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PHARMACOGNOSTICAL AND PHYTOCHEMICAL SCREENING OF MORINGA PTERYGOSPERMA LEAVES

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Abstract: The pharmacognostical and phytochemical screening of Moringa pterygosperma (Moringa oleifera) demonstrates its significant therapeutic potential and rich bioactive profile. The pharmacognostical and phytochemical screening of Moringa pterygosperma highlights the plant's potential as a valuable resource in both traditional and modern medicine. The identification of its morphological and microscopic features, along with the presence of various bioactive compounds, underscores its therapeutic significance. The presence of numerous bioactive compounds supports its use in managing various health conditions, including inflammation, infections, and nutritional deficiencies. Given its significant potential, Moringa could play a crucial role in enhancing health and well-being, particularly in resource-limited settings.

Keyword: Moringa pterygosperma, Moringa oleifera, pharmacognostical, phytochemical, bioactives

INTRODUCTION

Moringa pterigosperma, widely known as the drumstick tree, is a plant of remarkable significance due to its diverse applications in nutrition and medicine[1]. Originating from the Indian subcontinent, Moringa is now cultivated globally in tropical and subtropical regions[2]. This versatile plant is celebrated for its rich nutrient profile and therapeutic properties, making it a subject of considerable scientific and health interest[3].

Traditionally, various parts of the Moringa tree-such as its leaves, seeds, pods, and roots— have been employed in traditional medicine systems for their purported health benefits[4]. The leaves, in particular, are a rich source of essential vitamins, minerals, and proteins. They are often used in dietary supplements and as a food source to address nutritional deficiencies[5]. Moreover, the plant has been utilized for its anti-inflammatory, antioxidant, and antimicrobial properties, which have been documented in various traditional practices[6].

In recent years, there has been a surge in scientific research focusing on Moringa driven by its potential health benefits and its role in sustainable agriculture[7]. A thorough understanding of its pharmacognostical and physicochemical properties is crucial for validating traditional uses and ensuring the quality and efficacy of Moringa-based products[8]. Pharmacognostical studies involve examining the plant's botanical characteristics and identifying its chemical constituents, while physicochemical analyses assess its physical and chemical properties[9].

This study aims to conduct an in-depth pharmacognostical and physicochemical analysis of Moringa. By exploring its botanical features, microscopic characteristics, and chemical composition, the research seeks to contribute to the scientific validation of Moringa's therapeutic claims. Additionally, it will provide valuable data for the standardization and quality control of Moringa products, ensuring their effectiveness and safety in medicinal and nutritional applications.

EXPERIMENTAL WORK

Plant Collection: Plant was selected on the basic of literature and indigenous tradition acknowledge.

Moringa pterygosperma, often referred to as the drumstick tree, has garnered interest for its pharmacognostical properties. Here's a brief overview:

Macroscopic Features: Leaves were pinnate, with a bright green color and small leaflets. Pods were long, slender, and elongated, containing seeds.

Figure 1: Plant of *Moringa pterygosperma* with its pods and flowers

External morphology of *moringa pterigosperma*: It has tree structure, typically grows upto10-12meters height. Bark was light gray or brown, smooth when young, becoming slightly fissured with age. Leaves were pinnate, compound leaves. Leaflets were small, ovate to elliptical, arranged in pairs, bright green in color. Flowers showed inflorescence racemose clusters type, white to creamy color with a pleasant fragrance possessed five petals, with prominent stamens. Pods were long, slender, and cylindrical in shape, can reach up to 30-45 cm in length. Seeds were flat, round, and surrounded by a papery wing. Overall appearance was spreading and bushy, providing a dense shade canopy. Deep tap root, helping it access water in a rid environments. This morphology not only contributes to its adaptability but also its significance in various ecosystems and traditional uses.

Preparation of plant material: The collected fresh leaves were cleaned, dried under sunshade in dark room, and powdered by using mechanical mixer. After size reduction fruit powder under sieve No. 40 and sieve No. 60, stored in airtight container at room temperature

Powder microscopy: Powder microscopy of Moringa pterygosperma involves examining the powdered form of the plant's parts, typically leaves, for identifying characteristics that can aid in quality control and species identification. The powder microscopy of stem bark and leaves were studied as per the standard procedures by capturing the images of different fragments of tissues and obtained observations through image analyzer.

Powder was light brown in color, smooth to touch, smell agreeable and taste is slightly bitter. When powder treated with Chloral hydrate, water and saffranin different fragments of tissues was observed under microscope.

Figure 2: Powdered leaves of moringa

Characteristics of *Moringa pterygosperma* Powder:

- **Color:** Green, indicative of chlorophyll presence in leaf powder.
- **Texture:** Finely powdered with a slightly coarse feel due to fibrous material.

Microscopic Features:

- Epidermal Cells: Rectangular to polygonal, with smooth or slightly wavy cell walls. Presence of stomata, primarily on the lower epidermis.

- **Trichomes: g**landular trichomes may be present, contributing to the plant's aromatic properties.
- **Vascular Bundles:** Scattered, with distinct xylem and phloem elements visible.
- **Cellular Contents:** Presence of chloroplasts in the leaf cells, which may appear as greenish granules.
- **Starch Grains:** Round to oval starch grains, usually found in the parenchyma cells.
- **Fibers:** Long, narrow fibers, contributing to the fibrous texture of the powder.
- **Other Structures:** Fragments of flower or seed may also be present, depending on the part used for powdering.

Leaves microscopy:

Moringa pterygosperma powder have a various compound which is directly use likes, vitamin A , Vitamin C and Vitamin E which protects the body from pollutants and toxins and helps maintain healthy vision, immunity, and fetal growth which acts as an antioxidant. Moringa leaves, known for their nutritional benefits, have a unique structure that can be observed under a microscope. When you prepare a slide of moringa leaves for microscopy, you can observe the following key features:

- **Cell Structure:** Moringa leaves are composed of various cell types, including parenchyma cells, which are the most common. These cells are typically large and have thin cell walls, allowing for easy observation of their contents.
- **Chloroplasts:** The leaves contain numerous chloroplasts, which are the sites of photosynthesis. Under the microscope, these organelles appear as small green bodies within the cells.
- **Stomata:** You can also observe stomata, which are small openings on the leaf surface that allow for gas exchange. Each stoma is surrounded by a pair of guard cells that regulate its opening and closing.
- **Veins:** The vascular tissue, including xylem and phloem, can be seen as a network of veins running through the leaf. Xylem is responsible for transporting water, while phloem transports nutrients.
- **Cuticle:** The outer layer of the leaf, known as the cuticle, may also be visible. It is a waxy layer that helps prevent water loss.

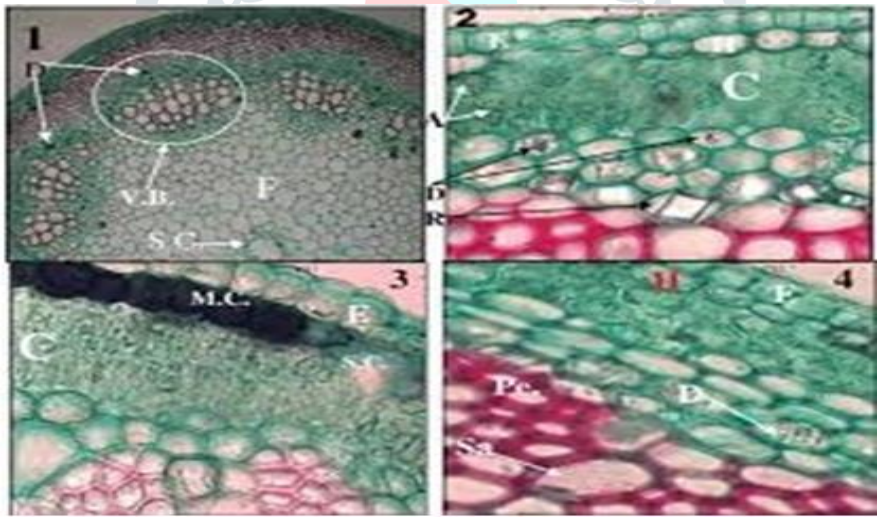

Figure 3: Microscopy of moringa leaves

Physicochemical screening of plant:

Ash Value: The ash value of moringa, which represents the total mineral content of the plant, typically ranges from 5% to 10%. This value can vary based on factors like the specific part of the plant analyzed (leaves, seeds, etc.) and the growing conditions. Moringa is known for its rich nutrient profile, including vitamins, minerals, and antioxidants.

Ash Value (%) = (Weight of Ash)/(Weight of Sample)×100

Result: The Ash value of *Moringa pterigosperma* powder was found to 7.2%.

Moisture Content: The moisture content of moringa leaves typically ranges from 6% to 10% when dried. Fresh moringa leaves can have much higher moisture content, around 80% to 90%. The exact percentage can vary based on factors like the time of harvest and storage conditions. The moisture content of a sample can be calculated using the following formula:

Moisture content (%) = (Weight of wet sample –Wet of dry sample)/(Weight of wet sample) ×100

Result = Moisture content of *Moringa pterigosperma* powder was found to be 8.3%

Extraction:

Soxhlet extraction has been a standard technique for extraction for over a century. The ground material is placed in a thimble filled with solvent for extraction purposes in this protocol. When the liquid reaches the overflow level, a siphon aspirates it from the thimble and unloads it back into the distillation flask with the extracted phytochemical. As this process is continuous, the method will be continued until the extraction is complete Furthermore, when the sample is continually brought into touch with fresh sections of the extracts, the mass transfer equilibrium is displaced.

It has extracted using the Soxhlet process which involved placing dried leaves on a thimble and extracting with 70% ethanol and solvent ratio of 1:50, w/v. The extraction was done five times until it was exhausted. The filtered are dried at 50ºC under decreased pressure. The crude yield obtained from the Soxhlet method. Soxhlet method requires a smaller quantity of solvent compared to maceration. Extraction requires a longer extraction duration which is 16 to 20 hours for extraction and also produces a high volume of solvent.

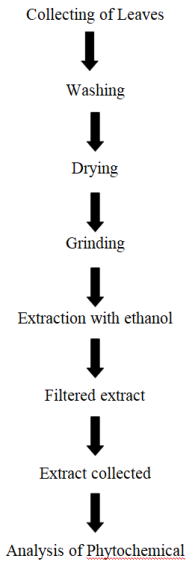

Figure 4: Flow diagram of extraction of Moringa

The fat and plant extract samples were analyzed for the presence of alkaloids, glycosides, steroids, flavonoids, phenols, tannins, polysaccharides, essential oil, etc.

Figure 5: Soxhlet extraction of *Moringa pterigosperma*

Phytochemical Screening:

The qualitative phytochemical analysis was carried out to detect the presence of different phytochemicals in *M. pterygospermar* extract. The standard procedures for the tests were followed.

Table No. 1: Phytochemical Screening of *M. pterygosperma* extract

Phytochemical	Leaves extract	Twigs extract	Stem Bark extract	Wood extract
Alkaloids	+	+	+	-
Flavonoids	+	+	+	+
Saponins	+	+	+	-
Carbohydrates	+	+	+	+
Polyphenols	+	+	-	-
Proteins	+	+	-	-
Amino acids	+	+	-	-
Phenolics	+	+	+	+
Triterpenes	-	-	-	-
Anthraquinones	-	-	-	-

RESULT AND DISCUSSION

The pharmacognostical and phytochemical screenings of *Moringa pterygosperma* indicate a rich profile of bioactive compounds, which contribute to its medicinal properties and traditional uses. This comprehensive profile supports its application in both nutritional and therapeutic contexts. Ash value of powdered of *Moringa pterygosperma* was 7.2%. Moisture Content value of powdered of *Moringa pterygosperma* was 8.3%. The various aspects of Moringa was including its worldwide research, ethnopharmacology, pharmacology activities, phytochemistry, phytopharmaceutical formulations, clinical studies, toxicology and other miscellaneous parameters. The presence of alkaloids, phenolic acid, glycosides, sterols, glucosinolates, flavonoids, terpenes and fatty acids are responsible for the medicinal effects of *M. oleifera*. In addition, *M. oleifera* is also rich in compounds such as vitamins, micronutrients, and carotenoids which increase its medicinal value and consumption as a super food. Pharmacological studies show that the active constituents of the plant have effectively cured various diseases such as neuropathic pain, cancer, hypertension, diabetes, obesity etc.

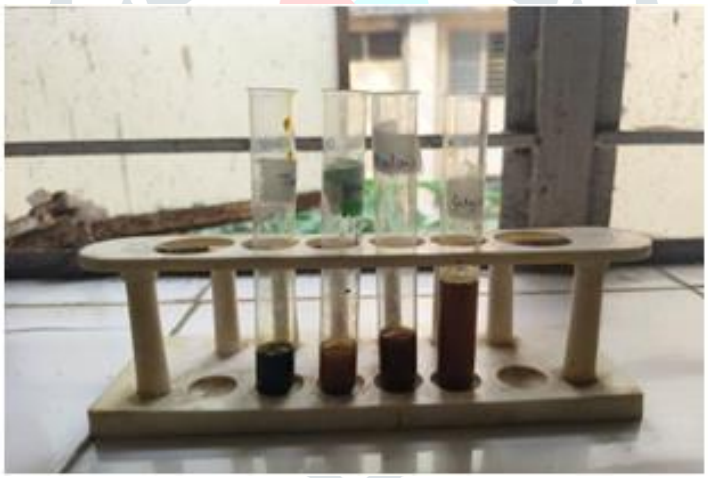

Figure 6: Phytochemical screening of Moringa pterygosperma

The pharmacognostical and phytochemical screening of *Moringa pterygosperma* highlights the plant's potential as a valuable resource in both traditional and modern medicine. The identification of its morphological and microscopic features, along with the presence of various bioactive compounds, underscores its therapeutic significance.

Pharmacognostical Insights:

Morphological Characteristics: The distinct features of Moringa, such as its pinnate leaves and long pods, play a role in its identification and traditional uses. Understanding these characteristics is crucial for the correct harvesting and application of the plant.

Microscopic Examination: The microscopic analysis reveals essential information about the plant's cellular structure. The presence of glandular trichomes and specific types of stomata can provide insights into the plant's ability to adapt to its environment and its potential medicinal properties.

Ash and Moisture Content: The ash content reflects the mineral composition of the plant, indicating its nutritional value. The moisture content analysis is crucial for determining the shelf life and storage conditions for dried moringa products

CONCLUSION

The pharmacognostical and phytochemical screening of *Moringa pterygosperma* demonstrates its significant therapeutic potential and rich bioactive profile. Key findings include:

- **Morphological Characteristics:** The distinct features of Moringa, such as its pinnate leaves and long pods, support its identification and traditional uses.
- **Microscopic Examination:** The plant's cellular structure reveals adaptations that may enhance its medicinal properties, including the presence of glandular trichomes and specialized stomata.
- **Phytochemical Profile:** Various bioactive compounds were identified, including alkaloids, flavonoids, saponins, tannins, terpenoids, and phenolic compounds. These contribute to the plant's antioxidant, anti-inflammatory, antimicrobial, and hypoglycemic activities.
- **Nutritional Value:** The high ash content indicates a rich mineral composition, emphasizing Moringa's role as a nutritional supplement, particularly in under nourished populations.

Moringa pterygosperma stands out as a valuable resource in both traditional and modern medicine, owing to its diverse therapeutic applications and nutritional benefits. The presence of numerous bioactive compounds supports its use in managing various health conditions, including inflammation, infections, and nutritional deficiencies. Future research should focus on standardizing extraction methods, conducting clinical trialsto validate health claims, and promoting sustainable harvesting practices to ensure the long- term availability of this important plant. Given its significant potential, Moringa could play a crucial role in enhancing health and well-being, particularly in resource-limited settings.

CONFLICTS OF INTERESTS

There are no conflicts of interests.

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