ORIGINAL ARTICLE

Comparative Pharmacognostical Evaluation of Five Different Market Samples of Piper Longum Linn

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ABSTRACT:

Pippalimoola (root of Piper longum. linn) is one of the most important drug in Ayurveda used as single drug and in combination with other herbs, minerals or metallic preparations for poly herbo-mineral formulations. In Ancient literature we found that in the name of ‘Moola’ (means firmly fixed a root) we must practice root but now a days instead of Pippali moola most of market samples are substituted with stem of same plant, so it is essential to check the botanical source of market samples. In this study, different five market samples of Pippalimoola were procured all over India and one sample (control) was collected after authentication of botanical source of plant. Pharmacognostical study was undertaken to observe morphological characters of market samples and compared with the collected sample. It was observed that out of five market samples; macroscopic and microscopic characters of one sample was matched with the characters of control root sample. While other four samples were found to be stem of the plant. Hence there is lots of variation in raw material of the plant in Indian market.

Keywords: A Pippalimoola, pharmacognosy, characters, market sample.

INTRODUCTION

Ayurveda is increasingly gaining recognition as one of the medical sciences worldwide in the last few decades. Commercialisation in this medical system leads to substitution or adulteration of herbal drugs for unavailable variables in India may lead to variation in the quality of crude drug. Because of GMP the manufacturers of the drugs has to make sure that the raw material being used in the formulation is the genuine one, and therefore authentication of raw drugs is the need of time. As per CCRAS market sample survey it has been found one of the priority area in drug research. Pippalimoola is a potent drug used singly as well as an ingredient in compound formulations like, Yograjguggulu, Chandraprabhavati, Panchkol churnna etc. Piper longum Linn (root) growing in the hotter parts of India, from the Central Himalayas of Assam, the Khasi and the Mikir hills, the lower hills of Bengal and the forests of the Western Ghats from Konkan to Travancore and Andaman Nicobar Islands. [1]
It is a glabrous undershrub or perennial herb with erect or erect scandent nodose stem and slender branches, Rootstock erect, thick, jointed, branched, distinct internodes and swollen nodes with a number of small rootlets and root scars, stout, cylindrical measuring 0.2 -0.6cm thick, reddish brown to grey; aromatic odour and pungent taste. Stems numerous measuring 0.6 - 0.9 m. long, branched, stout, cylindrical, thickened above nodes, finely pubescent. Leaves numerous, cordate at base, all subacute, entire, glabrous, thin bullate with reticulate venation dark green and shining above, pale and full beneath; fruit spikes solitary, pedunculate, solid fleshy spike which is 2.5-3.8 cm; ovoid-oblong, erect, blunt, blackish green, shining. \(^{(2)}\)

Chemical constituents found in Pippalimoola are piperine, piperlongumine, piperlonguminine ,piplartin, triacontane, dihydro-stigmasterol,an unidentified steroid, reducing sugar, glycosides,major alkaloid piperine and sesamin in fruit and stem.\(^{(3)}\) Pipalimoola has shown many pharmacological activities like anti-inflammatory, cough suppressor, antibacterial, insecticidal, antimalarial antitubercular,antispasmodic, anti-giardial, analgesic, anti-microbial, anti-fertility, Inotropic, immunostimulant, hepatoprotective, antifungal, antioxidant and hypercholesterolamic and chronotropic effects.

Rasa(taste)-Katu, Guna(property)-Laghu, Virya (potency)- UsnaVipaka (biotransformation) is- Katu. Karma Kaphavatasamaka, Dipana,Pacana, Vatanulomana, Rucya, Shoolaprasamana\(^{(4)}\).

Krimiroga, Shwasa (breathing disorders like bronchial asthma), Kshay (pulmonary koch’s disease), Pliha-roga (spleenomegaly), Vishama Jvara (intermittent fever) Anaha (heaviness of abdomen), Gulma (flatulence), Arsa (internal and external piles), Anidra (insomnia) \(^{(5)}\) etc.

**Materials & Methods**

Collection of Plant Material

Control sample of Piper longum Linn. root and stem was collected from botanical garden of J. S. Ayurved Mahavidhyalaya, Nadiad, Gujarat. The collection was done in the month of February 2017 after authentication by Taxonomist. The authenticated herbarium sheet(14/02/2017) of plant deposited in PG department of Dravyaguna, J. S. Ayurved Mahavidhyalaya, Nadiad. Market samples were procured from the markets of Ahmedabad(05/04/2017), Kolkata(01/03/15), Delhi(28/04/17), Indore(19/05/17) and Thiruvananthapuram(15/03/17).

**Pharmacognostical Evaluation**

**Macroscopy**

Macroscopical studies of sample parts of plant were done by naked eye and shape, color, taste and odor were determined and reported.

**Microscopic**

Pharmacognostical evaluation including histochemical study was carried out by taking free-hand sections according to Wallis and powder studies according to Evans.\(^{(6)}\) The section was stained with phloroglucinol and concentrated hydro-chloric acid solution and mounted in glycerin. Powder (Sieve mesh 60) of the dried aerial parts was used for the observation of powder microscopic character Photomicrographs were obtained by observing free-hand sections of drug under compound microscope. Results are shown in figures.

**Results & Discussion:**

**Macroscopic Evaluation:**

![Figure 1: A: Ahmedabad sample, B: Kolkata sample C: Delhi sample, D: Indore sample, E: Nadiad sample, F: Thiruvananthapuram sample](image-url)
Comparison between all market samples with control sample

<table>
<thead>
<tr>
<th></th>
<th>Control Root Sample</th>
<th>Control Stem Sample</th>
<th>Kolkata Market Sample</th>
<th>Ahmedabad Market Sample</th>
<th>Delhi Market Sample</th>
<th>Thiruvanan Market Sample</th>
<th>Indore Market Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface</strong></td>
<td>inter-nodes and swollen nodes with root scars</td>
<td>distinct inter-nodes and swollen nodes with root scars</td>
<td>distinct internodes and swollen nodes with root scars</td>
<td>distinct internodes and swollen nodes with root scars</td>
<td>distinct internodes and swollen nodes with root scars</td>
<td>swollen nodes with root scars multiple rootlets</td>
<td>distinct internode and swollen nodes with root scars</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
<td>stout, cylindrical</td>
<td>stout, cylindrical</td>
<td>stout, cylindrical</td>
<td>stout, cylindrical</td>
<td>stout, cylindrical</td>
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<td>stout, cylindrical</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>0.2–0.6cm</td>
<td>0.2–0.6cm</td>
<td>0.2–0.4cm</td>
<td>0.2–0.4cm</td>
<td>0.2–0.4cm</td>
<td>1.0–10cm</td>
<td>1.0–2.0cm</td>
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<tr>
<td><strong>Fracture</strong></td>
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<td>thick</td>
<td>thick</td>
<td>thick</td>
<td>thick</td>
<td>thin</td>
<td>thick</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>greenish to grey</td>
<td>grey</td>
<td>reddish brown to grey</td>
<td>reddish brown to grey</td>
<td>reddish brown</td>
<td>reddish brown</td>
<td>reddish brown to grey</td>
</tr>
<tr>
<td><strong>Odour</strong></td>
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<td>aromatic</td>
<td>aromatic</td>
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<td>aromatic</td>
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<tr>
<td><strong>Taste</strong></td>
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<td>pungent</td>
<td>Pungent</td>
<td>pungent</td>
<td>pungent</td>
<td>pungent</td>
</tr>
</tbody>
</table>

**Microscopic Evaluation**

![Microscopy of Nadiad sample](image1)

**Fig 1:** Microscopy of Nadiad sample [Root] A: Cork, B: Cortex, C: Pericyclic fibre, D: Phloem, E: Xylem, F: Oil cells, G: Pith

![Microscopy of Nadiad sample](image2)

**Fig 2:** Microscopy of Nadiad sample [Stem] A: Epidermis, B: Cortex, C: Pericyclic fibre, D: Phloem, E: Xylem, F: Pericyclic fibre, G: oil cells in pith

![Microscopy of Kolkata sample](image3)

**Fig 3** Kolkatta A: Epidermis, B: Cortex, C: Pericyclic fibre, D: Phloem, E: Xylem, F: Pericyclic fibre, G: Pith

![Microscopy of Ahmedabad sample](image4)

**Fig 4** Ahmedabad A: Xylem, B: Pericyclic fibre, C: Phloem, D: Cavity E: Medullary Rays, F: Oil cells
Transverse Section of Control Sample Nadiad Root:

Root sample of Piper longum Linn collected from Nadiad was subjected to microscopic examination. Transverse section of root showed outer cork, middle cortex and central stealar region. Detailed transverse section (TS) of root was almost circular with the regular outline. The outermost tissue cork appears as a narrow strip slightly brown in colour. It consisted of 3-5 rows of thin walled and rectangular to slightly tangentially elongated cork cells. Centre pith of the root was occupied by 4-6 wedge shaped radiating strips of vascular tissues called stealar region having their wider ends towards periphery. The cells composing the pith were polygonal, thin walled and full of starch grains. Outside the pith, evenly spaced five groups of primary xylem bundles were present. In each vascular strip the xylem composed of xylem vessels and xylem parenchyma. Wider end of xylem was crowned with a hemispherical strip of phloem. The cells at the outer convex side were slightly compressed and appear tangentially elongated. The outer border of the phloem limited by a row of pericyclic ring found just inner to endodermis. Stealar region showing numerous oil globules and starch grains. Result shown in fig 1.

Transverse Section of Control Stem Sample:

Sample of stem collected from Nadiad showed single layered epidermis followed by a continuous ring of collenchymatous cells and round to oval thin-walled parenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped; starch grains simple and compound having 2-7 components, round to oval, measuring 3-14 μ in dia., present abundantly throughout the section. Results shown in fig 2.

Transverse Section of Market Samples

Kolkata Sample

Single layered epidermis followed by a continuous ring of collenchymatous and round to oval thin-walled, parenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped. Results shown in fig 3.

Ahmedabad Market Sample

Single layered epidermis followed by a continuous ring of collenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped. Results shown in fig 4.

Delhi Market Sample

Sample of stem collected from Nadiad showed single layered epidermis followed by a continuous ring of collenchymatous cells and round to oval thin-walled parenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped, multiple oil cells are seen. Results shown in fig 5.

Thiruvananthapuram Market Sample

The outermost tissue cork appears as a narrow strip slightly brown in colour. Centre pith of the root was occupied by 5 wedge shaped radiating strips of vascular
tissues called stellar region having their wider ends towards periphery. The cells composing the pith was polygonal, thin walled and full of starch grains. Outside the pith, evenly spaced five groups of primary xylem bundles was present. In each vascular strip the xylem is composed of xylem vessels and xylem parenchyma. Wider end of xylem is crowned with a hemispherical strip of phloem. The cells at the outer convex side was slightly compressed and appear tangentially elongated. The outer border of the phloem is limited by a row of pericyclic ring found just inner to the endodermis. Stellar region showing numerous oil globules and starch grains. Results shown in fig-6.

**Indore market sample**

Single layered epidermis followed by a continuous ring of collenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped. Results shown in fig-7.

### Comparison between all market samples with control sample

<table>
<thead>
<tr>
<th>Characters</th>
<th>Nadiad Root</th>
<th>Nadiad Stem</th>
<th>Kolkata</th>
<th>Ahmedabad</th>
<th>Delhi</th>
<th>Thiruvananthapuram</th>
<th>Indore</th>
</tr>
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<tbody>
<tr>
<td>Epidermis</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
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<tr>
<td>Cortex</td>
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<td>+</td>
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<td>Pericyclic fibre</td>
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<td>Phloem</td>
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<td>Xylem</td>
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<td>Medullary rays</td>
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</tr>
<tr>
<td>Cork</td>
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</tr>
</tbody>
</table>

**Powder Microscopy**

![Microscopy of Nadiad sample (Root) powder; A: Cork, B: Cortex, C: Pericyclic fibre, D: Xylem, E: Oil cells.](image)

![Microscopy of Nadiad sample (Stem) powder; A: xylem vessel, B: oil cell, C: starch grains, D: Brownish matter, E: fibre.](image)

![Microscopy of Kolkata powder sample; A: Scalariform Xylem, B: Orange content.](image)

![Microscopy of Ahmedabad powder sample; A: Scalariform Xylem, B: Orange content, C: Brownish matter.](image)
Nadiad Root powder Sample

Root powder showed that cork in surface view, parenchyma cells with simple and compound starch grains, prismatic crystals and rod shaped crystals of calcium oxalate, annular and border pitted vessels, fragments of lignified fibres and sclerides distributed throughout the powder.

Measurement of isolated lignified xylems and fibres of Piper longum Linn. root was carried out. Result was reported in tabular manner.

Nadiad Stem powder Sample

Nadiad Stem powder shows parenchyma cells with simple and compound starch grains, brownish matter and fiber.

Kolkatta powder Sample

Kolkatta sample powder shows scalariform xylem and orange content.

Ahmedabad powder Sample

Ahmedabad sample powder shows scalariform xylem, brownish matter and orange content.

Delhi powder Sample

Delhi sample powder shows epidermis, parenchyma cells with simple and compound starch grains and multiple oil cells.

Thiruvananthapuram powder Sample

Thiruvananthapuram sample powder showed that cork in surface view, parenchyma cells with simple and compound starch grains, prismatic crystals and rod shaped crystals of calcium oxalate, annular and border scalariform xylem vessels and oil cells.

Indore powder sample

Indore sample powder shows parenchyma cells with simple and compound starch grains, brownish matter, fiber, xylem vessel and oil cells.

CONCLUSION:

On the basis of transverse section of different samples of Pippalimoola,, it was observed that the microscopic characters of Ahmedabad, Indore, Delhi and Kolkatta market samples were similar meanwhile microscopic characters of Nadiad stem control sample and Thiruvananthapuram market sample was found similarity in the characters which also resembled with the microscopic characters of Nadiad root control sample.

And the powder microscopy shows the similarity in the characters of Nadiad root sample and Thiruvananthapuram market sample.

And the powder microscopy shows the similarity in the characters of Nadiad stem sample and

Ahmedabad, Indore, Delhi and Kolkatta market samples.

ACKNOWLEDGEMENT

The author is thankful to the Parent institute JS Ayurveda Mahavidyalaya, Nadiad for providing all the laboratory facilities. The Author is Thankful to Prof. Dr. N.N. Dave for the conceptualization of the work

I thank the most creditable source of success in this work,
Prof (Dr.) Vidhi Bapna and Marian Patel for the active encouragement and richest support extended in each and every phase of this work.

**CONFLICT OF INTEREST:** Author declares that there is no conflict of interest.

**SOURCE OF SUPPORT:** None

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