

## MYANMAR HERBAL PHARMACOPOEIA

## 2013

## **VOLUME I**



## MYANMAR HERBAL PHARMACOPOEIA

2013

**VOLUME I** 

Department of Traditional Medicine, Ministry of Health Nay Pyi Taw, Myanmar



In cooperation with the Nippon Foundation, Japan

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# PREFACE

#### PREFACE

Since over 2000 years ago, Myanmar has possessed and nurtured a civilization, high enough to set up city states and the traditional medicine was already flourishing significantly as a major part of the Myanmar cultural superstructure during this time. Nowadays tremendous use of traditional and herbal medicines could be clearly seen in Myanmar and it is also greatly contributing primary health care needs of Myanmar people. At the same time, traditional and herbal medicine are being used increasingly not only in Asia but also in the rest of the world including developed countries. It is indicating the important role of traditional medicine in public health care services at grass-root level. In this circumstance, quality control programme of herbal medicine is vitally necessary to meet their authenticity and traditional therapeutic merits.

The Department of Traditional Medicine, Ministry of Health has formed a Technical Committee for the development of Myanmar Herbal Pharmacopoeia (MHP) in order to establish the quality specifications of Myanmar medicinal plants together with their traditional therapeutic uses. The MHP technical committee has arranged to select twenty medicinal plants as an initial phase according to wider use in local traditional drug Industries. The research laboratory of the Department of Traditional Medicine has determined both botanical authentic characters, physicochemical and phytochemical quality specifications of these twenty medicinal plants and also compiled traditional therapeutic uses together with research reports. Now the Myanmar Herbal Pharmacopoeia, volume 1 including pharmacopoeial monographs of twenty medicinal plants has been successfully documented and published. Subsequent volumes are also being attempted and will be developed year by year. It is believed that this MHP and developing volumes will provide technical guidance for the quality control system of medicinal herbs in the authorized regulatory organization and herbal medicine Industries. Meanwhile, the Nippon Foundation (Japan) should be recorded here for their financial support and encouragement for the development of Myanmar Herbal Pharmacopoeia.

# TECHNICAL COMMITTEE

#### MYANMAR HERBAL PHARMACOPOEIA TECHNICAL COMMITTEE

Chairperson	:		Dr. Htun Naing Oo, Director General,
			Department of Traditional Medicine.
Members	:	-	Prof. Dr. Than Maung, Rector,
			University of Traditional Medicine .
		-	Prof. Dr. Mar Lar Myint, Rector,
			University of Pharmacy (Yangon)
		-	Prof. Dr. San San Nwet, Rector,
			University of Pharmacy (Mandalay)
		-	U Aung Myat Kyaw,
			Deputy Director General (Retired)
			Department of Traditional Medicine.
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			Department of Medical Research
			(Central Myanmar).
		-	Prof. Dr. Nant Hla Hla Win,
			Head of Pharmacology Department
			University of Medicine 1, Yangon
		-	Prof. Dr. May Hla Thwin,
			Head of Pharmacology Department
			University of Medicine 2, Yangon
		-	Prof. Dr. Nu Nu Aye,
			Head of Pharmacology Department
			University of Medicine , Mandalay
		-	Prof. Dr. Daw Hla Ngwe,
			Head of Chemistry Department
			University of Yangon
		-	Prof. Dr. Aye pe,
			Botany Department
			University of Yangon
		-	Dr. Ne Win, Director, National Health Laboratory.

- Dr. Khin Phyu Phyu, Director (Research),
   Department of Medical Research (Upper Myanmar)
- Dr. May Aye Than, Deputy Director,
   Department of Medical Research (Lower Myanmar)
- Dr. Thazin Yi Hlaing, Assistant Director, Food and Drug Administration.
- U Than Tun, Head (Retired),
   Pharmacology Department,
   University of Traditional Medicine.
- U Maung Maung Thet, Associate Professor, University of Traditional Medicine.
- Daw Lay Myint, Traditional Drug Manufacturer, U Tha Yin Medicine Hall.
- Dr. Khin Maung Lwin, Traditional Drug Manufacturer, Fame Pharmaceuticals Ltd.
- U Maung Maung Oo, Traditional Drug Manufacturer, Great Wall Traditional Medicine Production .
- Secretary : U Win Myint, Director (Research and Development), Department of Traditional Medicine.
- Joint Secretary: Daw Thidar Swe, Deputy Director (Research), Department of Traditional Medicine

#### Working Japanese Experts (Short-term)

- 1. Professor Dr.Motoyoshi Satake, PhD
- 2. Assistant Professor Dr.Cohay Kazuma, PhD

#### Working group on Plant Collection Survey and Laboratory Analysis

- U Win Myint, BSc(Chemistry), MSc(Chemistry), Director(Research& Development), Department of Traditional Medicine
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   Deputy Director (Research), Department of Traditional Medicine
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- 15. Daw Zin Mar Naing, BMTM, Research Assistant(2), Department of Traditional Medicine
- 16. Daw Phyo Nandar, BMTM, Research Assistant(2), Department of Traditional Medicine
- 17. Daw Soe Sandar Phyo, B.Pharm., Research Assistant (2), Department of Traditional Medicine
- 18. U Khin Maung Aye, Clerk, Department of Traditional Medicine
- 19. Daw Kywe Wai Phyo, BSc (Botany), Dip.Agri., Research Assistant(3),Department of Traditional Medicine
- 20. Daw Khine War War Tun, BSc (Chemistry), Laboratory Assistant, Department of Traditional Medicine

# MONOGRAPHS

## Acori calami Rhizoma

Acorus calamus	: L. (/	Acoraceae)	လင်းလေ/လင်းနေ	(lin:lei, lin:nei)
Synonym(s)	-	Acorus clatus Salisb.		
		Acorus undulatus Stokes.		
		Acorus terrestris Spreng.		
		Acorus griffithii Schott.		
		Acorus nilaghirensis Scho	ott.	
		Acorus tartarinowii		
Other name(s)	-	Sweet Flag (English)		
		Myrtle Grass (English)		
		Calamus (English)		
		Vaj (Arabic)		
		Acore odorant (French)		
		Acori (French)		
		Waan nan (Thai)		
		Chang-po (Korea)		
		Vacã (India)		
		Che Ts'ang P'ou (China)		
		Pai ch'ang (China)		
		Choui Ts'ang P'ou (China	u)	
Part(s) used	-	Rhizome		

#### Definition

Acori calami rhizoma consists of the dried rhizome of *Acorus calamus* L. (Acoraceae).

## Description of the part used

### Macroscopic characteristics

Subcylindrical horizontal rhizome, covered within the thin brown cork. The outer surface is light yellowish brown with longitudinal furrows and rootlets scar. Internally buff color and fewer root scars, spongy surface. Aromatic odour and pungent bitter taste.

#### Microscopic characteristics

#### Transverse section of Acorus calamus L. rhizome shows:

- 1. epidermis composed of a single layer of thin-walled cells
- 2. under the epidermis, the outer cortex region consisting several layers of collenchyma
- 3. inner cortex region consists chain of starchy parenchyma surrounding large intercellular spaces with oil cells and some parenchyma contains prismatic crystals and starch grains
- 4. vascular bundles are found scattered throughout this region
- 5. under the cortex region, the endodermis composed of a single layer of thinwalled elliptical cells
- 6. stele composed of round, parenchymatous cells enclosing large schizogenous intercellular space. Parenchyma cells contain small starch granules and volatile oil globules. Vascular bundles are scattered throughout the stele

#### Characters of the powdered drug

Buff coloured powder, aromatic odour, pungent and bitter taste. The diagnostic characters are-

- 1. parenchyma attached with vessels
- 2. rounded parenchyma cells containing small starch granules
- 3. chains of parenchymatous cell with starch grains and oil droplets
- 4. fibres attached with calcium oxalate prism sheath
- 5. starch grains

#### Identification

- A. Add 2 mL of acetic anhydride solution to 1 mL of petroleum ether extract of the drug in chloroform followed by 1 mL of sulphuric acid. A greenish blue colour is produced.
- B. Add 1 ml of concentrated sulphuric acid to 2 mL of chloroform extract of the drug, carefully, from the side of the test tube. Red colour is produced in the chloroform layer.

#### **TLC analysis**

To 1 g of powdered drug add 5 mL of methanol, shake for 30 minutes, allow to stand for 30 minutes, filter and filtrate is used for chromatography.

Application volume	:	10 μL
Developing solvent system	:	Chloroform: Ethly acetate: Methanol (5:2:1.5)
Spray reagent	:	10 % Potassium hydroxide
Stationary phase	:	Silica gel G (A & D are glass plates, B & C are aluminium sheets $GF_{254}$ )



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray	UV 365 after spray
0.89	Yellow		Light green	Pale pink	Reddish
			yellow		borwn
0.85-0.84	Green	Brown	Red	Green	Brown
0.80-0.79	Pale	Brown	Red	Pale	
	green			brown	
0.64		Brown	Light blue		Light blue
0.55		Brown	Red	Yellow	Yellow
0.41		Brown	Light blue		Light blue
0.19-0.14			Brown		Pale yellow

- Loss on drying at 105°C ٠
- Foreign matter
- Total ash .
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important formulation
- Traditional therapeutic uses •
- Research reports

- Not more than 11.56 % Not more than 2.00 %
- Not more than 10.00 %

:

:

:

:

:

:

:

- Not more than 0.06 %
- Not less than 5.02 % :
  - Not less than 13.50 %
- Traditional Medicine Formulations : (TMFs)<sup>69</sup> - 8/31/34/37/47/Sup: 29
  - Indigestion, diarrhoea, cough, oedema, tingling & numbness, giddiness, infantile illness
  - Antibacterial<sup>1,2</sup>, antituberculous<sup>3</sup> antidiarrhoeal<sup>4</sup> and anthelmintic<sup>5</sup> activities, 58

#### Acori calami Rhizoma



- 6. Vascular bundle
- 7. Endodermis
- 8. Vascular bundle
- 9. Intercellular space



Source: Magway region

#### **Aloe Folium**

Aloe vera L. Burm.f. (Aloaceae)	

ရှားစောင်းလက်ပပ် (sha:zaun:le' pa')

- Synonym(s) Aloe barbadensis Mill. Aloe indica Royle. Aloe chinensis Bak. Aloe elongata Murray. Aloe officinalis Forsk. Aloe perfoliata L. Aloe rubescens DC. Aloe vulgaris Lam.
- Other name(s) -Aloe (English) Star Cactus (English)
  - Musabar (Arabic) Aloes (French) Aloe (Germany) Aloe (Italy) Lu Hui (China)
- Part(s) used Leaf
- Definition

Aloe folium consists of the fresh leaves of Aloe vera L.Burm.f (Aloaceae).

### Description of the part used

#### Macroscopic characteristics

Leaves are pea green colour, slightly concave, lanceolate, thick, succulent, glabrous, apex sharp and acute spine, margin spiny toothed. Odour not characteristic and very bitter taste.

#### Microscopic characteristics

#### Transverse section of *Aloe vera* L.Burm.f. leaf shows:

- 1. a strongly cuticularized epidermis with stomata on both surfaces
- 2. Palisade layer containing chlorophyll, starch and occasional bundles of calcium oxalate needles

- 3. a central region which occupies 3/5 of the total diameter of leaf consists of large mucilagenous parenchymatous cells
- 4. two rows of vascular bundles which occur at the junction of the two previous regions and have a well-marked pericycle and endodermis. The mucilage contained in this region as above

### Characters of the powdered drug

Greenish powder, odour not characteristic, taste very bitter. The diagnostic characters are:

- 1. parenchyma containing bundles of needle-shaped calcium oxalate crystals and starch
- 2. minute slender prism and needles (Treated with lactophenol)

#### Identification

A. Dissolve 2 mL of alcoholic extract of the drug in 1 mL of water, add sodium hydroxide solution. Yellow colour is produced.

### **TLC analysis**

To 1 g of powdered drug add 5 mL of methanol, shake for 30 minutes, allow to stand for 30 minutes, filter and filtrate is used for chromatography.

Application volume	:	10 μL
Developing solvent system	:	Chloroform: Ethly acetate: Methanol (5:2:1.5)
Spray reagent	:	10 % Potassium hydroxide
Stationary phase	:	Silica gel G (A & D are glass plates, B & C are
		1

aluminium sheets  $GF_{254}$ )

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:



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray	UV 365 after spray
0.89	Yellow		Light green yellow	Pale pink	Reddish borwn
0.85-0.84	Green	Brown	Red	Green	Brown
0.80-0.79	Pale	Brown	Red	Pale	
	green			brown	
0.64		Brown	Light blue		Light blue
0.55		Brown	Red	Yellow	Yellow
0.41		Brown	Light blue		Light blue
0.19-0.14			Brown		Pale yellow

- Loss on drying at 105°C
- Foreign matter
- Total ash

٠

- Acid-insoluble ash
- Ethanol soluble extract
  - Water soluble extract

- : Not more than 10.56 %
- : Not more than 2 %
  - : Not more than 18.3 %
  - : Not more than 0.06 %
  - : Not less than 25.5 %
- cact : Not less than 8.8 %

- Traditional therapeutic uses
- Hypertension, indigestion, hyperlipoproteinemia, constipation, menstrual disorder, eye and ear diseases, numbness, paresis, paralysis, skin disease

Source: Mon state, Taninthayi and Magwe regions

## **Aloe Folium**



Transverse section of Aloe vera L.Burm.f. leaf

- Stomata 1.
- 2. Upper epidermis
- 3. Palisade
- Spongy parenchyma 4.
- Calcium oxalate crystal 5.
- Pericyclic cells 6.
- Mucilage parenchyma 7.
- 8. Vascular bundle

Characters of the powdered drug

Parenchyma containing bundles of a. needle-shaped calcium oxalate crystals and starch

50µm

b. Minute slender prism and needle-shaped calcium oxalate crystals (Treated with lactophenol)

Andrographidis Herba

Andrographis paniculata (Burm.f.)Wall.ex Nees. (Acanthaceae) ဆေးခါးကြီး (hsei:ga:gji:)

- Synonym(s) *Justicia latebrosa* Russ. Justicia paniculata Burm.f. Justicia stricta Lam. ex. Steud.
- King of bitter (English) Other name(s) -Creat (English) **Common andrographis (English)** Kariyat (English) Sinta (English) Halviva (English) Qasabhuva (Arabic) Sadilata (Java) Hempedu bumi (Malaysia) Aerial parts of plant Part(s) used

#### Definition

Andrographidis Herba consists of the aerial parts of Andrographis paniculata (Burm.f.) Wall.ex Nees. (Acanthaceae).

## Description of the part used Macroscopic characteristics

Broken green lanceolate leaves and quadrangularly stem. Rarely found capsule fruits and flowers. Leaves opposite, petiole short, tapering at both ends, margin entire, glabrous on both surfaces, upper surface dark green, pale beneath. Characteristic odour and bitter taste.

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#### Microscopic characteristics

Transverse section of Andrographis paniculata (Burm.f) Wall.ex Nees. leaf shows:

- 1. upper epidermis consisting of single layer cells, glandular trichomes present, stomata absent, cystoliths fairly large, columnar palisade cells
- 2. spongy mesophyll consists of 4-6 layers of cells containing chloroplast, under the palisade layer
- 3. in midrib is composed of collenchyma cells beneath upper and lower epidermis
- 4. collateral type vascular bundle composed of lignified xylem in the upper part and phloem in the lower part. Vessel spiral, scalariform and reticulate
- 5. lower epidermis consisting a layer of wavy-walled cells, cystoliths present, stomata diacytic

#### Characters of the powdered drug

Greenish, slightly characteristic odour, strongly bitter taste. The diagnostic characters are:

- 1. surface view of upper epidermis with cystoliths
- 2. surface view of lower epidermis, wavy-walled cells with diacytic stomata
- 3. vessels
- 4. fragments of fibres

#### Identification

- A. Dissolve 1 g of alcoholic extract in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 mL of Dragendorff's reagent, orange colour is produced.
- B. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.
- C. Add 1 mL of concentrated sulphuric acid to 2 mL of chloroform extract of the raw material, carefully, from the side of the test tube. Red colour is produced in the chloroform layer.

#### TLC analysis

Extract 1 g of powdered drug in 15 mL of methanol for 15 minutes, filter and filtrate is used for chromatography.

: 10 μL

Application volume

Developing solvent system

: Chloroform: Methanol: Ethyl acetate (15:1:2.5)

Spray reagent Stationary phase

А

: Vanillin-sulphuric acid: Silica gel G (A & D are glass plates, B & C

are aluminium sheets  $GF_{254}$ )

Visual UV 254-nm

В

С

D

R<sub>c</sub> Visual UV 254 nm UV 365 nm Spray Red Light violet 0.80 0.78 Yellow Light yellow 0.71 Orange 0.68 Light violet Blue 0.56-0.53 Light yellow Violet Orange 0.51-0.49 Greenish yellow Violet Light violet Light blue 0.48 Violet Light blue 0.44

Loss on drying at 105°C	:	Not more than 8.25 %
Foreign matter	:	Not more than 2 %
Total ash	:	Not more than 18.4 %
Acid-insoluble ash	:	Not more than 0.035 %
Ethanol soluble extract	:	Not less than 9.1 %
Water soluble extract	:	Not less than 9.75 %
Important formulation	:	Traditional Medicine Formulations
		(TMFs) <sup>69</sup> -
Traditional therapeutic uses	:	Diabetes mellitus, malaria, fever,
		indigestion, paresis and paralysis,
		tingling and numbness
Research reports	:	Analgesic and antipyretic <sup>6</sup> ,
		antibacterial <sup>7</sup> , antihyperglycemic <sup>8</sup>
		and antidiarrhoeal <sup>9</sup> activities

## Andrographidis Herba



Transverse section of Andrographis paniculata (Burm.f) Wall.ex Nees. leaf

1. Upper epidermis

2. Collenchyma

3. Palisade

4. Spongy parenchyma

5. Xylem

6. Phloem

7. Parenchyma

8. Collenchyma



Characters of the powdered drug

- a. Surface view of upper epidermis with cystoliths
- b. Surface view of lower epidermis, wavy-walled cells with diacytic stomata
- c. Vessels
- d. Fragments of fibres

## **Betel Folium**

<i>Piper betle</i> L. (Piperaceae)	Piper	betle I	L. (Pipe	eraceae)
------------------------------------	-------	---------	----------	----------

ကွမ်းရွက် (kun:jwe')

Synonym(s)-Piper siriboa L.<br/>Piper peepuloides Ham.<br/>Piper charya Ham.<br/>Chavica betle Miq.Other name(s)-Betel leaf (English)<br/>Betel vine (English)<br/>Betel leaf pepper (English)<br/>Vine pepper (English)<br/>Poivre bètel (French)<br/>Chavique bètel (French)

Sireh (Malaysia) Pelu (Thailand)

Chu chiang (China)

Sirih hudang, sirih (Malaysia)Part(s) used-Leaf

## Definition

Betel folium consists of the leaves of Piper betle L. (Piperaceae).

## Description of the part used

## Macroscopic characteristics

Leaves are simple broadly ovate, base cordate, apex shortly acuminate, margin entire, glabrous, upper surface shiny deep green and paler beneath, palmate 7-9 nerves, petiole cylindrical. Odour is aromatic, taste pungent.

## Microscopic characteristics

## Transverse section of *Piper betle* L. leaf shows:

- 1. upper epidermis covered with thick smooth cuticle. It consists of polygonal and straight-walled in surface view. Stomata absent.
- 2. under the epidermis, 2-3 layers of hypodermis consisting of colourless cells and a few layers of collenchyma and vascular bundle collateral

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- 3. mesophyll layer differentiated into palisade single layered and 2-3 layers of spongy parenchyma containing abundant chloroplast and oil cells
- 4. in the midrib region consists of vascular bundles, schizogenous oil cavities and starch granules
- 5. lower epidermis single layered and almost similar to the polygonal and rather wavy- walled, numerous of anomocytic stomata present

## Characters of the powdered drug

Greenish powder, aromatic odour, pungent and slightly hot taste.

## The diagnostic characters are:

- 1. upper epidermis with vascular bundles and oil glands
- 2. lower epidermis with anomocytic stomata
- 3. oil cells
- 4. spiral vessels
- 5. scalariform vessels
- 6. trichomes

## Identification

- A. Add 1 mL of concentrated sulphuric acid to 2 mL of chloroform extract of the sample, from the side of the test tube. Red colour is produced in the chloroform layer.
- B. Allow 0.1-0.2 mL of the petroleum extract of sample to place onto a filter paper and leave it at room temperature for a period of 24 hours. Any greasy mark is left on filter paper within 24 hours.

## TLC analysis

Extract 1 g of powdered drug with 10 mL of methanol under reflux on water bath for one hour. Cool and filter. Filtrate is used for chromatography.

Application volume	:	10 μL
Developing solvent system	:	Toluene: Ethyl acetate (97:3)
Spray reagent	:	Vanillin-sulphuric acid
Stationary phase	:	Silica gel G (A & D are glass

Vanillin-sulphuric acid Silica gel G (A & D are glass plates, B & C are aluminium sheets  $GF_{254}$ )



#### A B C

R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.94-0.98	Brown	Brown	Red	Bluish black
0.84-0.86	Faint brown	Ш	Red	Pink
0.78	Green	Ш	Red	Brown
0.70	Light green	Ш	Red	Faint green
0.63-0.66			Faint red	Violet
0.56		Ш	Faint red	Faint brown
0.46		Ш	Violet	Brown
0.41	Yellow	Ш	Brown	
0.16	Faint yellow	Ш	Light brown	

- Loss on drying at 105°C
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations

- : Not more than 5.0 %
- Not more than 1 %Not more than 13.5 %
- Not more than 13.5 %
  Not more than 4.85 %
- Not more than 4.85 °
  Not less than 10.2 %
- : Not less than 5.2 %
- : Not less than 5.2 %
- : Traditional Medicine Formulations (TMFs)<sup>69</sup>- 4/39/54/Supp: 1/2/17/22/23

D

- Traditional therapeutic uses : Indigestion, fever, constipation, inflammation, cough, foul smelling oral disease
- Research reports : Antibacterial<sup>10,11,12,13,14,15,16</sup>
  - antihyperglycemic<sup>17</sup> and smooth muscle relaxant<sup>18</sup> and antiasthmatic<sup>83</sup> activities

## **Betel Folium**



Transverse section of Piper betle L. leaf

- 1. Cuticle
- 2. Upper epidermis
- 3. Hypodermis
- 4. Palisade
- 5. Spongy chloroplastics
- 6. Collenchyma
- 7. Oil cells
- 8. Xylem
- 9. Phloem
- 10. Collenchyma
- 11. Glandular trichome
- 12. Lower epidermis



Characters of the powdered drug

- a. Upper epidermis with vascular bundles and oil glands
- b. Lower epidermis with anomocytic stomata
- c. Oil droplets
- d. Spiral vessels
- e. Scalariform vessels
- f. Trichome

## **Black pepper Fructus**

Piper nigrum L. (I	Piperaceae)	ငရုတ်ကောင်း (n <u>ga</u> jou' kaun:)
Synonym(s)	- Piper trioicum Roxb.	
	Piper malabarense C.D	С.
	Piper baccatum C.DC.	
	Piper glyphium Hoffmg	g.
	Piper rotumdum Noron	ıha.
	Piper spurium Link.	
Other name(s)	- Black pepper (English)	
Part (s) used	- Fruit	

### Definition

Black pepper fructus consists of the dried mature fruit of *Piper nigrum* L. (Piperaceae).

## Description of the part used

## Macroscopic characteristics

Fruits are drupes, globose or ovoid. Externally brownish to black with wrinkled surface. Single seeded, white in colour. Odour aromatic and characteristic, taste strongly pungent and hot.

## Microscopic characteristics

Transverse section of Piper nigrum L. fruit shows:

- 1. epicarp composed of a single layered tabular epidermis having a distinct cuticle with dark brown to blackish contents
- 2. 2-3 layers of thin-walled parenchyma present below the epidermis intermingle with 1-2 layers of radially elongated lignified stone cells
- 3. a broad zone of mesocarp filled with a big band of tangentially elongated parenchymatous cells, containing a few isolated, tangentially elongated oil cells in outer region. Collateral fibrovascular bundles and a regular row of oil cells present in the inner region of mesocarp

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  - 4. a row of beaker-shaped stone cells lie in endocarp
  - 5. a single layer of yellow coloured testa composed of a thick-walled sclerenchymatous cells
  - 6. perisperm consists of parenchymatous cells containing oil globules, abundant starch and a few aleurone grains

## Characters of the powdered drug

Brownish powder, strongly characteristic odour and very strong pungent and hot taste. The diagnostic characters are:

- 1. stone cells with reddish brown contents from epicarp
- 2. beaker-shaped stone cells from endocarp
- 3. masses of cells containing abundant starch, aleurone grains and oil globules from perisperm

#### Identification

- A. Dissolve a few mg of alcoholic extract of the powder in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 ml of Dragendorff's reagent, orange precipitate is produced immediately.
- B. Add 1 mL of concentrated sulphuric acid to 2 mL of chloroform extract of the sample, from the side of the test tube. Red colour is produced in the chloroform layer.
- C. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, pink colour is produced.
- D. Add 0.5 mL of sodium hydroxide and 1 mL of Benedict,s solution to 0.5 mL of aqueous extract of powder and then boiled for 5 minutes. A brick red coloured precipitate is produced.

#### **TLC analysis**

To 2 g of powdered drug add 20 mL of 95 % ethanol, shake for 30 minutes, allow to stand for overnight, filter and use the filtrate for chromatography.

Application volume :  $5 \,\mu L$ 

Developing solvent system : Mixture of toluene and ethyl acetate (80:20)

Spray reagent Stationary phase

- : Vanillin-sulphuric acid
- : Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.18		Brown		
0.59		Brown		
0.5		Brown		
0.41	Yellow	Brown	Yellow	Yellow
0.26		Brown	Light yellow	
0.23			Light blue	

- Loss on drying at 105°C
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important formulation

- : Not more than 12.64 %
- : Not more than 2 %
- : Not more than 4.70 %
- Not more than 0.10 %
- : Not less than 12.26 %
- : Not less than 15.40 %
- : Traditional Medicine Formulations (TMFs)<sup>69</sup>-1/23/24/29/34/40/42/45/ Supp: 2/7/9/14/27

- Traditional therapeutic uses : Fever, gastro-intestinal disease, ٠ Menstrual disorder, diarrhoea
- : Antibacterial activity<sup>7,10,14,19</sup> • Research reports

## **Black pepper Fructus**



- Testa 7.
- 8. Perisperm consists of aluerone grains, starch and oil globules

Source: Mon state and Taninthayi regions

## Centellae Herba

Centella asiatica L. Urban (Apiaceae)		မြင်းခွာ/မြန်မာမြင်းခွာ (mjin: khwa/		
		mjama mjin: khwa)		
Synonym(s)	- Hydrocotyl asiatica			
	<i>Centella coriacea</i> Na	nnfd.		
	Hydrocotyl lunata La	am.		
	Trisanthus cochinchi	nensis Lour.		
Other name(s)	- Penny wort (English	)		
	Asia Penny wort (En	glish)		
	Indian water Nawel	Indian water Nawel wort (English)		
	Centella (English)			
Part(s) used	- Whole plant / Aerial	parts		

#### Definition

Centellae herba consists of the aerial parts or whole plant of *Centella asiatica* L. Urban (Apiaceae)

## Description of the part used

#### Macroscopic characteristics

Dried aerial parts or whole plant, greenish brown, stoloniferous plant. Stem thin, long. Leaves thin, orbicular or reniform with crenate margin, cordate at the base, petiole long. Slightly characteristic odour and slightly bitter and sweet taste.

#### Microscopic characteristics

#### Transverse section of Centella asiatica L. Urban leaf shows:

- 1. a layer of rectangular-shaped upper epidermis which are straight- walled with anisocytic stomata in surface view, covered with cutin
- 2. under the epidermis mesophyll layer composed of a large palisade and several layers of spongy parenchyma
- 3. oil ducts and calcium oxalate crystals present in the mesophyll and around the vascular bundle

- 4. vascular bundle is collateral, the fibrovascular bundle consists of phloem and xylem tissue
- 5. the midrib region shows a few large of collenchyma cells under and the both of epidermis
- 6. the lower epidermis is prominent cuticular striation and anisocytic stomata

#### Characters of the powdered drug

Greenish powder, slightly characteristic odour, slightly bitter and sweet taste. The diagnostic characters are:

- 1. fragment of lamina
- 2. fibre and vessel from stolon part
- 3. fibres
- 4. lower epidermis with anisocytic stomata
- 5. upper epidermis of polygonal cells with anisocytic stomata
- 6. rosette and prismatic calcium oxalate crystals

#### Identification

- A. Shake vigorously 500 mg of powder sample with 10 mL of water, a long lasting form is produced.
- B. Add 2 mL of acetic anhydride solution to 1 mL of petroleum ether extract of the drug in chloroform, followed by 1 mL of concentrated sulphuric acid. Greenish colour is developed which turns to blue.
- C. Add 1 mL of concentrated sulphuric acid to 2 mL of chloroform extract of the drug, carefully, from the side of the test tube. Red colour is produced in the chloroform layer.

#### **TLC analysis**

One gram of dried powder is extracted in 20 mL of 70% ethanol under reflux on a water bath for 30 minutes and filter. Evaporate the solvent and redissolve the residue in 1 mL of ethanol for chromatography.

Application volume	:	6 μL
Developing solvent system	:	Chloroform: Methanol: n-butanol: water (5:4:3:1)
Spray reagent	:	Anisaldehyde-sulphuric acid

## Stationary phase : Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.64-0.63		Brown		Bluish black
0.48-0.44		Brown	Blue	Yellow
0.35-0.33		Brown	Blue	Brown
0.23-0.21		Brown		Brown
0.18-0.14		Brown	Blue	
0.08-0.09	Yellow	Brown		Yellowish brown

:

:

:

:

- Loss on drying at 105°C
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- : Not less than 11.50 %

Not more than 9.80 %

Not more than 1.00 %

Not more than 10.85 %

Not more than 0.02 %

: Not less than 20.60 %

- Myanmar Herbal Pharmacopoeia Volume I 29
- Traditional therapeutic uses : Memory impairment, oliguria and burning mituration, eye disease

•

Research reports : Antipeptic ulcer<sup>20</sup> and antioxidant activities<sup>21</sup>

## Centellae Herba



Transeverse section of Centella asiatica L. Urban leaf

- 1. Upper epidermis
- 2. Palisade cells
- 3. Calcium oxalate crystal
- 4. Collenchyma
- 5. Oil duct
- 6. Spongy cells
- 7. Phloem
- 8. Xylem
- 9. Stomata
- 10. Parenchyma
- 11. Collenchyma
- 12. Lower epidermis



- Characters of the powdered drug
- a. Fragment of lamina
- b. Fibre and vessel
- c. Fibre
- d. Lower epidermis with anisocytic stomata
- e. Upper epidermis of polygonal cells with anisocytic stomata
- f. Rosette and prismatic calcium oxalate crystals

## Croton oblongifoliae Cortex

Croton oblongifolius Roxb. (Euphorbiaceae)	သက်ရင်း/သက်ရင်းကြီး
	(1 1

(the' jin: / the' jin: gji:)

Synonym(s)	-	Croton roxburghii Balak.
		Croton elaeocarpifolius Wall.
		Croton laevigatus Wall.
Other name(s)	-	Ganasur (India)
		Trapung (Cambodia)
		Plao Yai (Thailand)
Part(s) used	-	Root bark, Stem bark

### Definition

Croton oblongifoliae cortex consists of the root bark of *Croton oblongifolius* Roxb. (Euphorbiaceae).

## Description of the part used

## Macroscopic characteristics

Sub-cylindrical, outer surface grey to pale brown, with wrinkled and longitudinal striations. Inner surface white and fibrous. Odour slight, taste astringent.

## Microscopic characteristics

## Transverse section of Croton oblongifolius Roxb. root shows:

- 1. outermost 4-6 layers of rectangularly elongated cork cells
- 2. followed by cortex composed of thick-walled polygonal, tangentially elongated, the cells toward more elongated and flattened, containing small rosette-shaped calcium oxalate crystals and orange brown contents
- 3. in phloem region, composed of thin-walled sieve tube, phloem fibres and companium cell. Sclereids are also present
- 4. innermost region is the lignified xylem forming the compact central corse

#### Characters of the powdered drug

Light brown powder, slight odour and slight astringent taste. The diagnostic characters are:

- 1. cork fragment
- group of sclereids 2.
- 3. parenchyma with rosette calcium oxalate crystals from cortex region

#### **Identification:**

Add 2 mL of acetic anhydride solution to 1 mL of petroleum ether extract of the drug in chloroform followed by 1 mL of sulphuric acid. Greenish blue colour is produced.

#### **TLC analysis:**

Extract 1 g of coarse powder sample in a test tube with 5 mL of dichloromethane by shaking for 15 minutes at room temperature. Filter and filtrate is used for chromatography.

Application volume	:	10 µL
Developing solvent system	:	Hexane: Ethyl acetate (10:3)
Spray reagent	:	Vanillin-sulphuric acid
Stationary phase	:	Silica gel G (A & D are glass

Vanillin-sulphuric acid	
Silica gel G (A & D are glass plates,	B & C

are aluminium sheets  $GF_{254}$ 



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.96		Violet	Greenish blue	Purple
0.89		Violet		Blue
0.81		Violet	Light blue	Violet
0.75		Faint	Light blue	Bluish black
0.69		Faint		Purple
0.54-0.50		Faint	Light blue	Purple
0.43-0.39		Faint	Light blue	Violet
0.35		Faint	Light blue	Violet
0.28			Light blue	Violet
0.13			Light blue	Purple

- Loss on drying at 105°C •
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- **Important Formulations**
- Traditional therapeutic uses : •

: Not more than 4.14 %

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- Not more than 2 % :
- Not more than 8.25 % :
- Not more than 0.04 % :
- Not less than 11.5 % :
  - Not less than 9.25 % :
    - Traditional Medicine Formulations : (TMFs)<sup>69</sup>-27,28
    - Indigestion, constipation, inflammation

Source: Kayah State

## **Croton oblongifoliae Cortex**



## Curcuma Rhizoma

Curcuma longa\_L. (Zingiberaceae)

နနွင်းတက်/နနွင်း (n<u>a</u>nwin: de'/ n<u>a</u>nwin)

- Curcuma domestica Val.
  - Tumeric (English)
     Indian saffron (English)
     Banley (Cambodia)
     Aurukesafur (Arab)
     Kunyit (Malaysia)
     Kunir (Java)
     Kamin (Thailand)
     Jiánghuáng (China)
     Curcuma (French)
     Rhizome

Part(s) used

Synonym(s)

Other name(s)

## Definition

Curcuma Rhizoma consists of the dried rhizome of *Curcuma longa* L. (Zingiberaceae).

## Description of the part used Macroscopic characteristics

Primary rhizome known as bulb is thick and ovate or pear-shaped. Lateral rhizome known as finger is curved or nearly straight, ovate or oblong or pyriform or cylindrical in shape, slightly bent, outer surface is yellowish brown colour, longitudinally wrinkled and marked with transverse ring. Internally bright orange colour and waxy appearance. Characteristic odour and warm bitter taste.

### Microscopic characteristics

#### Transverse section of *Curcuma longa* L. rhizome shows:

- 1. epiblema layer composed of a layer of rectangular cells
- 2. cork consisting several layers of rectangular, thin-walled parenchyma
- 3. cortex characterized by the presence of thin-walled parenchymatous cells containing gelatinized starch grains volatile or bright yellow colouring matter

4. pseudoendodermis layer composed of thin-walled rectangular cells divides the cortical zone into the outer and inner parts. Vascular bundles found scattered. Vessels mostly spiral, a few with reticulate and annular thickenings

#### Characters of the powdered drug

Bright orange-yellow powder, characteristic aromatic odour, warm and bitter taste. The diagnostic characters are:

- 1. polygonal cork cells in surface view
- 2. cork cells rectangular in sectional view
- 3. parenchyma filled with gelatinized starch
- 4. altered starch mass
- 5. starch granules

#### Identification

- A. Dissolve a small amount of ethanol extract of sample in 1 mL of distilled water, add sodium hydroxide solution. Yellow colour is produced.
- B. Warm 500 mg of powder sample in 5 mL of methanol for 5 minutes and filter. 2 mL of filtrate are added a few drops of sulphuric acid. Ggreen colour is produced.
- C. Shake vigorously 500 mg of powder sample in 10 mL of water, a long lasting form is produced.
- D. Dissolve 0.015 g of Iodine and 0.075 g of potassium iodide in 5 mL of distilled water, and add 2-3 mL of an aqueous extract of the sample. Blue colour is produced.

#### **TLC analysis**

Dissolve 1 g of powder sample in 10 mL of methanol, and shaking for a while, allow to stand for 5 minutes. Filter and filtrate is used for chromatography.

:

- Application volume Solvent system
- Spray reagent
- Stationary phase

- : 4 μL: Dichloromethane: Methanol (100:3)
- : Vanillin-sulphuric acid
- Silica gel G (A & D are glass plates, B & C are aluminium sheets  $GF_{254}$ )



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.78	Yellow	Violet	Light blue	Red
0.75	Yellow	Yellowish brown	Yellowish brown	Red
0.57			Pale greenish blue	
0.55	Yellow	Yellowish brown	Yellowish brown	Red
0.37			Pale yellow	
0.35	Yellow	Yellowish brown	Yellowish brown	Red
0.30			Pale orange	

- Loss on drying at 105°C
  - Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations

- : Not more than 16.56 %
- : Not more than 1.52 %
- : Not more than 10.5 %
- : Not more than 1.7 %
- : Not less than 7.8 %
- : Not less than 7.2 %
- : Traditional Medicine Formulations (TMFs)<sup>69</sup>-6/32/40/46/53/54/ Supp: 1/3/12/13/17

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  - Traditional therapeutic uses : Diarrhoea, indigestion, fractures, inflammation
  - Research reports
- : Antidiarrhoeal<sup>22</sup>, antioedema<sup>23</sup>, antipeptic ulcer<sup>24</sup>, hypoglycemic<sup>25</sup>, antioxidant<sup>26</sup>, hypocholestrolemic<sup>82</sup> and antibacterial<sup>19</sup> activities



Transverse section of Curcuma longa L. Rhizome

- 1. Epiblema
- 2. Cork
- 3. Oil droplets
- 4. Gelatinized starch mass
- 5. Spiral vessel
- 6. Starch granules
- 7. Yellow coloring matter
- 8. Pseudoendodermal cells
- 9. Vascular bundle

Source: Mon state, Shan state and Taninthayi regions

## **Emblica Fructus**

ဆီးဖြူ (zi: bju:)

Phyllanthus emblica L.	(Euphorbiaceae)
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Emblica officinalis L. Synonym(s) Other name(s) Emblic Myrobalan (English) -Malacca Tree (English) Indian Gooseberry (English) Ambala (India) Part(s) used Fruit

#### Definition

Emblica fructus consists of the fruit of Phyllanthus emblica L. (Euphorbiaceae).

## Description of the part used

#### Macroscopic characteristics

Shining yellowish green, globose, 6 obscure vertical furrows, seeds, trigonous, two each in three crustaceous cocci. Taste sour and astringent, odour slightly characteristic.

### **Microscopic characteristics**

### Transverse section of Phyllanthus emblica L. fruit shows:

- 1. a layer of epicarp cells are rectangular-shaped and outer walls are highly cutinized
- 2. under the epicarp layer consists of different types of sclereids occuring as a single or small groups
- 3. vascular bundles composed of spiral vessels are scattered throughout the inner mesocarp
- 4. prismatic and rosette calcium oxalate crystals are present in the thin-walled parenchyma

#### Characters of the powdered drug

Brown powder, slightly characteristic odour, sour and astringent taste. The diagnostic characters are:

- 1. epicarp in surface view
- 2. sclereids
- 3. fibre sclereids
- prismatic calcium oxalate crystals 4.
- 5. rosette calcium oxalate crystals

## Identification:

- A. To 2 mL of aqueous extract of the sample add 1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boil the contents of the test tube for few minutes. A brick red coloured precipitation is produced.
- B. One mL of alcoholic extract of sample is dissolved in 1 mL of water and added sodium hydroxide solution. Yellow colour is produced.
- C. One mL of alcoholic extract of sample is dissolved in 1 mL of water and 2 drops of 10 % ferric chloride solution. Blue colour is produced.

### **TLC** analysis

Dissolve 1 g of powder sample in 5 mL of ethanol, and shaking for a while, allow standing for 5 minutes. Filter and filtrate is used for chromatography.

Application volume : 3 μL Solvent system: Chloroform Chloroform: Ethyl acetate: Acetic acid : (60:35:5)

Spray reagent Stationary phase

- Iodine vapour :
- Silica gel G (A & D are glass plates, B & C are aluminium sheets  $GF_{254}$



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.60-0.58	Yellow	Brown	Black	Deep yellow
0.08-0.3	Yellow	Brown	Black	Yellow

:

:

:

:

:

:

: Not more than 7.4 %

Not more than 1.0 %

Not more than 2.9 %

Not more than 0.3 %

Not less than 26.8 %

Not less than 33.4 %

- Loss on drying at 105°C
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations
- Traditional therapeutic uses :
- Research reports
- (TMFs)<sup>69</sup>-22/ Sup.: 9/26
  Anti-aging and general well-being, menorrhagia, insomnia
  Antimicrobial<sup>13,15,27,</sup> hepatoprotective<sup>28,29</sup> and
  - hypocholesterolemic<sup>30</sup> activities

**Traditional Medicine Formulations** 

#### Source: Taninthayi and Magwe regions





Transverse section of Phyllanthus emblica L. fruit

- 1. Cuticle
- 2. Epicarp
- 3. Group of sclereids
- 4. Sclereid
- 5. Parenchyma containing prismatic crystals
- 6. Rosette calcium oxalate crystals
- 7. Fibrous sclereids
- 8. Spiral vessel

## Galangae Rhizoma

Κı	aempferia galang	a L. (	Zingiberaceae)	ကွမ်းစားဂမုန်း	(kun: sa: <u>ga</u> moun:)
Synonym(s) - Kaempferia pr Kaempferia pl			Kaempferia procu Kaempferia planta	<i>mbens</i> Noroncha. <i>aginifolia</i> Salisb.	
			Kaempferia latifo	lia Donn.	
Other name(s)		-	East Indies galing	ale (English)	
			Kaempferia, Faux	galanga (French)	
			Chandramula (In	dia)	
			Cekur (Malaysia)		
			Kencur (Java)		
Pa	art(s) used	-	Dried Rhizome		

#### Definition

Galangae rhizoma consists of dried rhizome of *Kaempferia galanga* L. (Zingiberaceae).

## Description of the part used

#### Macroscopic characteristics

Rhizome includes little ovate tuber. Outer brownish yellow, rootlets or rootlets scar on the surface, inner off-white colour. Fragile and starchy. Odour aromatic, taste pungent.

#### Microscopic characteristics

#### Transverse section of Kaempferia galanga L. rhizome shows:

- 1. cork layers consisting several layers of rectangular cells
- 2. cortical parenchyma composed of cortical or polygonal cells, containing vascular bundle and starch granules
- 3. endodermis with casparian strip adjoining pericycle
- 4. pith parenchyma with slightly thick-walled cells, consisting starch granules and scattered with vascular bundles
- 5. oil cells present in both cortical and pith parenchyma

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#### Characters of the powdered drug

Off-white powder, aromatic odour and pungent taste. The diagnostic characters are -

- 1. parenchyma containing starch granules and yellow oil drops
- 2. scalariform vessel
- 3. cork in sectional view
- 4. numerous ovoid or spheroid-shaped starch granules

#### Identification:

- A. Add 2 mL of acetic anhydride solution to 1 mL of petroleum ether extract of the drug in chloroform, followed by 1 mL of sulphuric acid. Greenish blue colour is produced.
- B. Dissolve a small amount of aqueous extract of sample in 2 mL of distilled water, and add a few drops of 10 % aqueous ferric chloride solution. Blue colour is produced.

#### TLC analysis:

Add 1 g of sample powder in 5 mL of methanol, shake vigorously for 15 minutes, allow to stand and filter. Filtrate is used for Chromatography.

Application volume	:	5 μL
Solvent system	:	Hexane: Ethyl acetate (7:3)
Spray reagent	:	Anisaldehyde-sulphuric acid
Stationary phase	:	Silica gel G (A, D & E are glass plates, B &
		C are aluminium sheets $GF_{254}$ )



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray	365 nm after spray
7.5-7.4		Black		Violet	Violet
7.2-7.0				Blue	Violet
6.5-6.4			Green	Green	
6.2				Green	Yellow
5.8-5.7		Light black		Blue	Blue
5.5			Light yellow	Violet	Light blue
5.2-5.0		Light black		Dark blue	Dark blue
4.5-4.4		Light black	Green	Greenish blue	Violet
3.8		Light black			Light blue
3.5			Light yellow	Violet	
2.8				Greenish blue	
2.5-2.2		Light black	Green	Bluish black	Light blue

• Lo	ss on dryi	ing at 105°C
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- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract

- : Not more than 11.25 %
- er : Not more than 2 %
- : Not more than 6.45 %

:

- : Not more than 1.55 %
  - : Not less than 7.65 %

Not less than 9.25 %

Sourc

Important Formulations : Traditional Medicine Formulations (TMFs)<sup>69</sup>-7/14/15
 Traditional therapeutic uses : Sore eye, inflammation, wounds, giddiness, palpitation, anti-aging & well-being agent, poisoning, hiccup, nausea and vomiting, indigestion
 Research report : Antimicrobial activity<sup>31</sup>

Source: Shan state, Taninthayi and Magway regions

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## **Galangae Rhizoma**



Characters of the powdered drug

- a. Parenchyma with yellow drops and starch grains
- b. Scalariform vessel
- Cork in sectional view с.
- d. Starch granules

Transverse section of Kaempferia galanga L. rhizome

- 1. Cork layers
- 2. Oil cells
- 3,6. Vascular bundle
- 4,7. Starch granules
- 5. Endodermis with casparian strip

#### Leadwort Stem

Plumbago rosea L. (Plumbaginaceae)	
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ကန့်ချုပ်နီ (kan. gjou' ni)

Other name(s) Rosy flowered leadwort (English) Leadwort (English) Fire plant (English) **Officinal leadwort (English)** Chittermul (Arab) Cheraka merah (Malaysia) Dried stem, whole plant Part(s) used

#### Definition

Leadwort stem consists of the stem of Plumbago rosea L. (Plumbaginaceae).

## Description of the part used

### Macroscopic characteristics

Reddish brown short stout stem, cylindrical, bark thin, longitudinally striated and glabrous. Slightly astringent taste, odour not characteristic.

### **Microscopic characteristics**

#### Transverse section of *Plumbago rosea* L. stem shows:

- 1. outermost epidermis layer composed of rectangular cells
- 2. under the epidermis, collenchymatous cells are found
- 3. vascular bundles consists of vascular cambium, phloem cells and xylem elements. In each bundle separated by uni-biseriate rays
- 4. pith consists of parenchymatous cells, tannin present

### Characters of the powdered drug

Reddish brown powder, slight odour not characteristic, astringent taste. The diagnostic characters are:

- 1. thin-walled epidermal cells
- 2. parenchymatous pith cells

### Identification:

- A. In a test tube containing 0.5-1.0 ml of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.
- B. Dissolve a small amount of aqueous extract of sample in 2 mL of distilled water, and add a few drops of 10 % aqueous ferric chloride solution. Blue colour is produced.

## TLC analysis

Spray reagent

To 1 g of powdered drug add 5 mL of methanol, shake for 30 minutes, and allow standing for overnight, filter and using the filtrate for chromatography.

Application volume Developing solvent system

- 2 μL
  Toluene: Ethyl acetate, Formic acid: Methanol (3:3:0.8:0.2)
- : Anisaldehyde-sulphuric acid
- Stationary phase
- Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.78	Greenish yellow		Light blue	
0.70		Light brown	Pink	
0.61	Yellow		Blue	Yellow
0.55		Light yellow	Violet	
0.31			Light blue	

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:

:

- Loss on drying at 105°C : Not more than 9.22 %
  - Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
  - Water soluble extract
- Important Formulations
- Traditional therapeutic uses :
- Not less than 6.80 %
   Traditional Medicine Formulations (TMFs)<sup>69</sup>- 12/23/24/27/31/34/35A/ 35B/37/38/40/Supp: 9/17

Not more than 1.00 %

Not more than 5.05 %

Not more than 0.01 %

Not less than 9.20 %

Amenorrhoea, diarrhoea, diabetes Mellitus and vitiligo

Source: Taninthayi region

## Leadwort Stem



Transverse section of *Plumbago rosea* L. stem Character of the powdered drug

- 1. Epidermis
- 2. Collenchyma
- 3. Xylem
- 4. Parenchyma
- 5. Tannin

- a. Parenchymatous pith cells
- b. Thin walled epidermal cells

50µm

## Morindae citrifoliae Fructus

Morinda citrifolia L. (Rubiaceae)

ရဲယို ( je: jou )

- Morinda bracteata Roxb. Morinda littoralis Blanco.
- Other name(s) Indian mulberry (English) East Indian mulberry (English) Awl tree (English) Noni (English) Morinde (French) Mulberry (India) Tombongaso (Philippine) Mengkudu (Malaysia) Part (s) used Fruit

#### Definition

Synonym(s)

Morindae citrifoliae fructus consists of the unripe fruit of Morinda citrifolia L. (Rubiaceae).

## Description of the part used Macroscopic characteristics

Unripe fruit, syncarpium berries, polygonal marking on the outer surface, ovoid to elongated, greenish white, yellow when ripe. Seeds numerous. Odour disagreeable, taste sour.

### **Microscopic characteristics**

#### Transverse section of Morinda citrifolia L. fruit shows:

- 1. epicarp composed of rectangular or ovoid lignified and pitted cells and thinwalled parenchyma. Beneath the epicarp sclereids groups are found
- 2. mesocarp consisting of parenchymatous cells containing starch granules, rosette crystals and acicular calcium oxalate crystals. Collateral vascular bundles are scattered in mesocarp region

- 3. spermoderm composed of narrow lignified fibre cells
- 4. endocarp is closed to the centre axis, packed round parenchyma cell

#### Characters of the powdered drug

Brown powder, disagreeable odour, slightly sour.

The diagnostic characters are:

- 1. parenchyma cells with rosette and acicular calcium oxalate crystals
- 2. vessels

54

3. sclereids

#### Identification

- A. Dissolve a small amount of ethanol extract of sample in 1 mL of distilled water, add sodium hydroxide solution. Yellow colour is produced.
- B. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drop of 10 % ferric chloride solution, blue colour is produced.
- C. Two mL of aqueous extract of the sample is acidified and add 1 mL of a mixture of equal parts of Fehling's solution 'A' and Fehling's solution 'B' and boil the contents of the test tube for few minutes. Brick red precipitate is formed.

#### TLC analysis

Extract 1 g of sample powder in 10 mL of ethanol for 10 minutes, filter and filtrate is evaporated to dryness. Dissolve dried extract in 0.3 mL of benzene for chromatography.

- Application volume
- Solvent system
- Spray reagent
- Stationary phase

- : 10 μL
- : Benzene: Ethyl acetate: Formic acid (8:2:1)
- : Anisaldehyde-sulphuric acid
- : Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



A B

Not more than 1 %

: Not less than 26.58 %

Not more than 6.65 %

D

R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.75			Light yellow	Pink
0.70		Black		Violet
0.48			Light yellow	
0.45		Black		Violet
0.42			Grey	
0.35		Blue	Blue	Pink

- Loss on drying at 105°C : Not more than 3.5 %
- Foreign matter
- Total ash
  - Acid-insoluble ash : Not more than 0.5 %
  - Ethanol soluble extract : Not less than 13.16 %

:

:

- Water soluble extract
- Traditional therapeutic uses :
- Research reports

Infection, immunodeficiency
 Hypoglycemic<sup>32</sup>, antioxidant <sup>33</sup>, hypocholesterolemic<sup>33</sup> and antidiarrhoeal<sup>34</sup> activities

Source: Mon state and Taninthayi regions

## Morindae citrifoliae Fructus



Transverse section of Morinda citrifolia L. fruit

- 1. Epicarp
- Sclereids 2.
- Oil globules 3.
- Starch 4.
- Acicular crystal 5.
- Rosette crystal 6.
- 7. Vessel
- 8. Fibres

## **Moringa Cortex**

Moringa oleifera Lam. (Moringaceae)

ဒန့်သလွန် (dan. d<u>a</u>lun)

- Synonym(s) Moringa polygona DC. Moringa pterygosperma Gac. Moringa nuxben Perr.
- Local name(s) Horse radish tree (English) Drum stick tree (English) Murungai (India) La ken (China) Bois nèphrètigue (French) Stem bark, leaf

Part(s) used

### Definition

Moringa cortex consists of the dried stem bark of Moringa oleifera Lam. (Moringaceae).

## Description of the part used Macroscopic characteristics

Pieces of dried stem bark, outer surface dark brown with lenticels, inner surface light brown, corky with longitudinal fibres, adhering soft wood. Slightly characteristic odour, astringent and bitter taste.

## **Microscopic characteristics**

#### Transverse section of Moringa oleifera Lam. bark shows:

- 1. numerous layers of brownish cork consisting of rectangular tangentially flattened cells
- 2. cortex layer composed of groups of sclereids and parenchymatous cells containing rosette calcium oxalate crystals, prismatic calcium oxalate crystals, oil globules and starch granules
- 3. phloem consisting mainly of large patches phloem fibres and phloem parenchyma. Rosette and prismatic calcium oxalate crystals, oil globules and starch grains are also present in phloem parenchyma cells. Mucilagenous

cavities found scattered, filled with mucilage. Phloem rays numerous and composed of elongated thin-walled cells

#### Characters of the powdered drug

Brownish powder, slightly characteristic odour, astringent and bitter taste. The diagnostic characters are:

- 1. polygonal cork cells in surface view
- 2. rectangular cork cells in sectional view
- 3. stone cells
- 4. rosette and prismatic crystals of calcium oxalate
- 5. lignified fibres
- 6. thin-walled parenchyma containing rosette calciulm oxalate crystals

#### Identification

- A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, pale pink colour is produced.
- B. Dissolve a small amount of ethanol extract of sample in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 mL of Dragendorff's reagent, orange-red colour is produced.
- C. Dissolve a small amount of ethanol extract of sample in 1 mL of distilled water, add sodium hydroxide solution. Yellow colour is produced.

#### TLC analysis

Macerate 1 g of powder in 10 mL of dichloromethane for overnight, filter and filtrate is used for chromatography.

- Application volume Developing solvent system Spray reagent Stationary phase
- : 10 μL : Hexane: E
  - Hexane: Ethyl acetate (8:2)
- : Analsaldehyde-sulphuric acid
- : Silica gel G (A, D & E are glass plates, B & C are Aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	After spray visual	After spray 365
0.93				Violet	Violet
0.68-0.60		Faint yellow	Greenish blue	Violet	Pale yellow
0.46			Pale yellow	Red	Orange
0.37			Pale yellow	Red	Red
0.22			Yellow	Yellow	Yellow

- Loss on drying at 105°C : Not more than 9.1 %
  - : Not more than 1.0 %

:

:

:

Total ash

Foreign matter

٠

- Acid-insoluble ash
- Ethanol soluble extract :
- Water soluble extract
- Traditional therapeutic uses :

Menstrual disorder, tingling and numbness, oedema, dry cough, menorrhagia, oligospermia

Not more than 8.2 %

Not more than 0.7 %

Not less than 2.5 %

Not less than 8.4 %

- Myanmar Herbal Pharmacopoeia Volume I 60
  - Research reports

: Antihyperglycemic<sup>35</sup>, hypotensive<sup>36</sup>, antimicrobial<sup>37</sup> and hypocholesterolemic<sup>38</sup> activities

**Moringa Cortex** 

2.

3.

4.

6.

9. Ray



Thin-walled parenchyma containing rosette calcium oxalate crystals

Source: Shan state and Mandalay regions

## **Neem Folium**

Azadirachta indica	uss (Meliaceae)	ගහ (t <u>a</u> ma)	
Synonym(s)	-	Melia azadirachta Linn. Melia indica Brand. Melia fraxinifolia Salisb. Melia pinnata Stockes. Melia japonica Hassk. Melia parviflora Moom.	
Other name(s)	-	Neem (English) Margosa (English) Indian Lilac (English) Azadarach (English) Leaf	
Part(s) used	-	Leaf	

#### Definition

Neem folium consists of the leaves of *Azadirachta indica* A. Juss (Meliaceae).

#### Description of the part used

#### Macroscopic characteristics

Leaves compound, leaflets with oblique base, opposite, lanceolate, upper surface dark green, paler beneath, apex acute, margin serrate. Characteristic odour and bitter taste.

#### Microscopic characteristics

### Transverse section of Azadirachta indica A. Juss leaf shows:

- 1. epidermis covered with cuticle, unicellular trichomes are present
- 2. two layers of palisade cells below the upper epidermis
- 3. spongy parenchyma composed of 5-6 layered thin-walled cells
- 4. midrib region composed of several layers of collenchymatous cells
- 5. anomocytic stomata present only on lower surface

## Myanmar Herbal Pharmacopoeia Volume I 63

## Characters of the powdered drug

Greenish powder, characteristic odour , bitter taste. The diagnostic characters

#### are:

- 1. leaf fragment in sectional view
- 2. upper epidermis in surface view
- 3. unicellular trichome
- 4. lower epidermis with anomocytic stomata and rosette calcium oxalate crystals

### Identification:

- A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.
- B. Dissolve a small amount of aqueous extract of sample in 2 mL of distilled water, and add a few drops of 10 % aqueous ferric chloride solution. Blue colour is produced.

### TLC analysis:

Macerate 1 g of powder drug in 5 mL of methanol for three hours, filter and filtrate is used for chromatography.

Application volume	:	5 μL
Developing solvent system	:	Toluene: Ethyl acetate: Formic acid:
		Methanol (3:3:0.8:0.2)
Spray reagent	:	Anisaldehyde-sulphuric acid
Stationary phase	:	Silica gel G (A & D are glass plates, B & C
		are aluminium sheets GF <sub>254</sub> )



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.92			Red	
0.82	Yellow	Yellow	Red	Violet
0.75			Greenish blue	Light blue

•	Loss on drying at 105°C	:	Not more than 2.6 %
•	Foreign matter	:	Not more than 9.67 %
•	Total ash	:	Not more than 10.25 %
•	Acid-insoluble ash	:	Not more than 0.7 %
•	Ethanol soluble extract	:	Not more than 16.93 %
•	Water soluble extract	:	Not more than 26.94 %
•	Important Formulations	:	Traditional Medicine Formulation (TMF) <sup>69</sup> -36
•	Traditional therapeutic uses	:	Diabetes mellitus, skin diseases, malaria, fever, dysentery, worm infestation, injuries, oedema

- Research reports
- : Antiulcer<sup>39</sup>, antihyperglycemic<sup>40</sup> antibacterial<sup>7,10,41,42</sup>, mosquito repellant<sup>43</sup> and hypoglycemic<sup>25</sup> activities

## **Neem Folium**



Transverse section of Azadirachta indica A.Juss leaf

- 1. Unicellular trichome
- 2. Collenchymatous cells
- 3. Upper epidermis
- 4. Palisade cells
- 5. Spongy parenchyma
- 6. Vascular bundles
- 7. Lower epidermis



Characters of the powdered drug

- a. Leaf fragment in sectional view
- b. Upper epidermis in surface view
- c. Unicellular trichome
- d. Lower epidermis with anomocytic stomata and rosette calcium oxalate crystals

## Nutmeg Kernel

*Myristica fragrans* Houtt. (Myristicaceae)

ဇာတိပ္စိုလ် (za dei' hpou)

- Synonym(s)-Myristica aromatic Sio.Myristica moschata Thunb.Myristica officinalis L.f.
- Other name(s)-Nutmeg (English)<br/>Pala (Malaysia)<br/>Boch kak (Cambodia)<br/>Jou Tar K'ou, Tou K'ou (China)Part(s) used-Kernel

Definition

Nutmeg kernel consists of the kernel of dried seeds of *Myristica fragrans* Houtt. (Myristicaceae)

### Description of the part used Macroscopic characteristics

Ovoid-shaped fruit, externally brown or reddish brown, dark reddish brown pointed lines and reticulately marked with furrows. Internally light brown with longitudinal striation. Odour aromatic, warm and aromatic taste.

#### Microscopic characteristics

#### Transverse section of Myristica fragrans Houtt. kernel shows:

- 1. the outer perisperm cells are radially flattened and have brownish contents. A few of the cells contain prismatic or disc-shaped crystals. The inner perisperm shows numerous extensive lamellae, corresponding to the furrows on the surface and penetrating into the endosperm
- 2. ruminated endosperm are composed of parenchymatous cells with thin brown walls and oval oil cells and show in their outer part vascular strands composed of lignified vessels and large oil cells

3. the endosperm is composed of parenchymatous cells with thin brown cell walls and containing simple or 2-10 compounds starch grains, globular or irregular in shape with a slit-like hilum. A few tannin cells, containing tannin and starch, occur scattered in the endosperm

#### Characters of the powdered drug

Reddish brown powder, strong aromatic odour, astringent and warm taste. The diagnostic characters are:

- 1. simple or compound globular or irregular-shaped starch grains with slit-like hilum
- 2. parenchyma containing starch grains from endosperm layer

#### Identification:

- A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, pink colour is produced.
- B. Add 1 mL of concentrated sulphuric acid to 2 mL of chloroform extract of the sample from the side of the test tube. Red colour is produced in the chloroform layer.

#### TLC analysis

Extract 1 g of the powder sample in 5 mL of petroleum ether in a test tube by shaking for 30 minutes at room temperature and then filter and filtrate is used for chromatography.

- Application volume
- Developing solvent system
- Spray reagent
- Stationary phase

- : 5 µL
- : Toluene: Ethyl acetate (97:3)
- : Vanillin-sulphuric acid
- : Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.88-0.86	Pale yellow		Violet	Reddish brown
0.59-0.56	Pale yellow		Violet	Yellow
0.45-0.44			Violet	Reddish brown
0.38-0.36	Pale yellow	Light brown	Violet	Purple
0.21		Light brown		Purple
0.18		Light brown		Reddish brown
0.14-0.10	Pale yellow		Violet	Purple
0.06-0.04		Violet	Violet	Brown

- Loss on drying at 105°C :
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations

- : Not more than 13.0 %
- : Not more than 1.0 %
- : Not more than 3.0 %
- : Not more than 0.2 %
- : Not less than 17.6 %
- : Not less than 12.8 %
- Traditional Medicine Formulations (TMFs)<sup>69</sup>- 3/8/10/11/12/16/17/20 /23/24/25/26/29/30/31/33/34/35A /35B/36/37/38/39/40/41/Supp: 4/5/10/15/17/25/27/28

- 70 Myanmar Herbal Pharmacopoeia Volume I
  - Traditional therapeutic uses : Fever, cough, ulcer and tumors, diarrhoea, indigestion, gingivitis,

:

- Research reports
- asthma Antimicrobial<sup>44</sup>, antibacterial<sup>45</sup> and antidiarrhoeal<sup>34</sup> activities

## Nutmeg Kernel



Transverse section of Myristica fragrans Houtt. kernel

- 1. Perisperm
- 2. Vessel
- 3. Oil cells
- 4. Endosperm
- 5. Ruminated endosperm



Characters of the powdered drug

- a. Simple or compound globular or irregular-shaped starch grains with slitlike hilum
- b. Parenchyma containing starch grains from endosperm layer

Source: Mon State

#### Swertia Herba

#### Swertia purpurascens Wall. (Gentianaceae)

(ပန်းခါး/ရှမ်းဆေးခါး) (pan: ga:/shan: hsei: ga:)

Part(s) used - Aerial part

#### Definition

Swertia herba consists of the aerial part of *Swertia purpurascens* Wall. (Gentianaceae)

#### Description of the part used

### Macroscopic characteristics

Yellowish herb, glabrous, with cylindrical stem. Leaf oblong or lanceolate, flowers small, pale red-purple, a darker complete ring at its base, 5 merous, filaments dilated downwards, united into a short tube free from the corolla.Odour aromatic, taste bitter.

#### Microscopic characteristics

#### Transverse section of Swertia purpurascens Wall. stem shows:

- 1. cork 4-6 layers, composed of rectangular cells
- 2. cortex layer composed of 10-12 layers of thick-walled cells
- 3. under the cortex layer pith consists of thin-walled parenchyma cell surrounded by vascular bundles

#### Characters of the powdered drug

Yellowish brown powder, aromatic odour and strongly bitter taste. The diagnostic characters are:

- 1. pollens from flower
- 2. cork in sectional view
- 3. parenchyma cells from pith

#### Identification:

A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid, followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.

B. Dissolve a small amount of aqueous extract of sample in 2 mL of distilled water, and add a few drops of 10 % aqueous ferric chloride solution. Blue colour is produced.

#### **TLC analysis**

Macerate 1 g of powdered drug in 5 mL of methanol, shake for 30 minutes, allow to stand for overnight, filter and filtrate is used for chromatography.

Application volume Developing solvent system Spray reagent Stationary phase

- : 2 μ mL
- : Hexane: Ethyl acetate (7:3)
- 10% Ethanolic sulphuric acid
- : Silica gel G (A, D & E are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



A		В	С	D	E
R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray	365 nm after spray
0.89				Greenish blue	Light green
0.82			Red	Brown	Yellowish green
0.81			Red	Yellow	Dark blue
0.72	Green	Brown	Red	Violet	Orange
0.61	Green	Brown	Dark blue	Dark brown	Dark blue
0.53			Red	Brown	Pink
0.41			Dark blue		Dark blue

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0.11	Yellow	Dark blue
0.08	Light blue	Pale yellow

Not more than 0.25 %

Not less than 27.75 %

Not less than 23.16 %

- Loss on drying at 105 °C Not more than 8.92 % : ٠ Foreign matter
  - Not more than 2 % : Not more than 3.35 % :
  - Total ash Acid-insoluble ash :
- ٠

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- Ethanol soluble extract :
- Water soluble extract :
- Traditional therapeutic uses : Malaria, diabetes mellitus, fever
- Research reports : Antimalarial activity<sup>46</sup>

### Swertia Herba



Transverse section of Swertia purpurascens Wall.stem

- 1. Cork
- 2. Thick-walled parenchymatous cells
- 3. Thin-walled parenchymatous cells
- 4. Vascular bundle



Characters of the powdered drug

- a. Pollens from flower
- b. Cork in sectional view
- c. Parenchyma cells from pith

Source: Kayah State

## **Tinospora Stem**

Tinospora cordifolia	ဆင်တုံးမနွယ် (hsin doun: manwe)		
Synonym(s)	-	Menisperma cordifolium Willd.	
		Cocculus cordifolius DC.	
Other name(s)	-	Ambarvel (Indian)	
		K'uan chu Hsing (China)	
		Garjo (Nepal)	
Part(s) used	-	Stem	

#### Definition

Tinospora stem consists of the stem of *Tinospora cordifolia* Miers. (Menispermaceae)

#### Description of the part used

#### Macroscopic characteristics

Corky grooved stem. Young stem green, glabrous, older one with protuberances. Externally greenish brown to grayish, inner surface shows a radial structure medullary rays. Odour not characteristic, taste very bitter.

#### Microscopic characteristics

#### Transverse section of Tinospora cordifolia Miers. stem shows:

- 1. outermost cork layer composed of thick-walled brownish and compressed cells
- 2. beneath the cork layer, cortex, a broad zone of parenchymatous cells containing sclereids and calcium oxalate crystals are present
- 3. stele, composed of xylem and phloem . It occurs several bands from cortex to pith. The medullary ray is between the bands
- 4. phloem consists of thick-walled fibres and phloem tissue
- 5. xylem consists of large vessels, xylem fibres and xylem parenchymatous cells containing starch and various types of vessels. Such as annular, spiral, reticulate, pitted and bordered pitted
- 6. pith composed of large thin-walled cells containing starch granules.

#### Characters of the powdered drug

Greenish brown powder, odour not characteristic, bitter taste. The diagnostic characters are:

- 1. cork in surface view
- 2. vessels
- 3. various shape of sclereids

#### Identification:

- A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.
- B. Shake vigorously 500 mg of the sample in powder, with 10 mL of water: a long lasting form is produced.
- C. Add 2 mL of acetic anhydride solution to 1 mL of petroleum ether extract of the sample in chloroform followed by 1 mL of concentrated sulphuric acid. Green colour is developed.
- D. Dissolve 1 g of alcoholic extract in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 mL of Dragendorff's reagent, orange colour is produced.

#### **TLC analysis**

Extract 1 g of powdered drug with 25 mL of methanol in a conical flask on water bath for 3 hours and filter. Evaporate until 2 mL of residue are left and use for chromatography.

Application volume	:	10 µL
Developing solvent system	:	Ethyl acetate: Methanol: Water
		(100:13.5:10)

Spray reagent Stationary phase : Anisaldehyde-sulphuric acid

: Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.85			Red	Violet
0.75		Brown		
0.63-0.61		Brown		Faith yellow
0.48		Brown	Faint blue	
0.41-0.35			Yellowish green	Faint green
0.26-0.24			Yellowish green	Faint green

:

:

:

:

:

:

:

Not more than 7.92 %

Not more than 1.00 %

Not more than 7.75 %

Not more than 0.01 %

Not less than 8.25 %

Not less than 8.50 %

(TMFs)<sup>69</sup>-27/Supp: 25

generalized weakness

: Antihyperglycemic activity<sup>47,48</sup>

Impotence, diabetes mellitus,

Traditional Medicine Formulations

hypertension, paralysis and paresis,

- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations<sup>1</sup>
- Traditional therapeutic uses :
- Research reports

Source: Thaninthayi greion

- Ŧ
- Tinospora Stem



### Vasaka Folium

Adhatoda vasica l	မုရားကြီး (m <u>aja</u> gji:)		
Synonym(s)	-	Adhatoda zeylanica Medicus. Justica adhatoda Linn.	
Other name(s)	-	Vasaka (English) Adalsa (India) Carmantine (French)	
Part (s) used	-	Leaf	

#### Definition

 $Vasaka folium \ consists \ of the mature leaves \ of \ Adhatoda \ vasica \ Nees. \ (A can thaceae)$ 

#### Description of the part used

#### Macroscopic characteristics

Upper surface greenish and paler beneath, lanceolate or ovate-lanceolate, apex acuminate, base tapering, margin entire and 9-10 pairs of veins, pinnate venation, few hairs present on the midrib, petiole glabrous. Slightly characteristic odour and bitter taste.

#### Microscopic characteristics

#### Transverse section of Adhatoda vasica Nees. leaf shows:

- 1. large central midrib region and long wings of the lamina on both side
- 2. in dorsiventral surface with two layers of palisade cells under the upper epidermis
- 3. in the midrib region 4-6 layers of collenchyma cells occurring beneath the epidermis
- 4. epidermal cells sinuous with anomocytic stomata on both surfaces, more numerous on lower surface in surface view
- 5. clothing trichomes and glandular trichomes are present on both surfaces
- 6. prismatic calcium oxalate crystals and elongated cystoliths are found in the mesophyll layer

#### Characters of the powdered drug

Greenish powder, characteristic odour and bitter taste. The diagnostic characters

#### are:

- 1. sinuous epidermal cell with anomocytic stomata in surface view
- 2. trichomes more or less with base
- 3. elongated cystolith in mesophyll layer

#### Identification:

- A. Dissolve a few mg of alcoholic extract of the powder in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 mL of Dragendorff's reagent, orange precipitate is produced immediately.
- B. In a test tube containing 0.5 mL of alcoholic extract of raw material, add 5-10 drops of hydrochloric acid follow by a small piece of magnesium. Boil the solution for few minutes. Pink color is produced.

#### TLC analysis:

Extract 2 g of test sample in 2 mL of 25% ammonium hydroxide for one minute and add 10 mL of chloroform, shake vigorously for 10 minutes and filter. Filtrate is evaporated to dryness. Dried extract is redissolved in 1 mL of methanol for chromatography.

Application volume	:	4 μL
Developing solvent system	:	Toluene: Ethyl acetate: Diethylamine
		(7:2:1)

Spray reagent Stationary phase

- : Dragendorff's reagent
- : Silica gel G (A & D are glass plates, B & C are aluminium sheets GF<sub>254</sub>)



R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.73-0.75	Green	Greenish yellow	Red	Green
0.7			Violet	
0.65			Orange	
0.60-0.56	Yellow	Pale yellow	Reddish brown	Green
0.49-0.50		Pale yellow	Orange	
0.45-0.40	Yellow		Pale yellow	Reddish brown
0.35-0.38	Green	Violet		
0.25		Pale yellow	Reddish brown	Pale green
0.20-0.19			Orange	
0.15-0.14		Violet	Reddish brown	
0.10			Violet	
0.05-0.03	Green	Pale yellow	Orange	Pale green

• Loss on drying at 105°C	: Not more than 8.4 %
• Foreign matter	: Not more than 1.0 %
• Total ash	: Not more than 12.8 %
• Acid-insoluble ash	: Not more than 0.6 %
• Ethanol soluble extract	: Not less than 6.3 %
• Water soluble extract	: Not less than 16.7 %

- Important Formulations : Traditional Medicine Formulation (TMF)<sup>69</sup>-20
  - Traditional therapeutic uses : Cough, asthma, haematemesis, dysentery, piles, menorrhagia
- Research Reports : Bronchodilating activity<sup>49,50,51</sup>

•

Source: Mon state, Mandalay regions

## Vasaka folium



Transverse section of Adhatoda vasica Nees. leaf

- 1. Upper epidermis
- 2. Trichome
- 3. Cystoliths
- 4. Vascular bundle
- 5. Calcium oxalate
- 6. Lower epidermis



Characters of the powdered drug

- a. Sinuous epidermal cell with anomocytic stomata in surface view
- b. Trichomes more or less with base
- c. Elongated cystolith in mesophyll layer

### **Vitex Folium**

<i>Vitex trifolia</i> L. ( Verbenaceae)		ကြောင်ပန်း/ကြောင်ပန်းလေး			
			(kjaun ban:/ khaun ban: lei:)		
Synonym(s)	-	<i>Vitex rotundifolia</i> L.f.			
Local name(s)	-	Indian wild pepper (English)			
		Vitex (English)			
		Man kinh (Vietnam)			
		Man ching (China)			
		Mon kin (China)			
		Lagundindagat (Phillip	opine)		
Part(s) used	-	Leaf			

#### Definition

Vitex folium consists of the leaflets of Vitex trifolia L. (Verbenaceae)

## Description of the part used

### Macroscopic characteristics

Compound trifoliate leaf, upper surface dark green and grayish below, oblongobovate, base tapering, apex obtuse or accuminate, surface glabrous above and white tomentose beneath. Strong smell when crushed, taste not characteristic.

### Microscopic characteristics

#### Transverse section of Vitex trifolia L. leaf shows:

- 1. a layer of epidermis having unicellular hairs and multicellular trichomes
- 2. mesophyll layer consists of palisade cells and spongy parenchyma present in both epidermis
- 3. in midrib, 3-4 layers of collenchyma cells under the upper and lower epidermis
- 4. beneath the collenchyma cells, large parenchyma cells are present
- 5. vascular bundle consists of xylem surrounded by phloem
- 6. anomocytic stomata present in both surfaces
- 7. lower epidermis also covered with unicellular or multicellular trichomes

#### Characters of the powdered drug

Greenish brown powder, characteristic smell, tasteless. The diagnostic characters

are:

- 1. upper epidermis
- 2. lower epidermis
- 3. leaf fragment
- 4. trichome

#### Identification

- A. In a test tube containing 0.5-1.0 mL of ethanol extract of sample, add 5-10 drops of hydrochloric acid, followed by a small piece of magnesium ribbon. Boil solution for few minutes, red colour is produced.
- B. Dissolve a small amount of aqueous extract of sample in 2 mL of distilled water, and add a few drops of 10 % aqueous ferric chloride solution. Blue colour is produced.

#### **TLC analysis:**

To 1 g of powder sample add 5 mL of methanol, shake for 30 minutes, allow to stand for overnight. Filter and filtrate is used for chromatography.

Application volume Developing solvent system Spray reagent

- 2 µL :
- : :
- Stationary phase
- Hexane: Ethyl acetate (7:3) 10% Ethanolic sulphuric acid
- Silica gel G (A & D are glass plates, B & C : are aluminium sheets  $GF_{254}$ )

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R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.88	Green		Red	Reddish brown
0.72			Red	Light blue
0.65			Red	Light blue
0.42	Green	Green	Red	Light blue
0.37	Yellowish brown		Red	Yellowish green
0.28	Yellowish brown		Red	
0.2	Yellow	Green	Light brown	

:

:

:

:

:

- Loss on drying at 105°C : Not more than 8.10 % •
- Foreign matter ٠
- Total ash •
- Acid-insoluble ash •
- Ethanol soluble extract •
- Water soluble extract
- **Important Formulations** •
- Traditional therapeutic uses : •
- Not less than 13.14 % : Traditional Medicine Formulation (TMF)<sup>69</sup>-34 Indigestion, diarrhoea, dysentery, menstrual disorders, urinary disorders, muscle cramps

Not more than 1.00 %

Not more than 7.80 %

Not more than 0.50 %

Not less than 13.86 %

- 88 Myanmar Herbal Pharmacopoeia Volume I
  - Research Reports
- : Antimalarial<sup>37</sup>, antimicrobial<sup>37</sup>, antibacterial<sup>19</sup> and hepatoprotective<sup>52</sup> activities

**Vitex Folium** 





Characters of the powdered drug

b

50µm

C

- a. Upper epidermis
- b. Lower epidermis
- c. Leaf fragment
- d. Trichome

a

Source: Mon state and Taninthayi regions

#### Zingiber Rhizoma

Zingiber officina	<i>le</i> Roscoe. (Zingiberaceae)	ချင်း/ချင်းတက် (gjin: de'/gjin:)		
Synonym(s)	- Amomum zingiber L.			
	Amomum angustifoliu	Amomum angustifolium L.		
	Zingiber blancoi Mass	k.		
	Zingiber missionis Wa	.11.		
	Zingiber majus Rump	h.		
	Zingiber aromaticum	Noronha.		

Other name(s)-Ginger (English )Zingiber (English)Zingiber (English)Gung (Vietnam)Zanjabil (Arabic)Mangaratia (Bragil)Gingembre (Bragil)Gingembre (French)Ingwer (German)Ingefaer (Norway)Ada (Punjab)Part(s) used-Rhizome

#### Definition

Zingiber rhizoma consists of the dried rhizome of *Zingiber officinale* Roscoe. (Zingiberaceae)

#### Description of the part used

#### Macroscopic characteristics

Dried rhizome horizontal, tuberous. Externally buff coloured, longitudinally striations and internally pale yellow with fibrous surface. Aromatic and characteristic odour, pungent and hot taste.

#### Microscopic characteristics

#### Transverse section of Zingiber officinale Roscoe. rhizome shows:

- 1. outer cork layer composed of irregular parenchymatous cells
- 2. a few layer of inner cork consists of parenchymatous cells radially arranged in regular rows
- 3. cortex, a broad zone characterized by parenchymatous cells containing starch granules, oils, oleoresin and resin. This region is divided into outer and inner parts by thin-walled pseudoendodermis layer
- 4. fibro vascular bundles are scattered throughout the cortex

#### Characters of the powdered drug

Creamy coloured powder, characteristic aromatic odour and pungent and slightly hot taste. The diagnostic characters are:

- 1. cork cells in surface view
- 2. thin-walled septate fibres
- 3. strach granules
- 4. parenchyma filled with starch granules

#### Identification:

- A. Dissolve a few mg of alcoholic extract of the powder in 5 mL of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 mL of Dragendorff's reagent, orange precipitate is produced immediately.
- B. Add a few drops of mayer's reagent to 1 mL of acid aqueous extract. A white precipitate is formed.
- C. Add 1 mL of conc. sulphuric acid to 2 mL of chloroform extract of the sample, from the side of the test tube. Red colour is produced in the chloroform layer.

#### **TLC analysis**

To 1 g of powdered drug add 10 mL of chloroform, shake for 15 minutes at room temperature, filter and use the filtrate for chromatography.

Application volume	:	5 μL
Developing solvent system	:	Toluene: Ethyl acetate (97:3)
Spray reagent	:	Vanillin-sulphuric acid
Stationary phase	:	Silica gel G (A & D are glass plates, B & C
		are aluminium sheets GF <sub>254</sub> )





R <sub>f</sub>	Visual	UV 254 nm	UV 365 nm	Spray
0.99-0.98		Yellow	Light green	Violet
0.81	Faint yellow	Brown		Violet
0.76		Brown		Violet
0.71			Light green	
0.69-0.64		Brown		Bluish black
0.58			Light green	Violet
0.51		Light violet	Light green	
0.45		Light violet	Light green	

:

:

:

:

: Not more than 6.8 %

Not more than 2.0 %

Not more than 4.10 %

Not more than 0.01 %

Not less than 5.75 %

- Loss on drying at 105°C
- Foreign matter
- Total ash
- Acid-insoluble ash
- Ethanol soluble extract
- Water soluble extract
- Important Formulations
- Not less than 13.25 %
   Traditional Medicine Formulations (TMFs)<sup>69</sup>-1/3/10/23/24/29/34/40/ Sup.:14/15/25/27

• Traditional therapeutic uses : Indig

:

- Indigestion, cough, dyspepsia
- Research reports

٠

Antibacterial<sup>19</sup>, hypoglycemic<sup>53</sup>, anti- inflammatory<sup>54</sup>, nephroprotective<sup>55</sup> and antihyperlipidaemic activities<sup>56</sup>

Source: Shan state and Magway regions

## Zingiber Rhizoma





# REFERENCES

Characters of the powdered drug

- a. Cork cell in surface view
- b. Septate fibre
- c. Starch granules
- d. Parenchyma containing starch

Transverse section of *Zingiber officinale* 

- 5. Vascular bundle
- 7. Pseudoendodermis layer

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#### **APPENDIX I**

## **Preparation for Spray Reagents**

#### 1. Anisaldehyde-sulphuric acid reagent

Anisaldehyde (0.5 mL) is mixed with 10 mL glacial acetic acid, followed by 85 mL methanol and 5 mL concentrated sulphuric acid. Spray the plate with about 10 mL and heat at 1050 C for 5-10 minutes. Evaluate in day light or in UV 365 nm light. Reagent must be freshly prepared.

#### 2. Dragendorff's reagent

Dissolve 8 g of Potassium iodide in 20 mL of water and add the solution to a mixture of 0.85 g of bismuth oxynitrate, 40 mL of water and 10 mL of glacial acetic acid. Reagent must be freshly prepared.

#### 3. Ethanolic sulphuric acid

Prepare a solution of 10-20 % v/v of sulphuric acid in ethanol by adding the acid dropwise to ethanol with shaking. Spray the plate with about 10 mL and heat at 1050 C for 5-10 minutes.

#### 4. Iodine reagent (Iodine vapour)

About 10 g solid iodine are spread on the bottom of a chromatograph tank; the developed TLC plate is placed into the tank and exposed to iodine vapour.

#### 5. Potassium hydroxide reagent

Prepare a solution of 5-10 % ethanolic potassium hydroxide. The plate is sprayed with 10 mL and evaluated in day light or in UV 365 nm, with or without warming.

#### 6. Vanillin-sulphuric acid reagent

1 % ethanolic vanillin (solution 1)

#### 10 % ethanolic sulphuric acid (solution 2)

The plate is sprayed with 10 mL solution 1, followed immediately by 10 mL solution 2. Heat at 1100 C for 5-10 minutes under observation. Evaluate in day light.

# INDEX

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