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PHARMACOGNOSTICAL EVALUATION OF *NISHA KANDA* (RHIZOME OF *CURCUMA LONGA* LINN.) AND *AMALAKI PHALA* (FRUIT OF *PHYLLANTHUS EMBLICA* LINN.)

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ABSTRACT

Background: *Curcuma longa* Linn. (*Nisha*) and *Phyllanthus emblica* Linn. (*Amalaki*) are important medicinal plants used in Ayurveda. Pharmacognostic evaluation plays a vital role in establishing their identity, authentication, and quality through characteristic macroscopic and microscopic features. **Objective:** The study aims to evaluate the pharmacognostic characteristics of *Nisha Kanda* and *Amalaki Phala* in their fresh, dried, and powdered forms. **Materials and Methods:** Macroscopic evaluation was performed by examining the size, shape, colour, external surface, cut surface, fracture, texture, odour, and taste of the fresh and dried rhizomes of *Curcuma longa* and fruits of *Phyllanthus emblica*. Microscopic evaluation was carried out on transverse sections of fresh samples and powders of the dried plant materials to identify characteristic anatomical structures and diagnostic elements. **Results:** Macroscopic examination revealed characteristic features of both drugs, including the bright orange-yellow internal surface and aromatic odour of *Nisha* rhizome, and the six vertical furrows and sour-astringent taste of *Amalaki* fruit. Microscopic examination of *Nisha* rhizome showed cork cells, parenchymatous tissues, oleoresin-containing cells, vascular bundles, and abundant starch grains. *Amalaki* fruit exhibited distinct epicarp, mesocarp, and endocarp layers, along with vascular bundles, starch grains, calcium oxalate crystals, and stone cells. Powder microscopy further revealed characteristic cellular and vascular elements useful for identification. **Conclusion:** The pharmacognostic evaluation established characteristic macroscopic and microscopic features of *Nisha Kanda* and *Amalaki Phala*. These findings provide preliminary diagnostic parameters for their authentication and quality assessment and serve as a baseline for further standardization studies.

KEYWORD: *Curcuma longa* Linn., *Phyllanthus emblica* Linn., *Nisha Kanda*, *Amalaki Phala*, Pharmacognostic evaluation, Macroscopy, Microscopy.

INTRODUCTION

Pharmacognosy is the branch of science that deals with the identification, evaluation, and quality control of crude drugs obtained from natural sources, especially plants. Pharmacognostic evaluation is an essential step in establishing the identity, purity, and quality of medicinal plant materials used in Ayurveda.

Nisha Kanda (*Curcuma longa* Linn.), belonging to the family Zingiberaceae, is the rhizome of turmeric. It is traditionally used in Ayurveda for its *Kaphahara*, *Kledashoshana*, *Varnya* and *Shothahara* properties.[1] Curcumin is one of its major bioactive constituents.[2]

Amalaki Phala (*Phyllanthus emblica* Linn.), belonging to the family Phyllanthaceae, is the fruit of Indian gooseberry. It is traditionally used for its *Rasayana*, *Tridoshahara*, and antioxidant properties.[3] It contains various phytoconstituents, including tannins, phenolic compounds, and ascorbic acid.[4]

Pharmacognostic evaluation of these drugs involves the study of their macroscopic and microscopic characters, powder characteristics. These investigations help establish their botanical identity, detect adulteration, ensure quality, and provide standards for authentication.

In the present study, macroscopic and microscopic characters of rhizomes of *Curcuma longa* Linn. and fruits of *Phyllanthus emblica* Linn. are analysed.

Materials and Methods Collection of Drug

Curcuma longa Linn. (*Nisha*) rhizomes were collected at physiological maturity, indicated by yellowing and withering of the leaves followed by drying of the aerial parts.[5] The rhizomes were carefully uprooted, separated from roots and buds, rinsed thoroughly with water to eliminate residual soil and extraneous matter, and subjected to curing by boiling followed by complete drying.[6] Fresh fruits of *Phyllanthus embica* Linn. (*Amalaki*) were collected based on maturity, and absence of visible defects, washed thoroughly to remove impurities and contaminants. The collected drug specimens were identified by the faculty of the Department of Dravyaguna Vigyana, Government Ayurveda College, Tripunithura and further authenticated at the Department of Botany, St. Albert's College (Autonomous), Ernakulam, Kerala. The specimens were deposited and recorded under Voucher No. 632 for *Curcuma longa* Linn. (*Nisha*) and 633 for *Phyllanthus embica* Linn. (*Amalaki*) for future consideration.

Preparation of Drug

The collected drug specimens were adequately dried under shade and the rhizomes and fruits thus obtained were pulverized and passed through an 85-mesh sieve to obtain both *Nisha kanda churna* and *Amalaki phala churna.*

Procedure

I. Macroscopic evaluation of rhizome of *Nisha* (*Curcuma longa* Linn.) and fruit of *Amalaki* (*Phyllanthus emblica* Linn.)

A. Macroscopic evaluation

a) Aim

To analyze the macroscopic features of *Nisha kanda* (fresh and dried rhizomes of *Curcuma longa* Linn.) along with *Amalaki phala* (fresh and dried fruits of *Phyllanthus embica* Linn.)

b) Requirements

Fresh and dried rhizomes of *Curcuma longa* Linn., fresh and dried fruits of *Phyllanthus embica* Linn. magnifying lens, digital camera and white paper.

c) Procedure

The fresh rhizome of *Curcuma longa* Linn. and fresh fruit of *Phyllanthus embica* Linn. were identified using the naked eye and other sensory perceptions. Similarly, the macroscopic characteristics of the freshly harvested rhizome and the fruit were examined, and photographs of the drugs were captured using a digital camera.

B. Powder macroscopic evaluation

a) Aim

To examine the macroscopic features of *Nisha kanda churna* (powder of dried rhizomes of *Curcuma longa* Linn.) and *Amalaki phala churna* (powder of dried fruits of *Phyllanthus embica* Linn.)

b) Requirements

Churna (powder) of dried rhizomes of *Curcuma longa* Linn. and dried fruits of *Phyllanthus embica* Linn. magnifying lens, digital camera and white paper.

c) Procedure

The *churna* of dried rhizome of the drug was placed on a white paper and examined using a magnifying lens and naked eye. The powder macroscopic features like colour, texture, odour and taste were evaluated. Colour was assessed visually, texture was felt through touch, assessing its fineness and uniformity. The powder was also smelled for its odour and tasted to determine its taste. The procedure was repeated for the fruit powder and the photographs of the powdered drugs were taken with a digital camera.

II. Microscopic evaluation of fresh rhizome of *Nisha* (*Curcuma longa* Linn.) and fresh fruit of *Amalaki* (*Phyllanthus emblica* Linn.)

A. Microscopic evaluation of transverse section of rhizome and fruit

a) Aim

To analyze the microscopic characteristics of *Nisha kanda* (fresh rhizomes of *Curcuma longa* Linn.) and *Amalaki phala* (fresh fruits of *Phyllanthus embica* Linn.)

b) Requirements

Fresh rhizomes of *Curcuma longa* Linn. and fruits of *Phyllanthus embica* Linn., razor or safety razor blade, dissecting needles, petri dishes, watch glasses, glass slides, coverslips ¾ circles (No. 2 thickness), camel hair brush (medium size), dropper, safranin stain, glycerine, compound microscope and digital camera Procedure.

The transverse sections of the fresh rhizome of *Curcuma longa* Linn. and fresh fruits of *Phyllanthus embica* Linn. were procured using a razor blade. A fine section of both the specimens was successively mounted on a slide, covered with coverslips and placed on the stage of the dissecting microscope, and secured with clips. Light was focused on the mounted slide using the mirror. The microscope was initially adjusted to 10x magnification to observe the general histological features, and subsequently to 40x magnification for detailed examination. Photographs were captured using a digital camera at both 10x and 40x magnifications.

B. Powder microscopic evaluation

a) Aim

To evaluate the powder microscopic characteristics of *churna* of rhizomes of *Nisha* (*Curcuma longa* Linn.) and fruits of *Amalaki* (*Phyllanthus embica* Linn.) to verify the genuinity and authenticity of the drugs.

b) Requirements

Churna of dried rhizomes of *Curcuma longa* Linn. and dried fruits of *Phyllanthus embica* Linn., watch glass, glass slide, coverslips ¾ circles (No:2 thickness), camel hair brush (medium-sized), compound microscope and digital camera.

c) Proced ure

A small quantity of *churna* was taken and gently warmed with a few drops of chloral hydrate solution on a water bath. The treated sample was then washed and a small portion was mounted in glycerin for microscopic examination. In a separate preparation, a few milligrams of the *churna* were treated with iodine in potassium iodide solution and similarly mounted in glycerin. Another portion of the powder was treated with a solution of phloroglucinol, allowed to dry, followed by the addition of a few drops of hydrochloric acid (HCl), and then mounted in glycerin. A coverslip was then carefully placed over the sample using a needle to avoid the formation of air bubbles. The prepared slide was examined under a digital microscope, initially at low magnification (10x) and then at higher magnification (40x) for detailed observation. Photographs were captured using a digital camera. The procedure was repeated for both the *churna*.[7]

RESULTS

I. Macroscopic evaluation

A. Macroscopic features of fresh and dried rhizomes of *Nisha* (*Curcuma longa* Linn.) and fresh and dried fruit of *Amalaki* (*Phyllanthus embica* Linn.)

Macroscopic characteristics of the fresh and dried rhizome of *Curcuma longa* Linn. and fruit of *Phyllanthus embica* Linn. were analyzed and is tabulated as below:

Table No 1: Macroscopic features of rhizomes of *Curcuma longa* Linn.

Characteristics	Fresh rhizome	Dried rhizome
Size	Mother rhizome- 5-8 cm, thick Finger rhizome- 2-3 cm, slender	Reduced size
Shape	Primary rhizomes are bulky, ovoid/ oblong with cylindrical, elongated, slightly curved,often irregularly branched fingers	Similar in shape, wrinkled and shrunken
Color	Yellowish or greyish-yellow outside, bright orange-yellow inside	Yellow-brown to dull brown outside, brown inside
External surface	Rough, annulations of leaf base with nodes and internodes, circular root scars	Hard, rough, wrinkled, prominent annulations and scars
Cut surface	Smooth, homogeneous and orange colored	Brownish-yellow
Fracture	Short and horny	Short and hard
Odour	Characteristic aroma	Aromatic but less intense
Taste	Bitter, slightly pungent	Bitter and pungent

Table No 2: Macroscopic features of fruits of *Phyllanthus embica* Linn.

Features	Fresh fruit	Dried fruit
Size	2-3 cm diameter	Reduced size
Shape	Spherical or globose, slightly depressed at	Irregular, shrunken segments or

	poles, with 6 vertical furrows or stripes	pieces, ridged
Color	Yellowish green outside Light green to pale green inside	Brown to dark brown outside Yellowish-brown to brown inside
External surface	Smooth, shining, firm with 6 vertical stripes	Hard, rough, wrinkled with prominent ridges
Cut surface	Juicy, fleshy, translucent, segmented with a central seed	Dry, hard and faint segments
Fracture	Not easily fractured	Short
Texture	Soft and fleshy	Hard and brittle
Odour	Faint but characteristic	Faint, slightly astringent
Taste	Sour, astringent and bitter with sweet after taste	Astringent and sour



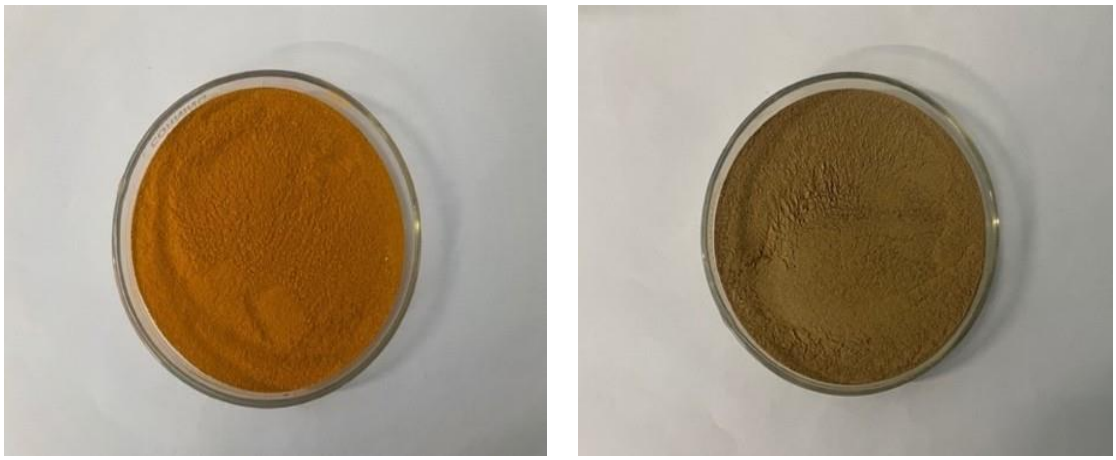
Picture No 1: Fresh and dried rhizomes of *Curcuma longa* Linn. and fruits of *Phyllanthus emblica* Linn.

B. Powder macroscopic evaluation of dried rhizome of *Nisha* (*Curcuma longa* Linn.) and dried fruit of *Amalaki* (*Phyllanthus emblica* Linn.)

Powder macroscopic features such as color, texture, odour and taste of dried rhizomes of *Curcuma longa* Linn. and dried fruits of *Phyllanthus embica* Linn. were assessed and is detailed below:

Table No 3: Powder macroscopy of dried rhizome of *Curcuma longa* Linn. and dried fruits of *Phyllanthus embica* Linn.

Macroscopic Features	Characteristics of *Nisha* powder	Characteristics of *Amalaki* powder
Color	Bright yellow	Light brown
Texture	Fine	Fine
Odour	Characteristic smell	Faint and characteristic
Taste	Bitter and pungent	Sour and astringent



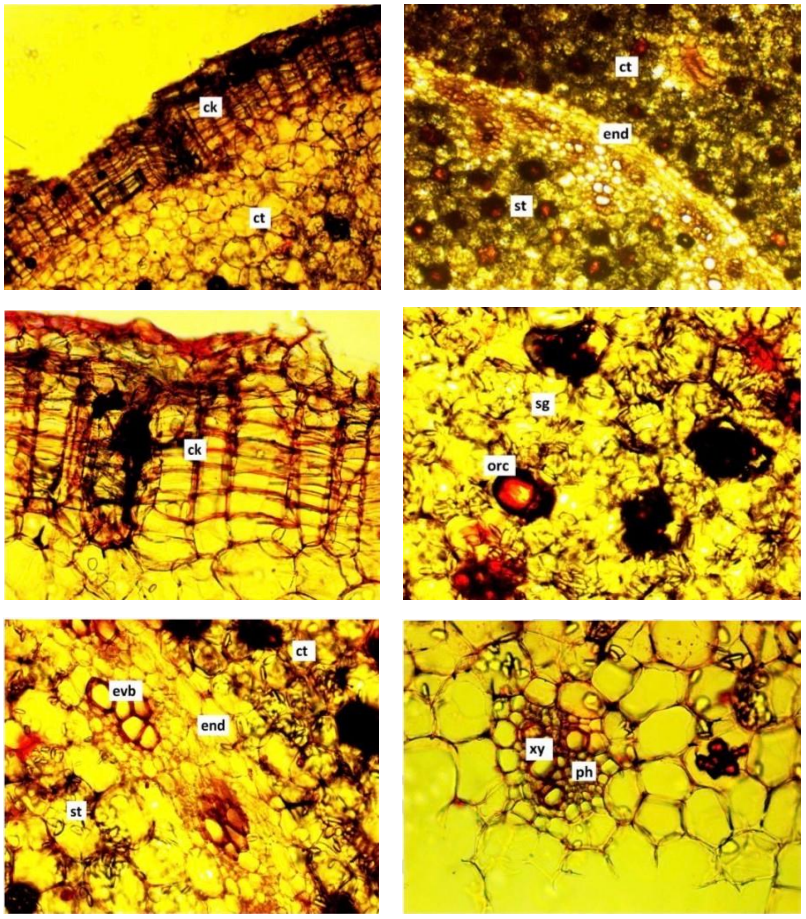
Picture No 2: Powder macroscopy of rhizome of *Curcuma longa* Linn. and fruit of *Phyllanthus emblica* Linn.

II. Microscopic evaluation

A. Microscopic evaluation of fresh rhizome of *Nisha* (*Curcuma longa* Linn.) and fruit of *Amalaki* (*Phyllanthus embica* Linn.)

a. Tranverse section of fresh rhizome of *Curcuma longa* Linn.

Transverse section of rhizome of *Curcuma longa* Linn. shows 5-7 layers of thick walled cork made of rectangular cells. It is followed by wide, multi-layered parenchymatous cortex with conjoint, collateral and closed vascular bundles. Oleoresin cells with yellow content are seen throughout the section. Endodermis is present. Small sized vascular bundles are embedded in the endodermis region. Stele is parenchymatous embedded with vascular bundles and oleoresin cells. Cells in the cortex and stele contain numerous oval shaped starch grains.

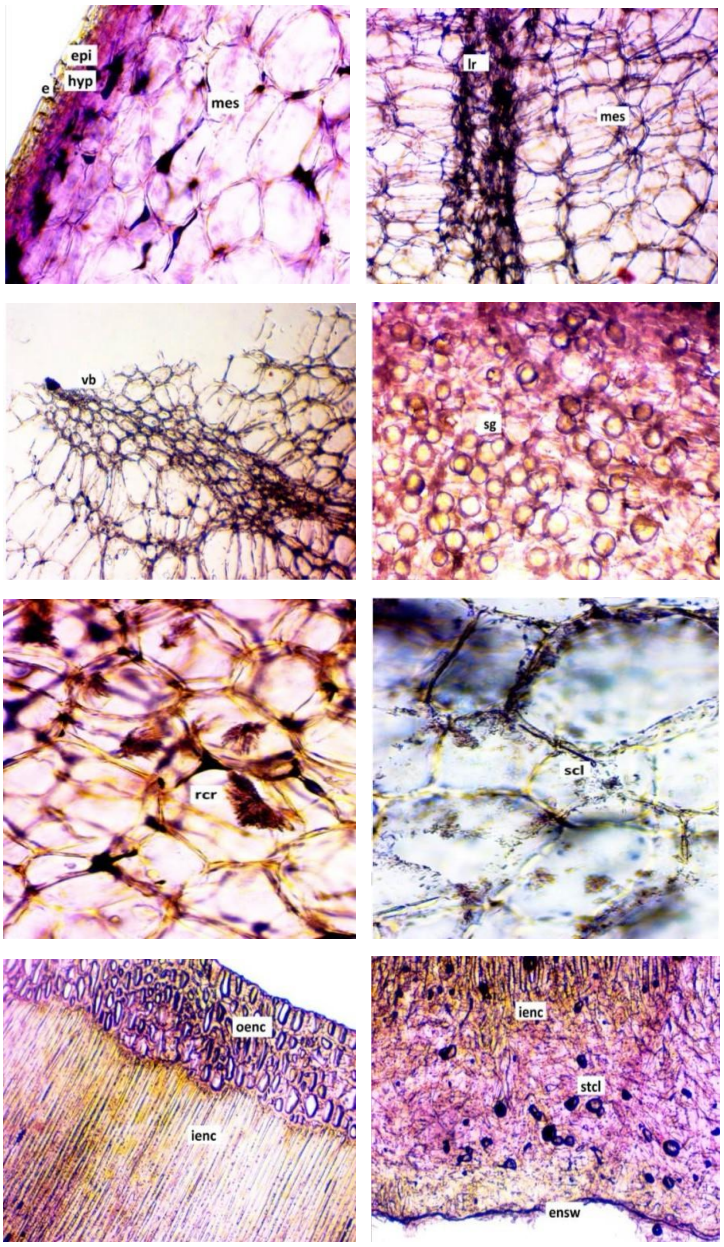


Picture No: 3 Transverse section of rhizome of *Curcuma longa* Linn. - ck- Cork; ct-Cortex; end- Endodermis; st- Stele; sg- Starch grain; orc- Oleoresin cell; evb-Endodermis vascular bundle; xy- Xylem; ph- Phloem.

b. Transverse section of fresh fruit of *Phyllanthus embica* Linn.

The transverse section of fruit of *Phyllanthus embica* Linn. shows the three fruit layers such as epicarp, mesocarp and endocarp. Epicarp is the outer most layer containing single layer of epidermis made of tubular cells, covered externally with thin layer of cuticle. Hypodermis follows epidermis which contains 2-3 layers of tangentially elongated thick walled cells. Mesocarp is a larger area containing large, thin walled parenchyma cells. Collateral, fibrovascular bundles are found scattered in the mesocarp. Several longitudinal ribs are found in the mesocarp. Also, mesocarp contains rosette calcium oxalate crystals, prismatic silica crystals and round shaped starch grains. The innermost layer is the endocarp which has outer and inner layers. Outer layer towards the mesocarp contains thick

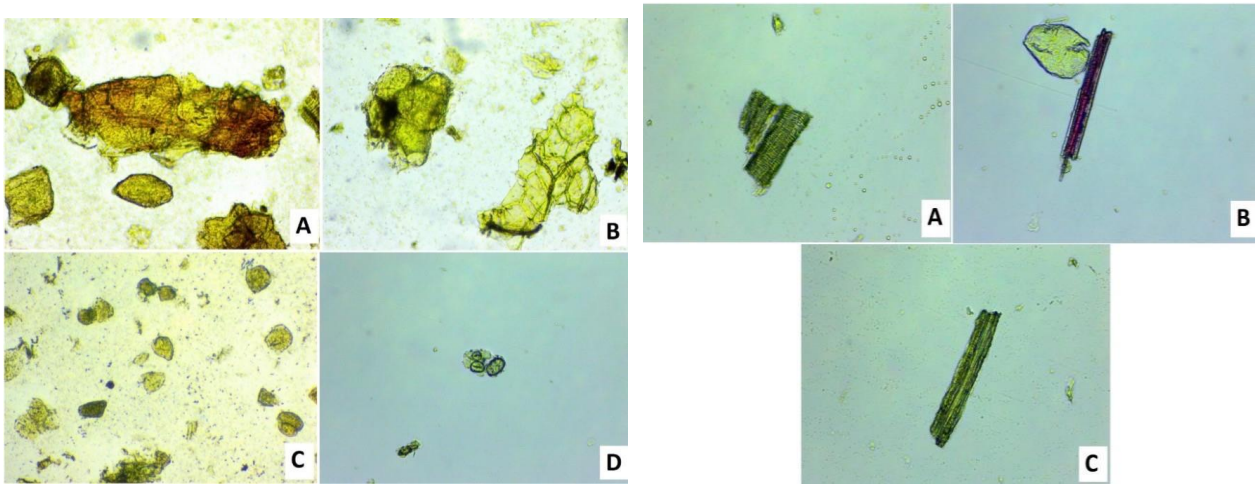
walled cells. Inner layer is broader and stone cells are found scattered. It is followed by the endosperm wall. The seed region contains three locules with each cell containing two seeds.



Picture No 4: Transverse section of fruit of *Phyllanthus embica* Linn. - epi- Epicarp; e-Epidermis; hyp- Hypodermis; mes- Mesocarp; lr- Longitudinal rib vb- Vascular bundle; sg- Starch grain; rcr- Rosette crystal; scl- Silica crystal; oenc- Outer endocarp; ienc-Inner endocarp; stcl- Stone cell; ensw- Endosperm wall Powder microscopic evaluation of dried rhizome of *Nisha* (*Curcuma longa* Linn.) and fruit of *Amalaki* (*Phyllanthus embica* Linn.)

c. Powder microscopic evaluation of rhizome of *Curcuma longa* Linn.

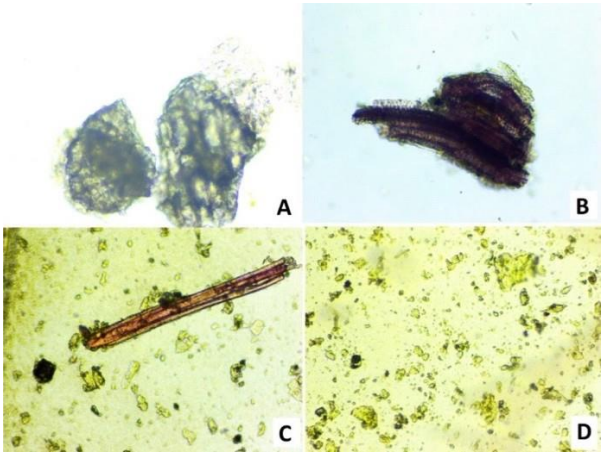
Powder microscopy shows fragments of brown coloured cork cells, parenchyma cells containing abundant oleo-resin with simple or compound starch grains. Xylem vessels, fibres and fragments of trichomes are present.



Picture No 5: Powder of rhizome of *Curcuma longa* Linn. – A- Cork cells; B-Parenchyma; C- Cells containing oleo-resin; D- Starch grains; E- Xylem vessel; F- Fibres; G- Trichome.

d. Powder microscopic evaluation of fruit of *Phyllanthus emblica* Linn.

Powder of fruits of *Phyllanthus emblica* is cream in colour. Epidermal cells of hexagonal shape and thickened cell wall are present. Short lignified fibres are visible. Starch grains are abundant. Lignified vessel elements are also found.



Picture No: 6 Powder of fruit of *Phyllanthus embica* Linn. – A- Epidermal cells; B- Xylem vessel; C- Fibre; D- Starch grains.

DISCUSSION

Pharmacognostic evaluation of *Nisha Kanda* (*Curcuma longa* Linn.) and *Amalaki Phala* (*Phyllanthus emblica* Linn.) was carried out through macroscopic and microscopic examinations of fresh, dried, and powdered samples.

Macroscopic evaluation revealed characteristic differences in size, colour, surface, texture, odour and taste between fresh and dried samples. The *Nisha* rhizome showed a bright orange-yellow internal surface and characteristic aromatic odour, whereas *Amalaki* fruit exhibited six vertical furrows and a sour, astringent taste. Drying resulted in shrinkage, wrinkling, and changes in colour and texture. Microscopic examination of *Nisha* rhizome revealed cork cells, parenchymatous tissues, oleoresin-containing cells, vascular bundles, and abundant starch grains. *Amalaki* fruit showed distinct epicarp, mesocarp, and endocarp layers, along with vascular bundles, starch grains, calcium oxalate crystals, and stone cells. Powder microscopy further revealed characteristic cellular and vascular elements useful for

identification of both drugs.

Overall, the macroscopic and microscopic findings established characteristic identifying features of *Nisha Kanda* and *Amalaki Phala*. These observations may provide preliminary standards for their authentication and quality assessment before further physicochemical, phytochemical, and biological investigations.

CONCLUSION

Pharmacognostic evaluation of *Nisha Kanda* (*Curcuma longa* Linn.) and *Amalaki Phala* (*Phyllanthus emblica* Linn.) revealed characteristic macroscopic and microscopic features that serve as preliminary parameters for their identification, authentication, and quality assessment.

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Conflicts of Interest: There are no Conflicts of Interest

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