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## COMPARATIVE ANALYSIS OF DRY MARKET SAMPLE OF *ACORUS CALAMUS* LINN. WITH PHARMACOPOEIAL STANDARDS

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### ABSTRACT:

A comparative analysis of market-available dry *Acorus calamus* Linn. Rhizome samples with pharmacopoeial standards provides valuable insights into the quality and authenticity of these products. The study revealed significant variations in morphological features among the market samples, highlighting the need for stringent quality control measures. The sample was identified as *Acorus calamus* Linn. while the drug meets API (Ayurvedic Pharmacopeia of India) standards, it lacks a few features. Most of the samples are of irregular shape rather than cylindrical, and triangular, transverse leaf scars were absent. These observations suggest potential variations or discrepancies in the market-available samples compared to pharmacopoeial standards. Further investigations and quality control measures are essential to ensure the consistency and efficacy of *Acorus calamus* Linn. samples in traditional and modern medicinal practices.

**Keywords:** Pharmacopoeial, Standards, *Acorus calamus* Linn.

## INTRODUCTION

*Acorus calamus* Linn., commonly known as sweet flag or calamus, is a perennial herbaceous plant that has been traditionally used in various medicinal systems, including Ayurveda, for its therapeutic properties. It is present in throughout India up to an altitude of 2200 m in himalayas.[1] The rhizome of *Acorus calamus* Linn. is particularly valued for its medicinal benefits and is used in the preparation of herbal formulations due to its diverse pharmacological activities. According to *Bhavaprakasha*, The one which improves voice is *Vacha*. [2]

Just like *Nagakeshara* it is also used for *Agnidipaka*[3], *Vacha* is also used for the same. It should be consumed after knowing the proper *Prakriti* and *Desha* [4] of person as it is having *Kaṭu*, *Tikta Rasa* with *Uṣṇa Virya*. In recent years, there has been a growing interest in the quality control of herbal drugs, including *Acorus calamus* Linn., to ensure their safety, efficacy, and consistency.

However, the market is flooded with a variety of *Acorus calamus* Linn. products, and there is often a lack of standardization and quality control measures in place. This raises concerns regarding the authenticity, purity, and potency of these products, which can significantly impact their therapeutic effectiveness. In this context, the present study aims to conduct a comparative analysis of market-available samples of dry *Acorus calamus* Linn. with pharmacopoeial standards. The study will

involve the evaluation of various parameters, including morphological features and macroscopic features, to assess the quality and authenticity of the market samples in comparison to established standards.

By comparing the market samples with pharmacopoeial standards, this study seeks to provide valuable insights into the quality of commercially available *Acorus calamus* Linn. products. The findings of this study are expected to contribute to the development of quality control measures and standards for *Acorus calamus* Linn. and other herbal drugs, ensuring their safety, efficacy, and reliability for therapeutic use.

## Ayurvedic properties

Ayurvedic properties refer to the effects and characteristics of herbs or substances according to Ayurvedic principles. Following are the properties enlisted of *Acorus calamus* Linn.[5]

**Table 1- Rasadi Panchaka**

<b>Rasa</b>	<i>Kaṭu</i> , <i>Tikta</i>
<b>Guna</b>	<i>Laghu</i> , <i>Ṭikṣṇa</i>
<b>Virya</b>	<i>Uṣṇa</i>
<b>Vipaka</b>	<i>Kaṭu</i>
<b>Prabhava</b>	<i>Medhya</i>
<b>Doshas</b>	<i>Kaphahara</i> , <i>Vatahara</i>
<b>Karmukata</b>	<i>Dipani</i> , <i>Krmihara</i> , <i>Kaṇṭhya</i>
<b>Doses</b>	0.25 to 0.5 gm for <i>Vamak</i> (emesis) 1 to 2 gm

## MATERIAL AND METHOD

Sample of *Acorus calamus* Linn. was purchased from Sector 26 Market of Chandigarh, India and

was examined further. Macroscopic examination of *Acorus calamus* Linn. sample was a foundational step in herbal quality control and identification. This examination involved visually inspecting the external characteristics of the herb, such as colour, shape, size, and texture. Odor assessment was also done, as many herbs had distinct smells that aided in their identification. Additionally, the texture and consistency of the herb were evaluated by touch. It was essential to check for the presence of any foreign matter, as this could affect the herb's quality and purity. Overall, macroscopic examination, along with organoleptic evaluation, helped in determining the quality, authenticity, and suitability of dry herb for medicinal or other applications.

The preparation of a transverse section of a dry herbal specimen involved several steps to ensure that the section was thin, even, and suitable for examination under a Compound microscope.

- Selection of Specimen: Rhizome is the useful part of *Acorus calamus* Linn. of the dry herbal specimen hence it was chosen for sectioning.
- Softening: The specimen was softened by soaking it in water for 24 hours.
- Sectioning: Thin, even sections of the specimen were cut using a sharp blade, with the thickness adjusted as needed.

- Mounting: The sections were transferred onto a glass slide and mounted ensuring proper arrangement and no overlapping.
- Drying: The mounted sections were allowed to dry thoroughly before staining.
- Staining: The sections were stained using safranin to enhance contrast and visualize specific structures of the rhizome.
- Cover-slipping: A coverslip was placed over the stained sections using a suitable mounting medium to protect them and improve clarity for microscopic examination.
- Labeling and Documentation: The slide was labeled with relevant information.

A fresh sample of *Acorus calamus* Linn. rhizome was also collected from the botanical garden of Shri Dhanwantry Ayurvedic College and Hospital, Sector 46 B, Chandigarh, India and its microscopy was also done using the similar steps as explained above.



**Figure 1:** *Acorus calamus* Linn. Rhizome Horizontal position of rhizome, round in shape with rootlets.

### RESULTS AND OBSERVATIONS

According to Ayurveda, *Acorus calamus* Linn., known as *Vacha*, is a potent herb used to improve memory, speech, and voice. It is also used to treat neurological disorders, respiratory conditions, and digestive issues. It is believed to have a calming effect on the mind and is used in

various Ayurvedic formulations for its medicinal properties.

Botanical Name- *Acorus calamus* Linn.

Family- Acoraceae

Classical Name- *Vacha*, *Uragandha*, *Ugra*

[6],[7],[8]

Part used- Rhizome

**Table 2: Macroscopic features**

Features	Standard (API Part 1 VOL 2)[9]	Findings (Market sample)
Shape	Sub cylindrical to slightly flattened, somewhat tortuous or rarely straight	Irregular and flattened
Resemblance	Thumb like branches at nodes	Thumb like branches at nodes
Size	Cut pieces of 1-5 cm long, and 0.5-1.5 cm thick	3-4 cm long 0.3-1cm thick
Colour	<b>Outer surface-</b> Light-brown with reddish-tinge to pinkish externally	<b>Outside surface-</b> Brownish
	<b>Inner surface-</b> Buff coloured internally	<b>Inner surface-</b> Buff coloured
Texture	<b>Upper surface-</b> Upper side marked with alternately arranged, large, broadly, triangular, transverse leaf scars which almost encircle the rhizome	<b>Upper surface-</b> Irregular to oval leaf scars present
	<b>Lower surface-</b> Lower side shows elevated tubercular spots of root scars.	<b>Lower surface-</b> Elevated tubercular spots of root scars present.
Fracture	Short fracture	Short fracture
Odour	Aromatic	Characteristic
Taste	Pungent and bitter	Pungent and bitter



**Figure 2: Dried sample *Acorus calamus* Linn. Rhizome**

**Table 3- Microscopic sections**

	<b>Microscopic features</b>	
<b>Features</b>	<b>Standard (API Part 1 VOL 2)</b>	<b>Findings (Market sample)</b>
Epidermis	Single layered	Single layered [Figure 3]
Cortex	Composed of spherical to oblong, thin-walled cells of various sizes, cells towards periphery, smaller, somewhat collenchymatous, more or less closely arranged cells towards inner side, rounded and form a network of chains of single row of cells, enclosing large air spaces,	Round to oblong cells, thin walled of different sizes. Periphery cells smaller [Figure 3]
Fibro-vascular bundles and secretory cells	Having light yellowish-brown contents, present in this region	Dark yellowish-brown contents present [Figure 4]
Endodermis	Distinct	Distinct [Figure 4]
Stele	Composed of round, parenchymatous cells enclosing large air spaces similar to those of cortex	Present with parenchymatous cells arranged enclosing air spaces, round in shape.
Vascular bundles	Several concentric vascular bundles arranged in a ring towards endodermis, a few vascular bundles scattered in ground tissues.	Vascular bundles arranged in a ring shape. [Figure 4]
Starch grains	Simple, spherical, measuring 3-6 $\mu$ in dia., present in cortex and ground tissue.	Present with the shape of spherical.

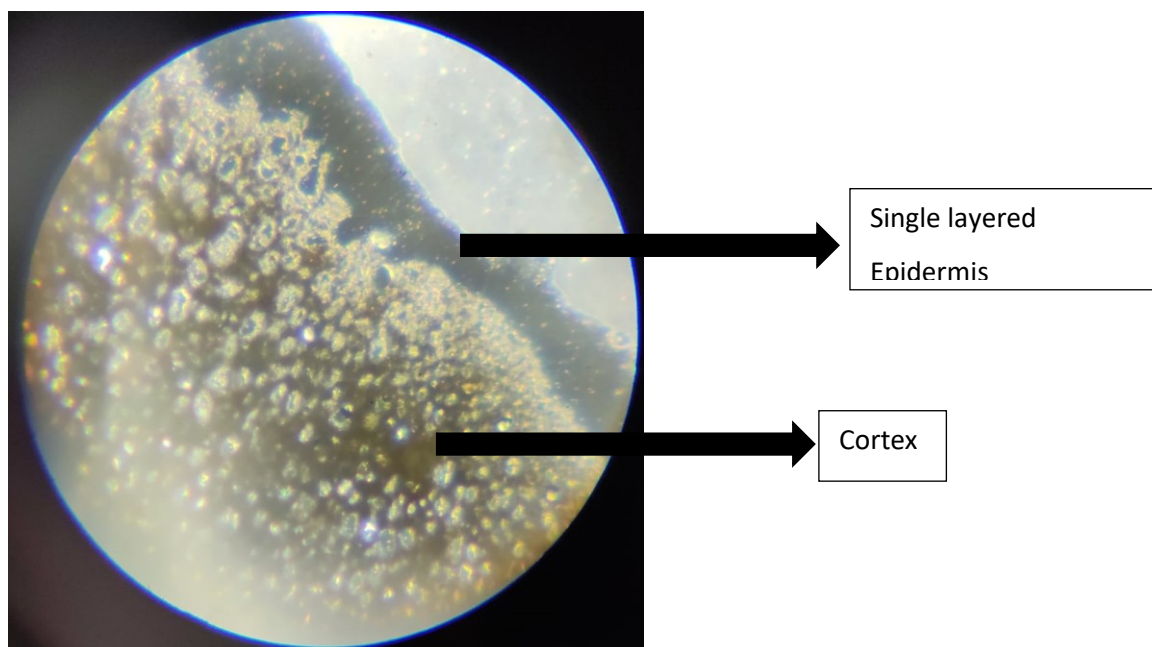


Figure 3: T.S. showing epidermis and cortex of *Acorus calamus* Linn.

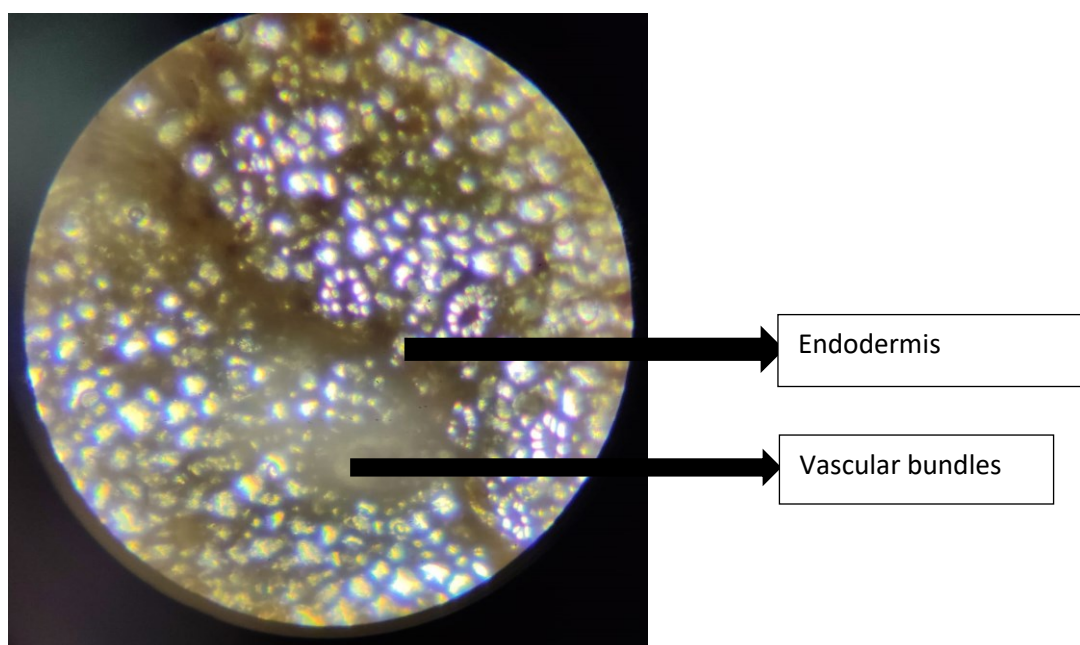


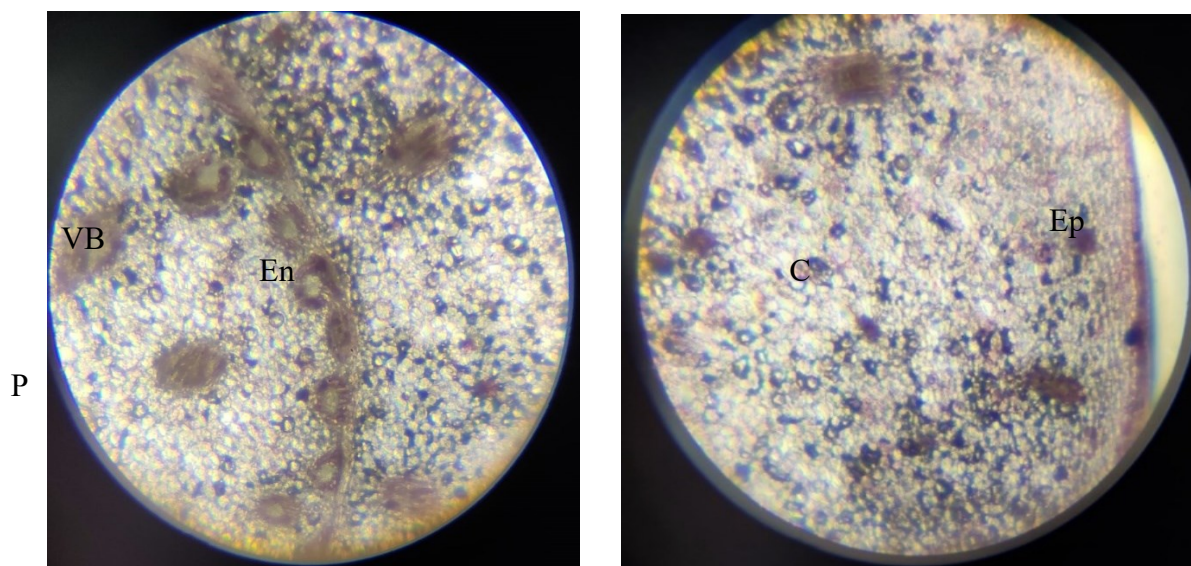
Figure 4: T.S. showing Distinct Endodermis of *Acorus calamus* Linn.

**Impression-** The Dried Sample was identified as *Acorus calamus* Linn. The drug meets with the API standards, but lacks few features: -

- Most of the samples are of irregular shape rather than cylindrical.
- Triangular, transverse leaf scars were absent.

Good Quality	
Moderate Quality	+
Poor Quality	





**Figure 5 & 6- Fresh sample of *Acorus calamus* Linn. Transverse section[10]**

[Figure 5-6: VB- Vascular bundles, P- Pith, En- Endodermis, C- Cortex, Ep- Epidermis of *Acorus calamus* Linn.]

## CONCLUSION

The comparative analysis of market-available dry *Acorus calamus* Linn. Rhizome samples with pharmacopoeial standards provides valuable insights into the quality and authenticity of these products. The study revealed significant variations in morphological features among the market samples, highlighting the need for stringent quality control measures. The sample was identified as *Acorus calamus* Linn. While the drug meets API standards, it lacks a few features. Most of the samples are of irregular shape rather than cylindrical, and triangular, transverse leaf scars were absent. These observations suggest potential variations or discrepancies in the market-available samples compared to pharmacopoeial standards. Further investigations and quality control measures are essential to ensure the consistency and efficacy of *Acorus calamus* Linn. products in traditional and modern

medicinal practices. Establishing standardized protocols for the evaluation and authentication of *Acorus calamus* Linn. specimen is essential to ensure their safety, efficacy, and reliability for therapeutic use. Further research is warranted to develop comprehensive quality control standards for *Acorus calamus* Linn. and other herbal drugs, enhancing their quality and promoting their safe and effective use in traditional and modern medicine.

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