

Pharmacognostic, Phytochemical and Nutritional Profile of *Moringa concanensis* Leaves

Research Article

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Abstract

The moringa genus has wide varieties cultivated worldwide; out of which only two species are cultivated in India i.e. *Moringa oleifera* and *Moringa concanensis*. *Moringa oleifera* was tested in all the aspects like; standardization parameters of plant and their pharmacological activities. *Moringa concanensis* Nimmo (Moringaceae) is a traditional medicinal plant, distributed in tropical deciduous forests of India. The standardization parameters play a vital role in quality assessment of plant material. Due to lack of standardization parameters the adulterants are passed as genuine drug. This plant has an impressive medicinal uses along with a good nutritional value. The present investigation provides research regarding standardization parameters as well as phytochemical constituents of *M. concanensis*. The plant is not edible due to its bitter taste but it has variety of phytochemical constituents as well as it is nutritionally rich. This investigation further helps to develop the formulations having medicinal activity as well as nutritional values.

Key Words: Pharmacognosy, Phytochemistry, Proximate analysis, Nutritional profile, *Moringa concanensis*.

Introduction

India has well-established traditional systems of medicine such as Ayurveda, Siddha, Unani and Homeopathy which utilise plants, animal and minerals for the welfare of human beings. There is a need to rationally utilise plants with medicinal value for curative purposes with maintenance of biodiversity. *Moringa* is a genus which contains approximately 13 species which are cultivated in different regions of Asian and African countries. These species are traditionally used as wound healer or in cough, cold, and diabetes. This genus is also consumed as a food material which has a good nutrient value as well as used for water purification (1). Two species of *moringa* out of 13 are cultivated in India i.e. *Moringa oleifera* and *Moringa concanensis*. This research is basically covering all the aspects related to *Moringa concanensis*. The *Moringa concanensis* is a plant belonging to family Moringaceae (2). This plant is cultivated in tropical dry regions of India. It is majorly cultivated in western and southern regions of India. This plant is not edible because of its bitter taste, but it has a variety of uses due to its chemical composition. It is traditionally used as antifertility agent in tribal areas (3). The *M. concanensis* have slender trunks. The leaves are bipinnate and

somewhat longer than *M. Oleifera*. In Tamilnadu, it is known as kattumurungai. It is glabrous (4). Due to the chemical composition, medicinal importance and lack of information; there is a need to develop the standardization parameters as well as phytochemical investigation using different analytical techniques for its effective identification and authentication.

Vernacular names(5):

- Hindi: Jangli Sargua, Senjana
- Kannada: Nugge, Kadu nugge
- Malayalam: Muringa
- Marathi: Mashinga, Ran Shevga
- Sanskrit: Bahupatraka, Garbhapatata, bahupallava
- Tamil: Kattumurungai
- Gujarati: Jangli Saragavo

Common name: Konkan Moringa

Taxonomical classification (6):

- Kingdom: Plantae
- Division: Tracheophyta
- Class: Magnoliopsida
- Order: Brassicales
- Family: Moringaceae
- Genus: *Moringa*
- Species: *concanensis*

Materials and methods

Collection and Authentication

The *Moringa concanensis* leaves were collected from Navsari district, south Gujarat region. After collection of material the dust and unwanted material was removed manually. Plant species was authenticated

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from Aspee College of horticulture and forestry, Navsari Agricultural University, Gujarat, India. After the authentication; the material was dried naturally under sunlight and open air by continuous observation to prevent over drying or burning of leaves. The dried material was coarsely ground powder which is used for further investigations.

Morphology

For the morphology study, fresh leaves were subjected to identify the colour, odor and taste, shape of leaf, size, appearance and determination of surface characteristics etc.

Microscopy

Microscopical characteristics of fresh leaves and dried leaves powder was determined according to previously described conventional methods.

Quantitative microscopy

Leaves of *Moringa concanensis* were subjected to quantitative microscopy for the following constants using reported methods;

- Stomatal index
- Palisade ratio
- Vein islet number
- Vein termination number

Proximate analysis

Proximate analysis of powdered plant material was carried out using reported methods for the following determinations

- Loss on drying
- Total ash
 - Acid insoluble ash
 - Water soluble ash
- Extractive value
 - Alcohol soluble extractive
 - Water soluble extractive (7-8)

Phytochemical screening

The powder of dried leaves of *Moringa concanensis* were successively extracted in soxhlet apparatus with solvents of increasing polarity as follows;

- Petroleum ether
- Chloroform
- Ethyl acetate

- Methanol
- Water

Each time before extraction with new solvent the material was dried. All the extracts were concentrated on rotary evaporator and then consistency, colour, appearance and percentage yield were noted.

Qualitative phytoprofile of extracts:

The qualitative phytochemical tests was performed as per reported methods to identify the phytochemical constituents such as;

- Alkaloids
- Amino acids
- Carbohydrates
- Flavanoids
- Anthraquinone glycosides
- Cardiac glycosides
- Saponin glycosides
- Phenolic compounds (Tannins)
- Proteins
- Steroids and Triterpenoids (8-9)

Nutritional profile

The nutritional profile was determined according to USFDA guidelines. Nutritional profile includes; vitamins, minerals, carbohydrates, proteins, energy, fats, cholesterol and dietary fibres etc. The determinations were done according to standard FSSAI and IS methods.

Result

Morphological characteristics

- Type: Compound (Bipinnate very rarely tripinnate)
- Phyllotaxy: Opposite
- Size: 45 cm long (leaflets are 2.5-3.8 cm long and 1.25-2.5 cm broad)
- Shape: Obovate
- Margin: Entire
- Apex: Obtuse
- Base: Rounded
- Venation: Reticulate
- Surface: Glabrous on upper surface and glaucous on lower side
- Colour: Green
- Odour: Characteristics
- Taste: Bitter

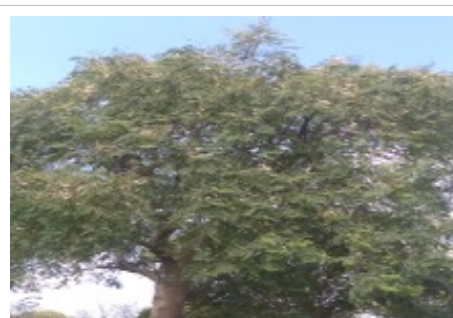


Figure 1 : *Moringa concanensis* tree



Figure 2 : Flowers of *Moringa concanensis*



Figure 3 : Leaves of *Moringa concanensis*

Microscopical characteristics

Leaf Microscopy

- The transverse section of leaf was dorsiventral. The sections shows two distinct regions i.e. lamina and midrib. The lamina of leaf shows three different layers i.e. upper epidermis, lower epidermis and mesophyll. The upper epidermal cells are slightly bigger than the lower epidermal cells. The mesophyll is further differentiated into palisade cells and spongy parenchyma. The palisade layer has single layer long, cylindrical and compact cells.
- The midrib is concave on upper side. The collenchymatous cells are present below the upper epidermis and above the lower epidermis. The stained section shows lignified xylem and non-lignified phloem. The unstained section shows presence of calcium oxalate crystals of rosette shape.

Figure 4 : Unstained Transverse Section of Leaves of *Moringa concanensis* (20 ×10)

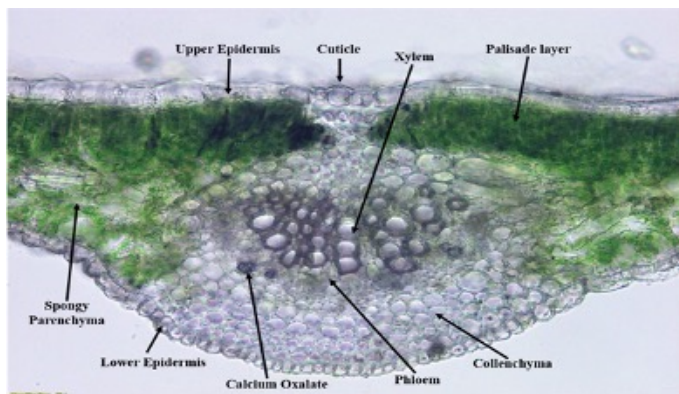
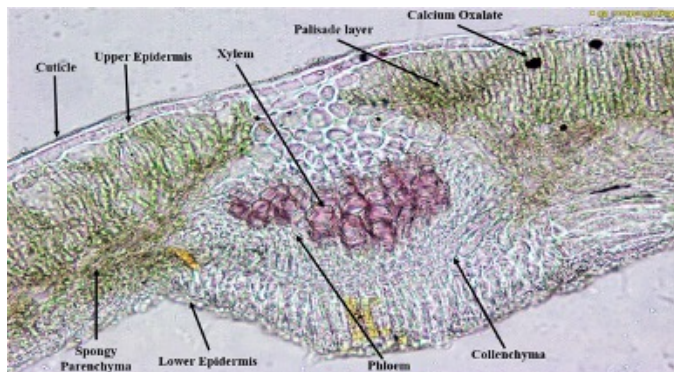


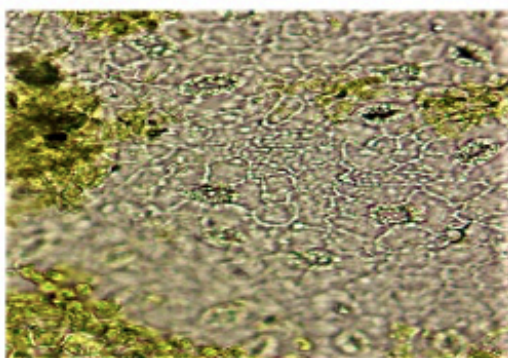
Figure 5 : Stained Transverse Section of Leaves of *Moringa concanensis* (20 ×10)



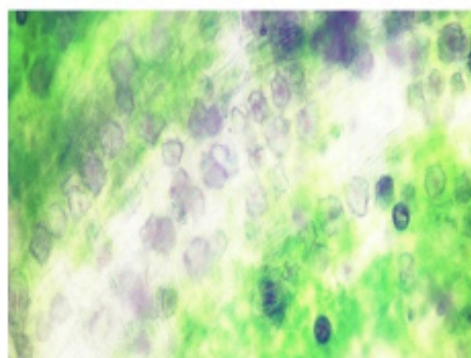
Powder microscopy:

- The organoleptic evaluation shows that powder was greyish green in colour with characteristic odor and bitter in taste. On microscopic examination; anomocytic stomata in which guard cells are covered with 5-6 epidermal cells, calcium oxalate crystals of rosette shape are also observed. The vascular bundle consists of lignified xylem of spiral shape and phloem, lamina with stomata was also observed.

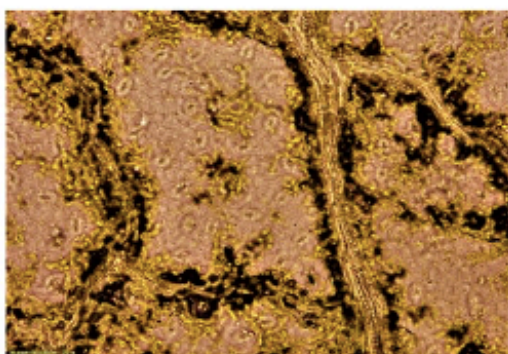
Figure 6 : Powder characteristics of *Moringa concanensis*



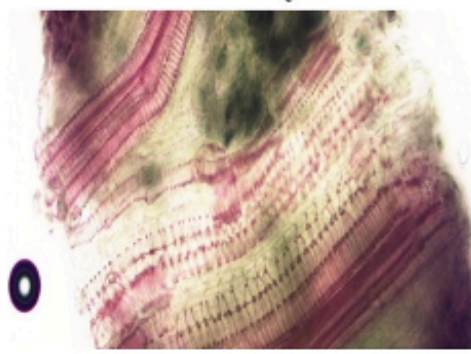
Anomocytic stomata



Rosette shape Calcium Oxalate crystals



Lamina



Xylem vessels : Spiral

Quantitative microscopy**Table 1. leaf constants of *Moringa concanensis* (3 leaves sample of same species taken for the study)**

Sr.No.	Parameters	Values (n=3)
1	Stomatal Index	11.01-14.26-16.90
2	Vein islet number	4-7 per mm sq
3	Vein termination number	2-4 per mm sq
4	Palisade ratio	7-10

Proximate analysis:

- The results obtained from determinations are compiled in following Table. The ash values gives an idea of the earthy matter or an inorganic composition and impurities present with the drug. The extractive values are useful for the determination of exhausted or adulterated drug.

Table 2. Physicochemical parameters of powder of *Moringa concanensis*

Sr. No.	Parameters	Values % w/w
1	Loss on drying	8.8%
Ash value		
2	Total ash	12.375%
	Acid insoluble ash	2.7%
	Water soluble ash	9.325%
Extractive value		
3	Water soluble extractive	23.84%
	Alcohol soluble extractive	8.96%

Preliminary phytochemical profile

- Moringa concanensis* plant powder was subjected to successive solvent extraction. The different extracts obtained with their % yield, color, consistency are recorded in following table.

Table 3. Preliminary phytochemical profile of *Moringa concanensis*

Sr.No.	Solvent	Colour	Consistency	% Yield w/w
1	Petroleum ether	Greyish green	Sticky	16%
2	Chloroform	Dark green	Sticky	3%
3	Ethyl acetate	Dark brown	Sticky	3%
4	Methanol	Yellowish brown	Sticky	8%
5	Water	Brown	Sticky	10%

Qualitative chemical tests

- The extracts obtained from successive solvent extraction was subjected to various qualitative chemical tests to determine the presence of various phytoconstituents like alkaloids, steroids, glycosides, phenolics, carbohydrates and tannins etc.

Table 4. Phytochemical screening of extracts of *Moringa concanensis*

Sr. No.	Phyto-constituents	Types of Extract				
		Petroleum Ether	Chloroform	Ethyl Acetate	Methanol	Water
1	Carbohydrates	-	-	-	+	+
2	Proteins	-	-	-	+	+
3	Terpenoids	-	+	+	-	-
4	Steroids	-	+	-	-	-
5	Cardiac Glycosides	-	+	-	-	-
6	Anthraquinone Glycosides	-	-	-	-	-
7	Flavanoids	-	-	-	+	+
8	Tannins and phenols	-	-	-	+	+
9	Alkaloids	-	-	-	+	+
10	Saponins	-	-	-	-	-

Nutritional profile

- The nutritional determinations are compiled in the following table

Table 5. Nutritional profile of *Moringa concanensis*

Sr. No.	Tested for	Limit of Quantitation (LOQ)	Results
1	Moisture, % by mass	0.10	9.35
2	Total Fat, gm/100gm	0.10	1.82
3	Protein gm/100gm	0.10	16.24
4	Total Sugar, gm/100gm	0.50	4.28

5	Energy, Kcal/100gm	-	322.15
6	Carbohydrates, gm/100gm	1.00	60.29
7	Cholesterol, mg/100gm	0.50	BLQ
8	Trans Fat, gm/100gm	0.10	BLQ
9	Polyunsaturated Fat, gm/100gm	0.50	BLQ
10	Monounsaturated Fat, gm/100gm	0.50	BLQ
11	Saturated Fat, gm/100gm	0.50	0.61
12	Vitamin C, mg/100gm	0.50	117.20
13	Vitamin A, µg/100gm	5.00	3682.24
14	Vitamin E, mg/100gm	0.50	14.44
15	Vitamin D, µg/100gm	1.00	2.06
16	Iron (As Fe), mg/kg	1.00	1887.88
17	Calcium, mg/kg	2.50	27105.34
18	Potassium (As K), mg/kg	0.50	15721.82
19	Sodium (As Na), mg/kg	2.50	5955.96
20	Dietary Fibres, gm/100gm	0.50	21.22

Discussion

The whole *Moringa* genus is rich in phytochemicals and nutrients. Two species which are cultivated in India are *Moringa oleifera* and *Moringa concanensis*. The present study was performed on *M. concanensis*. The morphology and microscopy of plant provides a detailed characteristics for identification of plant. In proximate analysis higher ash value and water soluble extractive value shows higher presence of minerals. While in extraction the petroleum ether extract and water extract was obtained abundantly. After phytochemical screening of different extracts they shows the presence of terpenoids, steroids, cardiac glycosides, alkaloids, tannins, phenols, carbohydrates and proteins. In nutritional profiling; it is rich in vitamins like; vitamin C, vitamin E, vitamin A and minerals like; calcium, sodium, potassium and iron.

Conclusion

Above study reveals the pharmacognostical parameters, phytochemical aspects and nutritional profile of *Moringa Concanensis* species. This study is useful for standardization of plant species in future. The phytochemical screening and nutritional profile shows the presence of some important phytochemicals as well as rich source of vitamins, minerals and dietary fibres. The study reveals that in future the plant should be a part of important herbal medicinal formulation as well as a good nutritional source for deficiency of vitamins and minerals.

Conflict of interest

The authors have no conflicts of interest regarding this investigation.

Acknowledgements

The authors would like to thank Parul University, Lilaba analytical laboratories, Surat and Bayer crop science Pvt. Ltd., Vapi for providing permissions to establish the above studies in every aspects.

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