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A DETAILED PHARMACOGNOSTIC, PHYSICOCHEMICAL AND PRELIMINARY PHYTOCHEMICAL STUDY OF SHUNTI (*ZINGIBER OFFICINALE* ROSCOE)

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ABSTRACT

Shunti (*Zingiber officinale* Roscoe), the dried rhizome of ginger, is an important medicinal drug widely used in Ayurveda for its Deepana, Pachana, Vatakaphahara and numerous therapeutic properties. The quality, safety and efficacy of Shunti depend upon its proper identification, purity and phytochemical composition; therefore, standardization of the crude drug is essential. The present study was undertaken to carry out a detailed pharmacognostic, physicochemical, and preliminary phytochemical evaluation of Shunti. Authenticated dried rhizomes of *Zingiber officinale* were subjected to pharmacognostic studies comprising macroscopic, microscopic and powder microscopic evaluation to establish their diagnostic characteristics. The findings of the present study establish comprehensive pharmacognostic, physicochemical, and preliminary phytochemical standards for Shunti (*Zingiber officinale* Roscoe), which can serve as reliable reference parameters for its authentication, quality control, and standardization in Ayurvedic pharmaceutical preparations and future research.

KEYWORDS: Shunti, *Zingiber officinale* Roscoe, Pharmacognosy, Pharmacognostical evaluation, Physicochemical analysis, Preliminary phytochemical screening, Powder microscopy, Standardization.

INTRODUCTION

The use of medicinal plants as therapeutic agents has formed the foundation of traditional systems of medicine and remains an important component of modern healthcare due to their efficacy, safety, and accessibility. With the increasing global acceptance of herbal medicines, there is a growing need to establish scientifically validated standards for medicinal plants to ensure their identity, quality, safety, and therapeutic efficacy. Pharmacognostic, physicochemical, and phytochemical evaluations are among the most reliable approaches for the standardization of crude drugs and play a crucial role in preventing adulteration and ensuring batch-to-batch consistency.

Shunti is the dried rhizome of ginger belonging to the family Zingiberaceae, one of the most important medicinal drugs described in the Ayurvedic classics. It has been extensively used since ancient times as a dietary spice as well as a therapeutic agent. In Ayurveda, Shunti is described as having Katu Rasa, Laghu and Snigdha Guna, Ushna Veerya, Madhura Vipaka and is predominantly Vata-Kaphahara in action. Owing to its Deepana, Pachana, Amapachana, Shoolahara, Kasahara, Shwasahara and Agnivardhaka properties, it is widely indicated in disorders such as Agnimandya, Ajeerna, Grahani, Kasa, Shwasa, Vata disorders, and Ama-related diseases.[1] In addition to its classical Ayurvedic applications, modern scientific investigations have demonstrated that ginger possesses anti-inflammatory, antioxidant, antimicrobial, antiemetic, analgesic, gastroprotective, and immunomodulatory activities, thereby supporting many of its traditional therapeutic uses.

The medicinal value of Shunti is primarily attributed to the presence of various bioactive constituents, including gingerols, shogaols, zingerone, terpenoids, flavonoids, phenolic compounds, carbohydrates, zingiberene**,** curcumene**,** farnesene**,** and biphellandrene and other secondary metabolites. The quantity and quality of these phytoconstituents may vary depending on factors such as geographical source, cultivation practices, harvesting period, processing methods, and storage conditions. Such variations may influence the therapeutic efficacy of the crude drug, highlighting the importance of proper identification and quality evaluation before its pharmaceutical or clinical use.

Pharmacognostic evaluation is a fundamental step in the authentication and standardization of medicinal plants. It includes macroscopic, microscopic and powder microscopic studies that help identify genuine drugs and detect adulteration. In Shunti, characteristic anatomical

features such as cork cells, starch grains, oleoresin cells, fibrovascular bundles, vessels, and fibres serve as important diagnostic markers.

Physicochemical evaluation assesses the quality and purity of crude drugs through parameters such as loss on drying, total ash, acid-insoluble ash, extractive values, pH, and foreign matter. These parameters are essential for pharmacopoeial standardization and quality control.[2]

Preliminary phytochemical screening identifies the major classes of bioactive constituents present in the drug, including carbohydrates, alkaloids, flavonoids, glycosides, tannins, phenolic compounds, terpenoids, steroids, saponins, and proteins. These studies provide valuable information regarding the chemical composition and therapeutic potential of the plant.

Therefore, the present study was undertaken to perform a detailed pharmacognostic, physicochemical, and preliminary phytochemical evaluation of Shunti (Zingiber officinale Roscoe). The findings of this study are expected to contribute to the establishment of reliable quality standards for Shunti and provide reference data for standardization and quality control of Ayurvedic medicinal plants.

2. MATERIAL AND METHODS

MATERIALS

i. **Collection:** Sunthi sample was collected from farm near our city in Hemant rutu according to Dravya sanghraha kala described by Charaka[3] and according to the Guidelines on Good Field Collection Practices for Indian Medicinal Plants. Complete intact rhizome were collected without doing any harm to them. Then this sample was cleaned with water and dried under direct sunlight.

ii. **Plant identification**: Shunthi was identified on the basis of its Morphology and family characters of the plant.

iii. Authentication: Collected sample of Shunthi was authenticated from taxonomist, Department of Botany of well-known research institute.

iv. Preparation of Root Powder: Dried Shunthi sample was powdered in mechanical grinder and sieved with the help of 20 mm sieve for further studies.

v. Storage: Polythene bags were used to store powdered drug to protect from moisture and any other contamination.

METHODOLOGY

i. **Pharmacognostic Study**:[4] The pharmacognostic study of Shunti was carried out by performing macroscopic (organoleptic) and microscopic evaluations.

ii. **Macroscopic study/ Organoleptic Study (Panchabhautik Parikshana):** The macroscopic evaluation of the Shunti samples was performed by observing their morphological and organoleptic characters, including size, shape, colour, surface characteristics, fracture, odour, taste, and Panchabhautik Parikshana parameters using sensory examination.

iii. **Microscopic study**- Microscopic evaluation was carried out by preparing transverse sections of the Shunti rhizome and examining them under a compound microscope. Powder microscopy was also performed using powdered samples to record the characteristic microscopic features according to standard pharmacognostical procedures.

iv. **Physicochemical Analysis**[5]**-** The physicochemical analysis of Shunti samples was carried out according to the standard procedures described in the Ayurvedic Pharmacopoeia of India (API). The parameters evaluated included loss on drying (LOD), pH, total ash, acid-insoluble ash, water-soluble extractive, and alcohol-soluble extractive values.

v. **Preliminary Phyto-chemical Analysis**[6] **-** The extracts obtained in physico-chemical analysis were subjected to qualitative tests for the identification of various plant constituents like glycosides, alkaloids, tannins, etc.

RESULTS

Macroscopic characteristics of Shunthi

Table No. 1: Macroscopic characters of Shunthi.

Characters		**Shunti**
Measurement	Length	5-10 cm (varies with dried piece)
	Bredth	2-4 cm
	Weight	5 -30 gm
Shape		Branched, laterally compressed, irregularly flattened with finger-like projections
Color		Externally buff to light brown; internally pale yellowish-yellowish-white
External Surface	Texture	Hard, rough, fibrous, dry
	Fracture	Short and fibrous
Smell		Strong, aromatic, pleasant, charactertictic
		Pungent, aromatic, slightly sweet warming

Figure 1: Shunthi rhizome.

Microscopic characteristics of Shunthi: Diagrammatic TS of unpeeled rhizome is circular to oval in outline shows large central stele occupying the major area of the section, separated by a circular line of endodermis from a narrow cortex and the outermosa cork greyish dots of vascular strands and yellowish of oleoresin cells. being scattered throughout the section Detailed TS shows outer few rows of irregularly arranged cells of the subcrised cork occasionally adherent to a layer of epidermis and inner broader zone of regularly arranged cells of the cork. A broad zone of parenchymatous cortex lies underneath this, embedded with yellowish-brown oleoresin cells and collateral, closed non-ligrafied fibrovascular bundles of varying sizes, the larger one being well protected by a sheath of non lignified libres, phloem tissue exhibit distinct sieve tissue, vessels vanes from 1 to 13 and are avsociated with pigment cells, embedded with dark brownish contents. endodermis is distinct, a narrow hand of parenchymatious pericyclic zone lies underneath this. The wide parenchymatous ground tissue of the stele resembles to the cortical tissue except the pericyclic region which is embedded with very small sized vascular bundles devoid of fibres. Parenchymatous cells of the whole section are loaded with simple oblong starch grains.

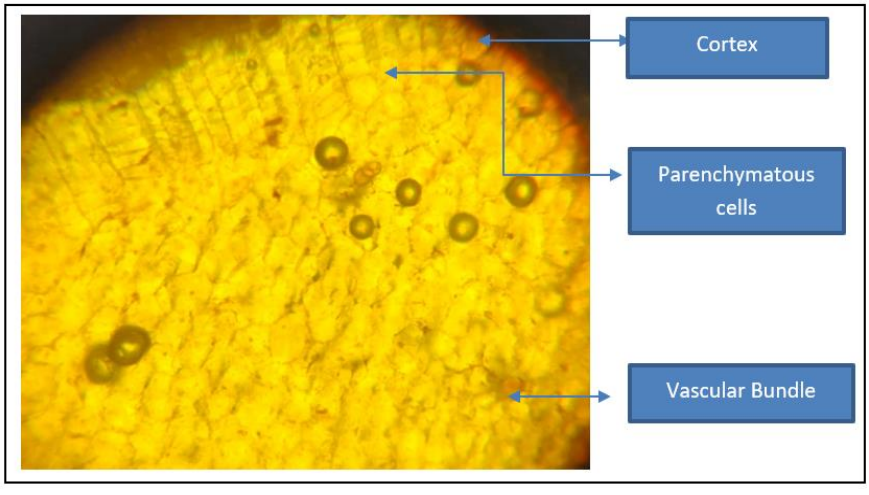

Figure 2: T.S. of Shunthi.

Powder Microscopy: Shows fragments of cork in surface view and cut transversely, oleoresin cells and simple starch grains with eccentric hilum scattered as such throughout, fragments of longitalinally cut nan-agnified reticulate vessels, often associated with pigment cells and thin walled septate non lignified fibres.

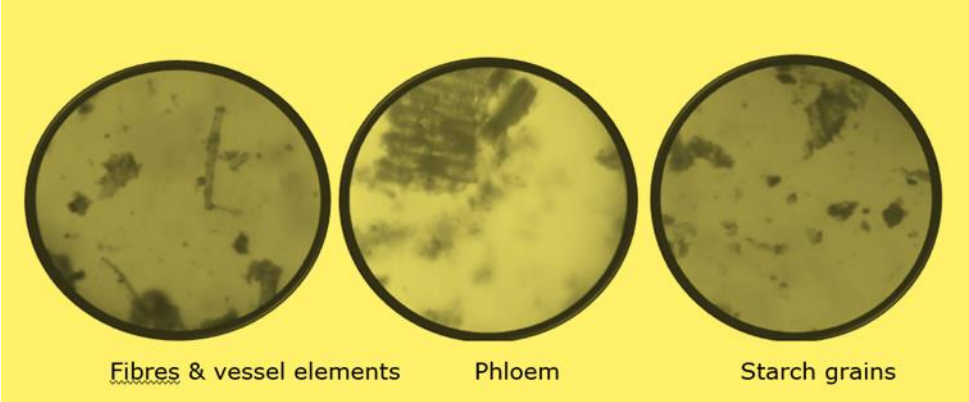

Figure 3: Powder microscopy of Shunthi.

Table No. 2: Physicochemical characters of Shunthi.

Sr. No.	Evaluation Parameters	Value
1	Total ash	4.00 %
2	Acid insoluble ash	0.8 %
3	Water soluble ash	2.20%
4	Sulphated ash	4.50 %
5	Water soluble extractive	13.5%
6	Alcohol soluble extractive	6.5%
7	LOD	8.5%

2. Preliminary Phyto-chemical Analysis

Table No. 3: Prelimnary Phyto-chemical characters of Shunthi.

Sr. No.	Evaluation Parameters	Presence
1	Test for Alkaloids	++
2	Test for Carbohydrate	+
3	Test for Flavonoid	+
4	Test for Tannin	++
5	Test for Glycoside	+
6	Test for Saponin	+
7	Test for Essential oil	+

DISCUSSION

The pharmacognostic evaluation of Shunthi (*Zingiber officinale Roscoe) confirmed the identity and authenticity of the crude drug through its characteristic macroscopic and microscopic features. Macroscopically, the rhizome was branched, laterally compressed,

irregularly flattened, and exhibited finger-like projections. The buff to light brown external colour, pale yellowish-white internal appearance, hard and fibrous texture, characteristic aromatic odour, and pungent taste were consistent with the standard descriptions of Shunthi reported in the Ayurvedic Pharmacopoeia of India and other pharmacognostic literature.

Microscopic examination of the transverse section revealed the typical anatomical features of Shunthi, including cork, parenchymatous cortex, oleoresin cells, fibrovascular bundles, endodermis, pericyclic region, and abundant simple starch grains. Powder microscopy also demonstrated diagnostic characters such as fragments of cork, reticulate vessels, non-lignified fibres, oleoresin cells, pigment cells, and simple starch grains with eccentric hilum. These observations further established the genuineness of the crude drug and provide reliable microscopic markers for its identification and quality control.

The physicochemical analysis showed that the values of total ash (4.00%), acid-insoluble ash (0.8%), water-soluble ash (2.20%), sulphated ash (4.50%), water-soluble extractive (13.5%), alcohol-soluble extractive (6.5%), and loss on drying (8.5%) were within acceptable limits. These parameters indicate good quality, acceptable purity, and the absence of excessive inorganic impurities or moisture. The comparatively higher water-soluble extractive value suggests the presence of appreciable quantities of water-soluble phytoconstituents, while the alcohol-soluble extractive value reflects the presence of alcohol-soluble bioactive compounds.

Preliminary phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, tannins, glycosides, saponins, and essential oils. These phytoconstituents are known to contribute to the diverse pharmacological activities of Shunthi, including antioxidant, anti-inflammatory, digestive, antimicrobial, and gastroprotective effects. Thus, the pharmacognostic, physicochemical, and phytochemical findings collectively support the quality and medicinal importance of Shunthi and provide baseline data for its standardization.

CONCLUSION

The present study successfully established the pharmacognostic, physicochemical, and preliminary phytochemical profile of Shunthi (Zingiber officinale Roscoe). The characteristic macroscopic, microscopic, and powder microscopic features confirmed the identity and authenticity of the drug. The physicochemical parameters were found to be within acceptable pharmacopoeial limits, indicating satisfactory quality and purity. Preliminary phytochemical

analysis demonstrated the presence of important bioactive constituents responsible for the therapeutic properties of Shunthi. The findings of this study provide reliable reference standards for the authentication, quality assessment, and standardization of Shunthi and may serve as valuable baseline information for future pharmacognostic, phytochemical, and pharmaceutical research.

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