MYANMAR HERBAL PHARMACOPOEIA

VOLUME II

Department of Traditional Medicine

Ministry of Health and Sports

Nay Pyi Taw, Myanmar

January, 2018

In cooperation with

the Nippon Foundation, Japan

Copy right©2018
Published by Department of Traditional Medicine
First Edition - January, 2018
ISBN 978-99971-0-274-4

Printed by :
Sayana Publishing House (mje:-01350), No. 249, Theinbyu Road,
Mingalar Taung Nyunt Township, Yangon, Myanmar.
Tel: 0951-394141, 0959-5123249, 0959-955123249 Fax: 0951-380899

CONTENTS

PREFACE

PREFACE

The quality control of herbal medicine became to be more and more important as the use of a variety of medicinal plants has increased gradually. Scientific research on the medicinal plants, based on the traditional therapeutic uses also encouraged to produce more numbers of herbal medicines and health supplements. Since the plant materials are growing in the natural environment, purity, authenticity and also maturity should be assessed by the specific quality criteria for effective use in health purposes.

Myanmar Herbal Pharmacopoeia volume I, comprising 20 medicinal plants has been published in 2013 and now the volume II has also been published successfully in this year of early 2018. The same numbers of Myanmar medicinal plants like volume I included in this volume II. Myanmar Herbal Pharmacopoeial Technical Committee has provided a great effort to put more data in volume II than volume I. For example, the whole plant pictures and closed-up picture of the respective title are included in this volume so that someone can image and identify visually the interested plant. Moreover, the General Notice on the analytical and technical subject matters which was lack in the volume I is included in this volume in order to be clearer for laboratory testings. It is hoped that Myanmar Herbal Pharmacopoeia volume II could provide benefit to all of traditional medicine industries to be controlled of qualities of plant materials.

Here also, the Nippon Foundation (Japan) should be expressed for their kind financial support and encouragement to develop a series of Myanmar Herbal Pharmacopoeia volumes.

TECHNICAL COMMITTEE

MYANMAR HERBAL PHARMACOPOEIA

TECHNICAL COMMITTEE

Chairperson : Dr. Yi Yi Myint
Director General
Department of Traditional Medicine

Members :
- Prof. Dr. San San Nwet
  Rector
  University of Pharmacy, Yangon
- Prof. Dr. Sein Hla Htwe
  Rector
  University of Pharmacy, Mandalay
- U Kyaw Soe
  Deputy Director General
  Department of Traditional Medicine
- Dr. Khin Chit
  Deputy Director General
  Department of Food and Drug Administration
- Dr. Theim Kyaw
  Rector
  University of Traditional Medicine
- Prof. Dr. Nang Hla Hla Win
  Professor & Head, Department of Pharmacology
  University of Medicine 1, Yangon
- Prof. Dr. Nu Nu Aye
  Professor & Head, Department of Pharmacology
  University of Medicine 2, Yangon
- Prof. Dr. Thein May Saw
  Professor & Head, Department of Pharmacology
  University of Medicine, Mandalay
- Prof. Dr. Yee Yee Tin
  Professor & Head, Department of Pharmacology
  University of Medicine, Magway

- Prof. Dr. Hla Ngwe
  Professor & Head, Department of Chemistry
  University of Yangon
- Prof. Dr. Aye Pe
  Professor & Head, Department of Botany
  University of Yangon
- Dr. Khin Phyu Phyu
  Director (National Poison Control Center)
  Department of Medical Research
- U Than Tun, Member, Traditional Medicine Council
  Head of Pharmacology (TM) Department (Retired)
  University of Traditional Medicine
- Prof. Maung Maung Thet
  Professor & Head, Department of Physical Medicine
  University of Traditional Medicine
- Dr. Cho Cho
  Director (Retired)
  Department of Traditional Medicine
- Daw Lay Myint
  Managing Director
  U Thar Yin Medicine Hall
- Dr. Khin Maung Lwin
  Managing Director
  FAME Pharmaceuticals Industry Co., Ltd.
- U Maung Maung Oo
  Managing Director
  Great Wall Traditional Medicine Manufacturing Co., Ltd.

Secretary : U Win Myint
Director (Retired) (Research and Development)
Department of Traditional Medicine

Joint Secretary 1 : Dr. Myint Myint Than
Director (Drug and Herbal Garden)
Department of Traditional Medicine

Joint Secretary 2 : Dr. Thein Zaw Linn
Director (Research and Development)
Department of Traditional Medicine

Working Japanese Expert

1. Professor Dr. Katsuhiro Konno, Ph.D., Professor and Head.
   Division of Kampo-Pharmaceutics, Institute of Natural Medicine,
   University of Toyama, Japan. (Work of training, JICA Project Manager)

Working group on Plant Collection, Survey and Laboratory Analysis

1. U Win Myint, B.Sc.(Chemistry), M.Sc.(Chemistry),
   Director(R & D)(Retd.), Department of Traditional Medicine
2. Daw Thidar Swe, B.Sc., M.Sc. (Botany),
   Deputy Director (Research)(Retd.), Department of Traditional Medicine
3. Dr. Cho Cho, B.Sc.(Hon.), M.Sc.(Taxonomy), Ph.D.(Ethnobotany),
   Director, Department of Traditional Medicine
4. Dr. Myint Myint Than, Dip. T. Med., B.Sc. (Chemistry), M.Phil.
   (Pharmaceutical Sciences), Ph.D.
   Director(Drug and Herbal Garden), Department of Traditional Medicine
5. Dr. Thein Zaw Linn, B.Sc. (Chemistry), Dip. T. Med.,
   M.Phil. (Pharmaceutical Sciences), Ph.D.(Pharmaceutical Sciences, Japan)
   Director (Research and Development), Department of Traditional Medicine
6. Dr. Khin Thant Zin, M.B.,B.S., M.Med.Sc.(Pharmacology)
   Assistant Director (Laboratory), Department of Traditional Medicine
7. Daw Yin Yin Aye, B.Sc., M.Sc.(Botany), Research Officer,
   Department of Traditional Medicine
8. Dr. Htar Zin Zin Ei, B.Sc., M.Sc., Ph.D.(Botany), Research Officer,
   Department of Traditional Medicine
9. Daw Khin San Linn, B.Sc.(Hon.), M.Sc.(Botany), Research Officer,
   Department of Traditional Medicine
10. Daw Soe Sandar Phyo, B.Pharm., M.Pharm., Analysis Officer,
    Department of Traditional Medicine
11. U Tun Aung Kyaw, Dip.T. Med., B.Sc.(Mathematics), B.M.T.M.,
    Analysis Officer, Department of Traditional Medicine
12. Daw Zin Mar Naing, B.M.T.M., Research Officer,
    Department of Traditional Medicine
13. Daw Wai Hnin Lwin, B.Med.Tech., Analysis Officer,
    Department of Traditional Medicine

14.Daw Ohnmar Thein, B.M.T.M., Deputy TM Officer,
Department of Traditional Medicine
15.Daw Kywe Wai Phyo, B.Sc. (Botany), Dip. Agri., Research Assistant(2),
Department of Traditional Medicine
16.Daw Ye Ye Nwet, B.Sc.(Zoo.), Med. Lab. Technician I
Research Assistant (2), Department of Traditional Medicine
17.U Khin Maung Aye, Clerk (Retd.)
Department of Traditional Medicine
18.Daw Muyar Win, B.Sc. (Chemistry), Dip. T. Med,
Assistant Traditional Medicine Officer
Department of Traditional Medicine
19.Daw Khin Zar Thin, B.Sc. (Chemistry), Research Assistant (4),
Department of Traditional Medicine
20.Daw Nyein Nyein Htet, Research Assistant (5),
Department of Traditional Medicine

ABBREVIATION

Fig	-	Figure
nm	-	nanometer
R_f	-	Retardation factor
TLC	-	Thin Layer Chromatography
TMF	-	Traditional Medicine Formulation
TS	-	test solution
UV	-	Ultraviolet

GENERAL NOTICES

GENERAL NOTICES

The information given in the general notice provides the basic guidelines for the interpretation and application of the test parameters and test procedures for each monograph of medicinal plants. All the test parameters represent the authenticity, purity and quality criteria of each medicinal herb when it is used as herbal medicine in the form of a single drug or as an ingredient of a traditional medicine formulation. Important formulation, traditional therapeutic uses and research reports are not to be regarded as analytical requirements and should be regarded as literatures cited in the traditional medicine books and scientific research papers.

Monograph nomenclature

Main title of most specimens of monographs is Latin genitive of plants. It is followed by botanical name and Myanmar name which is mentioned by Myanmar language as well as English spelling and pronunciation in accordance with English - Myanmar simplified dictionaries. The photographic records of plant habit are mentioned with their respective botanical names. The respective parts of the plant used as herbal medicines are described by close-up view of photographic records for correct identification of the relevant specimens. Synonyms of each monograph are described as available in the literatures.

English common names and the local names used by other countries are also described with their respective pronunciations observed in the available literatures.

Part(s) used

Part(s) used is clearly specified in the related subheading.

Definition

The definition of the herbal specimen(s) of the title of each monograph is clarified by the specific part(s) of the plant with official botanical name.

Description of the part used

Macroscopical characters and microscopic characters:

Description of the part(s) used in the monographs included the examination of microscopical characters and macroscopical characters for correct botanical identification. Macroscopical characterization carried out by using hand lens and dissecting microscope. Microscopical examinations were carried-out for determining identity, quality or purity of the crude drug.

Characters of the powdered drug

Identification

Identification of the plant drug specimen is usually based on the phytochemical test done on the specified extract of respective crude drug specimen. This test is preferably referring to preliminary identification test. Although base upon phytochemical reaction for the detection of organic compounds such as alkaloids, amino acids, carbohydrates, flavonoids, glycosides, phenolic compounds, reducing sugar, starch, saponins, steroids/ triterpenes and tannins, identification test refers to the indication of colour change, precipitation and prominent characteristics and not necessarily mean the presence of a particular organic compound.

Preparation of extracts

In the identification tests, different types of extracts were prepared. Powered sample is the simply the powder of specific dried specimen. Aqueous extract is prepared by boiling 1 g of sample with distilled water for about 10 min and then allow to cool and filtered. The alcoholic extract is prepared by extracting 1 g of sample with 10 mL of 70 % ethanol for about 10 mins and filtered. The chloroform extract is prepared by soaking 1 g of sample in 10 mL of chloroform for 6 hr and filtered. The pet-ether extract is prepared by refluxing 1 g of sample with pet-ether for 6 hr and the solvent is removed by distillation under reduced pressure.

TLC analysis

TLC analysis is done to provide a thin layer chromatographic profile of a particular extract of a given herbal specimen. TLC profile is a confirmatory iden

tifiable pattern after preliminary colour reaction test and it is an important representative for identification other than authenticity test done by macro-and microscopic examination of the original plant part specimen. Although TLC analysis can be useful for the identification of a particular phytochemical constituent by comparing with a reference standard, TLC profile in this Herbal Pharmacopoeia is only for the indication of a given plant in identification purpose by using plant part(s) extract.

The preparation of extract (test sample), applied volume, solvent system, detection / spray reagent and stationary phase (usually precoated plates) are described in detail so that identification procedure could be followed by someone when necessary. In this analysis, R_f values of spots may vary laboratory to laboratory and analyst to analyst and thus those should not be regarded as absolute values. The colour appearance may not be exactly same but should be similar.

Physico-chemical test parameters

Physico-chemical tests such as loss on drying at 105 °C, foreign matter, total ash, acid-insoluble ash, ethanol soluble extract and water soluble extract are determined for quantitative data of each plant part specimen. Plant part(s) is usually dried in air and powdered by mean of a grinding machine. Particle size of all powder pass through a No. 710 sieve and not more than 40 % through a No. 250 sieve. Most of physico-chemical tests are determined according to quality control methods for herbal materials published by World Health Organization (WHO) (2011).

Loss on drying at 105 °C

Moisture content of a herbal powder material is very important parameter for the safety aspects. An excess of water in medicinal plant materials will encourage microbial growth, the presence of fungi or insects, and deterioration following hydrolysis. Limits for water content should therefore be set for every given plant material. This is especially important for materials that absorb moisture easily or deteriorate quickly in the presence of water.

The quantitative data of loss on drying at 105 °C are resulted from the determination of moisture content by using moisture analyser setting the temperature at 105 °C.

Foreign matter

Foreign matters are defined as contaminated materials such as moulds, insects, animal faecal matter, earth, stones and extraneous material other than those named in the definition and description. The amount of foreign matter shall not be more than the percentage prescribed in the monograph. The foreign matter is detected by inspection with the nacked eyes or by the use of a lens (6x). Separate and weigh it and calculate the percentage present.

Total ash

The total ash represents the total amount of material remaining after ignition. This includes "Physiological ash" which is derived from the plant tissue itself, and "non-physiological ash", which is the residue of the extraneous matter (eg. sand soil) adhering to the plant surface.

The total ash is determined by mean of a muffle furnace. Place about 2-4 g of the ground air-dried material, accurately weighed, in a previously ignited and tarred crucible (usually silica). Spread the material in an even layer and ignite it by gradually increasing the heat to 500-600 °C until it is white, indicating the absence of carbon. Cool in a desiccator and weigh. It is again ignited, cool in a desiccator and weigh. When it showed constant weight, calculate the content of total ash in g per 100 g of air-dried material.

Acid-insoluble ash

Acid-insoluble ash is the residue obtained after boiling the total ash with dilute hydrochloric acid, and igniting the remaining insoluble matter. This measures amount of silica present, especially as sand and siliceous earth.

To the crucible containing the total ash, add 25 mL of hydrochloric acid (~70 g/L)TS, cover with a watch glass and boil gently for 5 minutes. Rinse the watch-glass with 5 mL of hot water and add this liquid to the crucible. Collect the insoluble matter on an ashless filter-paper and wash with hot water until the filtrate is neutral. Transfer the filter-paper containing the insoluble matter to the original crucible, dry on a hot-plate and ignite to constant weight. Allow the residue to cool in a desiccator for 30 minutes, then weigh without delay. Calculate the content of acid-insoluble ash in g per 100 g of air-dried material.

Extractable matter

The extractable matter represents the soluble amount of the ground air-dried material extracted with solvents from a given amount of medicinal plant material. Ethanol soluble extract is determined by cold maceration method and water soluble extract is determined by hot extraction method.

Ethanol soluble extract:

Place about 5 g of the ground air-dried material, accurately weighed, in a glass-stoppered conical flask. Macerate with 100 mL of 95% ethanol for 6 hours, Shaking frequently, then allow to stand for 18 hours. Filter rapidly taking care not to lose any solvent, transfer 25 mL of the filtrate to a tarred flat-bottomed dish and evaporate to dryness on a water-bath. Dry at 105 °C for 6 hours, cool in a desiccator for 30 minutes and weigh without delay. Calculate the content of extractable matter in mg per g of air-dried material.

Water-soluble extract

Place about 5 g of the ground air-dried material, accurately weighed, in a glass-stoppered conical flask. Macerate with 100 mL of water for 6 hours, Shaking frequently, then allow to stand for 18 hours. Filter rapidly taking care not to lose any solvent, transfer 25 mL of the filtrate to a tarred flat-bottomed dish and evaporate to dryness on a water-bath. Dry at 105 °C for 6 hours, cool in a desiccator for 30 minutes and weigh without delay. Calculate the content of extractable matter in mg per g of air-dried material.

Important Formulations

Myanmar has established a national traditional medicine formulary. There are 57 numbers of Myanmar traditional medicine formulations (TMFs) in this formulary book. Each TMF is denoted by serial numbers such as 1, 2, 3 and so on as well as by Myanmar traditional medicine name. In each monograph if important formulation refers to some numbers of TMFs, it is meant that the plant is used as an ingredient in the referring TMFs.

Traditional therapeutic uses

Traditional therapeutic uses of each medicinal plant are compiled from the reference books which are documentations of Myanmar medicinal plants and Myanmar traditional medicine system especially written by outstanding Myanmar traditional medicine practitioners. These uses are also due to experience Traditional Medicine Council members and members of Traditional Medicine Practitioners Association. Myanmar traditional medicine uses and terminologies of diseases, signs and symptoms are thoroughly interpreted by medical pharmacologists.

Research reports:

Many researchers in Myanmar are working on the locally grown plants for their quality, safety and efficacy. In each monograph, the activities of the respective plants are described according to the literatures collected from Universities, Medical Research Department and Research and Development Centers within the country.

MONOGRAPHS

Allii sativi Bulbus

***Allium sativum* L. (Alliaceae)** **ကြက်သွန်ဖြူ (Kje' thun bju)**

Fig. 1 *Allium sativum* L.
1. the plant; 2. bulbii

Sources : Shan State and Mandalay Region

Synonym (s) - ***Allium pekinense* Prokh.**

Other name (s) - **ail (French)**
ajo (Spanish)
Bawgang (Thai)
Garlic (English)
Lason (Hindi)
Rason, Lashuna, Ugragandha (Sanskrit)
Suan (Chinese)
Toi (Vietnamese)
Vellaipundu (Tamil)

Part (s) used - Bulbus / Bulblets

Definition

Allii sativi bulbus consists of the dried or fresh bulb or bulblet of *Allium sativum* L. (Alliaceae).

Description of the part used

Macroscopic characteristics

Bulb broadly ovoid, usually consisting of several bulblets or cloves covered with several outer layers of thin sheathing protective leaves which surround an inner sheath. The inner sheaths enclose the swollen storage leaves called cloves which arranged in whorled pattern around at the centre on woody disc like stem, the bulb. Each clove oblongoid in shape, 3-4 sided, acute at the apex, sometimes narrowed into a thread-like structure, truncate at the base. Odour strongly alliaceous, taste pungent.

Microscopic characteristics

Transverse section of *Allium sativum* L. fleshy leaf of bulblet or clove shows:

1. the two epidermii consist of a single layer of thin-walled parenchymatous cells respectively
2. the hypodermis occurs below the epidermis, 2-3 layered, hexagonal collenchymatous cell
3. next to hypodermis, a broad zone of ground tissue composed of thin-walled

polygonal shaped parenchyma

4. vascular bundles surrounded by parenchymatous sheath spread in the ground tissue
5. annular vessels, tracheids and lacticiferous cells occurred in the parenchyma of ground tissue
6. the cells of ground tissue contain prismatic calcium oxalate crystals

Characters of the powdered drug

Yellowish-cream colour powder, odour alliaceous and mucilaginous, characteristic and pungent taste. The diagnostic characters are:

a. parenchymatous cells of the mesophyll with granular contents
b. groups of narrowly annular arranged vessels
c. lignified pitted sclereids in epidermal cells
d. elongated thin-walled parenchymatous cells associated with prismatic crystals
e. parenchyma with lacticiferous cell

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to purple color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

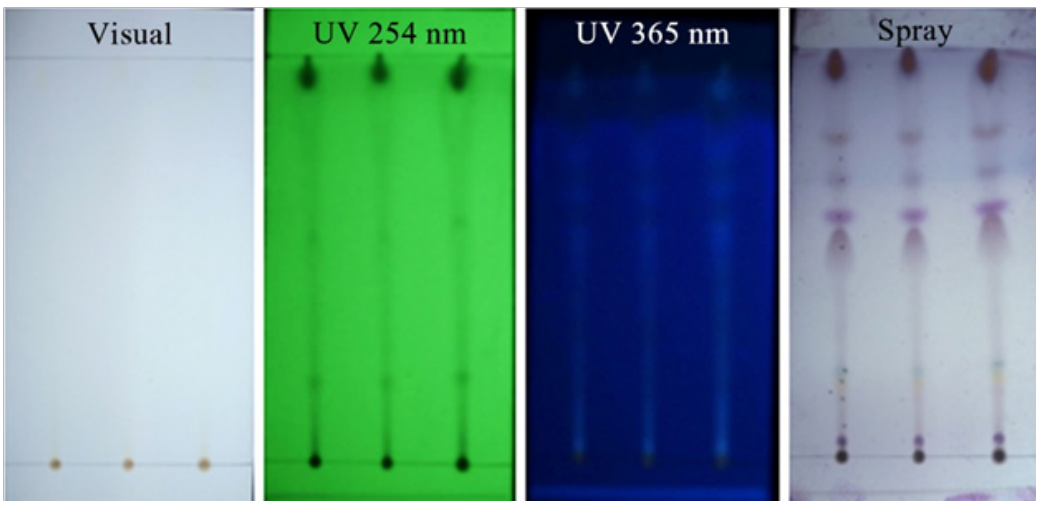
D. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution for a few minutes, pink colour is formed.

E. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

Extract 5 g of dried crude sample in 10 mL of dichloromethane. Shake frequently by using vortex mixer for 10 minutes at room temperature. Filter and filtrate is used for TLC investigation.

Application volume : 20 µL
Developing solvent system : Toluene : Ethyl acetate (7:3)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin - sulphuric acid



A B C D

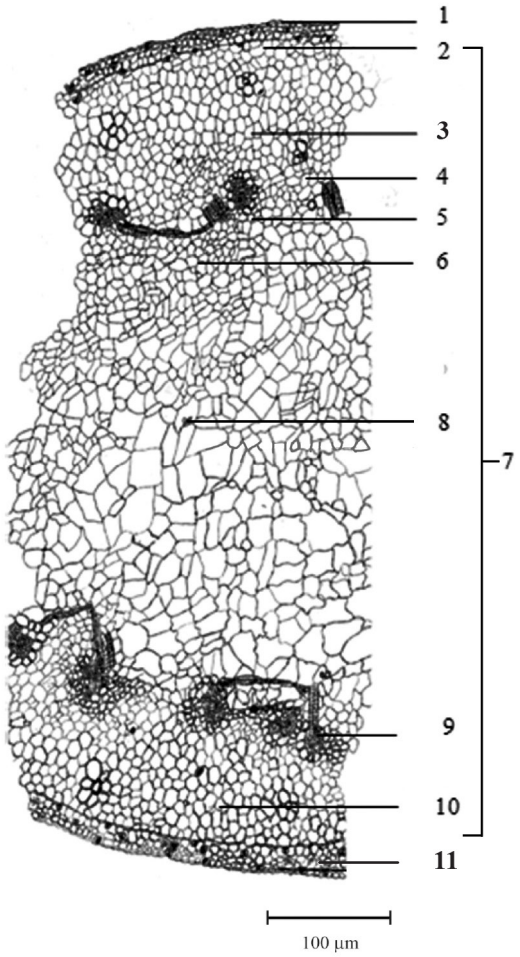
Fig. 2 Thin-layer Chromatogram of Dichloromethane Extract of the Bulblets of *Allium sativum* L.

Table 1. R_f values of Components in Dichloromethane Extract of the Bulbets of *Allium sativum* L.

R_f	Visual	UV 254 nm	UV 365nm	Spray
0.96	Yellow	Green	Blue	Yellowish brown
0.79			Blue	
0.78				Faint violet
0.72				Faint violet
0.69			Blue	
0.67				Faint violet
0.60		Green		
0.58			Blue	Violet
0.53			Blue	
0.50				Dark violet
0.23		Green		
0.20				Greenish blue
0.18				Pale yellow
0.04			Light blue	Faint violet

- Loss on drying at 105 °C : Not more than 5.32 %
- Foreign matter : Not more than 2.0%
- Total ash : Not more than 3.4 %
- Acid-insoluble ash : Not more than 0.25 %
- Water soluble ash : Not less than 2.45 %
- Ethanol soluble extract : Not less than 6.24 %
- Water soluble extract : Not less than 74.5 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 23, 32, 33, 34, Sup:2
- Traditional therapeutic uses : Appetent, Indigestion, Flatulence
- Research reports : Supplemention on serum lipid profile in hypercholesterolemic subjects [7], Antibacterial [8]

Allii sativi Bulbus



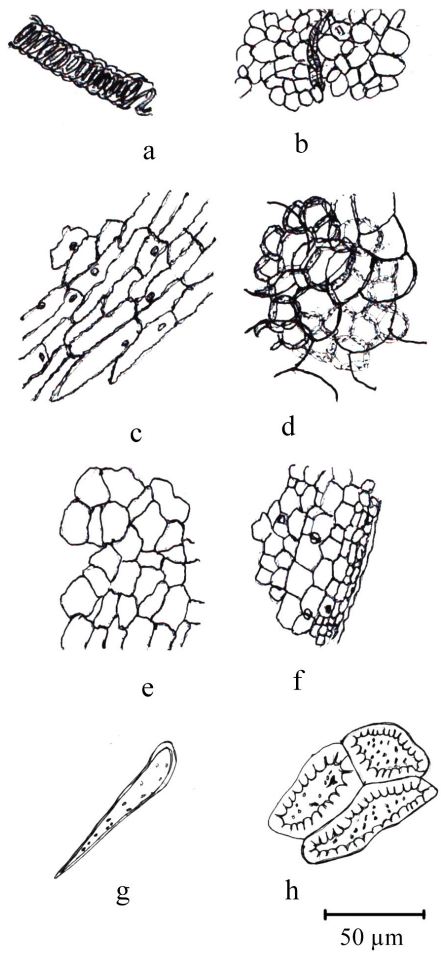


Fig. 3a Transverse section of *Allium sativum* L. bulblet

1. Epidermis
2. Hypodermis
3. Mesophyll cells
4. Lacticiferous cells
5. Vascular bundle
6. Tracheids
7. Ground tissue
8. Prismatic calcium oxalate crystal
9. Annular vessel
10. Mesophyll cells
11. Hypodermis

Fig. 3b Characters of powdered drugs

a. Annularly spiral vessel
b. Parenchymatous cells associated with spiral and annular vessel and prismatic calcium oxalate crystals
c. Elongated thin-walled epidermal cells with prismatic calcium oxalate crystals
d. Ground parenchyma with lacticiferous cells
e. Parenchyma of ground tissue
f. Thin-walled epidermis with crystals
g. Sclereid
h. Moderately thick-walled stone cells with conspicuous pits

Alpiniae conchigerae Rhizoma

***Alpinia conchigera* Griff. (Zingiberaceae)** **ပတဲကောကီး (Bade: go: gji:)**

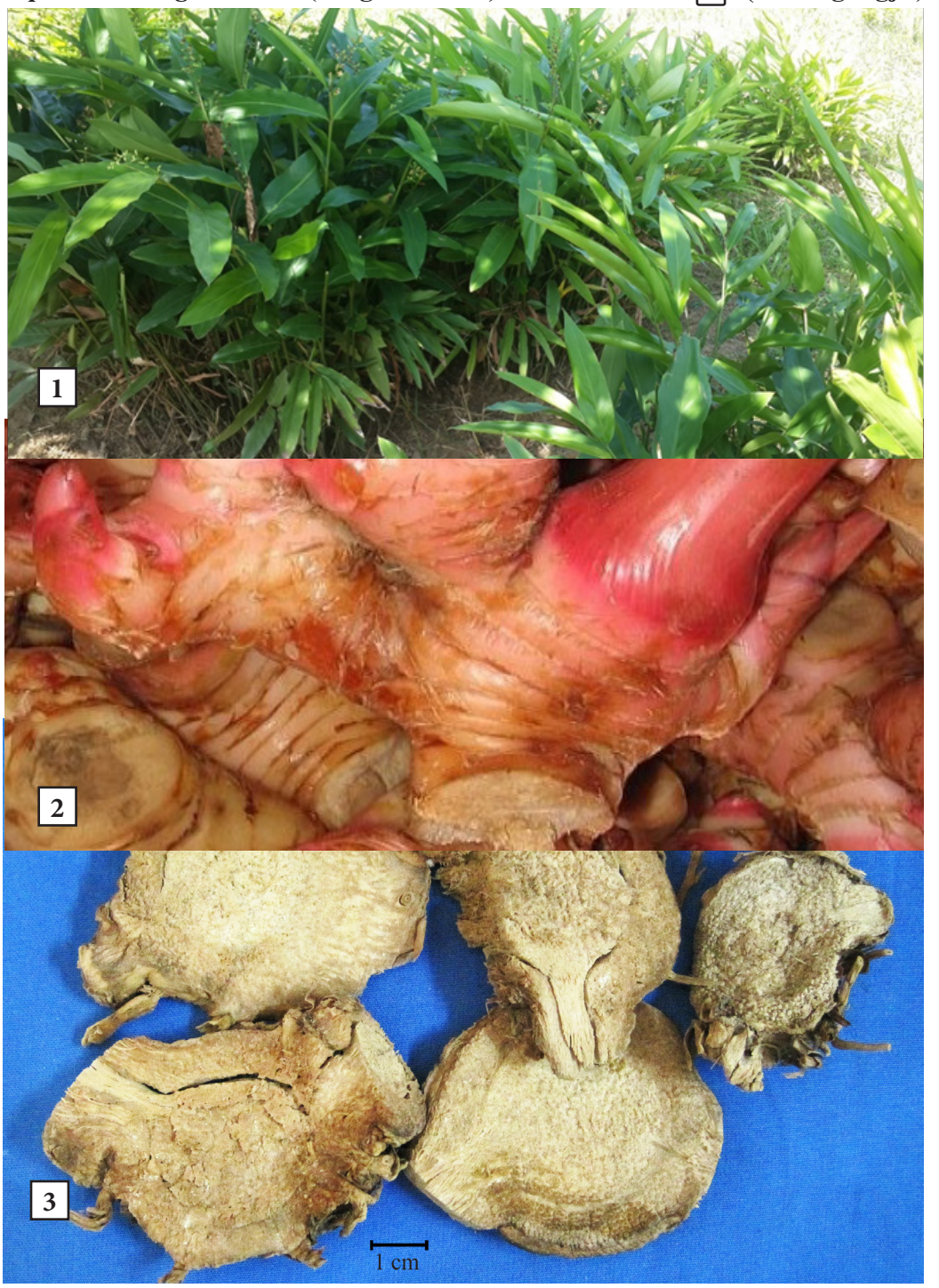


Fig. 1 *Alpinia conchigera* Griff.

1. the plant; 2. fresh rhizomes; 3. dried rhizomes

Sources : Shan State and Magway Region

Synonym(s) - ***Languas conchigera* (Griff.) Burkill**
***Alpinia galanga* (L.) Willd.**

Other name(s) - **Greater galangal (Singapore)**
Jie bian shan Jiang (Chinese)
Ketranga (Bengali)
Kha luang (Thai)
Kha ta daeng, kha (Lao PDR)
Kulanjan (Hindi)
Langkauas, lankauas, pal- la (Philippines)
Lengkuas, loas, kalawas (Indonesian)
Lengkuas padang, Lengkuas ranting (Malaysian)
Mushelgalgant (German)
Mussel Galangal, Greater galangal (English)
Rieng Rung, Rieng Nuoc (Vietnamese)
Romdeng (Cambodian)

Part(s) used - Dried Rhizome

Definition

Galangal Rhizome consists of rhizome of *Alpinia conchigera* Griff. (Zingiberaceae).

Description of the part used

Macroscopic characteristics

Rhizome horizontal, cylindrical, branches short, swelling at the base of aerial shoot covered with wavy annulations of the leaf bases. Externally reddish brown, internally light yellow, surface rough, fibrous. Odour pleasant, taste hot and sweet.

Microscopic characteristics

Transverse section of *Alpinia conchigera* Griff. rhizome shows:

1. the epidermis, a single-layered of parenchyma with cuticle layer
2. cortex, broad, many-layered of irregularly rounded parenchymatous cells
3. the cortical cells contain starch grains

4. larger size of cortical vascular bundles many, scattered in the cortical zone
5. xanthophyll pigmented cells are present in the cortex and stellar regions
6. the endodermis lies below the cortex, one-layered of barrel-shaped parenchyma, consists of starch grain, below the endodermis 1-2 layered of parenchyma cells, the pericycle, annular vessels are scattered throughout the rhizome
7. smaller size of vascular bundles many, scattered in the stelar region of rhizome

Characters of the powdered drug

Orange-brown powder, characteristic and pleasant odour, spicy and sweet taste. The diagnostic characters are:

a. fragments of the isodiametric parenchyma with dark secretory cells and numerous simple starch granules
b. club-shaped, large starch granules from the cortex

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for a few minutes. A brick red coloured precipitation is produced.

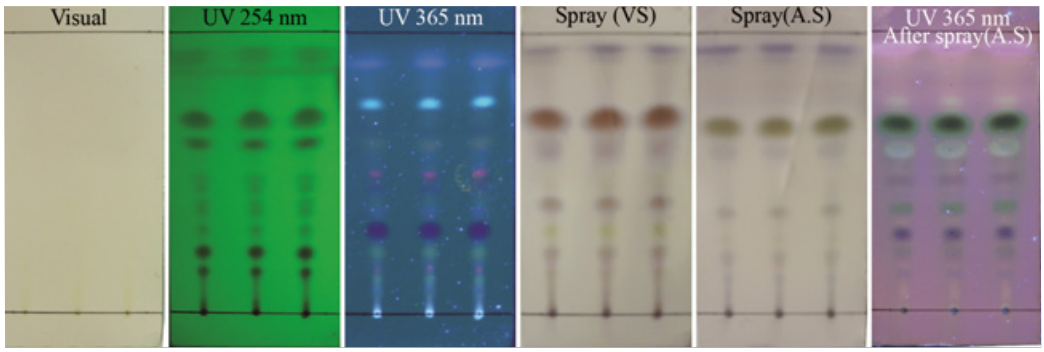
C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

D. Add 10 mL of chloroform to 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

TLC analysis

Extract 0.5 g of crude drug with 15 mL of dichloromethane under reflux for 10 minutes. Filter and filtrate is evaporated to dryness at room temperature. The dried residue is dissolved in 1 mL of dichloromethane for TLC investigation.

Application volume : 10 µL
Developing solvent system : Hexane: Ethyl acetate (10:3)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin - sulphuric acid (VS)
: Anisaldehyde - sulphuric acid (AS)



A B C D E F

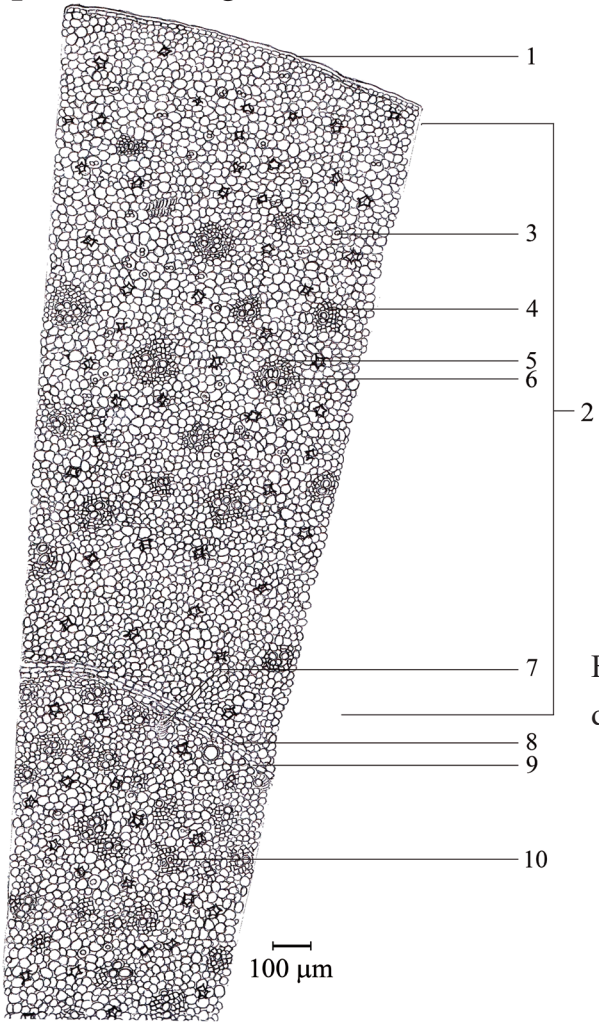
Fig. 2 Thin-layer Chromatogram of Dichloromethane Extract of the Dried Rhizome of *Alpinia conchigera* Griff.

- Loss on drying at 105 °C : Not more than 6.41 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 10.85 %
- Acid-insoluble ash : Not more than 5.15 %
- Water soluble ash : Not less than 3.30 %
- Ethanol soluble extract : Not less than 17.52 %
- Water soluble extract : Not less than 18.20 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 8/39/40 Sup: 17
- Traditional therapeutic uses : Indigestion, Flatulence, Dyspepsia, Colic, Nausea, Vomiting, Diarrhoea, Allergic reaction, Fever, Cough, Haemoptysis, Amenorrhoea, as blood purifying agent
- Research reports : Antituberculous [9, 10], Anti-proliferative and antioxidant activity [11], Pulmonary tuberculosis [12], Antibacterial [13]

Table 1. R_f values of components in Dichloromethane Extract of the Dried Rhizome of *Alpinia conchigera* Griff.

R_f	Visual	UV 254 nm	UV 365 nm	Spray (V.S)	Spray (A.S)	UV 365 nm After spray(A.S)
0.93		Pale brown		Dark violet	Violet	Pink
0.90		Faint brown	Blue	Pale violet	Pale violet	
0.75		Pale brown	Light blue			White
0.70			Pale white			
0.68		Brown		Reddish brown	Greenish yellow	Dark green
0.60		Dark brown	Pale white	Pale reddish brown	Pale dark blue	Pale white
0.48		Pale brown	Pink			Pale violet
0.45	No spots detected	Pale brown		Pale yellow	Pale yellow	
0.40		Pale brown		Reddish brown	Greenish yellow	
0.37		Pale brown	Faint blue			Green
0.30		Pale brown	Purple	Pale yellow	Pale yellow	Purple
0.22		Dark brown	Pale white	Reddish brown	Greenish yellow	Pale green
0.17			Faint pink			
0.13		Dark brown	Pale white			Pale purple

Alpiniae conchigerae Rhizoma



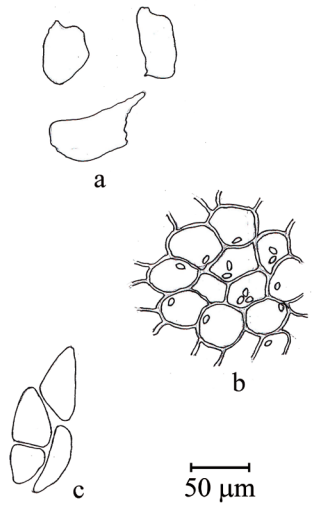


Fig. 3b Characters of the powdered drug

a. Secretory cell
b. Parenchyma with simple starch granules
c. Club-shaped large starch granules from the cortex.

Fig. 3a Transverse section of *Alpinia conchigera* Griff. rhizome

1. Epidermis
2. Cortex
3. Starch grains
4. Cortical vascular bundle
5. Phloem
6. Xylem
7. Vessel
8. Endodermis
9. Pericycle
10. Stelar vascular bundle

Alstoniae scholaris Cortex

***Alstonia scholaris* (L.) R. Br. (Apocynaceae)** **ဆောင်မုရိုး/ဆောင်မဲအုပ်**

(Taun majou:/Taun me: ou')

Fig. 1 *Alstonia scholaris* (L.) R. Br.
1. the plant; 2. dried stem bark

Sources : Mandalay and Magway Region

Synonym(s) - ***Echites scholaris* L.**
***Pala scholaris* (L.) Roberty**

Other name(s) - **Alstonie des ecoliers (French)**
Chatium, Chattiyan (Hindi)
Chhatim (Bengali)
Dita bark, Indian devil tree, Milky Pine,
Blackboard Tree (English)
Dita (Philippines)
Lame (Sundanese)
Popeal khe (Cambodian)
Pulai,rejang, Jelutong, basong (Malaysian)
Pule (Javanese)
Saptaparna,Visalatvak (Sanskrit)
Sativn Tree (Indian)
Tin ped, palai (Thai)

Part (s) used - Dried stem bark

Definition

Alstoniae scholaris Cortex consists of rough, grey, mature stem bark of *Alstonia scholaris* (L.) R. Br. (Apocynaceae).

Description of the part used

Macroscopic characteristics

The bark about half inch thick; externally mottled brownish and slightly smooth, but marked by shallow fissures. Internally the bark is light brown and slightly striated. Odour pleasant and bitter taste.

Microscopic characteristics

Transverse section of *Alstonia scholaris* (L.) R.Br. mature stem bark shows:

1. phellem or cork layer, the outermost part, 10-20 layers of thin-walled, slightly suberized and radially arranged cork cells. Some cork cells filled with brown content.
2. interior to the cork layer, a few-layered of phelloderm composed of somewhat tangentially elongated cells intermingled with sclerenchymatous cells

3. beneath the phelloderm, the cortex (stone-cell) region mainly composed of thin-walled, polygonal to rounded parenchyma cells mixed with variable sizes and shapes of sclerenchymatous cells (stone-cells). Some stone cells contain prismatic and rhomboidal crystals of calcium oxalate
4. a few phloem cells also occurred in this region
5. the bast or phloem region, interior to the cortex (stone-cells) region, composed of phloem and phloem parenchyma cells crossed by many pith rays and with many latex tubes
6. most of the phloem parenchyma cells contain prismatic and rhomboid calcium oxalate crystals
7. lacticiferous canals always present in some of cortical cells and ray cells

Characters of the powdered drug

Pale yellowish brown powder, slightly pleasant odour and bitter taste. The diagnostic characters are:

a. cork fragments filled with brown content
b. groups of pitted sclereids with wide lumen
c. parenchymatous cells containing prisms of rhomboidal calcium oxalate crystal and abundant starch grains
d. parenchyma with latex cannal

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110°C for a five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drop of 10 % ferric chloride solution, deep blue colour is produced.

D. The drug 1 g is introduced into the test tube and followed by the addition

of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

E. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution for a few minutes, pink colour is formed.

F. Add 10 mL of chloroform to 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A brick red colour is formed.

G. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

To extract 1 g of powder drug add 15 mL of ethyl acetate on the water bath for one hour and filter. The filterate is evaporated to dryness. The dried extract is redissolved in 1 mL of ethyl acetate for Thin Layer Chromatography.

Application volume : 15 µL
Developing solvent system : Hexane : Ethyl acetate (7:1.4)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin in sulphuric acid

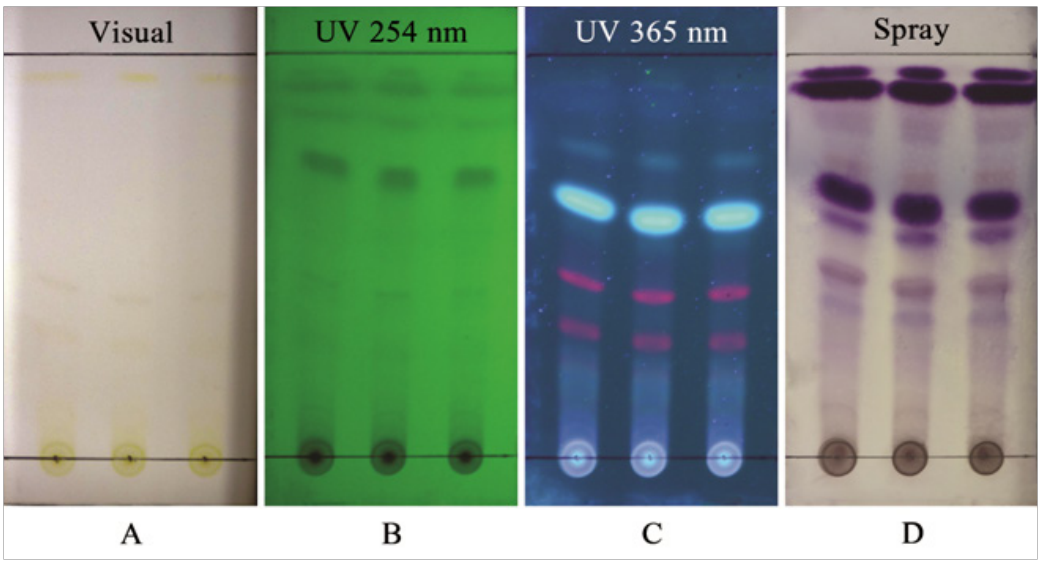


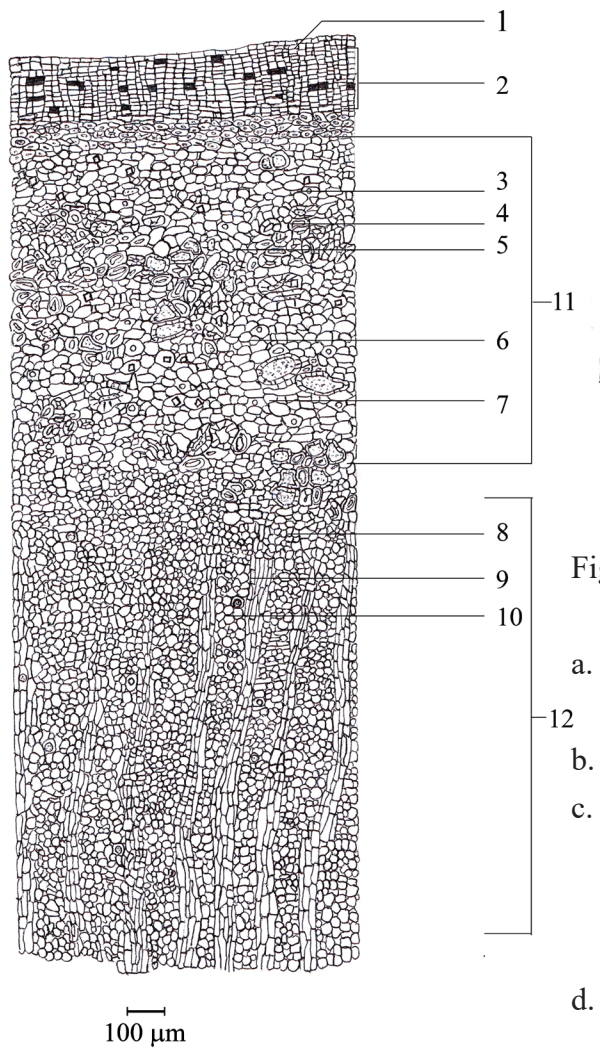
Fig. 2 Thin-layer chromatogram of Ethyl acetate extract of the dried barks of *Alstonia scholaris* (L.) R. Br.

Table 1. R_f values of components in Ethyl acetate extract of the dried barks of *Alstonia scholaris* (L.) R. Br.

R_f	Visual	UV 254 nm	UV 365nm	Spray
0.95	Orange			Deep blue
0.90		Brown	Blue	Deep blue
0.81		Brown		Pale violet
0.72			Blue	
0.68		Dark brown		Orange
0.61				Deep blue
0.58			Blue fluorescence	
0.55				Purple
0.40	Faint black	Pale brown	Red	Violet
0.35				Blue
0.30	Faint orange			
0.28			Red	
0.24		Pale brown		Pale pink
0.18			Blue	
0.10				Brown
0.07	Faint orange	Pale brown	Blue	

- Loss on drying at 105 °C : Not more than 8.57 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 5.15 %
- Acid-insoluble ash : Not more than 0.25 %
- Water soluble ash : Not less than 3.60 %
- Ethanol soluble extract : Not less than 10.96 %
- Water soluble extract : Not less than 15.60 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Arthritis, Diabetes Mellitus
- Research reports : Antibacterial (dysentery and diarrhoea)[14], Antihyperglycemic activity[15], Antimicrobial activity[16]

Alstoniae scholaris Cortex



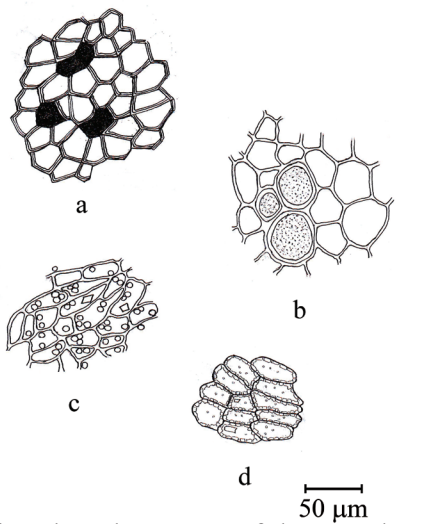


Fig. 3b Characters of the powdered drug

a. Cork fragments filled with brown content
b. Parenchyma with latex canal
c. Parenchymatous cells containing solitary prism of calcium oxalate crystals andabundant starch grains
d. Groups of sclereid with wide pitted lumen

Fig. 3a Transverse section of *Alstonia scholaris* (L.) R.Br. stem bark

1. Epidermis
2. Cork layer with brown content
3. Solitary calcium oxalate crystal
4. Stone cell
5. Cortical parenchyma cell
6. Starch grains
7. Intercellular space
8. Secondary phloem
9. Ray parenchyma
10. Latex canal
11. Cortex region
12. Secondary phloem region

Baheda Fructus

Terminalia bellirica **(Gaertn.) Roxb. (Combretaceae)** **သစ်ဆိမ့် (Thi' hsein.)**

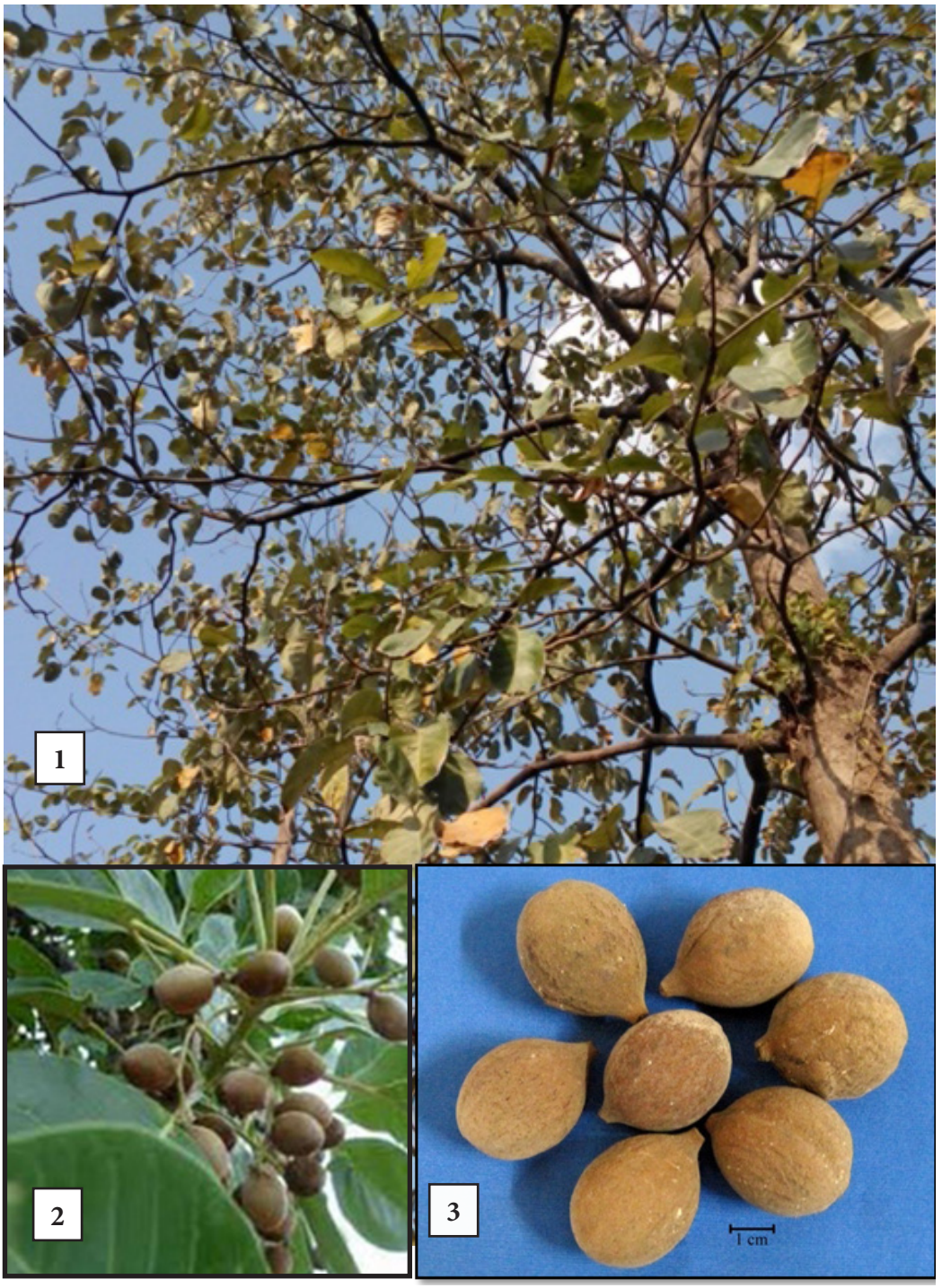


Fig. 1 *Terminalia bellirica* (Gaertn.) Roxb.
1. the plant; 2. fresh fruits; 3. dried fruits

Source : Magway Region

Synonym (s) - ***Myrobalanus belerica* B. Gaertn.**
***M. laurinoides* (Teijsm. & Binn.) Kuntze**
***Terminalia attenuata* Edgew.**
***T. bellirica* var. *laurinoides* (Teijsm. & Binn.) C. B. Clarke**
***T. eglandulosa* Roxb. ex C. B. Clarke**
***T. gella* Daizell**
***T. laurinoides* Teijsm. & Binn.**

Other name (s) - **Bahera (Hindi)**
Bahera (Indian)
Baheraa, Bhayraa, Bhairah (Bengali)
Belliric Myrobalan, Bastard Myrobalan (English)
Samo Phi Phek (Thai)
Taanni, Thani (Tamil)
Vibhitaki, Vibheetaka (Sanskrit)

Part (s) used - Dried mature fruits

Definition

Baheda Fructus consists of the mature fruit of *Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae).

Description of the part used
Macroscopic characteristics

Fruits grey drupes, spherical to ovoid to irregularly round, shortly stipitate, sub-globose to ovoid, slightly to strongly 5-6 or (-8) ridged, covered with densely velvety pubescent, stone very thick, indistinctly 5-angled. Odour not characteristic, bitter, spicy and astringent taste.

Microscopic characteristics
Transverse section of *Terminalia bellirica* (Gaertn.) Roxb. mature fruit shows:

1. epicarp, one-layered, thick-walled rectangular to barrel shaped parenchymatous epidermal cells, covered with thick cuticle and unicellular trichomes
2. the mesocarp composed of 2-3 to more layers of collenchymatous cell, parenchyma intermingle with stone cells, beneath the epidermis, the cells rec-

tangular to oval in shape and contain tannin, next to collenchyma a broad zone of compactly arranged rectangular to oval parenchyma in which few layered of (sclerenchyma) fibres and sclereids of various shapes and sizes, mostly tangentially elongated and interspread; tannin and aggregate crystals of calcium oxalate present in the cells of mesocarpic region

3. the cells of pericycle composed of starch grains
4. endocarp composed of thick-walled, mostly elongated, various shapes and sizes of lignified fibres, sclereids and scalariform pitted vessels
5. endosperm consists of stone cells, radiated

Characters of the powdered drug

Light brown colour, slightly characteristic odour and astringent, spicy and bitter taste. The diagnostic characters are:

a. epidermis of epicarp with hair-like unicellular trichomes
b. various shaped stone cells in longitudinal and transverse views
c. thick-walled sclereids with simple pits and large lumen
d. rosette of calcium oxalate crystals and starch grains
e. scalariform pitted vessels

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110°C for five minutes. Spot color is changed to purple color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drop of 10 % ferric chloride solution, deep blue colour is produced.

D. The powdered sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Mayer's reagent is added to the filtrate. White precipitate is produced.

E. The powdered sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Wagner's reagent is added to the filtrate. Reddish brown precipitate is appeared.

F. 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.

G. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

TLC analysis

Extract 0.5 g of crude powder drug in 5 mL of methanol for overnight, filter and the filtrate is used for chromatography.

Application volume : 4 µL
Developing solvent system : Ethyl acetate: Methanol: Water (15:2:1)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : 10% Potassium Hydroxide

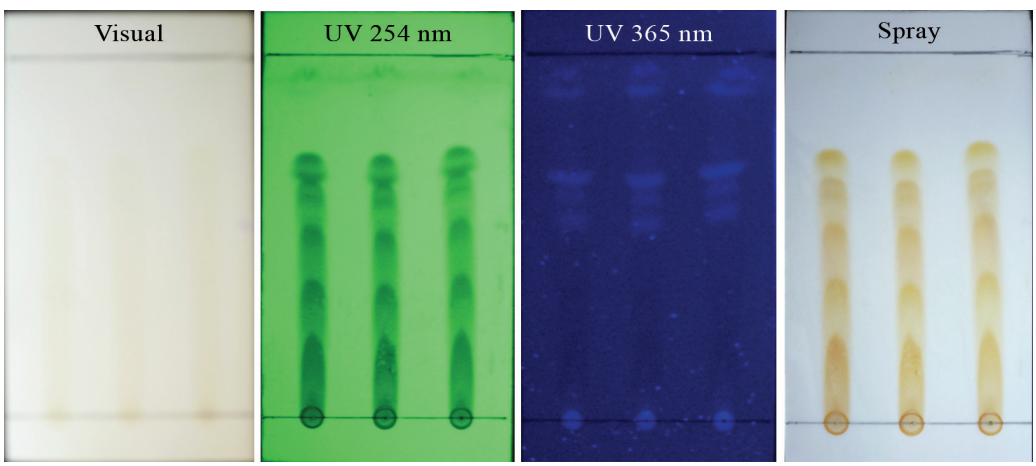


Fig. 2 Thin-layer Chromatogram of Methanol extract of the dried fruits of *Terminalia bellirica* (Gaertn.) Roxb.

Table 1 R_f values of Components in Methanol extract of the dried fruits of *Terminalia bellirica* (Gaertn.) Roxb.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.96			Faint pink	
0.91			Light blue	
0.71		Green	Light blue	
0.70				Orange
0.66			Light blue	
0.65		Green		
0.63		Green		Orange
0.60		Green	Light blue	
0.58				Orange
0.54			Light blue	
0.46		Green		
0.45				Orange
0.33				Orange
0.31		Green		
0.11		Green		
0.10				Orange

- Loss on drying at 105 °C : Not more than 8.88 %
- Total ash : Not more than 4.90 %
- Acid-insoluble ash : Not more than 1.60 %
- Water soluble ash : Not less than 2.45 %
- Ethanol soluble extract : Not less than 43.20 %
- Water soluble extract : Not less than 48.5 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 35
- Traditional therapeutic uses : Bowel disorder, Toothache, Arthritis, Itchness, Dryness of skin and Wounds
- Research reports : Antimicrobial [17], Antioxidant [17]

Baheda Fructus

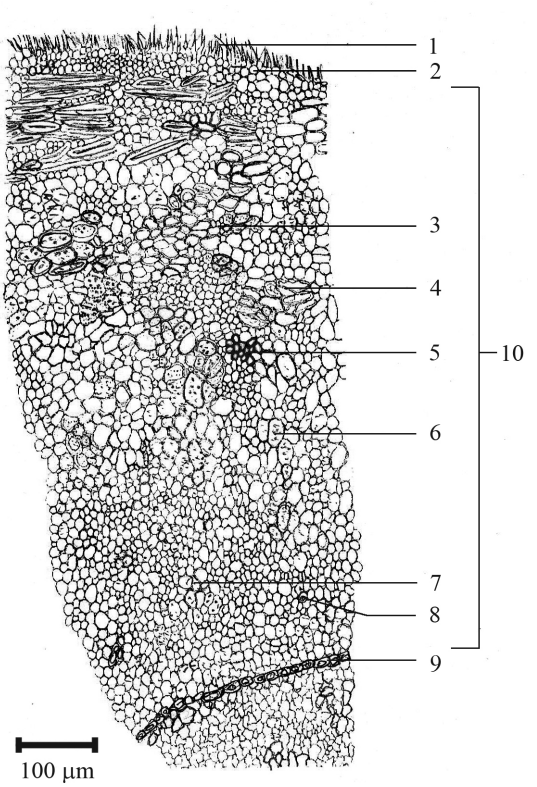


Fig. 3a Transverse section of *Terminalia bellirica* (Gaertn.) Roxb. mature fruit

1. Trichomes
2. Epidermal cell of epicarp
3. Porous parenchyma
4. Stone cell
5. Vascular bundle
6. Starch grains
7. Rosette calcium oxalate crytals containing parenchyma cells
8. Stone cell
9. Endocarp
10. Mesocarp

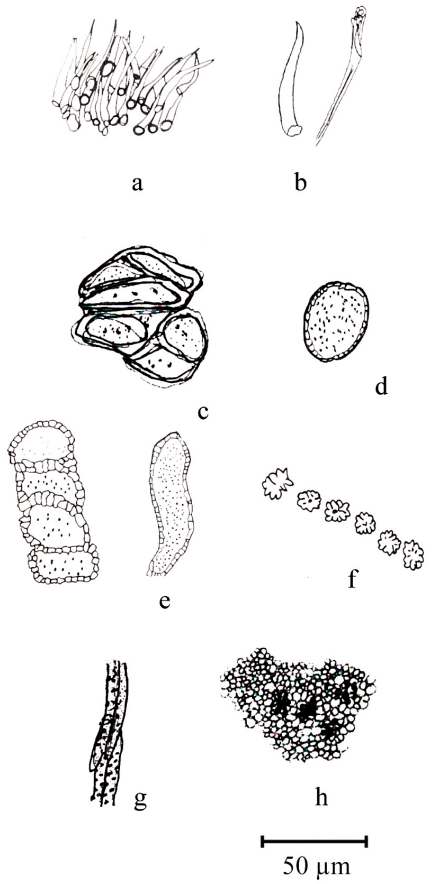


Fig. 3b Characters of powdered drugs

a. Groups of trichome
b. Separate unicellular trichome
c. Lignified stone cells
d. Porous parenchyma
e. Thick-walled, irregular shaped and simple pitted forms sclereids with large lumen
f. Rosette calcium oxalate crystals
g. Scalariform pitted vessels
h. Parenchyma containing aleurone grains, oil globules and rosette crystals

Bruceae Fructus

***Brucea javanica* (L.) Merr. (Simaroubaceae)** **ရာတန်ဇေ့ (Ja dan zei.)**

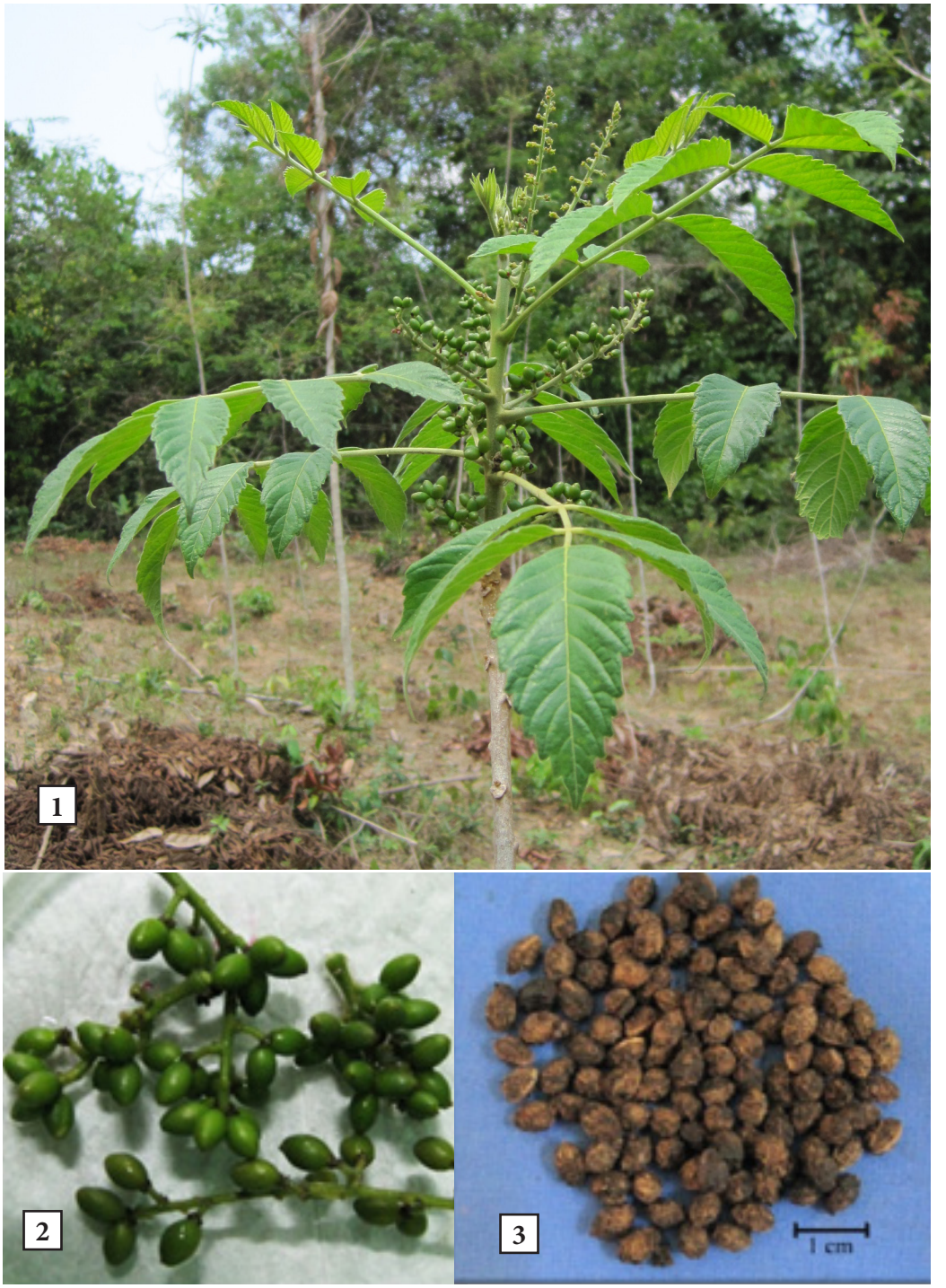


Fig. 1 *Brucea javanica* (L.) Merr.
1. the plant; 2. fresh fruits; 3. dried fruits

Source : Taninthayi Region

Synonym(s) - ***Rhus javanica* L.**
***Brucea amarissima* Desv.**
***Brucea sumatrana* Roxb.**
***Gonus amarissimus* Lour.**

Other name(s) - **Berul (Sumatran)**
Di-kon, Rachadat, Kadat (Thai)
Gallsumak (Swedish)
Java brucea, Macassar kernels (English)
Kendung peuchang, Kuwalot, Trawalot (Sundanese)
Kusum, Kumuke, Ya dan zi (Chinese)
Lada pahit, Meladapahit, Cerekjantan (Malaysian)
Malur, Sikalur, Kwalot (Javanese)

Part (s) used - Dried fruits

Definition

Bruceae Fructus consists of fruit of *Brucea javanica* (L.) Merr. (Simaroubaceae).

Description of the part used

Macroscopic characteristics

The fruit is ovoid drupe. Externally wrinkled, black to brown. Seeds ovoid, compressed, rugose. Externally yellowish white, reticulate; testa thin, cotyledons milky white and oily. Odourless, strongly bitter taste.

Microscopic characteristics

Transverse section of *Brucea javanica* (L.) Merr. fruit shows:

1. the epidermis of epicarp, a single-layered of parenchyma covered with cuticle layer
2. the epicarp, a few- layered of irregularly and rectangularly parenchymatous cells
3. the mesocarp, many-layered of loosely, irregularly rounded to oval parenchymatous cells which contains rosette type of calcium oxalate crystals and annular vessels
4. vascular bundles occur in the cells of mesocarpic layer

5. the innermost of mesocarpic cells, a few-layered of collapsed parenchymatous cells
6. a sclerenchymatous ring composed of thick-walled, rectangularly polygonal cells
7. the endosperm cells mostly polygonal to rounded parenchyma containing oil globules and aleurone grains

Characters of the powdered drug

Pale brown powder, slightly characteristic odour and bitter taste. The diagnostic characters are:

a. sclereids of endocarp
b. parenchyma containing oil globules and aleurone grains in contact with stone cells
c. oil globules
d. rosette and prismatic calcium oxalate crystals

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

E. An aqueous extract of the sample is dissolved in iodine solution. Blue precipitate is formed.

F. The drug powdered sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Mayer's reagent is added to the filtrate. White precip-

itate is produced.

G. The powdered drug sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Wagner's reagent is added to the filtrate. Reddish brown precipitate is appeared.

H. 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.

I. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

J. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

Extract 1g of crude drug with 15 mL of chloroform on the water bath for 30 minutes, cool for overnight, filter and the filtrate is used for TLC investigation.

Application volume	:	5 µL
Developing solvent system	:	Hexane: Ethyl acetate (10:2)
Stationary phase	:	Silica gel GF_{254} Aluminium sheet
Spray reagent	:	Vanillin-sulphuric acid

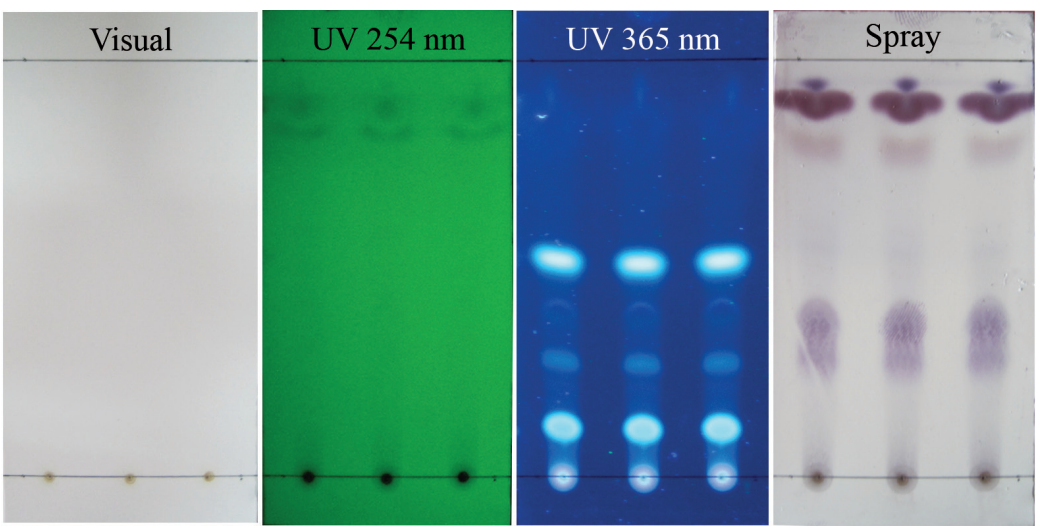


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Dried Fruits of *Brucea javanica* (L.) Merr.

Table 1 R_f values of components in Chloroform Extract of the Dried Fruits of *Brucea javanica* (L.) Merr.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.93		Brown		Purple
0.88		Brown		Dark blue
0.82		Faint brown		
0.78				Brown
0.60				Faint purple
0.58		Faint brown		
0.52			Fluorescent blue	Faint purple
0.41		Faint brown	Faint bluiish pink	Faint purple
0.36		Faint brown		Purple
0.32			Faint pink	
0.27			Blue	Purple
0.22			Pale pink	
0.17			Faint blue	
0.12			Light blue	
0.08		Faint brown		

- Loss on drying at 105 °C : Not more than 3.46 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 7.70 %
- Acid-insoluble ash : Not more than 1.25 %
- Water soluble ash : Not less than 2.30 %
- Ethanol soluble extract : Not less than 15.28 %
- Water soluble extract : Not less than 19.10 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Diarrhoea, Dysentery
- Research reports : Antiamoebic[18], Antimalaria activity [19]

Bruceae Fructus

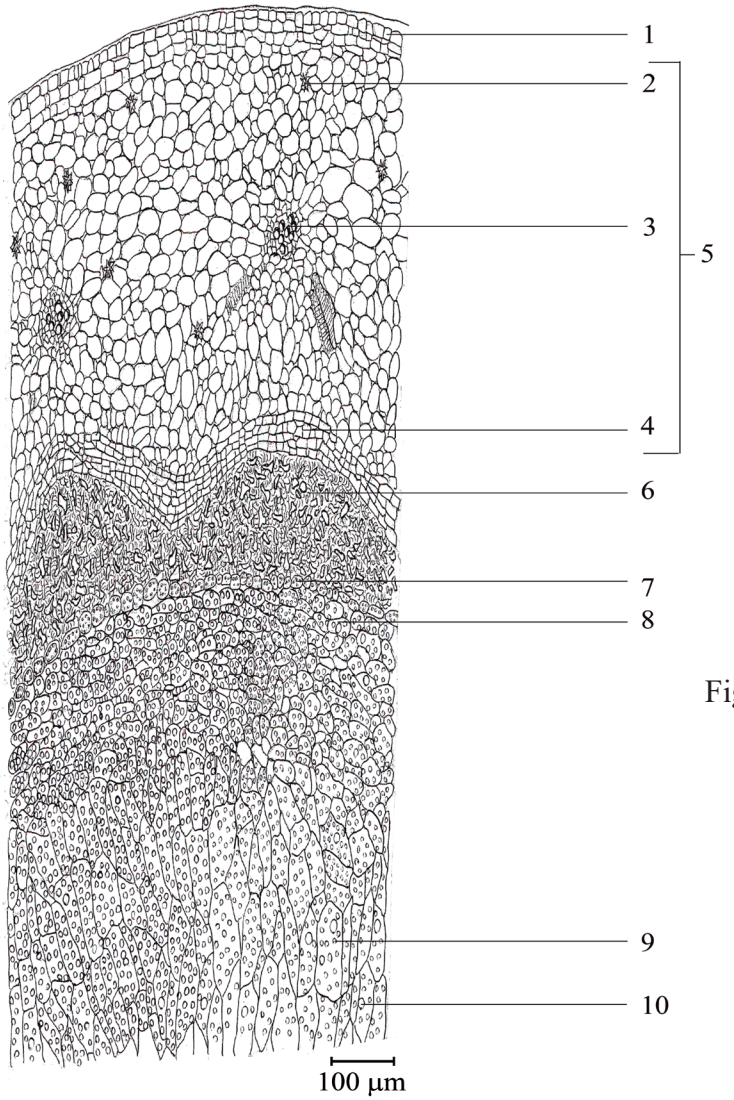


Fig. 3a Transverse section of *Brucea javanica* (L.) Merr. fruit

1. Epidermis of epicarp with cuticle
2. Rosette calcium oxalate crystals
3. Vascular bundles
4. Collapse parenchyma
5. Mesocarp
6. Stone cell
7. Sclerenchymatous endocarp
8. Endosperm cell
9. Polygonal parenchyma containing oil globules
10. Polygonal parenchyma cotaining aleurone grains

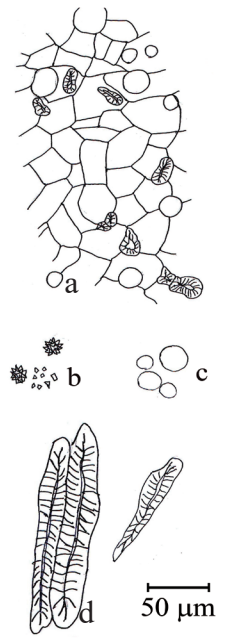


Fig. 3b Characters of the powdered drug

a. Stone cells associated with oil globules and aleurone grains containing parenchyma cell
b. Rosette and prismatic calcium oxalate crystals
c. Oil globules
d. Sclereids of endocarp

Chebulae Fructus

Terminalia chebula **Retz. (Combretaceae)** **ဖန်ခါး (Hpan ga:)**

Fig. 1 *Terminalia chebula* Retz.
1. the plant; 2. fresh fruits; 3. dried fruits

Source : Magway Region

Synonym (s) - ***Myrobalanus chebula* (Retz.) Gaertn.**
***Myrobalanus citrina* Gaertn.**
***Myrobalanus gangetica* (Roxb.) Kostel.**
***Terminalia gangetica* Roxb.**
***T. reticulata* Roth**

Other name (s) - **Badamier chebule, Myrobalan chebule (French)**
Chebulic myrobalan, Black myrobalan, gali nut, Indian gall-nut, ink nut, yellow myrobalan (English)
Chebulische myrobalane, Rispiger myrobala nenbaum (German)
Harre (Hindi)
Haritaki (Sanskrit)
He zi (Chinese)
Horitoky (Bengali)
Kadukkai (Tamil)
Myrobalanas indicas (Spanish)

Part (s) used - Dried mature fruits

Definition

Chebulae Frutus consists of the dried mature or nearly mature fruit of *Terminalia chebula* Retz. (Combretaceae).

Description of the part used
Macroscopic characteristics

The fruits 2.0-3.5 cm long, oblongoid to ovoid; externally yellowish-brown or dark-brown, somewhat lustrous, glabrous, marked with 5 or 6 longitudinal ribs or irregularly wrinkles, base with a rounded fruit stalk scar; one seeded; testa yellowish-brown, cotyledons white, overlapping and convolute. Slightly characteristic odour, taste slightly sour, astringent then sweet.

Microscopic characteristics
Transverse section of *Terminalia chebula* Retz. dried mature fruit shows:

1. epicarp, 1- layer of rectangularly parenchyma of epidermal cells covered

with thick cuticle layer

2. mesocarp, 2-3 layers of collenchyma followed by a broad zone of parenchyma in which fibres and sclereids, various shapes and sizes, mostly elongated; tannin and aggregate calcium oxalate crystals present in sclerenchyma and some mesocarpic parenchyma cells
3. vascular bundles embedded in parenchyma layer of the mesocarp
4. endocarp composed of thick-walled sclereids of various shapes and sizes, mostly elongated, lignified fibres and vessels
5. testa, one layer of large cubical cells, followed by a zone of reticulate parenchyma and vessels
6. tegmen consists of collapsed parenchyma cells
7. cotyledons folded and containing aleurone grains, oil globules and some rosette aggregate calcium oxalate crystals

Characters of the powdered drug

Yellowish-brown powder, odour slightly characteristic, sour and slightly bitter taste. The diagnostic characters are:

a. Epidermis
b. Sclereids
c. Fibres
d. Annular and spiral vessels
e. Embedded brownish masses, rosette calcium oxalate crystals and aleurone grains
f. Vascular bundle
g. Endocarp
h. Collapse parenchyma
i. Cotyledon

Identification

A. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for a few minutes. A brick red coloured precipitation is produced.

B. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, blue colour is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

D. Two drops of 1% lead acetate solution is added to aqueous extract sample, yellow precipitate is produced.

E. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

TLC analysis

Macerate 1g of dried powdered sample in a stopper container with 5 mL of methanol and allow standing for 24 hours. Use the filtrate for TLC investigation.

Application volume	:	2 µL
Developing solvent system	:	Chloroform: Ethyl acetate: Methanol (2.5: 2.0: 0.8)
Stationary phase	:	Silica gel GF_{254} Aluminium sheet
Spray reagent	:	10% Ferric chloride solution

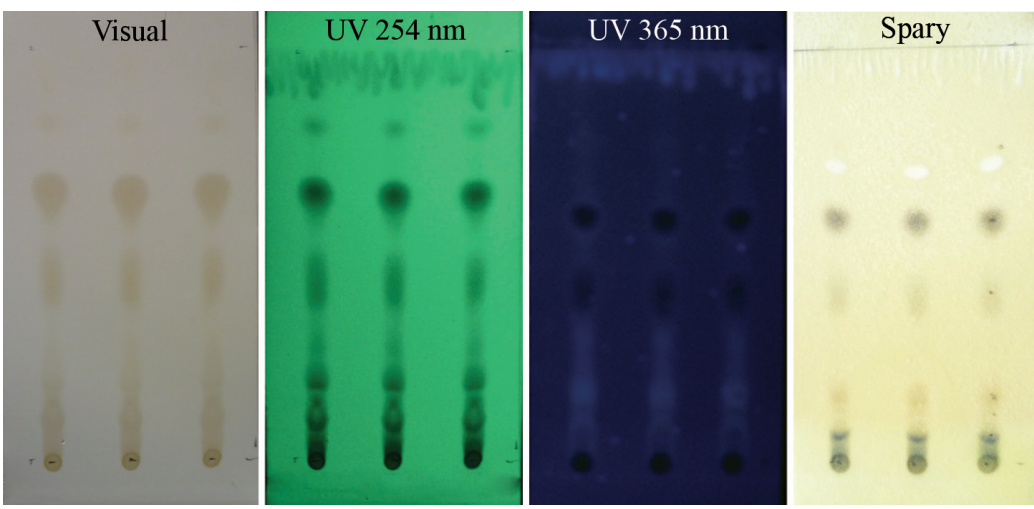


Fig. 2 Thin-layer Chromatogram of Methanol Extract of the Dried Fruits of *Terminalia chebula* Retz.

Table 1 R_f values of components in Methanol Extract of the Dried Fruits of *Terminalia chebula* Retz.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.83	Pale brown	Brown		
0.72				Pale gray
0.67	Yellow brown	Dark brown		
0.61			Dark brown	Brown
0.45	Yellow brown	Dark brown	Dark brown	
0.41				Pale brown
0.23		Dark brown		
0.19			Blue	Pale brown
0.13	Yellow brown	Dark brown		
0.08				Dark brown

- Loss on drying at 105 °C : Not more than 3.55 %
- Total ash : Not more than 7.60 %
- Acid-insoluble ash : Not more than 3.40 %
- Water soluble ash : Not less than 1.75 %
- Ethanol soluble extract : Not less than 30.96 %
- Water soluble extract : Not less than 47.40 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - Sup: 9, 26
- Traditional therapeutic uses : Bowel disorders, Bloody diarrhoea, Pile
- Research reports : Antihyperglycemic activity [15], Hypoglycemic effect [20], Anti-bacterial activity [13, 21, 22]

Chebulae Fructus

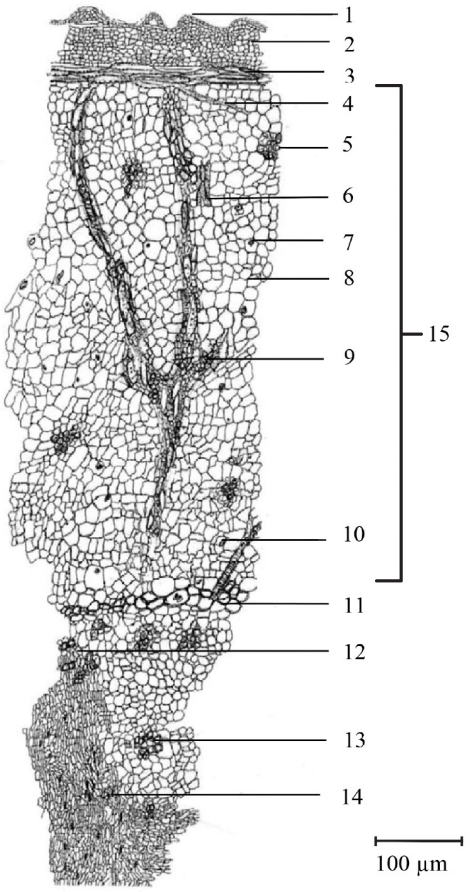


Fig. 3a Transverse section of *Terminalia chebula* Retz. fruit:

1. Epidermis
2. Sclereids
3. Fibres
4. Tracheids
5. Vascular bundle
6. Vessel
7. Brownish masses
8. Parenchyma
9. Porous parenchyma
10. Aleurone grains
11. Endocarp
12. Collapse parenchyma
13. Rosette calcium oxalate crystals
14. Cotyledon
15. Mesocarp

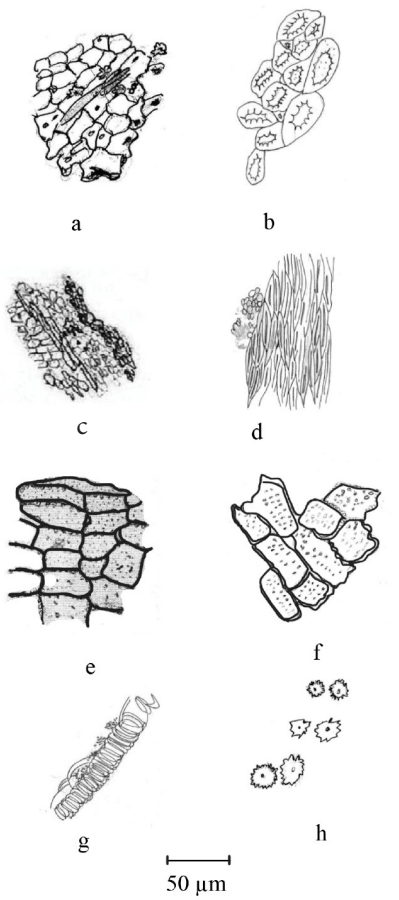


Fig. 3b Characters of powdered drugs:

a. Parenchyma cells containing aleurone grains, oil globules, rosette calcium oxalate crystals and brownish masses
b. Sclerenchyma cells (stone cells)
c. Epidermis in sectional view
d. Fibres
e. Sclereids
f. Porous parenchyma
g. Annularly spiral vessel
h. Aggregate rosette of calcium oxalate crystals

Cinnamomi Folium

Cinnamomum tamala **(Buch.-Ham.) T. Nees & Nees (Lauraceae)**

ကရဝေး (Karawei:)

Fig. 1 *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees
1. the plant; 2. dried leaves

Sources : Mandalay Region and Magway Region

Synonym(s) - ***Laurus tamala* Buch.-Ham.**
***Cinnamomum albiflorum* Nees**
***C. lindleyi* Lukman**
***C. pauciflorum var.tazia* (Buch.-Ham.) Meisn.**
***C. reinwardtii* Nees**
***C. veitchii* Lukman**

Other name (s) - **Bay leaf, Bay laurel leaf (English)**
Malabathrum (Latin)
Talishapattiri (Tamil)
Tamalapatran (Malaysian)
Tamalpatra (Sanskrit)
Tejipatta (Hindi)
Tejpata (Bengali)

Part (s) used - Dried mature leaves

Definition

Cinnamomi Folia consist of the dried mature leaves of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees (Lauraceae).

Description of the part used

Macroscopic characteristics

Leaves simple, opposite to nearly opposite, shortly petiolate, slightly sulcate adaxially, elliptic-oblong, tri-nerved from the base to the apex, margin entire, apex acute to broadly cuneate, upper surface smooth, shiny and leathery, lower surface slightly rough; glabrous on both surfaces, triplinerved. Odour characteristic, taste spicy and mucilaginous.

Microscopic characteristics

Transverse section of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees leaf shows:

1. both of the upper and lower epidermis composed of one-layered of sclerenchymatous cell covered by thick cuticle layer
2. a few-layered of collenchymatous hypodermis, beneath the adaxial side and

above the abaxial side of mid-rib

3. mesophyll composed of one-layered of palisade parenchyma and a few layered of spongy parenchyma cells
4. stone cells distinct, occur in the spongy layer of mesophyll
5. mucilage cells, oil cells and prismatic crystal containing cells are scattered in the mesophyll layer
6. vascular bundle surrounded by a sclerenchymatous sheath

Characters of the powdered drug

Dark greenish yellow powder, characteristic odour, mucilaginous and spicy taste. The diagnostic characters are :

a. leaf fragment in sectional view
b. upper epidermis with paracytic stomata
c. mucilage canal
d. stone cells

Identification

A. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, blue colour is produced.
B. In a test tube containing about 5 mL of aqueous extract of the sample, add a few drops of 1% solution of lead acetate. A yellow precipitate is formed.
C. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

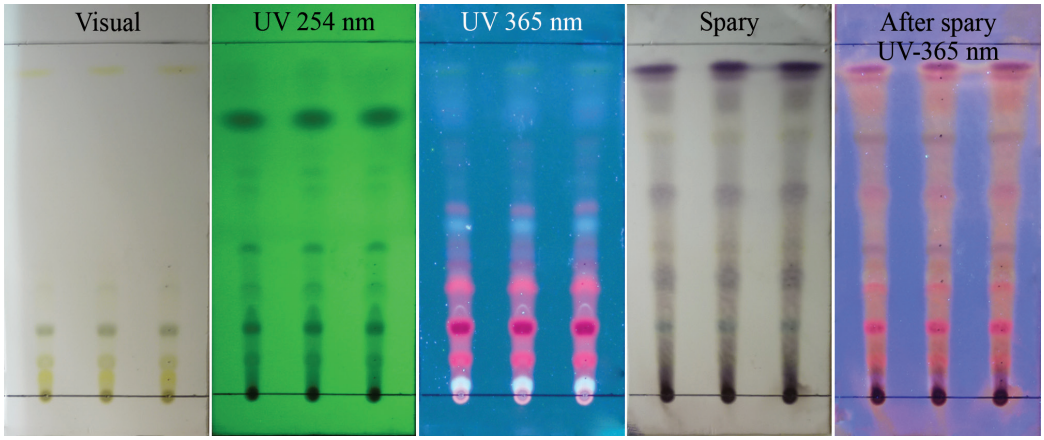
TLC analysis

Extract 1 g of crude dried powdered sample in a stoppered container with 10 mL of dichloromethane for a period of 6 hours and allowed to stand. Then the mixture is filtered and evaporated. The dried residue is dissolved in 1.0 mL of dichloromethane and used for Thin Layer Chromatography investigation.

Application volume : 5 μL
Developing solvent system : Hexane: Ethyl acetate (10:2)

Stationary phase : Silica gel GF_{254} Aluminium sheet

Spray reagent : Vanillin-sulphuric acid



A B C D E

Fig. 2 Thin-layer Chromatogram of Dichloromethane Extract of the Dried Leaves of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees

- Loss on drying at 105 °C : Not more than 7.61%
- Foreign matter : Not more than 0.5 %
- Total ash : Not more than 4.75 %
- Acid-insoluble ash : Not more than 1.25 %
- Water soluble ash : Not less than 0.85 %
- Ethanol soluble extract : Not less than 20.56 %
- Water soluble extract : Not less than 22.30 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 8/12/20/23/29/30/ 35 A 35 B/38/ 39/Sup 7/14
- Traditional therapeutic uses : Appetent, Indigestion
- Research reports : Antibacterial activity[13], Anti-tuberculosis[23]

Table 1 R_f values of components in Dichloromethane Extract of the Dried Leaves of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees

R_f	Visual	UV 254 nm	UV 365 nm	Spray	After Spray
0.93	Orange	Faint brown	Pale green-ish blue	Deep violet	Pink brown
0.83			Blue	Brown	
0.79		Deep brown			
0.74				Pale yel-low brown	Pink purple
0.63		Pale brown			
0.58		Pale brown		Violet brown	Pink
0.53			Pale pink		
0.49			Blue		
0.42		Brown	Blue pink	Pale brown	Pink brown
0.37	Faint brown				
0.31	Faint brown	Brown	Pink	Violet brown	Pink
0.20		Brown	Red		Pink
0.10		Brown	Red		Pink brown
0.05	Orange				
0.02			Faint brown	Black	

Cinnamomi Folia

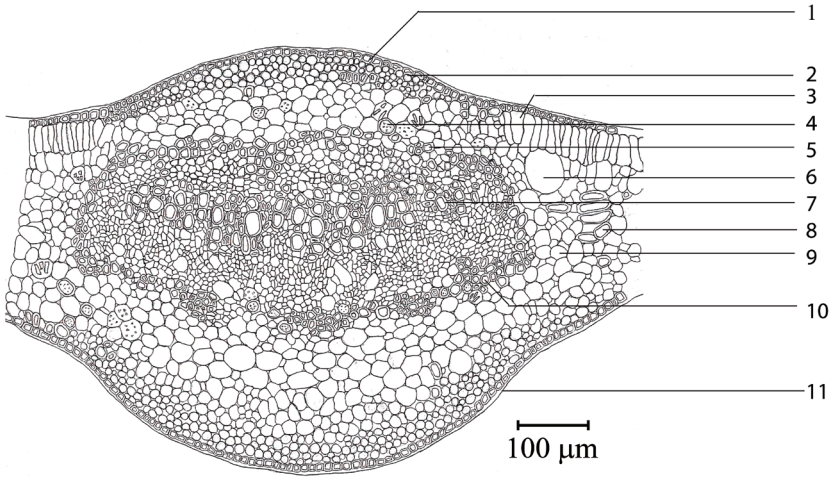


Fig. 3a Transverse section of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Nees leaf

1. Upper epidermis with cuticle layer
2. Collenchymatous hypodermis
3. Palisade parenchyma
4. Oil cell
5. Fibre
6. Mucilage cell
7. Vascular bundle
8. Stone cell
9. Spongy parenchyma
10. Sclerenchymatous bundle sheath
11. Lower epidermis with cuticle layer

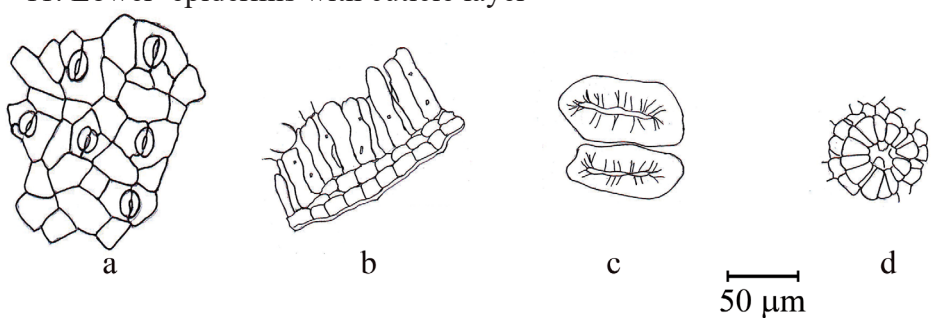


Fig. 3b Characters of the powdered drug

a. Upper epidermis with paracytic stomata
b. Leaf fragments in sectional view
c. Stone cells
d. Mucilage canal

Curcumae comosae Rhizoma

***Curcuma comosa* Roxb. (Zingiberaceae)** **နနွင်းခါး/နနွင်းရိုင်း**

(Nanwin: ga:/ Nanwin jain:)

Fig. 1 *Curcuma comosa* Roxb.
1. the plant; 2. fresh rhizome; 3. dried rhizome

Sources : Mandalay Region and Shan State

Synonym (s) - **Nil**

Other name (s) - **Bitter ginger, Wild turmeric (English)**
Dilaw dilao (Philippines)
False turmeric (English)
Javanese turmeric or Kunyit (Indonesian)
Temu lawak (Malaysian)
Wan-chuk-mot-luik (Thai)

Part (s) used - Dried rhizome

Definition

Curcumae comosae Rhizoma consists of the dried rhizome of *Curcuma comosa* Roxb. (Zingiberaceae).

Description of the part used

Macroscopic characteristics

The primary rhizome ovate, oblong to pear-shaped; the secondary rhizome palmately branched; externally yellowish to yellowish-brown, with rootlets and leaves scars; fracture horny; internally orange yellow to orange; waxy, showing a cortex separated from a central cylinder by a distinct endodermis, externally earthy-brown colour. Odour turmeric, hot and bitter taste.

Microscopic characteristics

Transverse section of *Curcuma comosa* Roxb. rhizome shows:

1. the outermost brownish epiblema consists of a single layered of parenchyma cells
2. a few layered of cork cells below the epiblema
3. the cortex, a broad zone, interior to the cork layer, compactly rounded to polygonal parenchymatous cells
4. cortical vascular bundles scattered in the cortical region
5. interior to the cortex, a single parenchyma layer of endodermis
6. below the endodermis, a few layers of parenchymatous pericycle
7. oil, starch containing cells, tracheids and annular and spiral vessels dis-

persed in the cortical region

8. yellow colour containing cells present in an entire rhizome

Characters of the powdered drug

Pale brown powder, aromatic and characteristic odour, warm and slightly bitter taste. The diagnostic characters are:

a. polygonal cork cells in transectional view
b. polygonal cork cells in surface view
c. fibre in sectional view
d. fibre attached with annular vessels
e. annular and spiral vessels
f. pitted trachea

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110°C for five minutes. Spot color is changed to violet color.

B. Add 1 mL of a mixture of equal volume of Fehling's solution 'A' and Fehling's solution 'B' to 2 mL of aqueous extract of the drug and boil the test tube for a few minutes. A red precipitate is produced.

C. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

D. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes. Foaming is appeared in the test tube.

TLC analysis

To extract 1 g of powder drug add 15 mL of ethyl acetate on the water-bath for one hour and allow to stand for 30 minutes. Filter and filtrate is evaporated to dryness. The dried extract is dissolved in 3 mL of ethyl acetate for TLC investigation.

Application volume : 4 µL

Developing solvent system : Dichloromethane : Methanol (10 : 0.25)
allow to stand for 30 minutes

Stationary phase : Silica gel GF_{254} Aluminium sheet

Spray reagent : (i) 10% sulphuric acid in Ethanol (10%SE)
(ii) Anisaldehyde in sulphuric acid (AS)

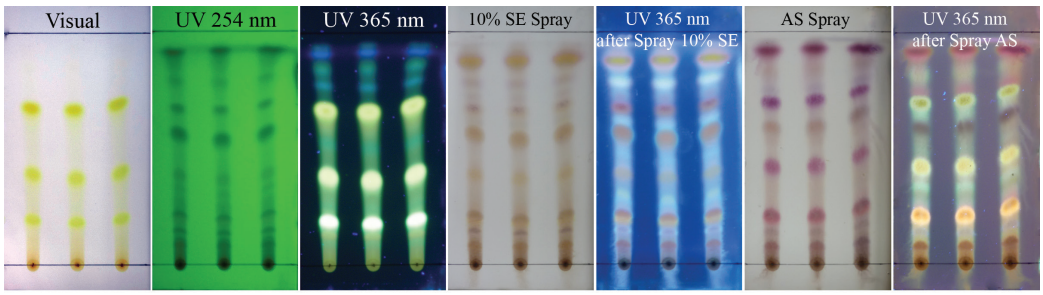


Fig. 2 Thin-layer Chromatogram of Ethyl acetate Extract of the Dried Rhizome of *Curcuma comosa* Roxb.

- Loss on drying at 105 °C : Not more than 11.88 %
- Foreign matter : Not more than 2.0 %
- Total ash : Not more than 8.40 %
- Acid-insoluble ash : Not more than 2.85 %
- Water soluble ash : Not less than 2.00 %
- Ethanol soluble extract : Not less than 14.40 %
- Water soluble extract : Not less than 27.80 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Hypertension, Inflammation, Paralysis
- Research reports : In vitro antioxidant activity [24], Antiproliferative and anti-oxidant activity [11], Hypoglycemic effect [25]

Table 1 R_f values of components in Ethyl acetate Extract of the Dried Rhizome of *Curcuma comosa* Roxb.

R_f	Visual	UV 254 nm	UV 365 nm	10% SE Spray	UV 365 nm after spray SE	10% AS	UV 365 nm after spray AS
0.95			Blue fluorescence				
0.91		Dark brown			Orange	Pink	Pink
0.87			Green fluorescence	Orange			Pink blue
0.77		Pale brown	Greenish blue fluorescence	Pale orange brown	White blue	Violet	
0.71				Pale orange brown		Pink	Greenish blue
0.68	Yellow	Brown	Yellow fluorescence	Orange brown	Pink brown		
0.62							Black
0.57		Dark brown		Orange	Pink brown	Orange	
0.41	Yellow		Yellow fluorescence			Pink	Orange
0.38		Pale brown		Orange	Orange blue		
0.35							Pale blue
0.30		Pale brown					
0.26		Pale brown					
0.21		Brown		Orange	Orange blue	pink	Orange
0.18	Yellow		Yellow fluorescence				
0.14		Brown		Brown	Blue	Brown	Pink brown
0.07		Dark brown		Orange	Pink brown	Pink brown	

Curcumae comosae Rhizoma

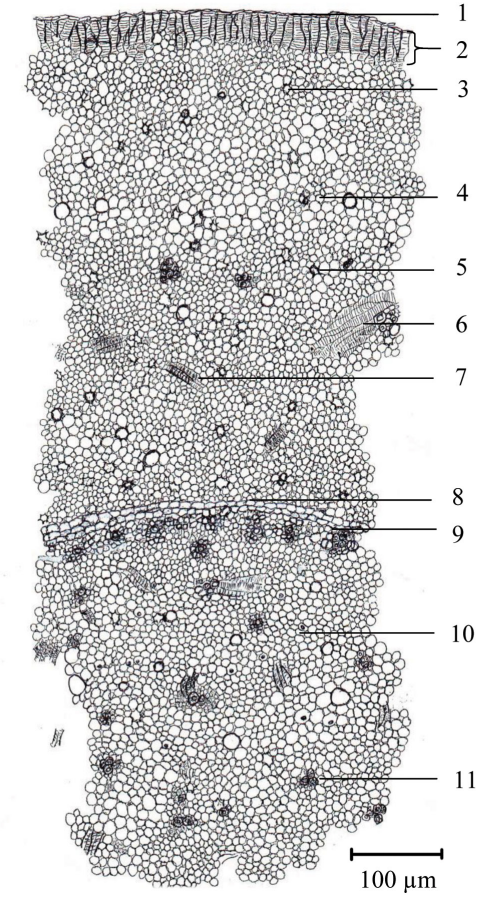


Fig. 3a Transverse section of *Curcuma comosa* Roxb. rhizome

1. Epiblema
2. Cork layer
3. Oil globules
4. Cortical vascular bundle
5. Yellow coloured and lignified contents
6. Annular thickening tracheids
7. Spiral vessel
8. Endodermis
9. Pericycle
10. Calcium oxalate crystals
11. Stelar vascular bundles

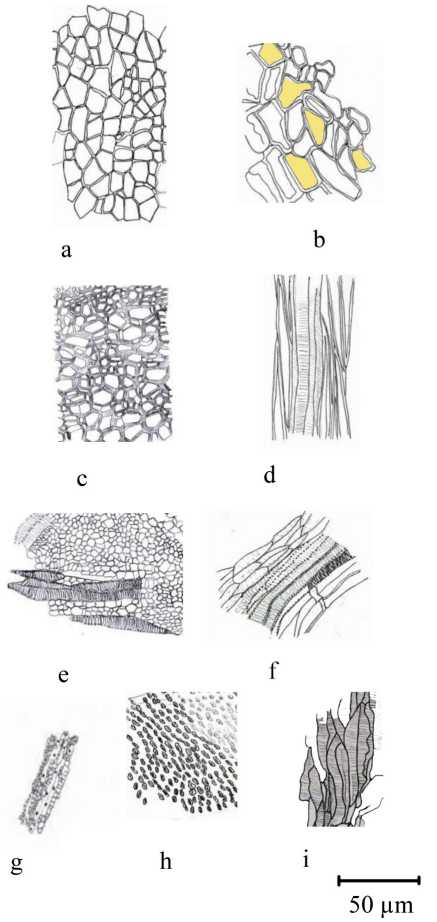


Fig. 3b Characters of powdered drugs

a. Cortical parenchyma
b. Cortical parenchyma with yellow content
c. Fibre in surface view
d. Fibre attached with annular vessel
e. Tracheids embedded in polygonal parenchyma
f. Spiral vessels
g. Sclerenchymatous fibre filled with calcium oxalate crystals
h. Pitted trachea
i. Bundle of tracheids

Desmodi Folium

***Tadehagi triquetrum* (L.) H.Ohashi (Fabaceae)** **လောက်သေ (Lau' thei)**

Fig. 1 *Tadehagi triquetrum* (L.) H.Ohashi
1. the plant; 2. dried leaves

Sources : Mandalay Region and Shan State

Synonym (s) - ***Hedysarum triquetrum* L.**
***Desmodium acrocarpum* Hance**
***D. triquetrum* (L.) DC.**
***Pteroloma triquetrum* (L.) Desv.**

Other name (s) - **Adkhapanal Chattagai, Kattarali (Malaysian)**
Anshumat (Sanskrit)
Ganja (Marathi)
Trefle Gros (English)

Part (s) used - Leaves

Definition

Desmodi Folia consist of the dried leaves of *Tadehagi triquetrum* (L.) H. Ohashi (Fabaceae).

Description of the part used
Macroscopic characteristics

The leaves unifoliolate, petiolate; the petiole wing-like; stipulate; the blade ovate-lanceolate to oblong with a tapering apex, rounded to slightly cordate at the base, entire along the margin, acuminate at the apex, abaxially pubescent more on mid-vein and lateral veins, and very sparsely tomentose on upper surface. Odourless, hot and bitter taste.

Microscopic characteristics

Transverse section of *Tadehagi triquetrum* (L.) H. Ohashi leaf shows:

1. both of the upper and lower epidermis consist of a single layer of parenchyma cells covered with cuticle
2. very sparsely multicellular and unicellular hairs present on upper epidermis, more unicellular hairs on mid-rib and lateral veins of the lower epidermis
3. mesophyll region consists of a single layered of palisade parenchyma and many layers of spongy parenchyma
4. most of the mesophyll cells contain starch grain
5. vascular bundles many and are arranged in a ring, surrounded by parenchy-

matous sheath

6. each vascular bundle consists of xylem and phloem

Characters of the powdered drug

Pale yellowish green powder, aromatic odour, and characteristic, warm and slightly bitter taste. The diagnostic characters are:

a. Lower epidermis with diacytic stomata
b. Upper epidermis with paracytic stomata
c. Wavy walled and elongated trichomes

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 ^{0}C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to 1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

D. The powdered drug sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Wagner's reagent is added to the filtrate. Reddish brown precipitate is appeared.

E. The dried powder is refluxed with petroleum ether for 6 hours and filtered. A few drops of acetic anhydride is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

F. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

G. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium rib-

bon. Boil solution for few minutes, pink colour is produced.

TLC analysis

Extract 1 g of dried powdered sample in 15 mL of chloroform on the water-bath for 30 minutes. Filter and filtrate is used for TLC investigation.

Application volume : 5 µL
Developing solvent system : Hexane: Ethyl acetate (10:3)
Stationary phase : Silica gel GF_{254} Aluminium sheeet
Spray reagent : Vanillin-sulphuric acid

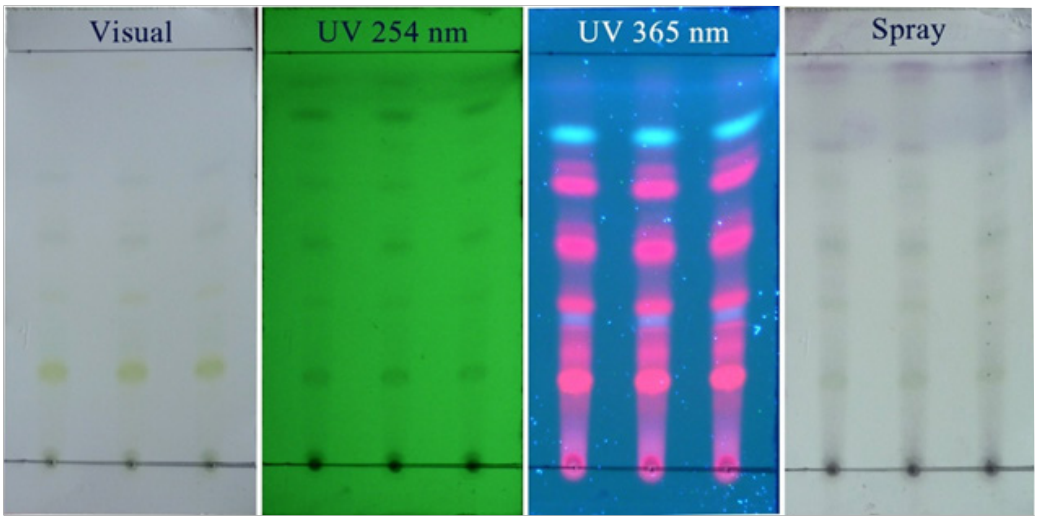


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Leaves of *Tadehagi triquetrum* (L.) H. Ohashi

- Loss on drying at 105 °C : Not more than 9.45 %
- Foreign matter : Not more than 2.0 %
- Total ash : Not more than 6.20 %
- Acid-insoluble ash : Not more than 3.2 %
- Water soluble ash : Not less than 0.45 %
- Ethanol soluble extract : Not less than 18.64 %
- Water soluble extract : Not less than 18.40 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Helminthic infections, Lung diseases
- Research reports : Anti-mycobacterial activity[26], Antiproliferative and anti-oxidant activity[11], Pulmonary tuberculous[12]

Table 1 R_f values of components in Chloroform Extract of the Leaves of *Tadehagi triquetrum* (L.) H.Ohashi

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.97	Pale yellow	Yellowish brown		Violet
0.90		Brown		Pale violet
0.80-0.77		Brown	Blue	Pale violet
0.71-0.67	Pale brown	Brown	Red	Faint yellowish brown
0.57	Pale brown		Pale red	
0.52		Brown	Red	Yellowish brown
0.40	Pale green	Brown		Yellowish brown
0.38			Red	
0.32	Faint green		Red	
0.27			Red	
0.22	Green	Brown	Red	Yellowish brown

Desmodi Folium

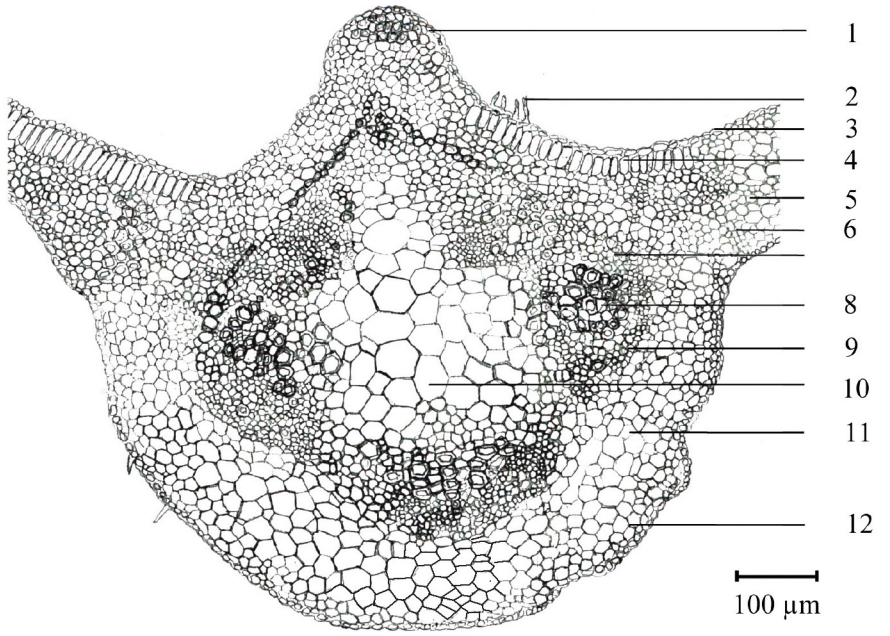


Fig. 3a Transverse section of *Tadehagi triquetrum* (L.) H. Ohashi leaf

1. Collenchymatous cells
2. Multicellular hairs
3. Upper epidermis
4. Palisade parenchyma
5. Spongy parenchyma
6. Starch grains
7. Phloem
8. Xylem
9. Bundle sheath
10. Pith of midrib
11. Cortical parenchyma of midrib
12. Lower epidermis

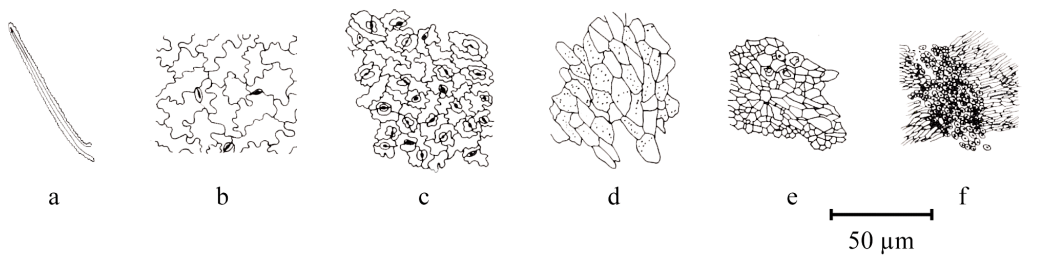


Fig. 3b Characters of powdered drugs

a. Warty, wavy-walled uniseriate trichome
b. Lower epidermis with diacytic stomata
c. Upper epidermis with paracytic stomata
d. Vittae fragment
e. Isodiametric parenchyma cells with starch grain
f. Vessel with bordered pit

Ecliptae Herba

***Eclipta prostrata* (L.) L. (Compositae/Asteraceae)** **ကြိတ်မှန် (Kjei'hman)**

Fig.1 *Eclipta prostrata* (L.) L.

1. the plant; 2. dried aerial parts of the plant

Sources : Mandalay and Magway Regions

Synonym(s) - ***Verbesina prostrata* L.**
***Eclipta alba* (L.) Hassk.**
***E. erecta* L.**

Other name (s) - Bhangara, Mochkand, Babri (Hindi)
Bhrin garaja, Gunta Kalagara, Keshabringa (Sanskrit)
Eclipte Blanche (French)
False daisy, Swamp daisy, Trailing eclipta (English)
Ka meng (Thai)
Keremak jantan, urang-aring (Brunei Darussalam)
Khmanh (Cambodian)
Li chang (Chinese)
Nha hom keo, gna cha chat (Lao PDR)
Nho noi, co nho noi, co muc, han nien thao (Vietnamese)
Tintatintahan, tinta-tinta, tultulisan, higis-manok,
Karimouaya (Philippines)
Urang aring (Indonesian)
Urang-aring, orang-aring, keremak jantan, keremak hutan, hutan, rumput migus (Malaysian)

Part (s) used – Aerial parts of the plants

Definition

Ecliptae Herba consists of the aerial parts of *Eclipta prostrata* (L.) L. (Compositae/Asteraceae).

Description of the part used
Macroscopic characteristics

An annual erect or a prostrate herb with rooting at the nodes, stem and branches.The lanceolate leaves, simple, opposite, sessile. Head, solitary, with white florets. Odour characteristic; taste slightly astringent.

Microscopic characteristics

Transverse section of *Eclipta prostrata* (L.) L. leaf shows:

1. upper epidermis consists of one layer of parenchymatous cells covered by cuticle layer and globular trichomes
2. mesophyll consists of one layer of elongated and packed parenchymatous palisade and a few layers of loosely arranged parenchymatous spongy
3. a row of vascular bundles embedded in the mid-rib area
4. each vascular bundle consists of xylem and phloem
5. lower epidermis consists of one layer of parenchymatous cells covered by cuticle and a few globular and glandular, aciculate trichomes
6. Interior to the both of upper and lower epidermis, 3-4 layers of collenchymatous hypodermis

Characters of the powdered drug

Greenish brown powder, slightly odour and slightly astringent taste. The diagnostic characters are:

a. Lower epidermal cells of leaf with anomocytic stomata
b. Upper epidermal cells with prism of calcium oxalate crystals
c. Lower portion of trichome
d. Spinulose pollen grains
e. Prism of calcium oxalate crystals
f. Annularly scalariform xylem vessel
g. Acicular trichome
h. Pitted vessel

Identification

A. The dried powder is refluxed with petroleum ether for 6 hours and filtered. A few drops of acetic anhydride is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

B. Add a few drops of 1% lead acetate to the aqueous extract of the drug. A yellow precipitate is formed.

TLC analysis

Powdered sample 1 g is extracted with 15 mL of chloroform on the water bath for one hour, filter and the filtrate is evaporated to dryness at room temperature. Dried extract is redissolved in 1mL of chloroform for chromatography.

Application volume : 10 µL
Developing solvent system : Toluene: Ethyl acetate (8:1.2)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : 10% sulphuric acid in ethanol

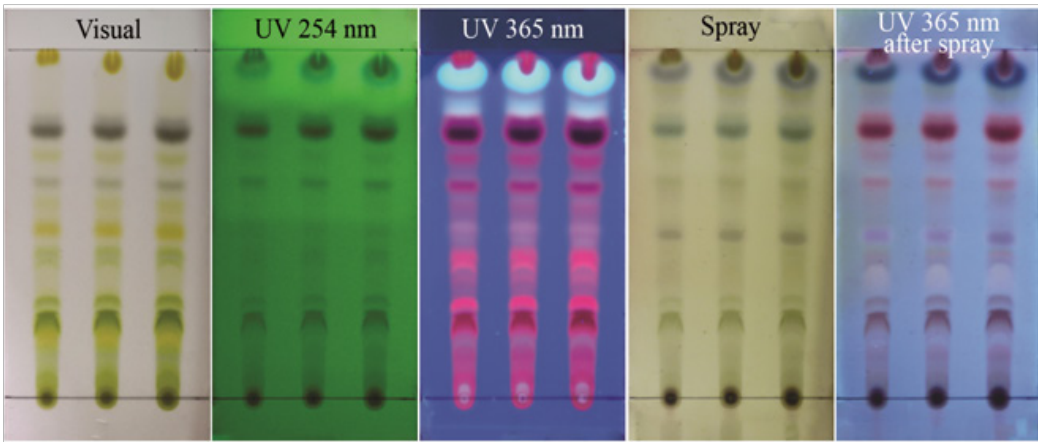


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Aerial parts of *Eclipta prostrata* (L.) L.

- Loss on drying at 105 °C : Not more than 13.96 %
- Foreign matter : Not more than 2.0 %
- Total ash : Not more than 24.45 %
- Acid-insoluble ash : Not more than 10.38 %
- Water soluble ash : Not less than 5.13 %
- Ethanol soluble extract : Not less than 15.28 %
- Water soluble extract : Not less than 26.40 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - Sup: 17
- Traditional therapeutic uses : Menstrual disorders, Anaemia, Perspiration, Bowel disorders, Indigestion, Hepatitis, Jaundice, Injuries, Burns, Scald

- Research reports : Antiviral[27], Hepatitis B virus[27, 28], Acute alcoholic liver disease[29], Carbon tetrachloride hepatotoxicity[30], Uterine smooth muscle activity[31] Antimicrobial[32], Acute toxicity[33], Uterine smooth muscle contraction and relaxation activity[33], Anti-hepatotoxic substance[34, 35] , Antitumor[36],

Table 1 *R_f values of components in* Chloroform Extract of the Aerial parts of *Eclipta prostrata* (L.) L.

R_f	Visual	UV 254 nm	UV 365 nm	Spray	After Spray
0.93		Brown blue	Blue Fluorescence	Brown blue	Violet purple
0.83			Blue Fluorescence		
0.77	Black	Black	Pink black	Green	Red
0.70	Pale yellow	Faint brown	Pink	Pale greenish black	Pale violet
0.62	Black	Brown	Pink	Greenish black	Pink
0.56	Pale yellow		Pink		
0.50		Faint brown	Pink		
0.47	Yellow			Black	Purple
0.41	Pale greenish yellow	Pale brown	Pink		Violet
0.28	Greenish yellow	Brown	Pink	Brown	Black
0.21		Brown	Reddish brown	Greenish brown	Deep violet
0.08			Pink		Violet
0.01	Greenish yellow				

Ecliptae Herba

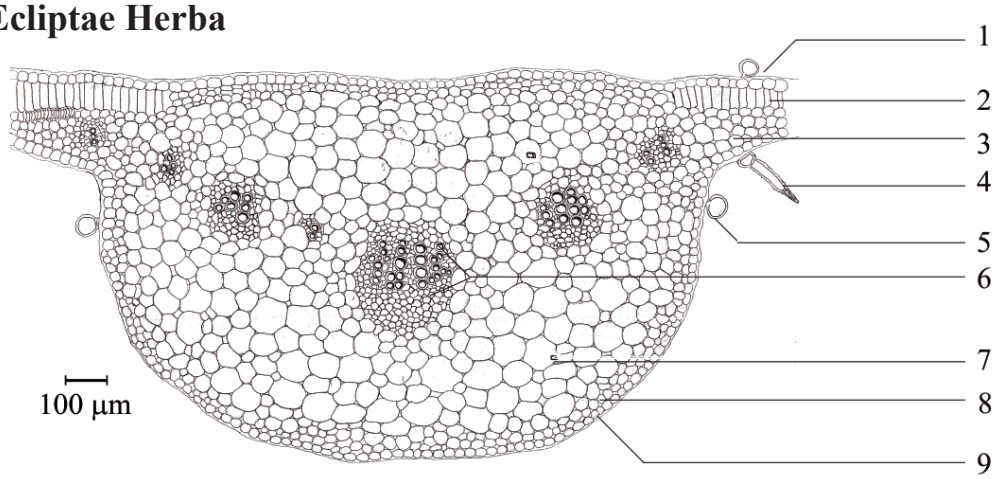


Fig. 3a Transverse section of *Eclipta prostrata* (L.) L. leaf

1. Upper epidermis with cuticle layer
2. Palisade parenchyma
3. Spongy parenchyma
4. Unicellular and glandular, aciculate trichome
5. Globular trichome
6. Vascular bundle
7. Prism of calcium oxalate
8. Collenchyma cell
9. Lower epidermis with cuticle layer

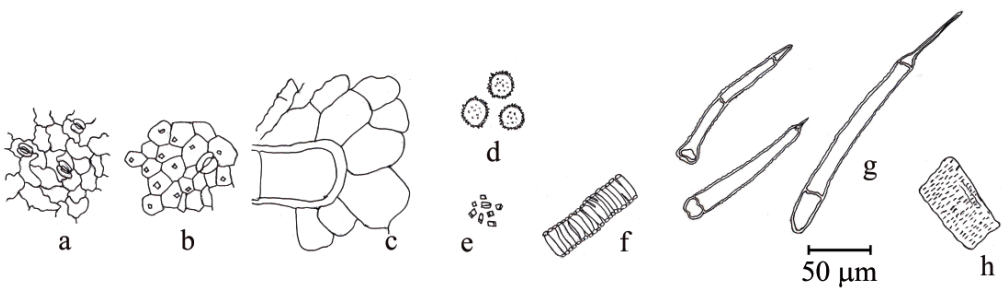


Fig. 3b Characters of the powdered drug

a. Lower epidermal cells of leaf with anomocytic stomata
b. Upper epidermial cell with solitary prismatic calcium oxalate crystal
c. Lower portion of trichome
d. Spinulose pollen grains
e. Prisms of calcium oxalate
f. Annularly scalariform xylem vessel
g. Acicular trichome
h. Pitted vessel

Euphorbiae hirtae Herba

***Euphorbia hirta* L. (Euphorbiaceae)** **ကျွဲကျောင်းမင်ဆေး**

(Kjwe: kjaun: min hsei:)

Fig.1 *Euphorbia hirta* L.
1. the plant; 2. the dried plant

Source : Mandalay Region

Synonym(s) - ***Chamaesyce hirta* (L.) Millsp**
***C. gamella* (Lag.) Small**
***Tithymalus pilulifera* (L.) Moench**
***Euphorbia pilulifera* L.**

Other name(s) - **Ara tanah, gelang susu, kelusan (Malaysian)**
Baridhudi, Lal dudhi (Hindi)
Chara, amampatchairasi, barokheruie (Sanskrit)
Co sua lon la (Vietnam)
Gatas-gatas (Philippines)
Gelang su su, gendong anak (Javanese)
Hairy spurge, Pill-bearing spurge, asthma weed (English)
Nam nom racha si (Thai)

Part(s) used - Aerial parts of plant

Definition

Euphorbiae hirtae Herba consists of the aerial parts of *Euphorbia hirta* L. (Euphorbiaceae).

Description of the part used
Macroscopic characteristics

An annual erect to prostrate herb. Stem slender, solid, hairy with milky latex. The stipulate leaves are simple, opposite in pairs, elliptic - oblong to oblong lanceolate, hairy on both surfaces. Slightly aromatic odour, slightly bitter taste.

Microscopic characteristics
Transverse section of *Euphorbia hirta* L. leaf shows:

1. upper epidermis composed of one layer of thick-walled irregularly, rectangularly polygonal parenchymatous cells covered by thin cuticle layer
2. the upper epidermal cells more larger than those of the lower epidermal cells
3. mesophyll differentiated into one layer of palisade parenchyma and a few layers of spongy parenchyma. The palisade lies towards and right angle to the upper epidermis and spongy towards the lower epidermis; latex vessels

present in the spongy parenchyma

4. vascular bundles embedded in the mesophyll layer surrounded by fan-shaped parenchymatous sheath
5. a few layers of collenchyma between the vascular bundle and lower epidermis
6. lower epidermis composed of one layer of parenchymatous cell irregularly polygonal in shape
7. lower epidermis bears bulbous base, glandular trichomes and covered by thin cuticle layer

Characters of the powdered drug

Greenish brown powder, slightly aromatic, slightly bitter taste. The diagnostic characters are:

a. upper epidermis with anisocytic stomata
b. lower epidermis with anomocytic stomata
c. bulbous base and glandular multicellular trichomes
d. oil globules

Identification

A. Add a few drops of 10% ferric chloride into the aqueous extract of the drug. A deep blue colour is indicated the presence of phenolic compound.

B. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow is appeared in the test tube.

C. The dried powdered is refluxed with petroleum ether for 6 hours and filter. A few drops of acetic anhydride solution is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

D. In a test tube containing an aqueous extract of the drug is treated with 1% lead acetate solution. A yellow colour is formed.

TLC analysis

Extract 1g of powder drug in 15 mL of methanol for 30 minutes on the water bath, filter and filtrate is used for TLC investigation.

Application volume : 5 µL

Developing solvent system : Toluene: Ethyl acetate: Formic acid: Methanol (5:5:2:2)

Stationary phase : Silica gel GF_{254} Aluminium sheet

Spray reagent : Vanillin - sulphuric acid

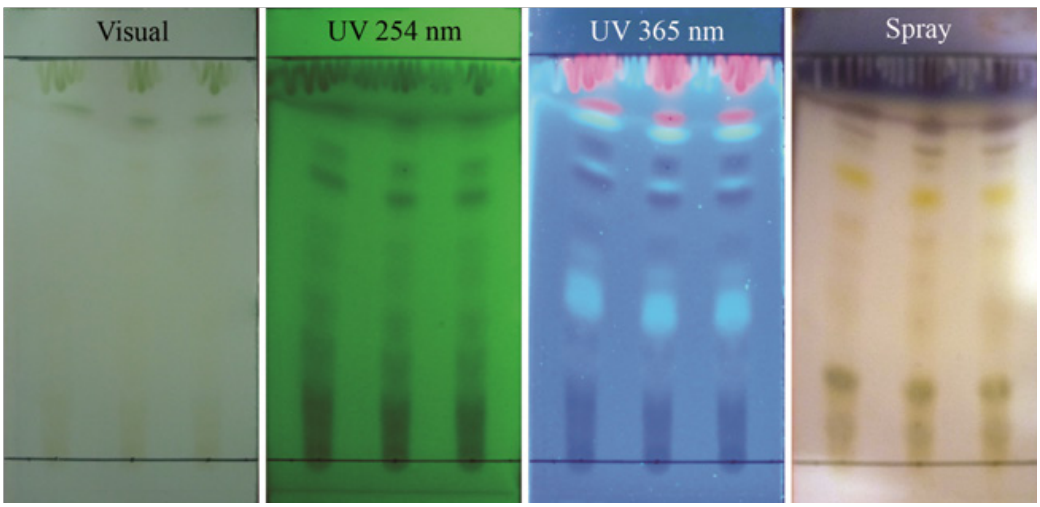


Fig. 2 Thin-layer Chromatogram of Methanol Extract of the Aerial parts of *Euphorbia hirta* L.

Table 1 R_f values of components in Methanol Extract of the Aerial parts of *Euphorbia hirta* L.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.85			Red	
0.82	Green	Brown	Light blue	Purple
0.77				Brown
0.72	Faint yellow	Brown	Brown	Pale brown
0.67			Light Blue	
0.65	Faint yellow	Brown	Dark blue	Yellow
0.53		Brown	Faint brown	Faint brown
0.46		Faint brown	pale blue	Faint brown
0.35		Brown	Blue	Faint brown
0.23		Brown	Pale dark	
0.18				Brown
0.10		Brown		
0.08			Dark	Brown

- Loss on drying at 105 °C : Not more than 8.29 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 10.94 %
- Acid-insoluble ash : Not more than 3.7 %
- Water soluble ash : Not less than 5.73 %
- Ethanol soluble extract : Not less than 10.64 %
- Water soluble extract : Not less than 34.5 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Dysentery, Menorrhagia, Bronchial Asthma
- Research reports : Antidiarrhoeal Activity [37], Antiasthmatic Activity [38], Cholesterol lowering effect [39]

Euphorbiae hirtae Herba

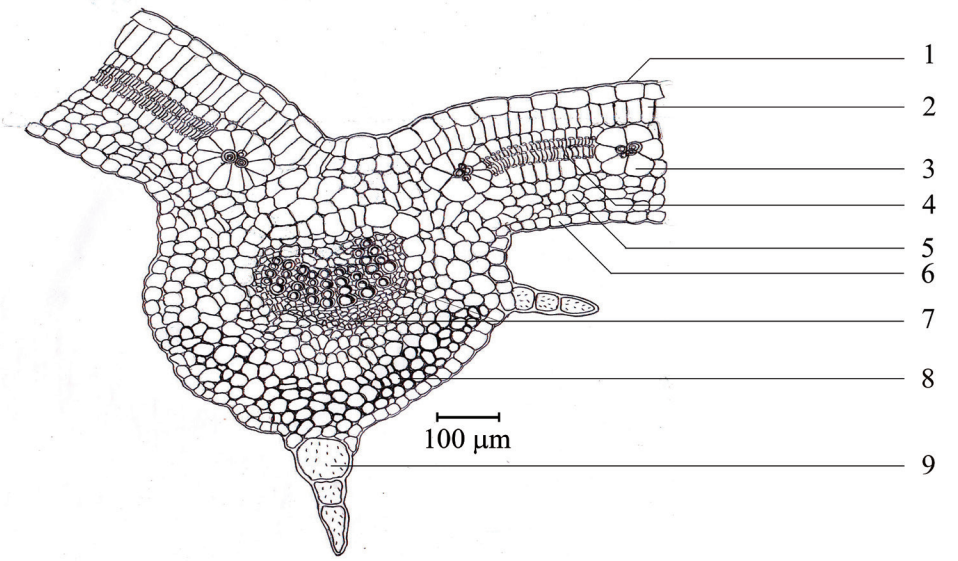


Fig. 3a Transverse section of *Euphorbia hirta* L. leaf

1. Upper epidermis with cuticle
2. Palisade parenchyma
3. Fan-shaped parenchyma of bundle-sheath
4. Latex vessel
5. Spongy parenchyma
6. Lower epidermis with cuticle
7. Vascular bundle
8. Collenchyma
9. Glandular and multicellular trichome

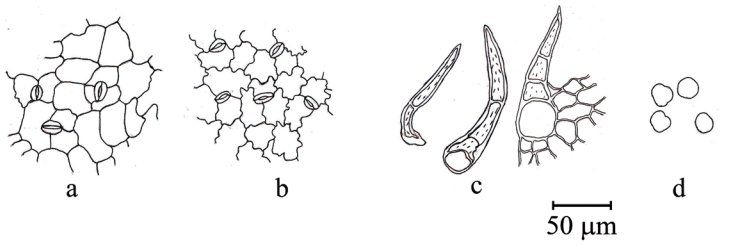


Fig. 3b Characters of the powdered drug

a. Upper epidermal cells with anisocytic stomata
b. Lower epidermal cells with anomocytic stomata
c. Glandular and multicellular trichomes
d. Oil globules

Gynurae Folium

***Gynura procumbens* (Lour.) Merr. (Compositae/Asteraceae)** ပျားမြီး/ပျားမြီးစွဲ

(Pja: mji:/Pja: mji: swae)

Fig. 1 *Gynura procumbens* (Lour.) Merr.
1. the plant; 2. dried leaves

Sources : Mandalay Region and Magway Region

Synonym (s) - ***Cacalia procumbens* Lour.**
***C. sarmentosa* Blume**
***Gynura cavaleriei* H. Leveille**
***G. emeiensis* Z. Y. Zhu**
***G. sarmentosa* (Blume) DC.**

Other name (s) - **Bai Bing ca, ju san qi shu (Chinese)**
Chi angkam (Cambodian)
Chlolesterol Spinach, Googoolipid, Leaves of Gods, Longevity Spinach, Mollucan Spinach, Nature's longevity Herb, Tomorrow leaves (English)
Daun dewa (Indonesian)
Dewa reja (Malaysian)
Paetumpung (Thai)
Tiem Vinh (Vietnamese)

Part (s) used - Leaves

Definition

Gynurae Folia consist of the leaves of *Gynura procumbens* (Lour.) Merr. (Compositae/Asteraceae).

Description of the part used
Macroscopic characteristics

Leaves simple, alternate, shortly petiolate to sub-sessile, exstipulate; blade ovate to ovate-oblong, acute at the apex, entire to slightly dentate and hairy along the margin, cuneatly attenuate at the base and merging into petiole, abaxially purplish green and adaxially green, mostly sparsely hairy on both surfaces, fleshy. Slightly characteristic odour, mucilaginous and astringent then sweet taste.

Microscopic characteristics

Transverse section of *Gynura procumbens* (Lour.) Merr. leaf shows:

1. both of upper and lower epidermis composed of one layer of compact, mostly polygonal, barrel to oval-shaped parenchyma. Both of upper and lower epidermis covered by cuticle layer, and composed of non-glandular,

uniseriate and multicellular trichomes

2. mesophyll differentiated into 1-2 layers of palisade parenchyma and few layers of spongy parenchyma
3. the palisade parenchyma present towards the adaxial side, vertically elongated, compactly arranged and composed of many chloroplasts
4. the spongy parenchyma present towards the abaxial side and loosely arranged, oval to rounded and composed of few chloroplasts
5. vascular bundle composed of xylem and phloem and surrounded by 1-2 layered of parenchymatous sheath
6. a few layers of collenchyma present interior to the lower epidermis of the mid-rib region

Characters of the powdered drug

Pale brownish green in colour, milky in odour and slightly sour taste.

The diagnostic characters are:

a. multicellular uniseriate trichome
b. chloroplast bearing parenchyma
c. anomocytic stomata

Identification

A. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

B. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution into filtrate, deep blue colour is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes. Foaming is appeared in the test tube.

D. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A brick red colour is formed.

TLC analysis

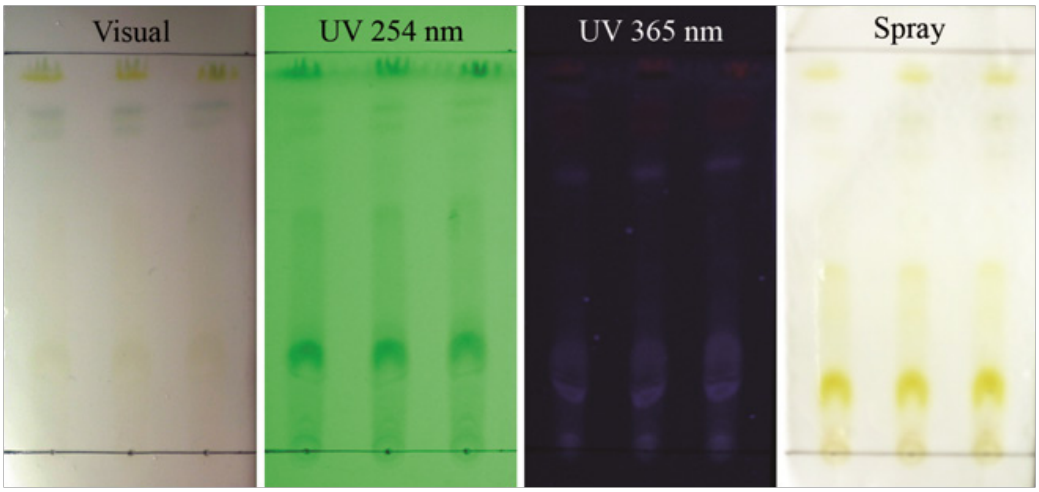
Extract 0.2 g of crude powdered drug in 2 mL of methanol for overnight, filter and the filtrate is used for chromatography.

Application volume : 10 µL

Developing solvent system : Ethyl acetate: Methanol: Water (10:2:1)

Stationary phase : Silica gel GF_{254} Aluminium sheet

Spray reagent : 10% Potassium hydroxide



A B C D

Fig. 2. Thin-layer Chromatogram of Methanol Extract of the Leaves of *Gynura procumbens* (Lour.) Merr.

- Loss on drying at 105 °C : Not more than 13.99 %
- Foreign matter : Not more than 0.5 %
- Total ash : Not more than 16.45 %
- Acid-insoluble ash : Not more than 2.90 %
- Water soluble ash : Not less than 7.80 %
- Ethanol soluble extract : Not less than 6.24 %
- Water soluble extract : Not less than 27.28 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Diabetes Mellitus, Renal disorders
- Research reports : Hypoglycemic activity [40, 41, 42, 43, 44], α-Glucosidase inhibitory effect [41],

Table 1. R_f value of components in Methanol Extract of the Leaves of *Gynura procumbens* (Lour.) Merr.

R_f	Visual	UV 254 nm	UV 365nm	Spray
0.98			Pink	
0.95	Yellow			Yellow
0.94			Black	
0.88	Greenish yellow			
0.84		Green		Faint yellow
0.83	Greenish yellow			
0.81			Faint pink brown	Faint yellow
0.75			Faint pink	
0.74				Faint yellow
0.61			Faint blue	
0.59			Light blue	
0.54			Faint blue	
0.46		Green		Pale yellow
0.35				Pale yellow
0.28			Pale blue	
0.18			Pale blue	
0.16		Green		Light yellow
0.05		Green	Light blue	
0.04				Faint yellow

Gynurae Folium

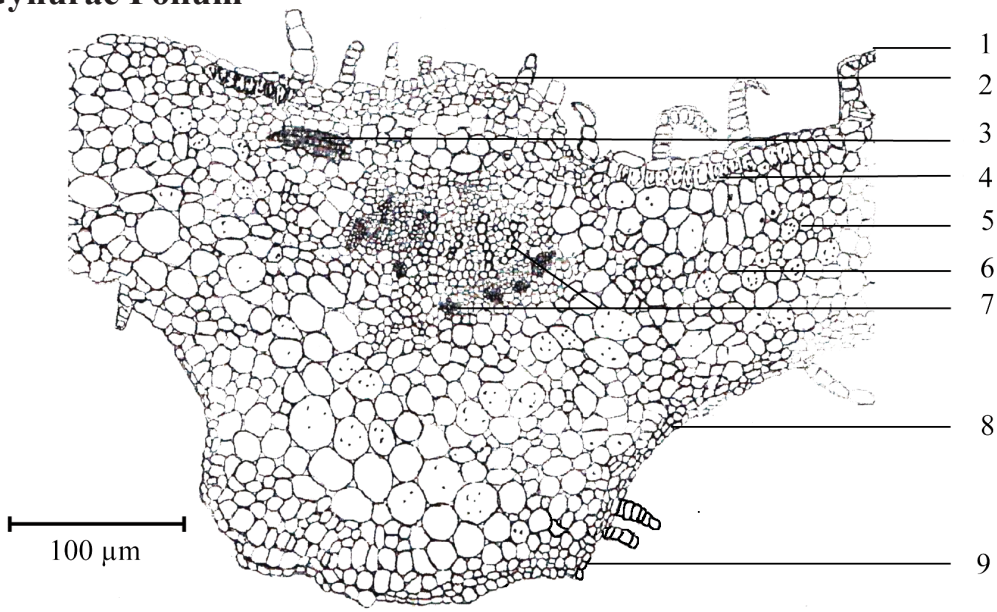


Fig. 3a Transverse section of *Gynura procumbens* (Lour.) Merr. leaf

1. Uniseriate and multicelluar trichome
2. Upper epidermal cells with cuticle
3. Annular vessel
4. Palisade parenchyma with many chloroplasts
5. Spongy parenchyma with few chloroplasts
6. Intercellular space
7. Vascular bundle
8. Collenchyma cells
9. Lower epidermal cells with cuticle

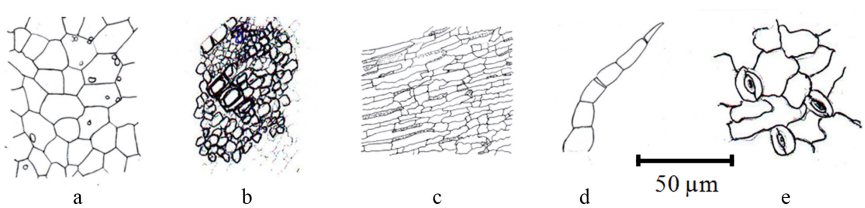


Fig. 3b Characters of powdered drugs

a. Parenchyma containing chloroplast in surface view
b. Vascular bundle
c. Parenchyma containing chloroplast in longitudinal view
d. Multicellular and uniseriate trichome
e. Anomocytic stomata

Mesuae ferreae Flos

***Mesua ferrea* L. (Guttiferae/Clusiaceae)** **ကုံကော် (Gan. go)**

Fig.1 *Mesua ferrea* L.

1. the plant; 2. fresh flower; 3. dried pollen grains and stamens

Sources : Mandalay Region and Sagaing Region

Synonym (s) - ***Mesua coromendeliana* Wt.**
***M. nafassarium* (Burm.f.) Kosterm.**
***M. pedunculata* Wt.**
***M. roxburghii* Wt.**
***M. scleophylla* Thw.**
***M. speciosa* Choisy**

Other name (s) - **Bunnak (Thai)**
Ceylon ironwood, Cobra's saffron,
Indian rose chesnut (English)
Kaliuas (Philippines)
Nagakesara (Sanskrit)
Nagesar (Bengali)
Nagkesara (Hindi)
Penaga (Malaysian)
Sirunagappu (Tamil)
Vap (Vietnamese)

Part (s) used - Flowers, pollen grains and stamens

Definition

Mesua ferreae Flos consist of dried flowers, pollen grains and stamens of *Mesua ferrea* L. (Guttiferae/Clusiaceae).

Description of the part used

Macroscopic characteristics

The androecium consists of many stamens; each stamen consists of an anther, connective and a filament; the anther lobe dithecous, linear, basifixed; each thecus consists of two anther sacs containing numerous granular pollen grains; the filament slender, filiform, curved and more or less twisted after anthesis. Odour fragrant and astringent taste.

Microscopic characteristics

Transverse section of *Mesua ferrea* L. an anther and a filament show:

Structure of an anther wall

1. epidermis, one layer of flattened parenchyma, (the outermost layer) covered by unicellular, multicellular and uniseriate trichomes
2. endothecium - cell layer radially elongated, beaded parenchyma, multilayer towards connective
3. vascular strand contains annular to spiral vessels
4. tapetum, innermost layer, 1- layer of parenchyma, some tapetal cells secrete nourishing substances
5. pollen grains zonocolpate, oblate to suboblate, exine reticulate

Structure of a filament

1. vascular bundle surrounded by a few layers of parenchymatous cell
2. the outermost parenchymatous layers covered by thin cuticle layer with appressed hairs

Characters of the powdered drug

Golden yellow brown colour, characteristic and fragrant odour and astringent taste. The diagnostic characters are:

a. fibrous layer of anther with pitted wall
b. tricolpate pollen grains

Identification

A. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution for a few minutes, pink colour is formed.

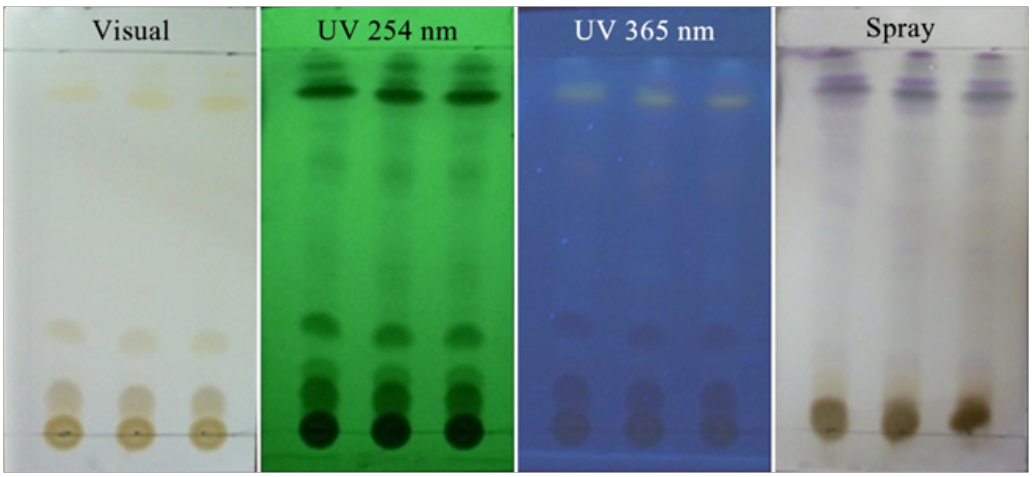
B. The aqueous extract of the drug is treated with 3 drops of ferric chloride solution. A deep blue colour is indicated.

C. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

TLC analysis

Macerate 1 g of dried powdered sample in a stopper container with 5 mL of hexane and allow to stand for 24 hours. Use the filtrate for TLC investigation.

Application volume : 5 µL
Developing solvent system : Hexane: Ethyl acetate (8:2)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin-sulphuric acid



A B C D

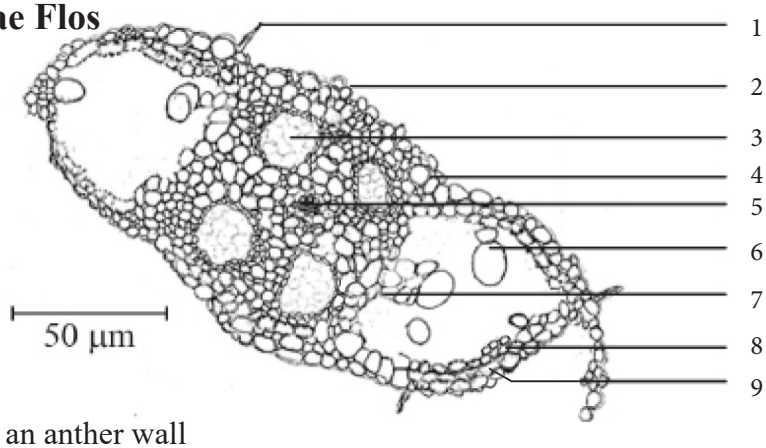
Fig. 2 Thin-layer Chromatogram of Hexane Extract of the Dried pollen grains and stamens of *Mesua ferrea* L.

- Loss on drying at 105 °C : Not more than 5.54 %
- Foreign matter : Not more than 2.0 %
- Total ash : Not more than 3.6 %
- Acid-insoluble ash : Not more than 0.65 %
- Water soluble ash : Not less than 0.6 %
- Ethanol soluble extract : Not less than 38.08 %
- Water soluble extract : Not less than 34.2 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 8/14/15/16/17/34/35A/35B/36/43/44 Sup: 6/7/9
- Traditional therapeutic uses : Insomnia, Palpitation, Dizziness, Breathlessness, Menstrual disorders
- Research reports : Antibacterial activity [13]

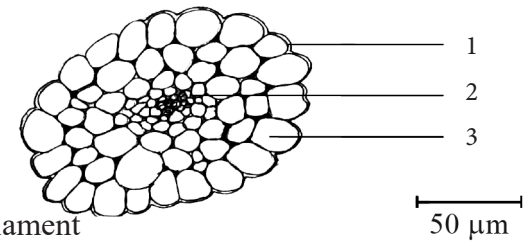
Table 1 R_f values of components in Hexane Extract of the Dried pollen grains and stamens of *Mesua ferrea* L.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.98				Violet
0.96		Brown	Blue	
0.92	Yellow	Brown		Purple
0.87	Yellow	Dark brown	Yellow	Dark brown
0.85				Violet
0.78		Pale brown		Pale brown
0.67		Pale brown	Pale pink	Pale brown
0.50			Blue	
0.47				Pale brown
0.42			Blue	Pale brown
0.25	Yellow brown		Brown	
0.13				Pale yellow
0.08	Yellow brown		Brown	
0.03				Yellow Brown

Mesuae ferreae Flos



(A) Structure of an anther wall



(B) Structure of a filament

Fig. 3a Transverse section of *Mesua ferrea* L. stamen

(A) Structure of an anther wall
1. Trichome
2. Cuticle
3. Resin ducts
4. Epidermal cell
5. Vascular bundle
6. Pollen grain
7. Tapetum
8. Fibrous layer of pollen sac
9. Endothecial cell

(B) Structure of a filament
1. Cuticle layer
2. Vascular bundle
3. Parenchyma cells

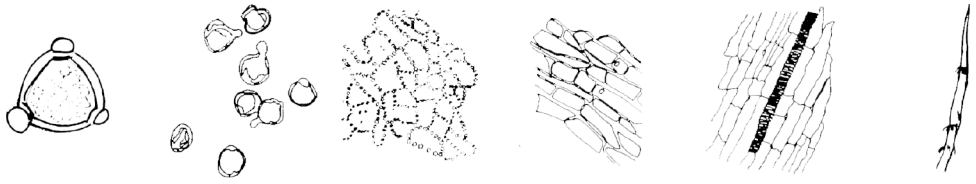


Fig. 3b Characters of powdered drugs

a. Zonocolpate pollen grain
b. Groups of pollen grain
c. Fibrous layer of anther with pitted wall and oil globules
d. Radially elongated parenchyma
e. Vessel
f. Trichome

Mimusopsis elengi Flos

Mimusops elengi **L. (Sapotaceae)** **ခဇရ့ (Kha jei)**

Fig. 1 *Mimusops elengi* L.

1. the plant 2. fresh flowers; 3. dried flowers

Sources : Mandalay, Taninthayi and Magway Regions

Synonym(s) - ***Kaukenia elengi* (L.) kuntze**
***Mimusops parvifolia* R. Br.**

Other name (s) - **Bakul/Marathi (Bengali)**
Betis, Bansalagin, Kabiki (Philippines)
Bukal, Tanjung (French)
Bakula (Sanskrit)
Bunga tanjung, Pokok tanjong mengkula,
Pekola batu kekula(Malaysian)
Kun, Pigul, Pi kun (Thai)
Magadanm, Llanji (Tamil)
Maulsari (Hindi)
Sa koun, Phi koun (Lao PDR)
Spanish cherry, Medlar, Bullet wood (English)
Tangung, Karikis, Tanjung laut (Indonesian)
Tanjung (Javanese)
Tanjung (Sundanese)

Part (s) used – Dried flowers

Definition

Mimusopsis elengi Flos consists of flower of *Mimusops elengi* L. (Sapotaceae).

Description of the part used

Macroscopic characteristics

The flowers are pedicellate, bisexual, complete, actinomorphic, hairy and scented, axillary fascicles, densely appressed pubescent;the central cone of flower formed from the petals and stamens; the calyx segments narrowly ovate-acuminate, densely appressed ferruginous pubescent on both sides.The corolla segments 8.The 8 stamens alternate with 8 petal like sterile stamens; the anther dithecous extrorse; the stamen short; the style exserted; the ovary 8 locular, hairy, basal placentation.

Microscopic characteristics

Transverse section of *Mimusops elengi* L. petal shows:

1. both of upper and lower epidermis consist of one layer of rectangular parenchyma covered by cuticle layer.
2. mesophyll parenchyma consists of many layers of slightly, loosely arranged rounded to polygonal parenchyma.
3. oil cells present in some of mesophyll parenchyma
4. vascular bundles embedded in the mesophyll parenchyma

Transverse section of *Mimusops elengi* L. anther shows:

1. epidermis (exothecium) consists of a single layer of parenchymatous cells
2. endothecium consists of continuous fibrous brand
3. stomium consists of a few numbers of thin-walled parenchymatous cells.
4. the globular and smooth pollen grains released through stomium during anthesis
5. latex containing parenchyma cells occur between the connective tissue and tapetum

Characters of the powdered drug

Brown, fragrant, astringent taste. The diagnostic characters are :

a. thick-walled unicellular, straight to T-shaped trichomes of the sepals
b. pollens of the stamen
c. rectangularly elongated epidermal cell with wavy wall covered by auticular striation of the corolla
d. thin-walled parenchyma probably of corolla appendage
e. fibrous anther wall from the anther

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mix-

ture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

D. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

E. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

F. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution a few minutes, pink colour is formed.

TLC analysis

Macerate 0.5 g of dried drug sample in a stopper container with 5 mL of chloroform and allow standing for 24 hrs, Filter and the filtrate is evaporated to dryness at room temperature. The dried extract is redissolved in 0.5 mL of chloroform for chromatography.

Application volume : 10 µL
Developing solvent system : Toluene: Ethyl acetate (8:1.2)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Anisaldehyde - sulphuric acid

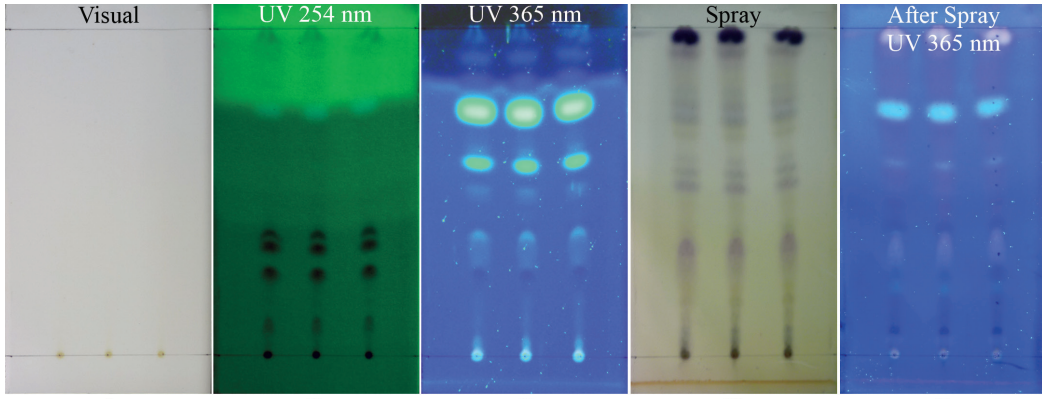


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Dried Flowers of *Mimusops elengi* L.

Table 1 R_f values of components in Chloroform Extract of the Dried Flowers of *Mimusops elengi* L.

R_f	Vtisual	UV 254 nm	UV 365 nm	Spray	After Spray
0.97				Deep violet	Pink violet fluores-cence
0.93			Blue	Violet brown	
0.86			Blue		
0.77			Blue fluo-rescence	Dark brown	Blue fluo-resence
0.74		Faint greenish blue		Dark brown	
0.68				Orange brown	
0.61	No spots detected	Greenish blue	Blue fluo-resence	Pale brown	
0.58				Dark brown	Blue
0.52			Pale blue	Purple brown	
0.37		Dark brown			
0.32		Dark brown	Blue	Purple	Gray dark brown
0.26		Dark brown			
0.21					Gray dark brown
0.16				Yellow brown	
0.10		Brown			
0.07					Dark brown
0.03			Blue		

- Loss on drying at 105 °C : Not more than 6.88 %
- Foreign matter : Not more than 0.5 %
- Total ash : Not more than 7.45 %
- Acid-insoluble ash : Not more than 5.70 %
- Water soluble ash : Not less than 0.55 %

- Ethanol soluble extract : Not less than 28.96 %
- Water soluble extract : Not less than 45.30 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 15/20
- Traditional therapeutic uses : Oral infection, Diabetes Mellitus, Heart disease, Insomnia, Palpitation, Giddiness, Itchiness, Fever
- Research reports : Antihyperglycemic [45]

Mimusopsis elengi Flos

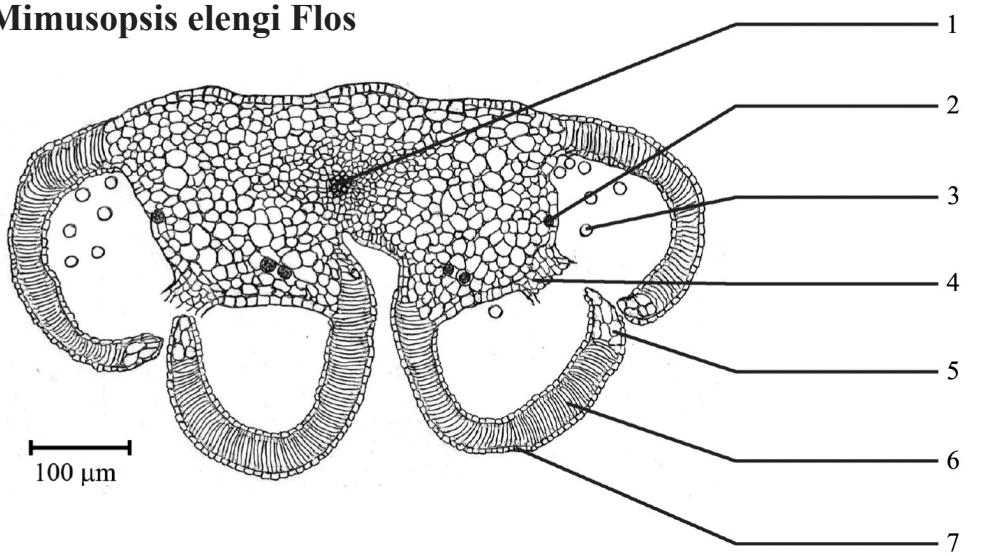


Fig. 3a Transverse section of the anther of *Mimusops elengi* L.

1. Vascular bundle of connective
2. Latex cell
3. Pollen grain
4. Disintegrated tapetum
5. Stomium
6. Endothecial fibre
7. Exothecium (Epidermis)

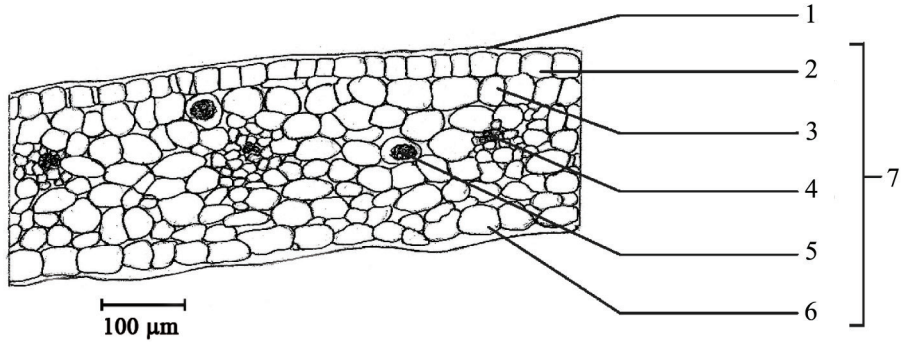


Fig. 3b Transverse section of the petal of *Mimusops elengi* L.

1. Cuticle
2. Upper epidermis
3. Parenchyma cell
4. Vascular bundle
5. Oil droplet
6. Lower epidermis
7. Mesophyll parenchyma

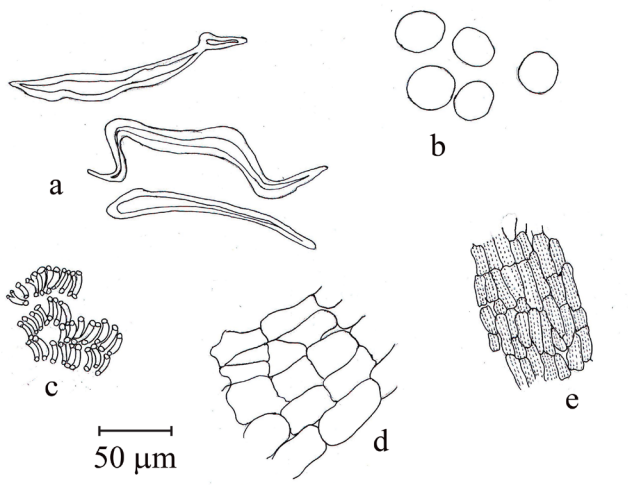


Fig. 3c Characters of the powdered drug

a. Thick-walled unicellular, straight to T- shaped trichomes of the sepals

b. Pollens of the stamen

c. Fibrous anther wall from the anther

d. Thin-walled parenchyma probably of corolla appendage

e. Rectangularly elongated epidermal cell with wavy wall covered by cuticular striations of the corolla

Orthosiphonis Folium

***Orthosiphon aristatus* (Blume) Miq. (Labiatae/Lamiaceae)** **သိကြားမကိုင်ရွှေ (Dhagji: magai)**

Fig. 1 *Orthosiphon aristatus* (Blume) Miq.
1. the plant; 2. flower; 3. dried aerial parts of plant

Sources : Mandalay Region and Magway Region

Synonym(s) - ***Ocimum aristatum* Blume**
***Orthosiphon stamineus* Benth.**

Other name(s) - **ava pusi (Samoan)**
Cat's whiskers, Java tea, Kidny tea (English)
Kava 'i pusi (Tongan)
Kumi ni pusi (Fijian)
Kumi Kucing, remuk jung (Javanese)
Pokok misai kucing (Malayan)
Shen cha (Chinese)
Thé de Java (French)
Yoa-nuat-maeo (Thai)

Part(s) used - Aerial parts of plant

Definition

Orthosiphonis Folia consist of the leaves of *Orthosiphon aristatus* (Blume) Miq. (Labiatae/Lamiaceae).

Description of the part used

Macroscopic characteristics

Leaves simple, opposite and decussate, ovate-lanceolate; papery; acuminate at the apex, cuneate at the base, coarsely serrate and hairy along the margin from about middle upwards, minutely hairy on the mid-rib and nerves, more on lower surface and glandular punctuate beneath. Odourless, astringent and slightly bitter taste.

Microscopic characteristics

Transverse section of *Orthosiphon aristatus* (Blume) Miq. leaf shows:

1. both of lower and upper epidermis composed of a single layer of rectangularly parenchymatous cells covered with cuticle, bears minutely unicellular and multicellular trichomes
2. mesophyll composed of a layer of palisade parenchyma and many layers of loosely arranged, oval to rounded spongy parenchyma
3. a few layers of collenchyma occur below the upper epidermis and above the

lower epidermis of mid-rib region

4. vascular bundles arranged in a discontinuous row and collateral type

Characters of the powdered drug

Darkish green in colour, slightly aromatic odour, a little bitter and salty, and astringent later. The diagnostic characters are:

a. Diacytic and anomocytic stomata with glandular trichome base on both surfaces
b. Spiral, reticulate and scalariform vessels
c. Collenchyma cell

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

D. The dried powder is refluxed with petroleum ether for 6 hours and filtered. A few drops of acetic anhydride is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

E. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

F. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution a few minutes, pink colour is formed.

G. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

To extract 1 g of powder sample in 15 mL of chloroform on a water-bath for one hour and filter. The filtrate is evaporated to dryness. Dried extract is redissolved in 1 mL of chloroform for chromatography.

Application volume : 5 µL
Developing solvent system : Hexane: Ethyl acetate (10:3)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : (i) 10% sulphuric acid in Ethanol (10% SE)
(ii) Anisaldehyde- sulphuric acid (AS)

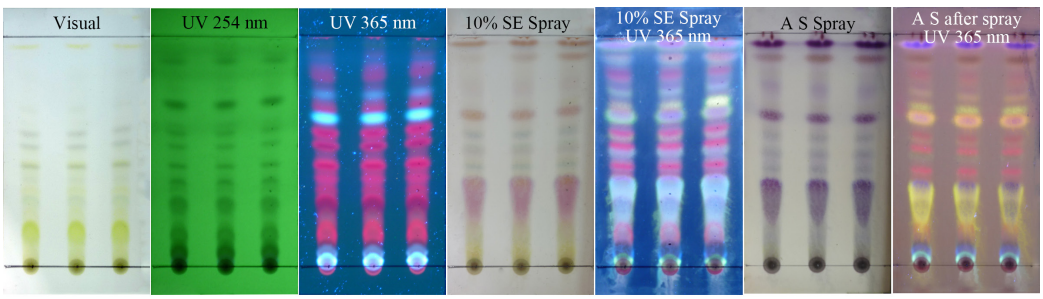


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Dried aerial parts of *Orthosiphon aristatus* (Blume) Miq.

- Loss on drying at 105 °C : Not more than 10.62 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 12.60 %
- Acid-insoluble ash : Not more than 2.45 %
- Water soluble ash : Not less than 5.25 %
- Ethanol soluble extract : Not less than 10.48 %
- Water soluble extract : Not less than 37.9 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Diabetes Mellitus, Inflammation
- Research reports : Hypoglycemic effect[46, 47], Hypoglycemic and diuretic activity[48], Anti-bacterial[49]

Table 1 R_f values of components in Chloroform Extract of the Dried aerial parts of *Orthosiphon aristatus* (Blume) Miq.

R_f	Visual	UV 254 nm	UV 365 nm	10% SE Spray	After 10% SE Spray UV 365 nm	AS Spray	After AS Spray UV 365 nm
0.96	Orange			Reddish brown	Pink	Violet	Blue
0.90				Reddish brown	Pink	Yellow	Reddish brown
0.88		Brown					
0.84	Faint black		Red		Violet		Pink
0.76			Blue fluore-scence	Pale violet	Purple	Pale violet	Violet
0.70	Faint black	Dark brown	Red		Orange		Green-ish yellow
0.66					Violet		Yel-lowish Violet
0.63			Blue fluore-scence	Reddish brown		Pink	
0.60	Black						
0.57		Brown	Red	Green	Pink	Green	Red
0.52	Black	Brown	Red	Green	Pink	Green	Red
0.43	Green-ish yellow	Brown	Red	Green	Pink	Green	Red
0.37	Faint greenish yellow	Brown	Red				
0.31	Faint greenish yellow		Red	Pink	Blue fluore-scence	Violet	Purple yellow
0.26	Pale greenish yellow	Dark brown					
0.14	Green-ish yellow	Brown	Red		Pink		Yellow
0.07					Purple		Blue fluore-scence
0.05		Dark brown	Blue fluore-scence				

Orthosiphonis Folium

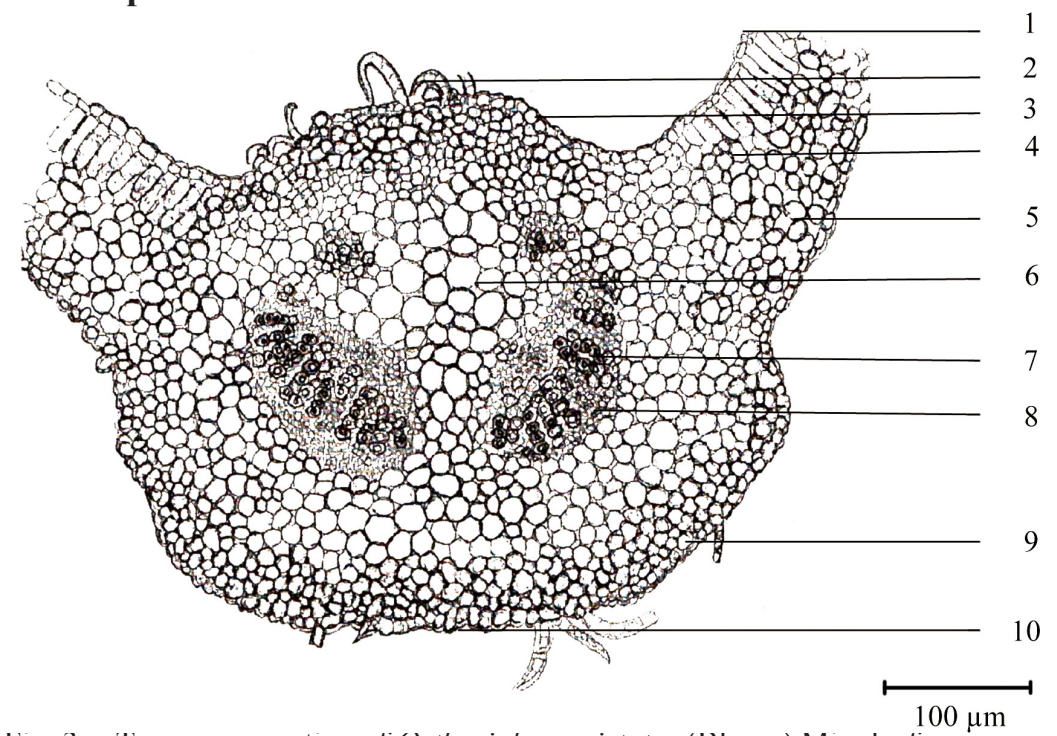


Fig. 3a Transverse section of *Orthosiphon aristatus* (Blume) Miq. leaf

1. Upper epidermis
2. Multicellular trichome
3. Upper epidermal cell
4. Palisade parenchyma
5. Spongy parenchyma
6. Parenchyma of pith
7. Xylem
8. Phloem
9. Collenchyma cells
10. Lower epidermis

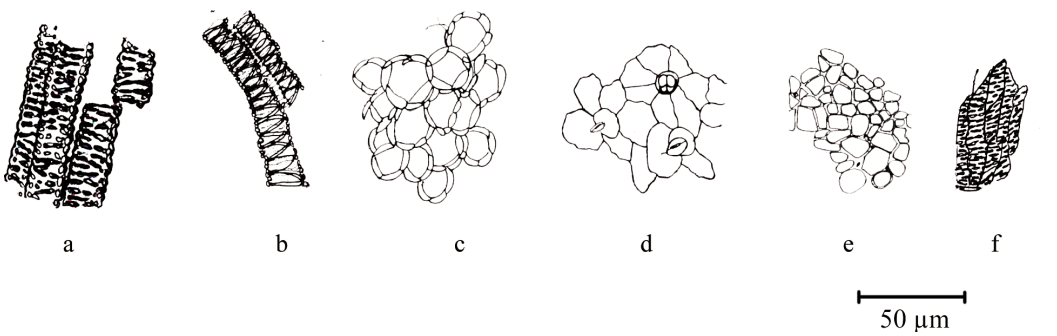


Fig.3b Characters of powdered drugs

a. Scalariform vessels
b. Annular vessel
c. Collenchyma cells
d. Diacytic stomata with glandular trichome base
e. Thin-walled parenchymatous cells
f. Reticulate vessels

Phyllanthi amari Herba

***Phyllanthus amarus* Schum & Thonn (Phyllanthaceae)** **တောင်ဆီးဖြူ (Taun zi: bju)**

Fig. 1 *Phyllanthus amarus* Schum & Thonn

1. the plant; 2. dried aerial parts of the plant

Sources : Mandalay Region and Magway Region

Synonym (s) - ***Phyllanthus niruri* var. *amarus* Schum & Thonn**
***Phyllanthus niruri* Thw.**
***P. nanus* Hook. f.**

Other name (s) - **Bahupatra, Bhumyaam alaki (Sanskrit)**
Bhui amala (Hindi)
Keelaanelli, Kizhukai nelli, Kizanelli (Tamil)
Kilanelli (Malayam)
Nelausirika (Teluga)
Bhuiamla, Bhumamla (Bengali)
Poudre de plomb (French)
Weisse Blatt-blume (German)
Memenirian, meniran (Javanese)
Quebra-pedra, arrebenta pedra (Portugese)
Chancapiedra, rompepiedra, sarandi blanco (Spanish)

Part (s) used - The aerial parts of whole herb

Definition

Phyllanthi amari Herba consists of the dried aerial herb of *Phyllanthus amarus* Schuma & Thonn (Phyllanthaceae).

Description of the part used
Macroscopic characteristics

An anual erect, monoecious herb; leave simple, distichous, seembling a unipinnately compound, stipulate; the stipule lanceolate; leaf blade oblong, obovate-oblong lanceolate, membranous, slightly papery, rounded and slightly oblique at the base, entire along the margin, rounded and slightly apiculate at the apex, glabrous on both surfaces. Flowers unisexual, small, greenish yellow; axillary on secondary branchlets, 1-2 per axil. Fruit rounded capsule, seeds 6, trigonous, longitudinal striations on the back. Characteristic odour and bitter, astringent and a little sweet taste.

Microscopic characteristics

Transverse section of *Phyllanthus amarus* Schum & Thonn leaf shows:

1. both of the upper and lower epidermis composed of a single layer of sub-rectangular to polygonal parenchymatous cells covered with thin cuticle layer, the epidermal cells with a few anisocytic stomata
2. palisade parenchyma consists of a single-layer of cylindrical cells towards the upper epidermis, and some cells contain prismatic and rosette calcium oxalate crystals, a few layers of collenchymatous cells below the upper epidermis and above the lower epidermis of the midrib area. Spongy parenchyma, a few layers of loosely arranged oval to rounded cells towards the abaxial side of epidermis; spiral tracheids contain in the spongy cells of mesophyll layer
3. vascular bundle composed of radiate xylem and an arc phloem

Characters of the powdered drug

Brightly green in colour, aromatic odour and bitter taste. The diagnostic characters are:

a. Anisocytic stomata
b. Prismatic and rosette calcium oxalate crystals
c. Spiral tracheids

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

D. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

E. The dried powder is refluxed with petroleum ether for 6 hours and filter. A few drops of acetic anhydride solution is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

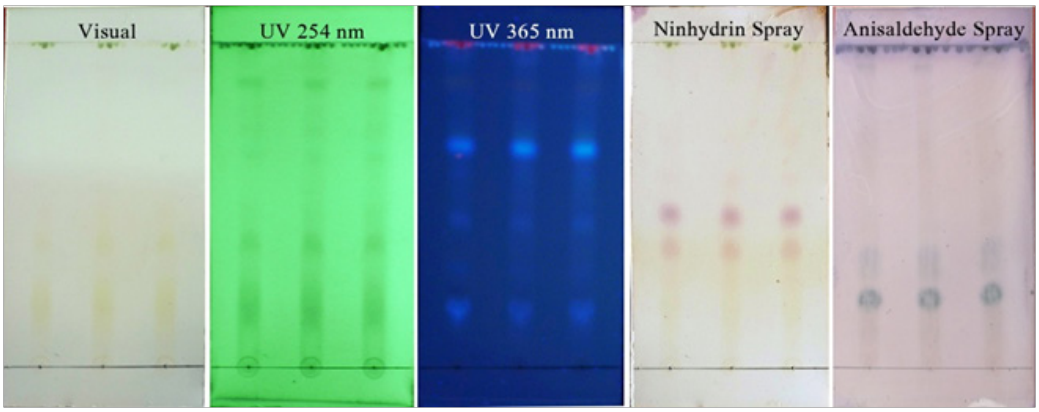
F. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

G. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

Extract 0.5 g of sample powder drug in 10 mL of methanol for 30 minutes on the water bath. Filter and the filtrate is used for chromatography.

Application volume	:	6 µL
Developing solvent system	:	Chloroform: Glacial acetic acid: Methanol: Water (60: 32: 12: 8)
Stationary phase	:	Silica gel GF_{254} Aluminium sheet
Spray reagent	:	Ninhydrin reagent Anisaldehyde - sulphuric acid



A B C D E

Fig. 2 Thin-layer Chromatogram of Methanol Extract of the Dried Aerial parts of *Phyllanthus amarus* Schum & Thonn

Table 1 R_f values of components in Methanol Extract of the Dried Aerial parts of *Phyllanthus amarus* Schum & Thonn

R_f	Visual	UV 254 nm	UV 365 nm	Ninhydrin Spray	Anisal-dehyde Spray
0.99			Faint blue		
0.90			Faint blue		Pale dark brown
0.80			Faint blue		
0.70		Pale green	Light blue	Faint purple	
0.60		Pale green	Faint blue		
0.50			pale blue	Faint purple	
0.40			Faint blue	Purple	Pale dark brown
0.30	Pale yellow	Green		Pale purple	Pale dark brown
0.20	Pale yellow	Green	Faint blue	Faint yellow	Dark brown
0.10	Pale yellow		Light blue	Faint yellow	
0.07		White ring			

- Loss on drying at 105 °C : Not more than 6.13 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 16.7 %
- Acid-insoluble ash : Not more than 11.40 %
- Water soluble ash : Not less than 1.05 %
- Ethanol soluble extract : Not less than 12.08 %
- Water soluble extract : Not less than 28.0 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Hepatitis, Hepato-protective effect, Diabetes Mellitus
- Research reports : Anti-bacterial activity [21, 50], Diuretic effect [51]

Phyllanthi amari Herba

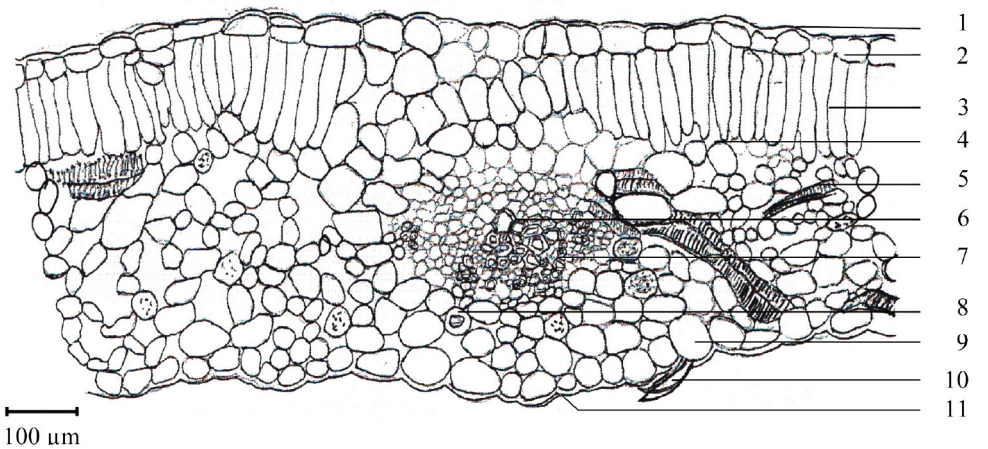


Fig. 3a Transverse section of *Phyllanthus amarus* Schum. & Thonn. leaf

1. Cuticle of upper epidermis
2. Upper epidermal cell
3. Palisade cell
4. Spongy cell
5. Annular tracheids
6. Xylem
7. Phloem
8. Prismatics calcium oxalate crystal
9. Lower epidermal cell
10. Trichome
11. Cuticle of lower epidermis

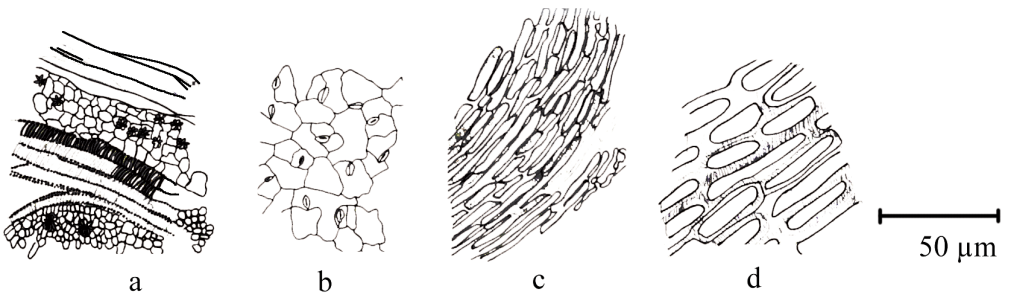


Fig. 3b Characters of the powdered drug

a. Parenchymatous cells attached with vessels, cluster crystals and fibre
b. Anisocytic stomata
c. Fragment of elongated parenchyma in longitudinal view
d. Elongated parenchyma in surface view

Phyllanthi virgati Herba

***Phyllanthus virgatus* G. Forst. (Phyllanthaceae)** **မြေဆီးဖြူ/သျှိသျှား**

(Mjei zi: bju /Shi: Sha:)

Fig.1 *Phyllanthus virgatus* G. Forst.

1. the plant; 2. dried aerial parts of the plant

Sources : Mandalay Region and Magway Region

Synonym(s) - ***Diasperus virgatus* (G. Forst.) Kunz.**
***Phyllanthus simplex* Retz.**

Other name(s) - **Bhuii amalaa (Nepalse)**
Bhui aonla (Hindi)
Virgate leaf-flower, Seed under leaf (English)
Xi ye you shu (Chinese)

Part(s) used - Aerial parts of plants

Definition

Phyllanthi virgati Herba consists of the aerial parts of *Phyllanthus virgatus* G. Forst. (Phyllanthaceae).

Description of the part used

Macroscopic characteristics

An annual erect herb, monoecious; stem slightly woody at base; branchlets angled. Leaves simple, alternate, nearly distichous, oblong-lanceolate; acute and mucronate at the apex, entire along the margin, slightly rounded at the base, glabrous on both surfaces; fruits rounded capsule, warty, 3- lobed; seeds 6, 2 in each cell, 3-angled, minutely tubercled. Odour characteristic and astringent, slightly sweet taste.

Microscopic characteristics

Transverse section of *Phyllanthus virgatus* G. Forst. leaf shows:

1. upper epidermis, a single layer of parenchyma cell covered by cuticle layer
2. lower epidermis, a single layer of parenchyma cell covered by cuticle layer bears multicellular trichomes
3. mesophyll layer composed of a single layer of palisade parenchyma and a few layers of slightly packed spongy parenchyma; annular vessels are sparsely dispersed in the spongy parenchyma of mesophyll
4. vascular bundle composed of xylem and phloem
5. vascular bundle embedded in the parenchymatous cells

Characters of the powdered drug

Yellow green powder, pungent, astringent and hot. The diagnostic characters are :

a. upper epidermis with paracytic stomata
b. fragment of lamina
c. fibre attached with prism of calcium oxalate crystals
d. rosette calcium oxalate crystals
e. pollen grains

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drop of 10 % ferric chloride solution, deep blue colour is produced.

D. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes. Foaming is appeared in the test tube.

E. The dried powder is refluxed with petroleum ether for 6 hours and filter. A few drops of acetic anhydride solution is added into the filtrate followed by concentrated sulphuric acid carefully. The filtrate is turned to blue colour.

F. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

G. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

Extract 0.5 g of powder drug with 10 mL of chloroform on the water bath for 30 minutes and filter. The filtrate is dried and redissolved in 1mL of chloroform for chromatography.

Application volume : 15 µL
Developing solvent system : Hexane: Ethyl acetate: Methanol (10:3:0.5)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Anisaldehyde-sulphuric acid

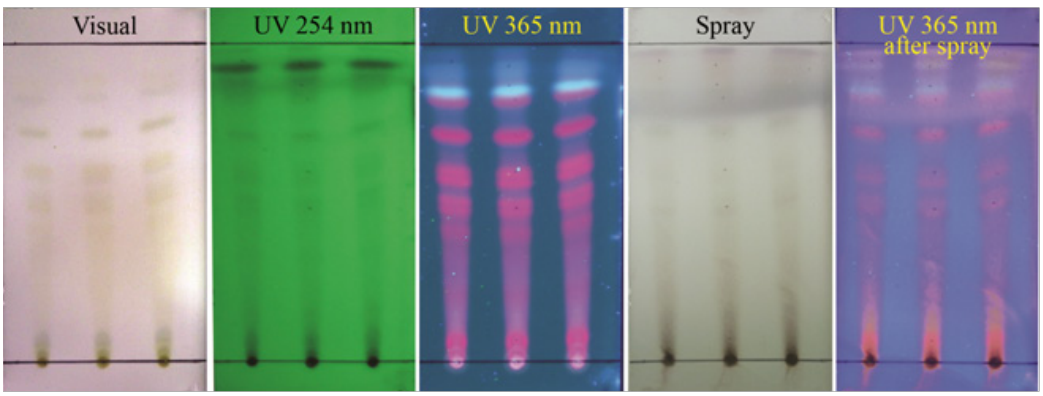


Fig. 2 Thin-layer Chromatogram of Chloroform Extract of the Dried Aerial parts of *Phyllanthus virgatus* G. Forst.

- Loss on drying at 105 °C : Not more than 7.04 %
- Foreign matter : Not more than 1.0 %
- Total ash : Not more than 15.85 %
- Acid-insoluble ash : Not more than 11.00 %
- Water soluble ash : Not less than 0.80 %
- Ethanol soluble extract : Not less than 11.92 %
- Water soluble extract : Not less than 18.16 %
- Important formulation : Traditional Medicine Formulations (TMFs) - Nil
- Traditional therapeutic uses : Hypertension, Diabetes Mellitus, Dysuria
- Research reports : Antioxidant [29]

Table 1 R_f values of components in Chloroform Extract of the Dried Aerial parts of *Phyllanthus virgatus* G. Forst.

R_f	Visual	UV 254 nm	UV 365 nm	Spray	UV 365 nm After spray
0.97				Dark purple	Pale yellow
0.93		Dark brown	Blue		Pale yellow
0.90			Light blue		
0.86		Pale brown	Red		
0.83					Pink
0.75			Red	Pale brown	
0.71	Faint yellow	Pale brown			
0.65					Red
0.60	Pale brown yellow	Pale brown	Red	Pale brown	
0.58					Red
0.52			Red	Pale brown	
0.48	Pale green	Pale brown	Red		Red
0.06	Pale yellow	Brown	Red		

Phyllanthi virgati Herba

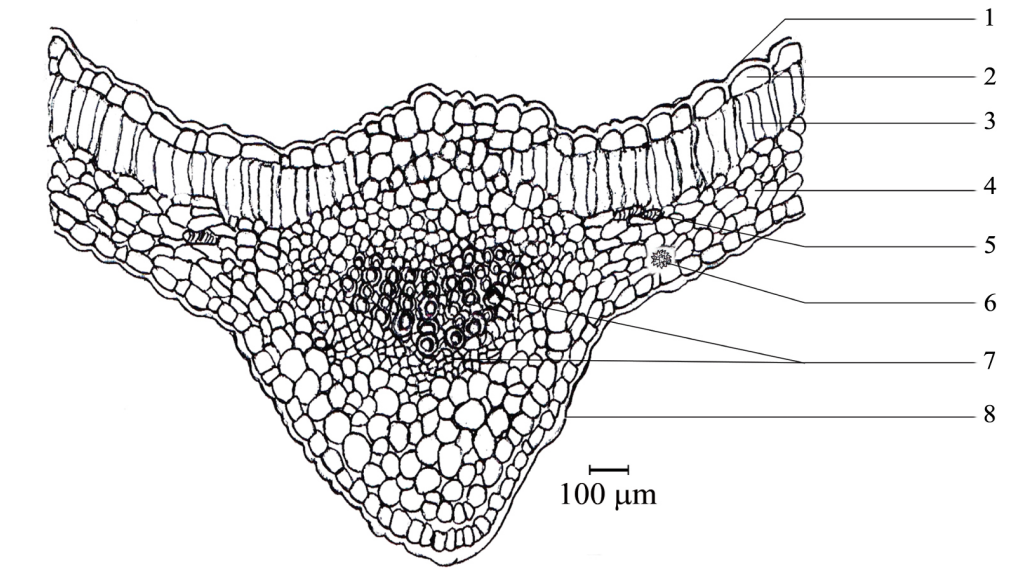


Fig. 3a Transverse section of *Phyllanthus virgatus* G. Forst.

1. Cuticle
2. Upper epidermis
3. Palisade parenchyma
4. Spongy parenchyma
5. Annular vessel
6. Rosette calcium oxalate crystals
7. Vascular bundle
8. Lower epidermis with cuticle

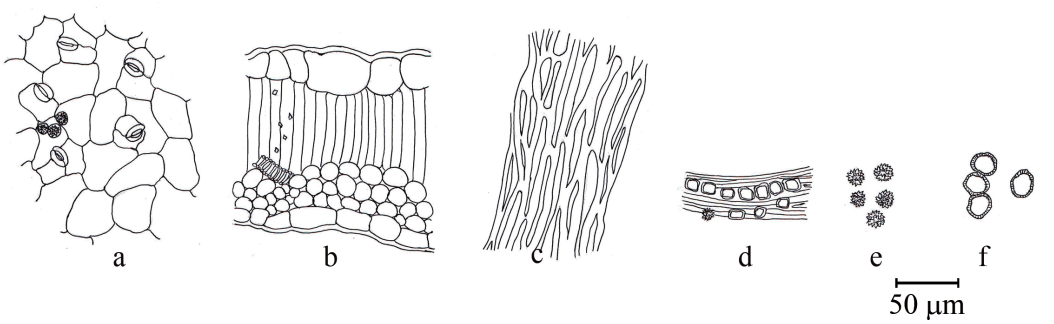


Fig. 3b Characters of the powdered drug

a. Upper epidermis with paracytic stomata and rosette calcium oxalate crystals
b. Leaf fragment in sectional view
c. Sclerenchymatous layer
d. Fibre attached with prism of calcium oxalate crystal
e. Rosette calcium oxalate crystals
f. Pollen grains

Sennae Folium

***Senna alexandrina* Mill. (Fabaceae)** **ပွဲးကိုဲး (Pwei: gain:)**

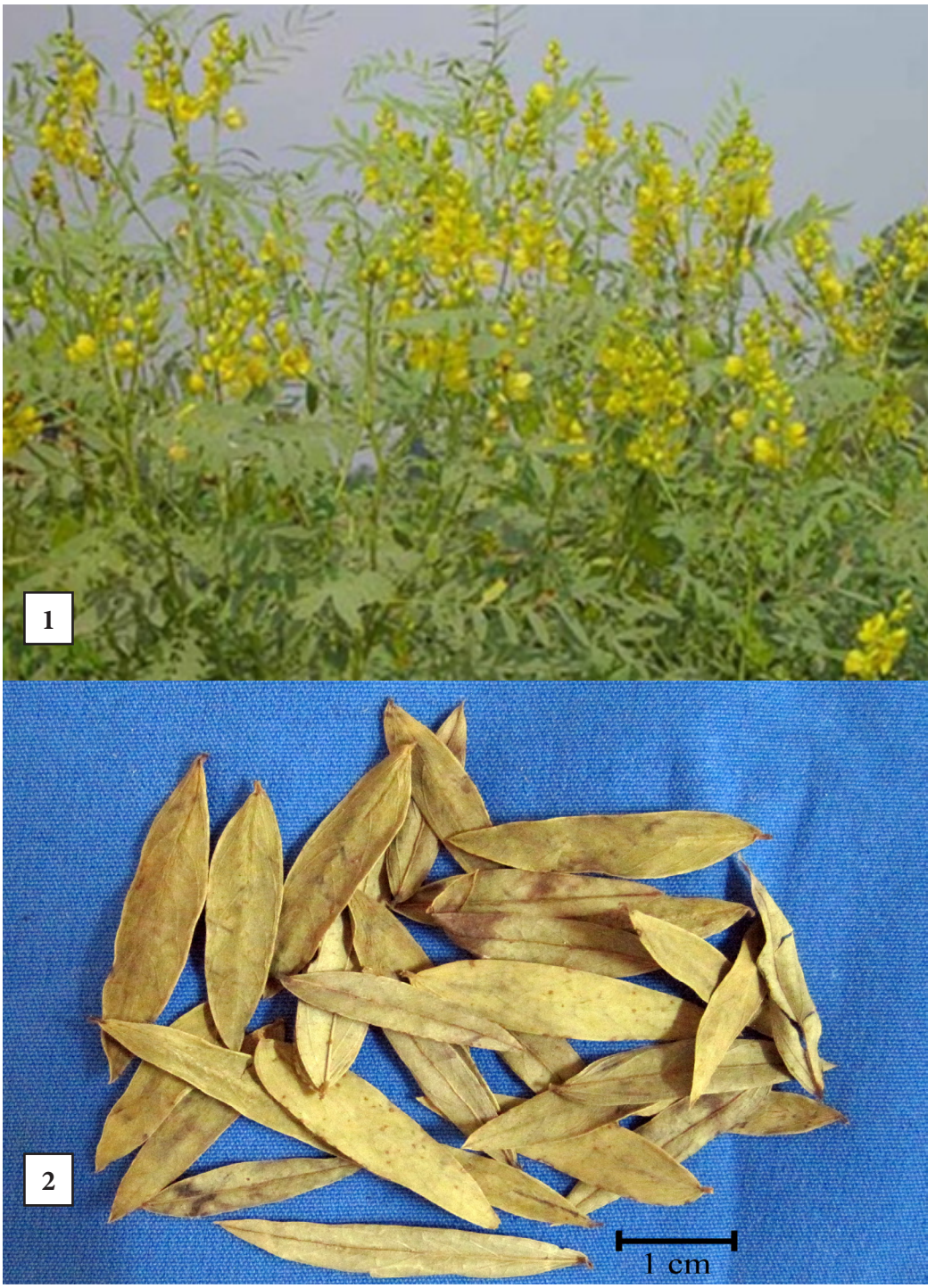


Fig.1 *Senna alexandrina* Mill.
1. the plant; 2. dried leaves

Source : Magway Region

Synonym(s) - ***Cassia acutifolia* Delile**
***C. alexandrina* (Garsault) Thell.**
***C. angustifolia* M.Vahl**
***C. angustifolia* Vahl**
***C. senna* L.**
***Senna angustifolia* (Delile) Batka**
***S. alexandrina* Garsault**
***S. angustifolia* (Vahl) Batka**

Other name(s) - **Alexandria senna, Senna leaves (English)**
Chinnkki Sunnamukhi, Nilavaka (Malaysian)
Nilappanaia (Tamil)
Sanaya (Hindi)
Swarn patric (Sanskrit)

Part(s) used - Dried leaflets

Definition

Sennae Folia consist of the dried leaflets of *Senna alexandrina* Mill. (Fabaceae).

Description of the part used

Macroscopic characteristics

The leaves paripinnately compound having 3-7 pairs of leaflets; the leaflets opposite, pale green to yellowish green, lanceolate to ovate-lanceolate, oblique at the base, with entire margin, acute and mucronate at the apex; hairy on both surfaces; the petiole stout, pubescent. Characteristic odour and mucilagenous bitter taste.

Microscopic characteristics

Transverse section of *Senna alexandrina* Mill. leaflets show:

1. both of the upper and lower epidermis composed of a single layer of rectangularly polygonal parenchyma cells covered with cuticle layer
2. both of the epidermis bear unicellular, non-glandular trichomes, and muci-

lage containing cell

3. mesophyll consists of upper and lower palisade layers and median spongy parenchyma
4. the cells of upper palisade layer more longer than those of the cells of lower palisade
5. both of upper palisade and lower palisade composed of one layer of elongated and compactly arranged parenchymatous cells respectively
6. the median spongy consists of many layered of loosely arranged, rounded to oval parenchymatous cells
7. raphides, annular tracheids, and druses of calcium oxalate crystals occur in some of spongy cells
8. vascular bundle surrounded by discontinuous sclerenchymatous sheath, xylem towards adaxial side, phloem towards the outside
9. a few-layered of collenchyma cells occur between the lower epidermis of mid-rib area and vascular bundle

Characters of the powdered drug

Yellowish green powder, faint characteristic odour, mucilagenous and slightly bitter taste. The diagnostic characters are:

a. Groups of pieces of thick-walled sclerenchymatous fibre adhere with prismatic calcium oxalate crystals
b. Unicellular, non-glandular, conical trichomes with thick, distinctly warted walls and with straight or curved base
c. Fragments of epidermis with elliptical stomata, two unequal parallel subsidiary cells
d. Fragments of upper and lower epidermal cells of leaves with thin, straight wall and paracytic stomata, short unicellular, non-glandular, conical, warty and thick-walled trichomes

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

D. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

E. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

F. A test tube containing70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution a few minutes, pink colour is formed.

G. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

To extract 1 g of powder drug add 10 mL of dichloromethane, allow standing for overnight at room temperature and filter. The filtrate is evaporated to dryness. The dried extract is redissolved in 1 mL of dichloromethane for thin layer chromatography.

Application volume	: 10 µL
Developing solvent system	: Hexane: Ethyl acetate (10:2)
Stationary phase	: Silica gel GF_{254} Aluminium sheet
Spray reagent	: 10% sulphuric acid in Ethanol

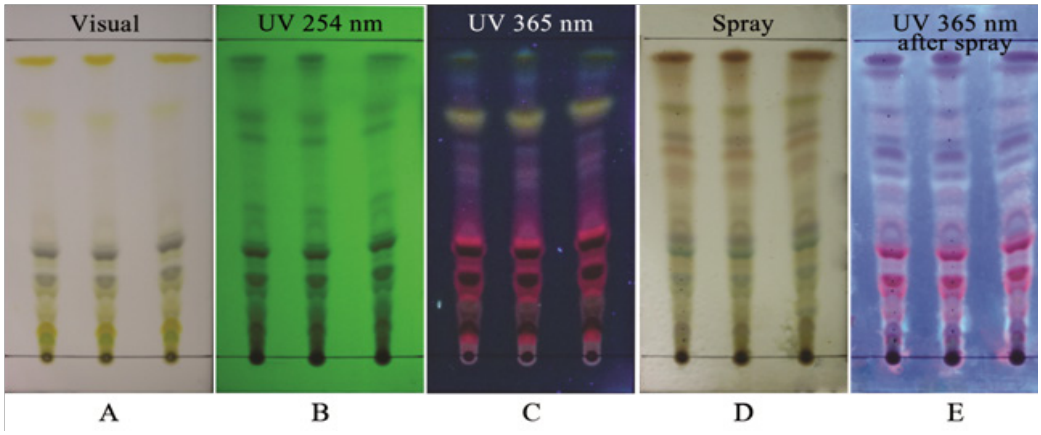


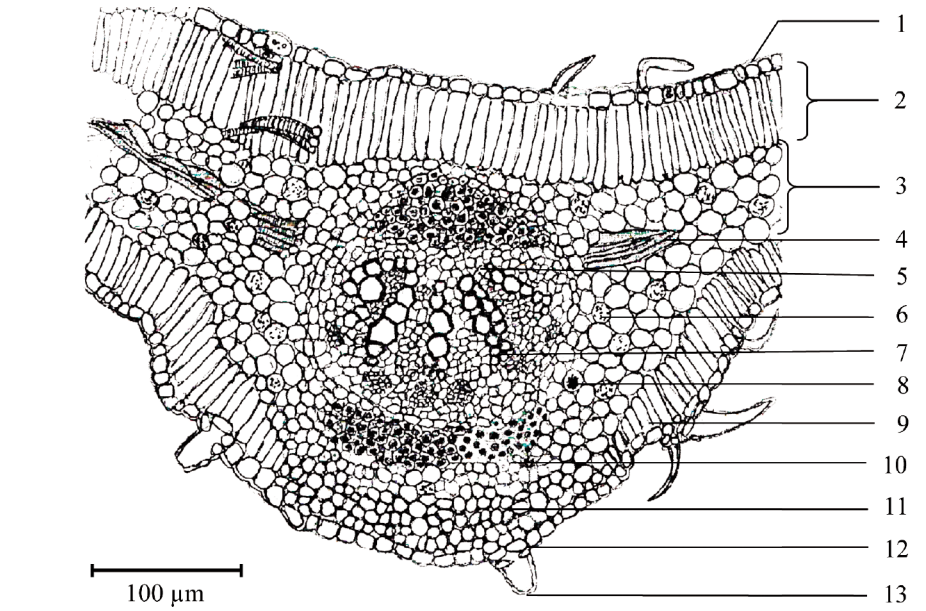
Fig. 2 Thin-layer Chromatogram of Dichloromethane Extract of the Dried Leaflets of *Senna alexandrina* Mill.

- Loss on drying at 105 °C : Not more than 7.34 %
- Foreign matter : Not more than 0.5 %
- Total ash : Not more than 11.15 %
- Acid-insoluble ash : Not more than 3.75 %
- Water soluble ash : Not less than 2.20 %
- Ethanol soluble extract : Not less than 13.92 %
- Water soluble extract : Not less than 32.96 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 9/10/12/Sup: 16
- Traditional therapeutic uses : Constipation, Digestant, Mucolytic, Quenches heat, Diuretic
- Research reports :

Table 1 R_f values of components in Dichloromethane Extract of the Dried Leaflets of *Senna alexandrina* Mill.

R_f	Visual	UV 254nm	UV 365nm	Spray	UV 365nm after spray
0.95			Greenish blue	Reddish brown	Violet
0.92	Yellow	Brown			Violet
0.88			Blue		
0.78				Yellowish green	Black
0.75	Yellow	Brown	Yellow		
0.68		Brown		Reddish black	Black
0.64			Blue	Reddish brown	White violet
0.60			Pink		
0.57				Reddish brown	Light blue
0.52			Pink blue		
0.46		Brown		Pale brown	
0.38				Black	Blue
0.33	Black	Dark brown	Reddish black	Green	Red
0.25	Black	Dark brown	Reddish black	Green	Red
0.20	Yellowish brown	Brown		Pale green	Red
0.14	Yellowish brown	Brown	Reddish black		Pink
0.08	Yellow	Dark brown		Brown	Blue
0.05	Green		Reddish black		Pink

Sennae Folium



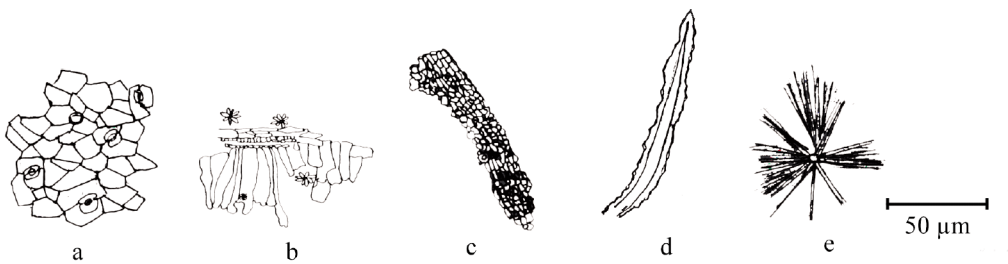


Fig. 3a Transverse section of *Senna alexandrina* Mill. leaflet

1. Upper epidermis with cuticle
2. Upper palisade cell
3. Median spongy cell
4. Annular tracheids
5. Xylem
6. Mucilage cell
7. Phloem
8. Raphide
9. Lower palisade cell
10. Discontinuous sclerenchymatous sheath
11. Collenchymatous layer
12. Lower epidermis with cuticle
13. Trichome

Fig. 3b Characters of powdered drugs

a. Paracytic stomata
b. Rosette calcium oxalate crystals scattered in palisade and spongy parenchyma
c. Thick-walled sclerenchymatous fibre attached with prismatic and rosette calcium oxalate crystals
d. Unicellular,conical trichome composed of warted walls and curved base.
e. Bundle of raphides

Tamarindi indicae Pulpa

***Tamarindus indica* L. (Caesalpiniaceae)** **မန်ကျည်း (Magji:)**

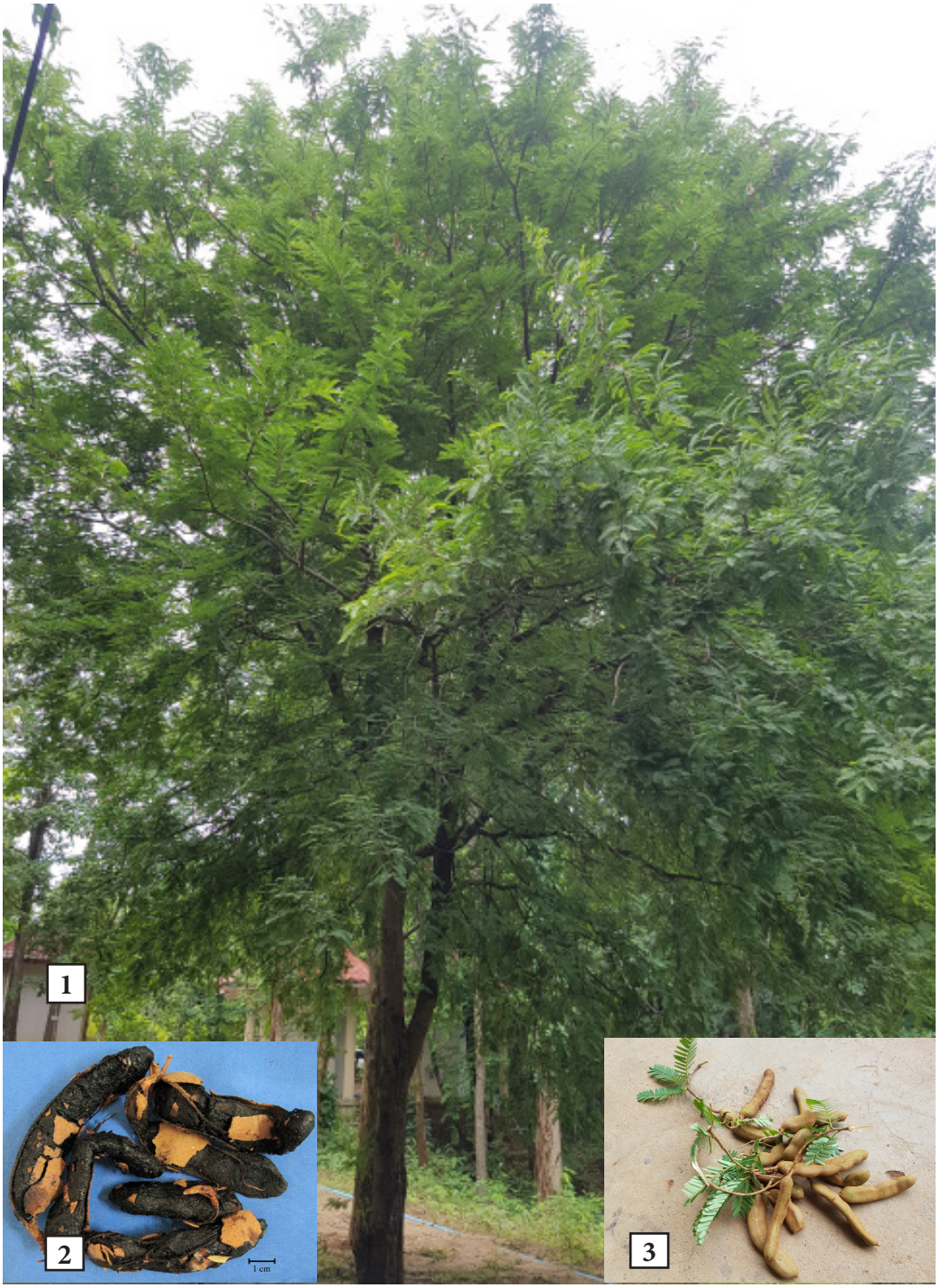


Fig. 1 *Tamarindus indica* L.
1. the plant; 2. ripe fruits; 3. green fruits

Sources : Magway Region and Mandalay Region

Synonym(s) - ***Tamarindus occidentalis* Gaertn.**
***T. officinalis* Hook**
***T. umbrosa* Salisb.**

Other name(s) - **Asam jawa, Asam, Celagi (Malaysian)**
Ampil (Cambodia)
Daralsida, Hommar (Arabic)
Imli (Hindi)
Makam (Thai)
Suan dou (Chinese)
Tamarind (English) (Caribbean) (Jamaica)
Tamarinden baum (German)
Tamarindo (Italian) (Philippines)(Spanish)
Tamarindo, Jubay (Brazil)
Tamarinier (French)
Tangkal asem (Sundanese)
Thinthinee (Sanskrit)
Wit asem (javanese)

Part(s) used - Fruit pulp

Definition

Tamarindi indicae Pulpa consists of the rippen fruit pulp of *Tamarindus indica* L. (Caesalpiniaceae).

Description of the part used

Macroscopic characteristics

Indehiscent, dorsiventrally flattened, cylindrical and stalked pod; pericarp hard and brown, fleshy and pasty pulp contain yellowish-brown fibres. Odour pleasant, characteristic; taste sweetish and acidic.

Microscopic characteristics

Transverse section of *Tamarindus indica* L. fruit pulp shows:

1. epicarp: 2-3 layered of irregularly parenchymatous cells. Prismatic crystals

contain in some cells of interior portion

2. mesocarp: many-layered of thin-walled, rounded, oval to polygonal parenchyma cells, some filled with brownish substances and prismatic calcium oxalate crystals; groups of stone cell occur in abundance
3. vascular bundles found in the middle portion of mesocarp layer
4. many fibres and prismatic crystals occur in the cells of mesocarp layer
5. seed coat consists of a few-layered of compactly arranged and rectangularly parenchyma cells
6. prismatic crystals contain in some cells of seed coat

Characters of the powdered drug

Reddish brown pulp, slightly characteristic odour, sweet and sour taste. The diagnostic characters are:

a. parenchyma cells containing prismatic calcium oxalate crystals
b. stone cells
c. fibres

Identification

A. One drop of aqueous extract of sample is taken and spotted on a filter paper using a capillary tube, allowed to dry and spray with ninhydrin reagent. The filter paper is dried at room temperature and then kept in oven at 110 °C for five minutes. Spot color is changed to violet color.

B. Two millilitres of aqueous extract of the sample is added to 1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

D. The powdered sample is boiled with 2 M hydrochloric acid and filtered. A few drops of Mayer's reagent is added to the filtrate. White precipitate is produced.

E. The powdered sample is boiled with 2 M hydrochloric acid and filtered. A

few drops of Wagner's reagent is added to the filtrate. Reddish brown precipitate is appeared.

F. 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.

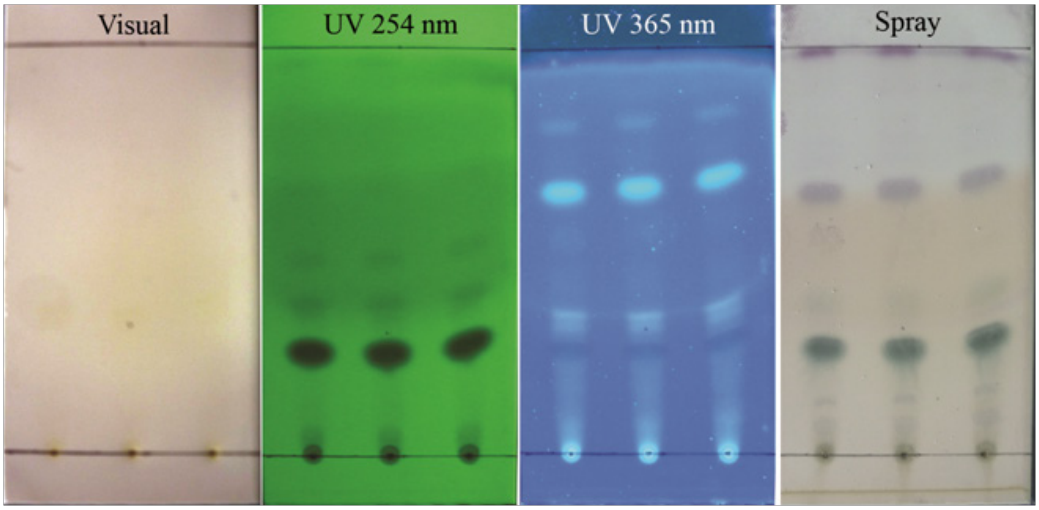
G. A test tube containing 70% ethanolic extract of the drug is added 5-10 drops of dilute hydrochloric acid followed by a small pieces of magnesium ribbon. Boil solution a few minutes, pink colour is formed.

H. The aqueous extract of the drug is treated with a few drops of sodium hydroxide solution. A yellow colour is appeared in the test tube.

TLC analysis

Extract 0.5 g of powder sample with 15 mL of ethyl acetate on the water bath for 30 minutes, filter and the filtrate is used for chromatography.

Application volume : 10 µL
Developing solvent system : Toluene: Ethyl acetate: Methanol: Glacial acetic acid (10:2:0.5:0.5)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin-sulphuric acid



A B C D

Fig. 2 Thin-layer Chromatogram of Ethyl acetate Extract of the fruit pulp of *Tamarindus indica* L.

Table 1 R_f values of components in Ethyl acetate Extract of the fruit pulp of *Tamarindus indica* L.

R_f	Visual	UV 254 nm	UV 365 nm	Spray
0.98		Faint brown		Purple
0.81			Pale blue	
0.66		Faint brown	Light blue	Purple
0.56			Faint blue	
0.43			Faint blue	
0.48		Pale brown		
0.36		Brown	Pale yellowish pink	Faint brown
0.32	Faint yellow		Pale yellowish pink	
0.27		Dark blue	Dark brown	Dark green
0.15				Pale brown
0.08				Pale brown
0.03		Pale brown		

- Loss on drying at 105 °C : Not more than 20.28 %
- Foreign matter : Not more than 2.0 %
- Total ash : Not more than 3.8 %
- Acid-insoluble ash : Not more than 1.15 %
- Water soluble ash : Not less than 1.8 %
- Ethanol soluble extract : Not less than 33.76 %
- Water soluble extract : Not less than 51.20 %
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - Sup: 3/5/16
- Traditional therapeutic uses : As Laxative agent, Indigestion
- Research reports : -

Tamarindi indicae Pulpa

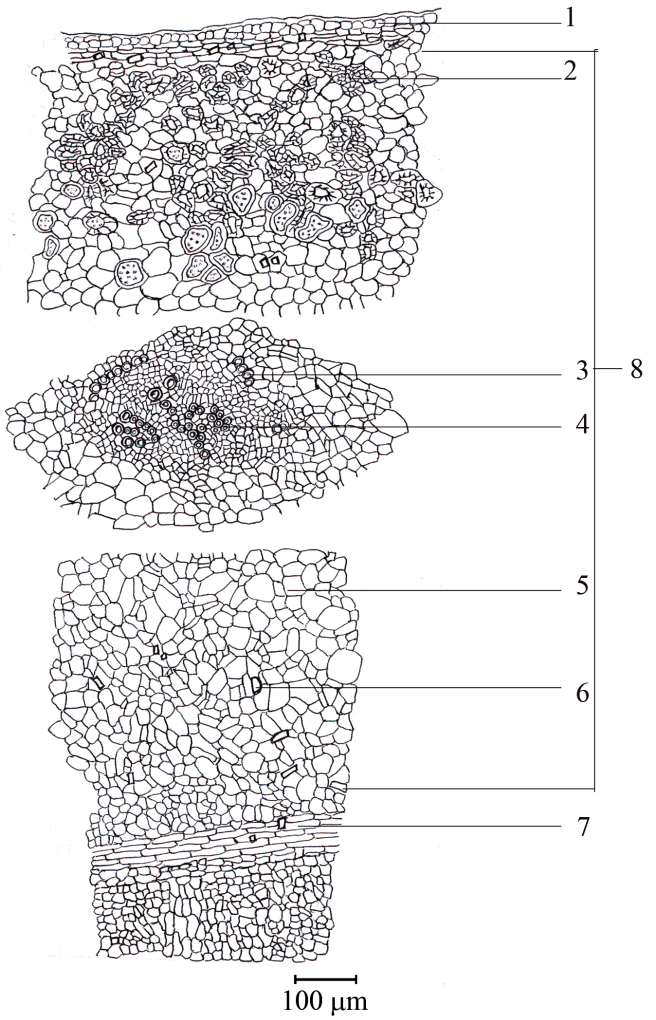


Fig. 3a Transverse section of *Tamarindus indica* L. fruit

1. Epicarp
2. Stone cell
3. Fibre
4. Vascular bundle
5. Parenchyma cell
6. Solitary crystal
7. Seed coat
8. Mesocarp

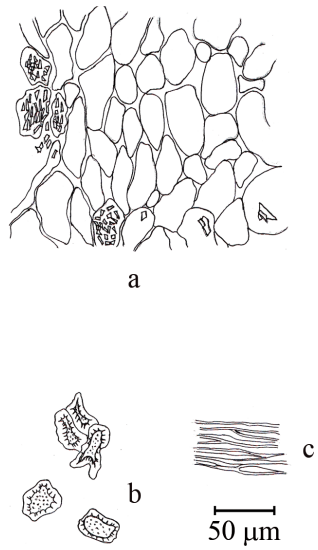


Fig. 3b Characters of the powdered drug

a. Loosely arranged parchyma cells containing prismatic calcium oxalate crystals
b. Stone cells
c. Fibres

Terminaliae citrinae Fructus

Terminalia citrina **(Gaertn.) Roxb. (Combretaceae)** **ကြို (Kja zu.)**

Fig. 1 *Terminalia citrina* (Gaertn.) Roxb.
1. the plant; 2. dried fruits

Sources : Magway and Taninthayi Regions

Synonym(s) - ***Myrobalanus citrina* Gaertn.**
***Terminalia arborea* Koord.&Valeton**
***T. comintana* Merr.**
***T. curtisii* Ridl.**

Other name(s) - **Abhay, Pathy, Pathya (Sanskrit)**
Blabah (Indonesian)
Citrine Myrobalan, Yellow Myrobalan (English)
Haritaki (Bengali)
Jelawai, antoi (Malasian)
Samow di ngu (Thai)
Manahei (Manipuri)

Part(s) used - Dried mature fruit

Definition

Terminaliae citrinae Fructus consists of dried mature fruits of *Terminalia citrina* (Gaertn.) Roxb. (Combretaceae).

Description of the part used

Macroscopic characteristics

The 5-angled fruit is an ellipsoid to broadly ellipsoid, coriaceous, glabrous, rugose, dark green when young, bright yellow in aged; seeds ellipsoid, 5- ribbed, rugose, non-endospermic. Odour not characteristic, taste sour and astringent.

Microscopic characteristics

Transverse section of *Terminalia citrina* (Gaertn.) Roxb. fruit shows:

1. epidermis of epicarp: composed of a single layer of rectangularly and tangentially elongated parenchyma covered with thick cuticle. Some of the epidermal cells contain brownish tannin and oil
2. mesocarp composed of many layers of parenchymatous cells, some cells contain tannin and starch grainins
3. a few oil cells dispersed in the mesocarpic layer; and lignified, thick-walled

and elongated sclereids are also present in mesocarpic region

4. below the sclereids (sclerenchyma), many layers of large parenchymatous cells. Some cells contain rosette of calcium oxalate crystals, starch grains and oil cells
5. vascular strands and bundles are dispersed between the innermost part of mesocarpic region and endocarpic region

Characters of the powdered drug

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

a. parenchyma containing prismatic crystals
b. reticulate parenchyma
c. sclereids
d. porus parenchyma
e. brownish tannin
f. prismatic and rosette aggregate crystal
g. parenchyma containing oil globules

Identification

A. Two millilitres of aqueous extract of the sample is added to 1 mL of a mixture of equal part of Fehling's solution 'A' and Fehling's solution 'B' and boiled the contents of the test tube for few minutes. A brick red coloured precipitation is produced.

B. Boil 0.5 g of powdered sample in 20 mL of distilled water and filter. Add a few drops of 10 % ferric chloride solution, deep blue colour is produced.

C. The drug 1 g is introduced into the test tube and followed by the addition of 10 mL of distilled water and shaken vigorously for a few minutes, a long lasting foam is produced.

D. An aqueous extract of the sample is dissolved in iodine solution. Blue precipitate is formed.

E. Add 10 mL of chloroform in 1 g of the drug for 6 hours and filter. The filtrate is added to 0.3 mL of acetic anhydride followed by a few drops of

concentrated sulphuric acid. A red colour is formed.

TLC analysis

To extract 1 g of powder drug in 15 mL of ethyl acetate on water-bath for 30 minutes and filter. Evaporate the solvent and redissolve the residue in 1 mL of ethyl acetate for chromatography.

Application volume : 5 µL

Developing solvent system : Chloroform : Methanol (9:1)

Stationary phase : Silica gel GF_{254} Aluminium sheet

Spray reagent : Vanillin- sulphuric acid

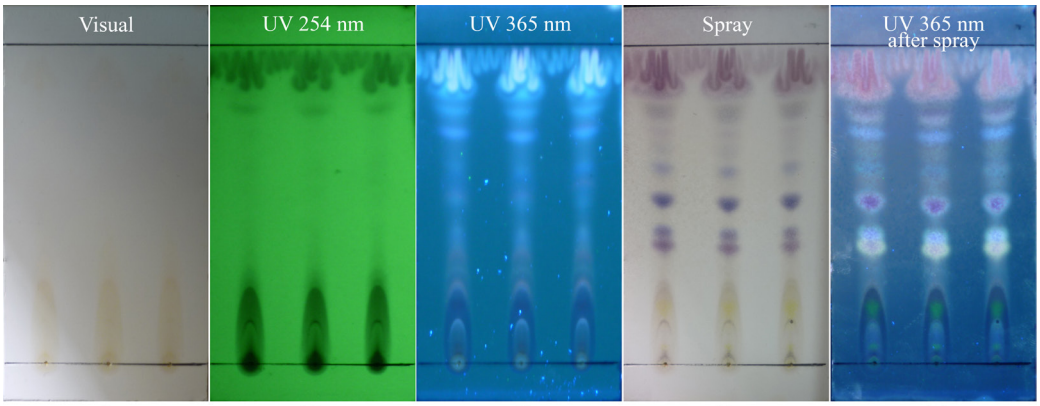


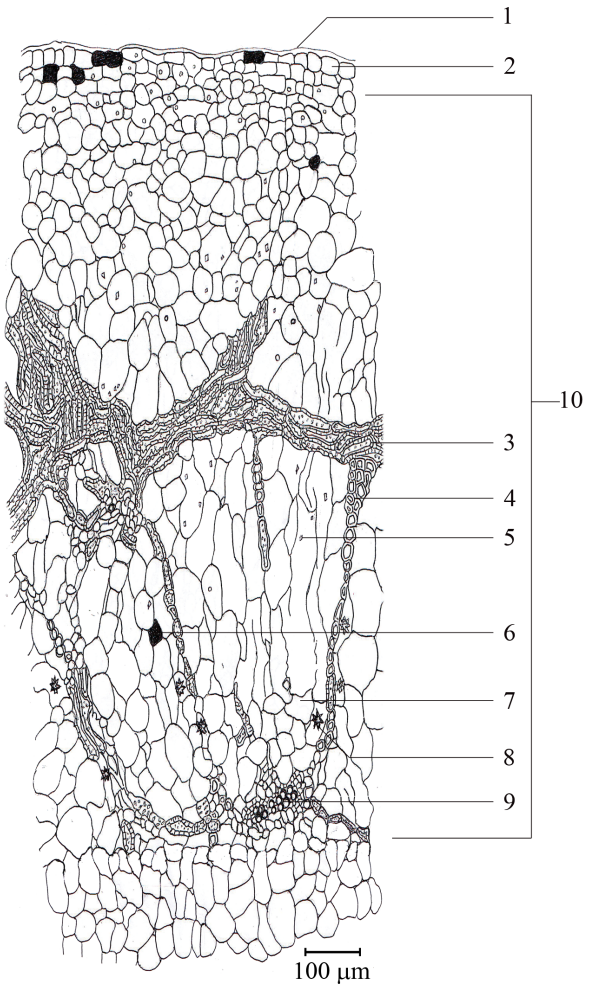
Fig. 2 Thin-layer Chromatogram of Ethyl acetate Extract of the Dried Fruits of *Terminalia citrina* (Gaertn.) Roxb.

- Loss on drying at 105 °C : Not more than 7.23 %
- Foreign matter : Not more than 0.5 %
- Total ash : Not more than 4.35 %
- Acid-insoluble ash : Not more than 1.05 %
- Water soluble ash : Not less than 2.15 %
- Ethanol soluble extract : Not less than 26.32%
- Water soluble extract : Not less than 35.2%
- Important formulation : Traditional Medicine Formulations (TMFs) [2] - 8/9/10/17/22/24/29/33, 35-A,B/37/39/Sup: 7/15/26/27
- Traditional therapeutic uses : As Laxative agent, Piles, Jaundice
- Research reports : -

Table 1 R_f values of components in Ethyl acetate Extract of the Dried Fruits of *Terminalia citrina* (Gaertn.) Roxb.

R_f	Visual	UV 254 nm	UV 365 nm	Spray	After spray
0.80		Brown	Fluores-cence blue	Black	Pink violet
0.72				Pale violet	Blue
0.67			Fluores-cence blue	Pale violet	Pale gray
0.61			Blue	Purple	Pale purple
0.51			Blue	Purple	purple
0.40			Blue	Purple	
0.36				Violet	
0.31			Blue		Fluores-cence pink
0.13	Orange	Brown	Purple	Orange	Yellow pur-ple

Terminaliae citrinae Fructus



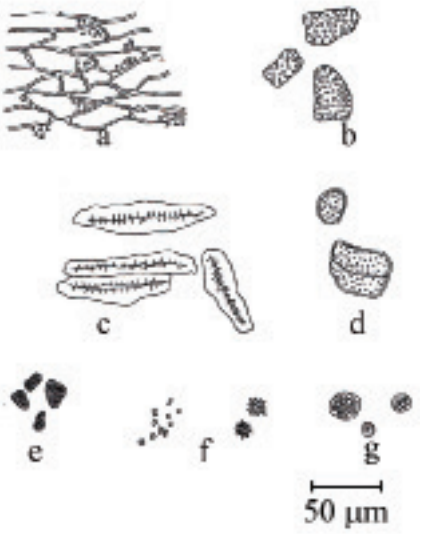


Fig. 3b Characters of the powdered drug

a. Parenchyma containing prismatic crystals
b. Reticulate parenchyma
c. Sclereids
d. Porus parenchyma
e. Brownish tannin
f. Prismatic and rosette aggate crystals
g. Parenchyma containing oil globules

Fig. 3a Transverse section of *Terminalia citrina* (Gaertn.) Roxb. fruit

1. Cuticle
2. Epidermis of epicarp
3. Sclereids of mesocarpic region
4. Fibre
5. Oil cell
6. Tannin containing cell
7. Parenchyma of innermost mesocarpic layer
8. Druses of calcium oxalate crystal
9. Vascular bundle
10. Mesocarpic layer

REFERENCES

References

1. Central Council for Research in Unani Medicine. Physicochemical Standards of Unani Formulations Part 2. New Delhi; 1987.
2. Department of Traditional Medicine. Myanmar Traditional Medicine Formulary. Ministry of Health, Myanmar; 1990.
3. Department of Traditional Medicine. Medicinal Plants of Myanmar. Vol.1. Ministry of Health,. Myanmar; 2000.
4. Department of Traditional Medicine. Medicinal Plants of Myanmar. Vol. 2. Ministry of Health, Myanmar; 2007.
5. Harborne J B. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. 3rd ed. Chapman & Hall Ltd; 1998.
6. Wagner H. and Bladt S. Plant Drug Analysis: A Thin Layer Chromatography Atlas. 2nd ed. Springer. Germany; 1996.
7. Moe-Thida-Kyaw. Effect of raw garlic (*Allium sativum*) supplementation on serum lipid profile in hypercholesterolemic subjects. [MMedSc. (Biochemistry) Thesis] Yangon: University of Medicine (2) Yangon; 2006.
8. Nwe-Yee-Win. Evaluation of antibacterial activity and characterization of phytoconstituents of selected Myanmar medicinal plants. [PhD (Engineering Chemistry) Thesis]. Yangon: Technology University; 2001.
9. Hnin-Hnin-Aye. Antituberculosis Activities and Chemical Investigation of Myanmar Traditional Medicine Used for the Treatment of Tuberculosis. [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2002.
10. Khin-Chit *et., al*. Experimental evaluation of biological and anti-mycobacterial activities of medicinal plants. Myanmar Health Res Congr, 1995: p35.
11. Khin-Chit *et., al*. Anti-proliferative and antioxidant activity of some Myanmar medicinal plant. Myanmar Health Res Congress, 2009: p20.
12. Lwin-Ko *et., al*. Clinical trial of Myanmar traditional medicine in the treatment of new cases of pulmonary tuberculosis in Myanmar. Myanmar Health Res Congr, 2001: p31.

13. Mar-Mar-Nyein, Mi-Mi-Htwe and Aye-Than. Antibacterial activity of herbs used in traditional medicine formulation as remedies for gastrointestinal disorder (diarrhoea and dysentery). Myanmar Health Res Congr, 2002: p6.

14. Win-Naing. Characterization & evaluation of antibacterial activity of phytoconstituents isolated from selected Myanmar medicinal plants. [PhD Chemistry Thesis]. Yangon: University of Yangon; 2002.

15. Khin-Hnynn-Phyu, Aye-Aye-Tun and Hla-Ngwe. Investigation of antihyperglycemic activity of *Alstonia scholaris* (Linn.) R. Br. (Taung-mayo) leaf and *Terminalia chebula* Retz. (Phan-khar) bark. Jour. Myan. Acd. Arts. and Sc. 2009; VII (1) : 281-292.

16. Yi-Yi-Win. Antimicrobial Activity of Stem Barks of *Picrasma javanica* BL. (Nann-paw-kyawt) and *Alstonia scholaris* L. (Taung-mayo) and Isolation and Identification of Active Compounds. [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2014.

17. Htay-Htay-Yee. Evaluation of some Bioactive Constituents and Screening of Antimicrobial and Antioxidant Activities of *Tectona grandis* Linn. (Kyun) Heart-wood and *Terminalia bellerica* Roxb. (Thit-seint) Fruit Shell. [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2007.

18. Thaung-Hla and Maung-Maung-Wint. Clinical trial of anti-amoebic potential of traditional herbal drug Yar-dan-tze. Myanmar Health Res Congr, 1997: p9.

19. Ye-Htut *et., al*. Screening of Myanmar medicinal plants for antimalarial activity. Myanmar Health Res Congr, 2000: p43.

20. Ei-Pyae-Phyo-Aung. Hypoglycemic effect of *Terminalia chebula* Retz. (Phan-kha-thee) on diabetic albino rat models. [MMedSc (Pharmacology) Thesis]. Mandalay: University of Medicine, II. Yangon; 2011.

21. Mar-Mar-Nyein *et., al*. Plants possessing antibacterial activity. Myanmar Health Sci Res J.1999; 11(1-3): p26-32.

22. Mu-Mu-Thin. Antibacterial properties of some Myanmar medicinal herbs. [MSc (Zoology) Thesis]. Yangon: University of Yangon; 1998.

23. Khin-Myint-Soe. A study on the Antituberculosis Activity of Extracts and Compounds from the Aerial Parts of *Boerhvia diffusa* L. (Pa-yan-na-war) and the Leaves of *Cinnamomum tamala* (Buch-Ham) Nees and Eberm. (Karawe). [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2014.

24. Wah-Wah-Aung. In vitro antioxidant activity and acute toxicity study of *Curcuma comosa* Roxb. Rhizome [M.Pharm Thesis]. Yangon: 2016

25. Khine-Khine-Lwin *et., al.* Hypoglycemic effect of *Curcuma comosa* Roxb. (Nanwin-ga) rhizomes on rabbits model. Myanmar Health Sci Res J. 2008; 20(2): p107-113.

26. Khin-Chit. Study of the antimycobacterial activity of biologically active medicinal plant *Desmodium triquetrum* DC. (Lauk-they). [MMedSc (Pharmacology) Thesis]. Yangon: University of Medicine (1), Yangon; 1996.

27. Ni-Ni-Than. Antiviral assay of Myanmar traditional medicine used for the treatment of hepatitis B virus. [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2001.

28. Myo-Khin *et., al*. In-vitro Assessment of some reputed Medicinal Plants against Hepatitis B Virus, Poster submitted in Myanmar Health Congress Yangon, Myanmar: 2009.

29. Win-Maung-Maung. Effect of *Eclipta alba* on acute alcoholic liver disease. [MSc. (Zoology) Thesis]. Rangon: University of Rangoon; 1982.

30. Nyunt-Nyunt. Effect of *Eclipta alba* on carbon tetrachloride hepatotoxicity. [MSc. (Zoology) Thesis]. Rangon: Rangoon Arts & Science University; 1976.

31. Aye-Than, Win-Myint, Mu-Mu-Sein-Myint, Tin-Myint, Mya-Bwin. The effect of some medicinal plants on uterine smooth muscle. Myanmar Health Sci Res J. 1995; 7(2):p70-74.

32. Si-Si-Thet, Than-Than-Nu, Phyu-Phyu-Myint, Hla-Ngwe. Investigation of some organic constituents and some biological activities of the whole plant of *Eclipta alba* (Linn.) Hassk (Kyeik-hman) and the Bark of *Butea monosperma* (Lam.) Kuntze (Pauk). Jour. Myan. Acd. Arts and Sc. 2013; XI (1): 261-280.

33. Si-Si-Thet. Investigation of some Organic Constituents and some Biological Activities of the whole Plant of *Eclipta alba* (Linn.) Hassk (Kyeik-hman) and the Bark of *Butea monosperma* (Linn.) Kuntze (Pauk). [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2012.

34. Win-Myint. Antihepatotoxic substances from *Eclipta alba* (L.) Hassk. (Kye-ik-hman). Myanmar Health Sci Res J. 1995 April; 7(1): p9-13.

35. Yee-Yee Nyunt. Chemical studies and some pharmacological activities of *Eclipta alba* (L.) Hassk. [MSc (Botany) Thesis]. Yangon: University of Yangon; 1991.

36. Ni-Ni-Than. Investigation of Bioactive Constituents and the Antitumour Activity of *Eclipta alba* Linn. Universities Research Journal. 2010; 3(5): 137-144.

37. Cho-Cho-Mar. Antidiarrhoeal activity of *Euphorbia hirta* Linn. (Kywe-Kyaung-Hmin-Hsay) in experimental animals. [MMedSc (Pharmacology) Thesis]. Mandalay: University of Medicine, Mandalay; 2011.

38. Kyaw-Soe. Antiasthmatic action of *Euphorbia hirta* Linn. (Kywe-Kyaung-Hmin-Hsay) in guinea pigs. [MMedSc (Pharmacology) Thesis]. Mandalay: University of Medicine, Mandalay; 2009.

39. Thandar-Aung, Hla-Ngwe and Maung-Maung-Htay. Cholesterol lowering effect of *Euphorbia hirta* Linn. Euphorbiaceae (Kywe-kyaung-hmin-sae) and *Oldenlandia corymbosa* Linn. (Sular-na-phar). Jour. Myan. Acd. Arts. and Sc. 2007; V (1-2).

40. Aung-Kyaw-Moe. Hypoglycemic activity of aqueous extract of *Gynura procumbens* (Lour.) Merr. (Pyar-Mee-Swae) leaves in diabetic wistar rats. [MMedSc (Pharmacology) Thesis]. Mandalay: University of Medicine, Mandalay; 2012.

41. Hla-Ngwe, Khin-Chaw-Win, May-Mon-Kyaw, Thaw-Thaw-Zin, Kyaw-Thu and San-San-Maw. Investigation of the Bioactive Principles and α-Glucosidase Inhibitory Effect of some Myanmar Traditional Medicinal Plants Possessing the Antidiabetic Potency. Journal of the Asia Research Centre, Yangon University. 2013; 3(2): 127-137.

42. Nyan-Tun-Aung. Blood sugar lowering effect of *Gynura procumbens* (Linn.) on type 2 diabetic patients. [MMedSc (Pharmacology) Thesis]. Yangon: Defence Services Medical Academy, Yangon; 2011.

43. Thura-Aung. Antihyperglycemic activity of the leaves *Gynura procumbens* (Lour.) Merr. Family: Asteraceae. [M Pharm, Thesis]. Yangon: Military Institute of Nursing and Paramedical Sciences; 2011.

44. Wai-Mi-Aung. In-vitro antioxidant activity of fresh leaves and dried leaves of *Gynura procumbens* (Lour.) Merr. [MPharm, Thesis]. Yangon: University of Pharmacy Yangon; 2010.

45. Nyein-Nyein-Htwe. Isolation and Characterization of some Organic Constituents from *Mimusops elengi* Roxb. (Kha-ye) Bark and Investigation of Antihyperglycemic Activities of Kha-ye Bark and Seeds of Mahogany (*Swietenia macrophylla* King.). [PhD (Chemistry) Thesis]. Yangon: University of Yangon; 2008.

46. Khin-Chit, Khin-Ye-Myint, Aye-Than. Mu-Mu-Sein-Myint and Myint Lwin. Hypoglycemic effect of *Orthosiphon aristatus* (Bl.) (See-cho-pin) on Type II Diabetes Mellitus patients (NIDDM) Myanmar Health Res Congr, 1998: p54.

47. Khin-Chit, Khin-Ye-Myint, Myo-Win, Aye-Than and Myint-Lwin. Hypoglycaemic effect of *Orthosiphon aristatus* (Bl.) (See-cho-pin) on health volunteers. Myanmar Health Res Congr, 1998: p52.

48. Than-Than-Htay. Chemical studies and pharmacological evaluation of *Orthosiphon aristatus* (Bl.) Miq. [MSc (Botany) Thesis]. Yangon: University of Yangon; 1995.

49. Yin-Yin-Myint. Investigation of some Bioactive Constituents and Bioactivities of *Hydrocotyle rotundifolia* Roxb. (Say-myin-khwar) and *Orthosiphon aristatus* Miq. (Thagya-ma-geik). [PhD (Chemistry) Thesis]. Yangon: University of Yangon: 2007.

50. Thandar-Oo. Studies on the in vitro antibacterial activity of some indigenous plant extracts. [MSc (Botany) Thesis]. Yangon: University of Yangon; 1998.

51. Moe-Moe-Thin. The diuretic effect of *Phyllanthus niruri* Linn. on albino rats. [MMedSc (Pharmacology) Thesis]. Yangon: University of Medicine (2), Yangon; 2005.

52. Trease, G. E. and Evans, W. C. Trease and Evans Pharmacognosy. 15th ed. Saunders: New York. 2004.

APPENDIX

APPENDIX

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 105 °C for 5-10 minutes. Evaluate in day light or in UV 365 nm light. Reagent must be freshly prepared.

2. Ninhydrin reagent (NIH)

30 mg ninhydrin is desolved in 10 mL n-butanol, followed by 0.3 ml 98% acetic acid. After spraying (8-10 mL), the plate is heated for 5-10 minutes under observation and evaluated in visible.

3. Ferric chloride solution, ethanol

A 10 % w/v solution of ferric chloride in ethnol**.**

4. 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 105 °C for 5-10 minutes.

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 110 °C for 5-10 minutes under observation. Evaluate in day light.

INDEX

INDEX

C

D

E

F

G

N

O

P

Q

R

S

T

U

V

W

AMENDMENTS

AMENDMENTS TO MHP VOLUME I

Page 3

TLC analysis

To macerate 1 g of powdered drug add 10 mL of dichloromethane, allow to stand for 48 hours. Filter and evaporate the solvent and redissolve the residue in 1 mL of dichloromethane for chromatography.

Application volume : 10 mL
Developing solvent system : Hexane : Ehyl acetate (10:1)
Stationary phase : Silica gel GF_{254} Aluminium sheet
Spray reagent : Vanillin- sulphuric acid

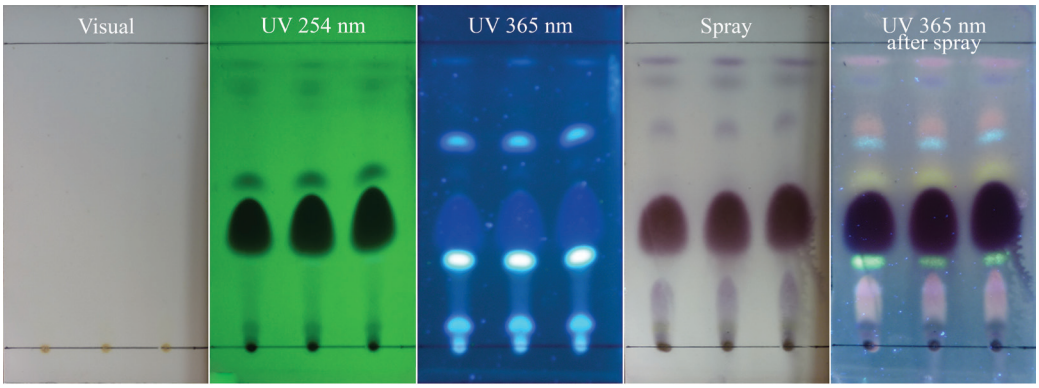


Fig. 2 Thin-layer Chromatogram of Dichloromethane Extract of the Dried Rhizome of ***Acorus calamus* L.**

Table 1. R_f values of Components in Dichloromethane Extract of the Dried Rhizome of ***Acorus calamus* L.**

R_f	Visual	UV 254 nm	UV 365 nm	Spray	After spray
0.96		Pale brown	Pale blue		
0.93				Purple	Pink
0.87		Pale brown	Faint blue	Black	Purple
0.82		Pale brown			
0.77			Faint blue	Purple	
0.72					Pink
0.67			Fluorescence blue		Blue
0.60			Pale blue		
0.58		Brown			Orange
0.43		Dark brown	Blue	Violet	Deep violet
0.30			Fluorescence blue		Fluorescence yellow
0.12				Purple brown	Pink purple