capsules beaked; seeds.

Plan and Objective of the Work

Looking to the scope of herbal drug and increasing demand especially in disease of liver, hypertension, diabetes, cancer, renal diseases, inflammation, infectious diseases, arthritis and skin disease etc., hence, it is planned here to study the plant like *Moringa concanensis* Nimmo. The selection of the plant *Moringa concanensis* Nimmo was made on the basis of its

- Easy availability
- Therapeutic value
- Degree of research work which is not done

The plan of work was as follows:

1. **Plant collection and identification**
   a. Collection
   b. Identification
2. **Pharmacognostic studies**
   a. Macroscopic investigation
   b. Microscopic investigation
   c. Powder Microscopy
   d. Fluorescence analysis
   e. Ash values
   f. Extractive values

1. Plant Collection and Identification

Collection of specimen

The plant ***Moringa concanensis* Nimmo** belonging to family Moringaceae is widely found throughout Rajasthan and Tamilnadu. The species for the proposed study that is ***Moringa concanensis* Nimmo** was collected from Jaipur in the month of June 2011. Care was taken regarding the age and the health of the plant to obtain a best condition bark part.

Taxonomical Identification

The species for the proposed study was identified and authenticated as ***Moringa concanensis* Nimmo** by Dr. P.

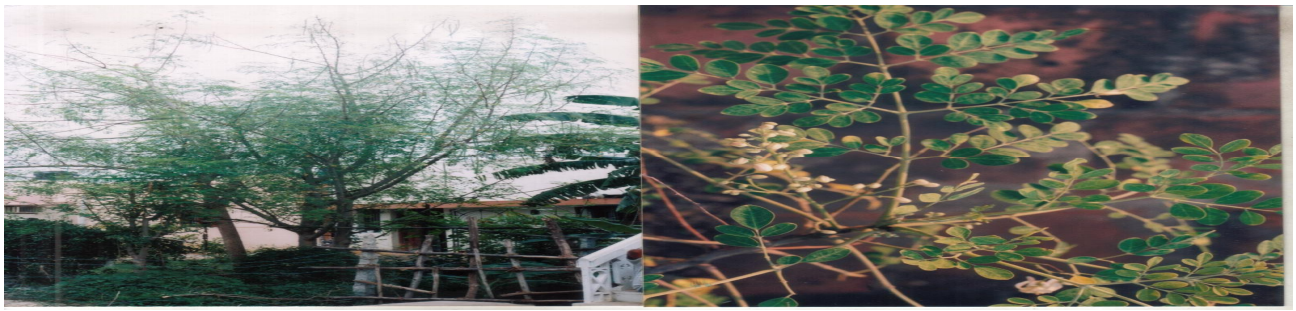

Figure 1: Exomorphic feature of Moringa concanensis Nimmo

Jayaraman, Botanist, Plant Anatomy Research Center (PARC), Chennai.

Treatment

The bark was washed with water & dried it in sunlight first hour & then it was dried in shade. The dried bark was coarsely powdered by means of grinder and the powder was passed through the sieve no 60 for powder microscopy & course powder was used for further studies.

2. Pharmacognostic Studies

a. Macroscopic Evaluation

The macroscopical characters of the bark of *Morianga concanensis* Nimmo are described as:

Color

- Externally grey or brownish white rough bark deep and irregularly fissured.
- Internally yellowish white or sandal colored.

Texture

Externally and internally are granular in texture.

Thickness : 6.3 mm. thick

Taste : Bitter

Odour : Odourless

Shape : Curved, Quill bark

Fracture : Short in outer bark and fibrous in inner bark

Figure 2: Surface feature of *Moringa concanensis* Nimmo

Utmost care was taken to select healthy plant and for normal organs. The required sample of Different organs were cut and removed from the plant and fixed in FAA (Farmalin-5ml.+ Acetic acid -5ml.+ 70% Ethyl alcohol-90ml.). After 24 hrs of fixing, the specimens were dehydrated with graded series of tertiary-Butyl alcohol. Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60 ºC) until TBA solution attained supersaturation. The specimens were cast into paraffin blocks.

Sectioning

The paraffin embedded specimens were section with the help of rotary Microtome. The thickness of the sections was 10-12 µm. Dewaxing of the sections was by customary procedure.[4] The sections were stained with Toluidine blue.[5] Since Toluidine blue is a polychromatic stain, the staining results were remarkably good; and some cytochemical reactions were also obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cells, dark green to suberin, violet to the mucilage, blue to the protein bodies etc. wherever necessary sections were also stained with safranin and Fast-green and KI(for Starch).

For studying the stomatal morphology, venation pattern and trichome distribution, paradermal sections (sections taken parallel to the surface of Leaf) as well as clearing of leaf with 5% sodium hydroxide or epidermal peeling by partial maceration employing Jeffrey's maceration fluid were prepared.[6] Glycerine mounted temporary preparations were made for maerated/cleared materials. Powdered materials of different parts were cleared with NaOH and mounted in glycerin medium after staining. Different cell component were studied and measured.

Photomicrographs

Microscopic descriptions of tissues are supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon Labphot 2 Microscopic Unit. For normal observations bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was employed.

b. Microscopic Evaluation[7,8]

Surface features of the bark

Young barks of the branches and trunks are smooth, old barks are fissused and rough surfaced. The bark is granular, soft and breaks easily. The outer bark is mucilaginous.

Microscopy features

The bark consists of the following tissue zones as seen in cross section view (Figure 3.1 & Figure 3.2)

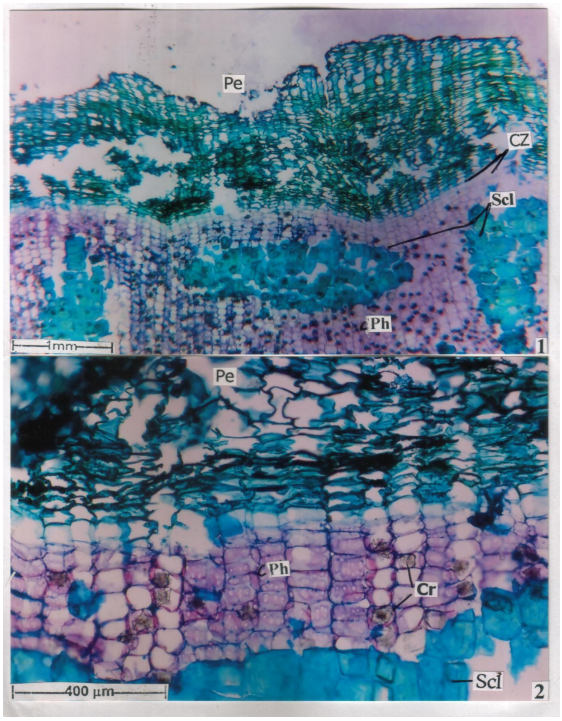

Figure 3: T.S. of Brak of *Moringa concanensis* Nimmo

1. Periderm showing phloem and phelloderm
2. Phelloderm cells enlarged

(Cr-Crystals; CZ- Cork cambium (Phellogen) Zone Pe-Periderm; Ph – Phelloderm Scl-Sclereids)

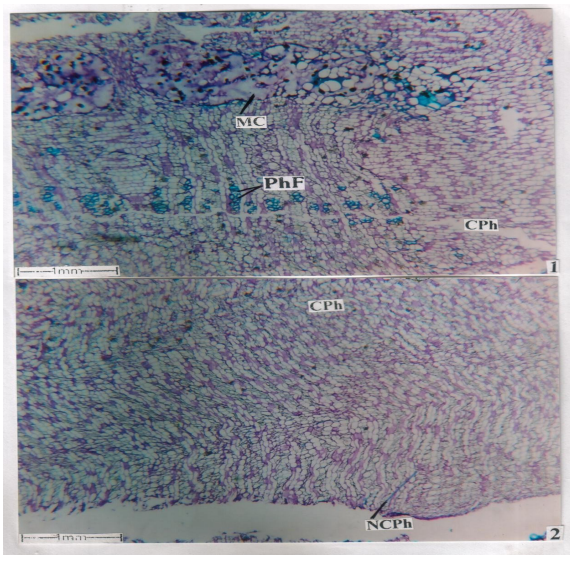

Figure 4: Structure of Inner Bark of *Moringa Concanensis* Nimmo

1. Collapsed Phloem Showing mucilage cavities and Phloem fibre.
2. Structure of outer collapsed phloem and inner non-collapsed phloem

(Cph– Collapsed Phloem; MC- Mucilage cavities; Ncph– Non-Collapsed Phloem; Phf– Phloem Fibre)

Outer wide Periderm:

It consists of wide, undulated, homogeneous thin walled phellum and equally wide phelloderm. The phelloderm cells are rectangular and occur in regular radial files. Some of the phellon cells are converted into sclereids. The sclereids are levady sclareids, isodimetric and thick walled.

Secondary Phloem

It is wider than the periderms and it can be divided into outer collapsed or crushed phloem and inner intact or noncollapsed phloem as shown in Figure 4 & Figure 5.

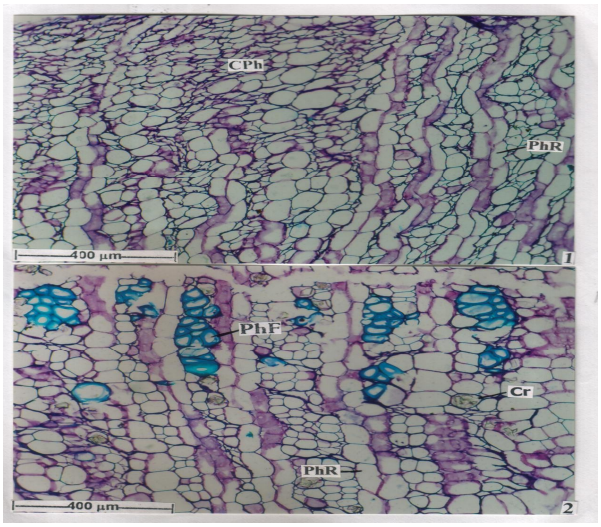

Figure 5: Microscopy of inner phloem of *Moringa Concanensis* Nimmo

1. T.S. of collapsed phloem showing crushed dark cells and wavy phloem rays.
2. Non-collapsed phloem with outer radial segments of phloem fibres and inner portion of intact sieve elements.

(Cph – Collapsed Phloem; MC- Mucilage cavities; Ncph – Non- Collapsed Phloem; Phf – Phloem Fibre)

Mucilage Cavities

Wide circular mucilage cavities are seen in tangential row in the outer region of the bark. The cells of the cavities are disintegrated forming a viscous fluid and dark, dense, globular bodies, perhaps tannin bodies as shown in Figure 6.

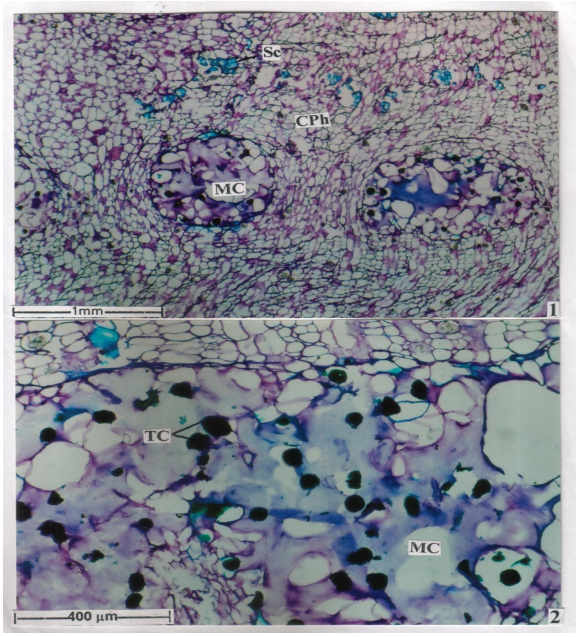

Figure 6: Structure of Mucilage Cavities

1. Mucilage cavities seen in horizontal low
2. Mucilage cavities enlarged showing tannin bodies or "Myrosin" inclusions

(Cph – Collapsed Phloem; MC – Mucilage cavitiy; Sc – Sclereids; TC – Tranniferous cells or "Myrosin" inclusions).

c. Powder Microscopy

The bark powder exhibits two important inclusions:

1. Masses of sclereids with crystal inclusions. They are isodiametric and have thick lignified walls and narrow lumen prismatic crystals are seen in most of the sclereids.
2. Calcium oxalate crystals of druses and Rosettes are abundant in the phloem parenchyma. They occur in radial rows and one crystal per cell. They are 30-50µm in diameter. Occasionally, prismatic crystal may also be seen in the powder.

d. Fluorescence Analysis[9]

Many crude drugs show fluorescence when the sample is exposed to ultraviolet radiation. Evaluation of crude drugs based on fluorescence in daylight is not of much use as it is usually likely to be unreliable due to the weakness of the fluorescent effect. Fluorescent lamps are fitted with a suitable filter, which eliminates visible radiation from the lamp and transmits ultraviolet radiation of definite wavelength. Several crude drugs show characteristic fluorescence useful for their evaluation.

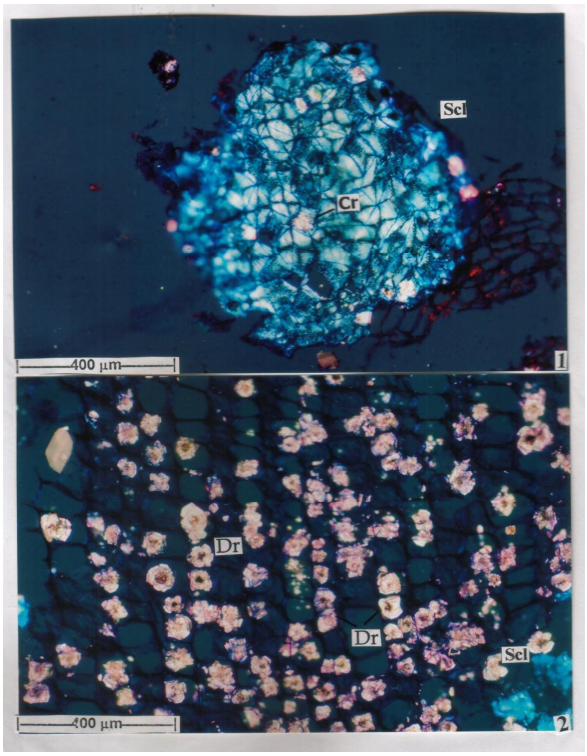

Figure 7: Powder microscopy of the bark.

1. The mass of phloem sclereids some of them having crystals.
2. Crystals of Druses and Rosette Seen in the powder.

(Cr- Crystals; Dr – Druses; Scl – Sclereids)

The fluorescence studies were done for the bark powder of *Moringa concanensis* Nimmo as such and also by treating the bark powder with different chemical reagents. The fluorescence studies on different solvent extracts of bark of *Moringa concanensis* Nimmo were also performed under daylight and UV-light.

e. Ash values [9,10,11]

Principle: The residue remaining left after incineration of the crude drug is designated as ash. The residue obtained usually represents the inorganic salts naturally occurring in the drug and adhering to it. It varies with in definite limits according to the soils. It may also include inorganic matter added for the purpose of adulteration. Hence, an ash value determination furnishes the basis for judging the identity and cleanliness of any drug and gives information relative to its

adulteration/contamination with inorganic matter, thus ash values are helpful in determining the quality and purity of drug.

Table 2: Data for Fluorescence analysis of Powdered Bark of *Moringa concanensis* Nimmo

S. No.	Treatment	Day Light	UV Light (254nm)
1.	Powder as such	Light brown	Light green
2.	Powder +50%HNO_3	Yellowish orange	Light green
3.	Powder +50%H_2SO_4	Yellowish orange	Light green
4.	Powder+ aqueous 1N NaOH	Yellow	Dark green
5.	Powder+ alcoholic 1N NaOH	Pale yellow	Yellowish green
6.	Powder + 1N HCl	Yellowish brown	Dark green
7.	Powder + 50% I_2 solution	Bluish black	Dark brown

Procedure given in Indian Pharmacopoeia was used to determine the different ash values such as total ash, acid insoluble ash, water-soluble ash value and sulphated ash.

i) Determination of Total Ash Value

Accurately weighed about 3g of air dried powdered drug was taken in a tared silica crucible and incinerated by gradually increasing the temperature to make it dull red hot until free from carbon. Cooled and weighed, repeated for constant value. Then the percentage of total ash was calculated with reference to the air-dried drug. (Table 3)

ii) Determination of Acid Insoluble Ash Value

The ash obtained as directed under total ash was boiled with 25 ml of 2N-HCl for 5 minutes. The insoluble matter was collected on an ash less filter paper, washed with hot water, dried the filter paper, ignited and weighed. The percentage of acid insoluble ash with reference to the air-dried drug then calculated. (Table 3)

iii) Determination of Water Soluble Ash Value

The total ash obtained was boiled with 25 ml of water for 5 minutes. The insoluble matter was collected on an ash-less filter paper, washed with hot water and ignited for 15 minutes at a temperature not exceeding 450°C. The weight of insoluble matter was subtracted from the weight of total ash. The difference in weight represents the water-soluble ash. The percentage of water-soluble ash was calculated with reference to the air-dried drug. (Table.3)

iii) Determination of Sulphated Ash Value

About 3g of accurately weighed air dried powdered drug was taken in a tared silica crucible, which was previously ignited and weighed. Then ignite gently at first until the drug was thoroughly charred. The crucible was cooled and residue was moistened with 1ml of concentrated sulphuric acid, heated gently until the white fumes were no longer evolved and ignited at 800°C± 25°C until all the black particles has disappeared. The crucible was allowed to cool, few drops of sulphuric acid was added and again heated. The ignition was carried out as before, allowed cooling and weighed to get a constant weight (difference not more than 0.5gm between two consecutive readings). The percentage of sulphated ash was calculated with reference to the air-dried drug. All the ash values were calculated and recorded. (Table. 3)

Table 3: Data for Ash Values of *Moringa concanensis* Nimmo

Sl. No.	Analytical Parameters	% W/W
1.	Ash values	
(a)	Total Ash	2.486
(b)	Acid Insoluble Ash	0.533
(c)	Water Soluble Ash	0.215
(d)	Sulphated Ash	0.541

f) Extractive Values[10,12]

Extractive values of crude drugs are useful for their evaluation, especially when the constituents of a drug cannot be readily estimated by any other means. Further, these values indicate the nature of the constituents present in a crude drug.

i) Determination of Alcohol Soluble Extractive Value

5g of the air-dried coarse powder of *Moringa concanensis* Nimmo was macerated with 100 ml of 90% ethanol in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. Out of that filtrate, 25 ml of the filtrate was evaporated to dryness in a tarred flat-bottomed shallow dish, dried at 105°C and weighed. The percentage of ethanol soluble extractive value was calculated with reference to the air-dried drug and the results were recorded. (Table.4)

b) Determination of Water Soluble Extractive Value

The above procedure was followed using water. The percentage of water-soluble extractive was calculated with reference to the air dried drug and the results were recorded. (Table.4)

Table 4: Data for Extractive Values Powder Bark of *Moringa concanensis* nimmo

Analytical Parameters	% W/W
Alcohol Soluble Extractive	5.52
Water Soluble Extractive	4.40

iii) Loss on Drying

Loss on drying is the loss in weight in % w/w determined by means of the procedure given below. It determines the amount of volatile matter of any kind (including water) that can be driven off under the condition specified (desiccators or hot air oven). If the sample is in the form of large crystals, then reduce the size by quickly crushing to a powder.

Procedure

About 1.5g of powdered drug was weighed accurately in a tared porcelain dish, which was previously dried at 105°C in hot air oven to constant weight and then weighed. From the difference in weight, the percentage loss of drying with reference to the air dried substance was calculated. The Loss on drying at 105°C was found to be 12.22% w/w.

Conclusion

The bark of *Moringa concanensis* Nimmo belonging to family Moringceae has been studied to compare and give detailed reports on pharmacognostic profile. The pharmacognostic studies made on the bark of *Moringa concanensis* Nimmo like macroscopical and microscopical characters, powder microscopy, physico-chemical constants like ash values, extractive value and loss on drying gave valuable information. This will help correct identification of this plant for future references.

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