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Pharmacognostic and phytochemical studies on leaves of *Launaea sarmentosa* (Willd.) Schultz - Bip. Ex Kuntze

Research Article

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Abstract

Aim: The objective of the current research was to conduct pharmacognostic and phytochemical studies on leaves of *Launaea sarmentosa* (Willd.). Methods: Freshly collected young plant leaves were cleaned and put through pharmacognostic tests that looked at organoleptic, morphological, and microscopic characteristics. A MOTIC photomicroscope that came with the MOTIC IMAGES PLUS 2.0 software was used to take pictures of the microstructures of stained leaf sections. The shade dried powder of same leaves was utilized to study powder characteristics. Preliminary phytochemical screening was performed on fractionally extracted extract using petroleum ether, methanol, ethanol and water. Different solvent extracts were dried and weighed separately and used for phytochemical analysis. Result: Pharmacognostic study revealed the macroscopic and microscopic characters of leaf. Upper epidermis, mesophyll and lower epidermis are visible in the leaf's midrib which exhibits 1-2 layers of collenchymas, distinctive phloem tissue and well-developed xylem tissue towards the dorsal side. The lower epidermis is made up of the same single layer of rectangular cells as the upper epidermis. A thick cuticle covers both layers of the epidermis. Only upper epidermis has shown the presence of anomocytic stomata. In powder characteristics study elongated and non-lignified fibres, prisms and clusters types of calcium oxalate crystals was obtained. Preliminary phytochemical screening revealed the presence of glycosides, flavonoids, tannins, phenolic compounds, amino acids, and proteins in alcoholic extract, whereas streroidal group was present in petroleum ether extracts. Conclusion: From the finding of above studies, it clearly indicates that leaves contain active phytoconstituents which can be utilized for various purposes.

Key Words: *Launaea sarmentosa,* Pharmacognostic, Phytochemical, Qualitative analysis, Asteraceae.

Introduction

"Sagar Paathri" (*Launaea sarmentosa*, a member of the Asteraceae family) is a recumbent, climbing, fleshy, herbaceous perennial found in farms in India, South Africa, Madagascar,West Indies, Mauritius, and Maldives. In the rural areas of Maharashtra, this plant is used as a source of medication for analgesic purposes. (1) The leaflets of *L. sarmentosa* have a basic toothed shape and are 20-25 cm long on average. The leaves are slightly bitter and have a distinct odour. Upper epidermis, Lower epidermis, Palisade, Vascular bundles, Cuticle, Mesophyll, Stomata, and Trichome were found in the leaves of *L. sarmentosa*, as well as Glycosides, flavonoids, amino acids, glycosides, tannins and phenolic compounds, proteins, and steroids.(2–4)The aerial parts of plant is used to treat rheumatoid arthritis and gout, while the leaf is used to treat rheumatism and skin injuries produced by fish spines while fishing.(5) The existing material focuses mostly on its traditional use by rural people in coastal locations. The pharmacognostical and phytochemical qualities of the leaves *Launaea sarmentosa* were investigated in this study. In India, *Launaea sarmentosa* has long been utilised as a folk remedy. The roots are used to treat jaundice, as a galactagogue, and to purify blood, especially by tribes from the Western Ghats. It's also been used to treat allergy illnesses as a cooling agent, diuretic, and demulcent.(6-8)

The purpose of this study was to analyse the numerous qualitative parameters of *Launaea sarmentosa* (Willd.) schultz-bip.ex Kuntze, the results of which would aid in the establishment of standards for this medicinal plant.

The taxonomical position of *Launaea sarmentosa (Willd.)*:

Kingdom : Plantae
Clade : Angiosperms
Class : Asterids
Order : Asterales

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Family : Asteraceae
Tribe : Cinchorieae
Genus : *Launaea*
Species: *L.sarmentosa*

Vernacular Names

Bonapatre (Kannada); Kadalkozhuppa (Malayalam); Chentam (Tamil); Sagar Pathari (Marathi) (9).

Materials and Methods

The young leaves of *Launaea sarmentosa* had been gathered from rural areas of Dhule district in Maharashtra. Leaves were washed and clean by distilled water. It was then verified, recognized and certified by the botanist from SSVPS College Dhule. A leaves were shade dried and voucher specimen of same was preserved in department for future reference. The remaining leaves were used and examined for organoleptic properties, morphological and microscopical characteristics. The dried powder of same leaves was used for analysis of ash values, extractive values, and phytoconstituents analyses. All other chemicals and reagent used in the study was provided by SD Fine Chemicals and Loba Chemicals, both in Mumbai, same were of analytical grade.

Experimental work

Microscopical characterization of leaves

For the microscopical investigations, fresh leaves of L. sarmentosa were employed. Microscopic sections of leaves were cut by using Microtome and manual hands sectioning. Cutted sections were handled carefully and maintain hydration to avoid the damage of the sections. Multiple transient as well as persistent mounts of the leaf specimen sections were made and examined microscopically. Standard staining reagent containing Concentrated hydrochloric acid and phloroglucinol (1:1) were used to stained lignified components and fibres, Sudan red III used to stained leaf cuticle. Specific phytochemical test like, Keller-killiani for Glycosides, Shinoda for flavonoids, Xanthoprotein for proteins, and Ninhydrin for amino acids were used to identify the secondary metabolites presents in leaves. (10)

Photographs of microstructures of stained sections of leaves were captured using a MOTIC photomicroscope which inbuilt with the MOTIC IMAGES PLUS 2.0 software.

Powder characteristics of Leaves

The powder of shade dried leaves was utilized to analyze powder properties following direct microscopic examination of leaves for microscopical characteristics. The behavior of powder with various chemicals and reagents, as well as microscopical examination, were investigated using standard techniques.(11,12)

Leaf constants

Various leaf constants play a significant role in the qualitative assessment of leaves. The leaf constants for L. sarmentosa leaves were determined according to standard procedure.(13)

Preliminary phytochemical analysis

Preliminary phytochemical analysis was a critical tool for determining the nature of chemical ingredients present in a crude drug sample. For the preliminary phytochemical analysis, about 40 g powder of shade dried leaves was fractionally extracted using petroleum ether (60-80 ^{o}C), methanol, ethanol, and water in that sequence. Different solvent extracts were dried and weighed separately. The presence or absence of various phytoconstituents such as alkaloids, flavonoids, steroids, tannins, glycosides, and amino acids, among others, was determined using standard procedures. (14,15)

Result

Macroscopy

Leaves are soft, simple, fleshy, thick, broad, obovate and greenish in colour.
Taste-Aromatic,
Odour- Pleasant
Size and shape-20-25cm X 6.0-8.0cm, obovate.
Apex of the leaf is variable, normally it is obtuse blunt.
Extra features- The full border of the leaf is visible, and the bases are uneven.

Figure 1: Morphology of *Launaea sarmentosa* (Willd.) Leaf

Transverse section of leaf

The dorsiventral nature of the leaf is evident in the transverse section, with distinct facing towards the plant's stem and placed out of or directed away from the axis surfaces, and the following tissues are present in the midrib and lamina sections.

Midrib

The top side of the section passing through the midrib has a concavity, while the anterior surface has a pronounced lesion. Underneath the upper epidermis, the midrib exhibits 1-2 layers of collenchyma. The existence of mesophylls in the middle further differentiates it. It displays vascular bundles of the auxiliary type. On the posterior edge of the midrib, distinctive phloem tissue may be seen, as well as well-developed xylem tissue towards the dorsal side. In the lower boundary of the xylem, tracheids can be seen. The xylem vessels are reticulate, while the tracheids are cylindrical and elongated. The xylem is followed by thick-walled nonlignified phloem. A broad area of

phloem tissue with dispersed phloem fibres is found. Pericyclic layer protects the vascular bundle. 4-6 layers of thick, vascular bundles cellulose make up the pericyclic layer. With 1-2 layers of collenchyma above the lower epidermis, the pericycle is covered in parenchymatous cells..

Upper epidermis, mesophyll, and lower epidermis are visible in the leaf's midrib. The upper epidermis is made up of a single layer of rectangular cells that is flat. Palisade tissue and spongy parenchyma are two types of mesophyll. Palisade cells are single-layered, elongated, and compactly packed, whereas spongy parenchyma is made up of randomly placed polygonal cells that fill the entire midrib area. The lower epidermis is made up of the same single layer of rectangular cells as the upper epidermis. A thick cuticle covers both layers of the epidermis. Only the top epidermis has stomata (Anomocytic). Table 1 shows the results of numerous histochemical reactions. Table 2 lists the various leaf constants.

Table 1: Histochemical colour reactions

Reagent	Constituents	Colour	Histological zone
Phloroglucinol+ hydrochloric acid	Lignin	Pink	Vascular bundles
Aniline sulphate + sulphuric acid	Lignin	Yellow	Vascular bundles
Sudan III Solution	Oil globules	Pink	Vascular bundles
Aqueous ferric chloride	Tannins	Black	Lamina
Libermann-Burchard reagent	Steroids	Greenish	Lamina
Millon's reagent	Proteins	-	-

Table 2: Leaf constants for L. sarmentosa

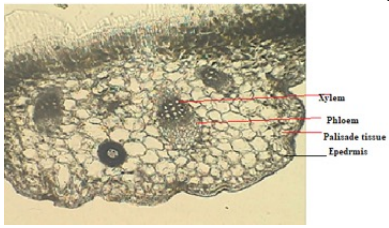
Leaf constants	Value
Stomatal number	Lower surface : Nil Upper surface : 350-400
Stomatal index	Lower surface : Nil Upper surface : 14.82
Vein –islet number	03-04
Vein-termination number	02-03

Microscopical examination of plant leaf

Epidermis: Single layered, rectangular slightly bulging, parenchymatous cells. Covered with thin striated cuticle. (Figure 2)

Palisade: Cells those are compact and radially elongated on a single layer. (Figure 2)

Figure 2: Transverse Section of leaf through Midrib



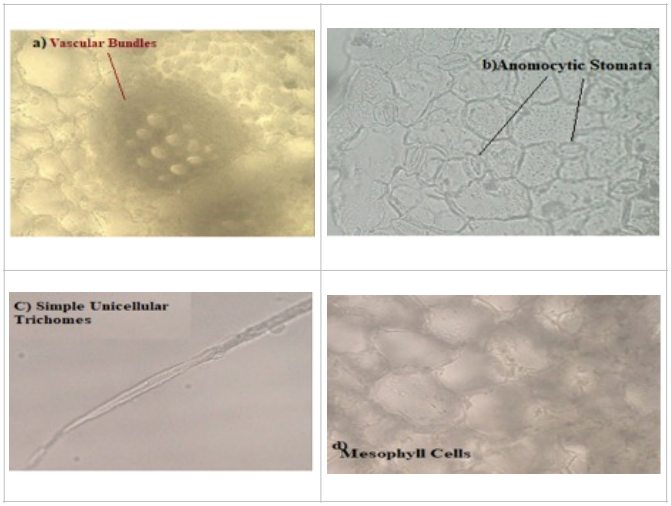
Vascular Bundles: Collateral type of vascular bundles with distinct xylem and phloem (Figure 3a)

Stomata: Anomocytic type of stomata. (Figure 3b)

Trichomes: Nonglandular, simple unicellular, 156-170 µ in length and rarely observed. (Figure 3c)

Mesophyll: Leaf fragment with spongy parenchymatous cells. (Figure 3d)

Figure 3



Powder characteristics

Green is the predominant colour.

Odor: It has a distinct odour.

Slightly bitter in flavour.

Smooth texture.

A mucilaginous mass did not form after a modest amount of water was added, indicating the absence of mucilage. No greasy stain was discovered after squeezing a small quantity of materials between filter paper, suggesting the lack of fatty oils. No persistent foam occurred after mixing the powdered with water in a test tube, demonstrating the absence of saponins. Table 3 shows the behaviour of powder with several chemical reagents.

Table 3: Behaviour of leaf powder of *L. sarmentosa* with different chemical reagents.

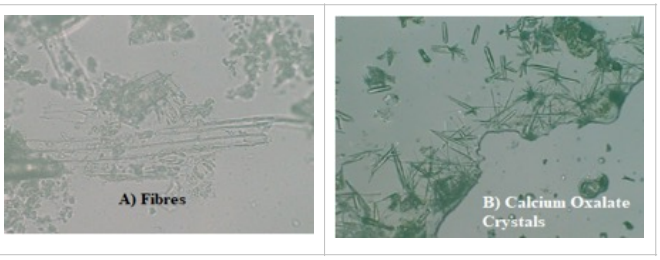
Reagent	Colour / ppt.	Constituent
Conc. sulphuric acid	Reddish	Steroids present.
Aqueous Ferric chloride solution	Blackish	Tannins Present
Iodine solution/ Magnesium-hydrochloric acid	Blue	Starch Present
Aqueous Silver nitrate solution	No change	Flavonoids absent
Ammonia solution	No precipitate	Proteins absent
Aqueous Potassium hydroxide solution (5%)	No change	Glycosides absent

Microscopical examination of powder

Fibres: Elongated and non-lignified fibres. (Figure 4A)

Calcium Oxalate Crystals: Calcium oxalate prisms and clusters. (Figure 4B)

Figure 4



Physico-chemical parameters

Tables 4 and 5 show the percentages of total ash, acid-insoluble ash, waters soluble ash, sulphated ash and various extractives values respectively.

Table 4: Ash values of *L. sarmentosa* leaf

Types of ash values	% w/w (Mean a± SEM)
Total ash	18.86 ± 0.01
Acid insoluble ash	1.20 ± 0.001
Water soluble ash	2.10 ± 0.001
Sulphated ash	22.33 ± 0.011

Table 5: Extractive values with different solvents

Type of solvent	% Extractability (Mean a± SEM)
Petroleum ether (40-60%)	15.53 ± 0.51
Ethanol	19.53 ± 0.43
Methanol	24.07 ± 0.68
Water	30.03 ± 0.84

Fluorescence analysis of the leaves powdered not indicated presence of any fluorescent compound shown in Tables 6

Table 6: Fluorescence analysis of powdered leaves of *L. sarmentosa* leaf.

Sample	Color in Daylight	Color in Short UV	Color in Long UV
Powder	Light green	Light green	Light red
Powder+Sodium hydroxide in methanol	Dark green	Green	Orange
Powder+Sodium hydroxide in water	Dark green	Dark green	Dark red
Powder+1N hydrochloric acid	Dark green	Dark green	Violet
Powder+50%nitric acid	Brown	Green	Blue
Powder+50%sulphuric acid	Dark green	Green	Green
Powder + nitrocellulose	Green	Green	
Powder+Methanolic sodium hydroxide+ nitrocellulose	Light green	Green	Purple Yellowish red

Preliminary phytochemical analysis

In methanolic extracts, preliminary phytochemical screening revealed the presence of Glycosides, flavonoids, tannins and phenolic compounds, amino acids, and proteins, whereas petroleum ether extracts revealed the presence of steroidal moiety. (Table 7)

Table 7: Qualitative phytochemical analysis of various extracts of leaves of *L. sarmentosa.*

Type of constituent	Petroleum Ether	Water	Ethanol	Methanol
Steroids	+	-	+	+
Glycosides	+	-	+	+
Reducing sugars	-	-	-	+
Flavonoids	-	-	+	+
Tannins and Phenolics	-	-	-	+
Proteins	+	-	+	+
Amino acids	-	-	-	+

Note: (+) Indicates present; (-) Indicates absent

Discussion

The quality starting or raw material is very important for development of formulation. Thus, there has been a focus on standardizing medicinal plants with therapeutic potential in recent years. Before conducting any testing, a macroscopic and microscopic description of a medicinal plant is recommended by the World Health Organization (WHO) as the first step in determining its identity and purity..

In present study, we examine the various pharmacognostical parameters of *L. sarmentosa* leaf which include morphological, microscopical and powder characteristics. The result of pharmacognostic studies were up to the mark, which will further help to identify the leaf correctly. The leaves are odourless and greenish with a silky texture. The complete border, asymmetrical bases, dorsiventral arrangement, single layered palisade cells, and vascular bundles enclosed by pericyclic layer are just a few of the leaves' distinguishing characters.

The phytochemical investigation revealed the presence of secondary metabolites including glycosides, flavonoids, tannins, phenolic compounds, amino acids, and proteins in alcoholic extract. However petroleum ether extract shows presence of steroidal moieties.

Conclusion

Launaea sarmentosa is a perennial and prostrate herb rooting at each rosette, white milky juice were come out from its broken roots, stem and leaves. Standardization of herbal medicine is very important and tedious task in development of drugs from herbal sources, as it directly used in health care. The pharmacognostic studies of herbal drugs will help in the development of pharmacopoeial standards and their further exploration in various Ayurvedic or polyherbal formulations.

After performing pharmacognostic and phytochemical investigations in present study, it can be concluded that leaves of *Launaea sarmentosa* yielded a set of qualitative and quantitative pharmaco-botanical parameters or standards that can serve as an important

source of information to identity and determine the quality and purity of the plant material in future studies.

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