



**Government of the Union of Myanmar
Ministry of Forestry
Forest Department**



**Studies on Morphology and Histology of Some
Medicinal Plant Parts on Sale in Mandalay**

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မန္တလေး ဘယဆေးဈေးကွက်တွင် အသုံးပြုနေသော ဆေးဝင်ပင် အင်္ဂါပိုင်းများ၏ ပြင်ပရုပ်သွင် နှင့် အနုကြည့် လက္ခဏာများကို ခွဲခြားလေ့လာခြင်း။

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ဤစာတမ်းသည် မြန်မာ့ရိုးရာ တိုင်းရင်းဆေးများ ဖော်ထုတ်ရာ၌ စီးပွားရေးဈေးကွက်တွင် ရေပန်းစားနေသော ဘယဆေးဝင်ပင် အစိတ်အပိုင်းများ၏ အတွင်းအပြင် ရုပ်သွင်အင်္ဂါများကို လေ့လာတင်ပြထားခြင်း ဖြစ်ပါသည်။ ဆေးဘက်ဝင် အပင်များအား ပြင်ပရုပ်သွင်လက္ခဏာများကို ခွဲခြားလေ့လာရုံသာမက အတွင်းအင်္ဂါအစိတ်အပိုင်းများ၏ ဆဲလ်များကိုပါ ခွဲခြား၍ အသေးစိတ် တိုင်းထွာလေ့လာ ထားပါသည်။ မန္တလေးမြို့ ဘယဆေးဆိုင်များတွင် ရောင်းချလျက် ရှိသော ဆေးဝင်ပင် အချို့အား အစိတ်အပိုင်းအဖြစ်၎င်း၊ အမျှန် အခြေအနေအဖြစ်၎င်း၊ လေ့လာ၍၎င်းအပင်၏ အင်္ဂါအစိတ်ပိုင်းတို့အား စစ်မှန်သော မျိုးရိုး၊ အမည်နာမများကို ခွဲခြားသိမြင်နိုင်ရန် ဖော်ထုတ်ခဲ့ခြင်း ဖြစ်ပါသည်။ ယင်းကဲ့သို့ ဖော်ထုတ်ခြင်းဖြင့် စီးပွားရေးဈေးကွက်တွင် အရေးပါသော ဘယဆေး ကုန်ကြမ်းတွင် အတုအပ အရောအနှော များမှ ရှာဖွေဖော်ထုတ်နိုင်မည် ဖြစ်ပါသည်။

Studies on Morphology and Histology of Some Medicinal Plant Parts on Sale in Mandalay

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Abstract

This paper presents the morphology and anatomy of the medicinal plant parts sold in the market for use as raw materials in the preparation of indigenous traditional medicine. Identifications were made mainly on the external character (morphology) while the internal character (Anatomy) were studied in detail after the separation of cell elements by various maceration techniques. An attempt is made to identify the genuine plant parts and their names in marketing at Mandalay and to specify each of the medicinal plant parts both in intact and powdered form. By this way the adulterations of commercially important raw material would be detected.

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1. Introduction

Myanmar is endowed with a large number of medicinal plants. Though there are publication on medicinal plants of Myanmar there are no morphology and anatomical descriptions on the plant-parts on sale for use in indigenous medicine. The quality of this materials, possibility of adulterations and the source plant from which these were obtained are not properly known yet, since, some of these are imported form neighbouring countries.

Information obtained from the dealers in Mandalay reveals that there are about 250 materials of medicinal plant-parts are on sale. This present work describes 16 materials, including 7 roots and rhizomes, 2 pieces of serial stem, 2 from the wood, 2 kinds of bark and 1 each from fruits, seeds and nuts. Outs of them Khan-Tauk (*Coptis teeta*) from icy mountains of Kachin State, Shan Khan-Tauk (*Thalictrum foliolosum*) collected from M. Popa and Natsaygamon (*Saxifraga ligulata*) from Southern Chin State. have received special attention, as they are believed to possess high medicinal values.

In this preliminary work, morphological studies were described through their from and dimension, of the materials, colour, condition, direction of growth, surface characters fracture and texture, odour and taste were recorded. In addition, microscopic studies were undertaken on macerated materials. This study will be of great help in the identifications of the materials and in detecting adulterations.

2. Materials and Methods

The 16 materials studied in this work are:

2.1. Roots and Rhizomes

1. Khan-Tauk - *Coptis teeta*
2. Nat say gamon - *Saxifraga ligulata*
3. Shan Khan Tauk - *Thalictrum foliolosum*
4. Say- Palei - *Gentiana kurroo*
5. Kuntbalu - *Valeriana officinalis*
6. Alo-kyu - *Arundo donax*
7. New-cho - *Glycyrrhiza glabra*

2.2. Aerial stems

1. Kunt Chike Ni - *Plumbago rosea*
2. Say Wah Gyi - *Berberis asiatica*

2.3. Wood

1. Nant tha phyu - *Santalum album*
2. Na lin Kyaw - *Cinnamomum obtusifolium*

2.4. Bark

1. Maniawga - *Catallia lucida*
2. Dant da ku ni - *Soymida febrifuga*

2.5. Fruit

- Eik hwe thee - *Embelia ribes*

2.6. Seed

Kyuzu - *Terminalia citrina*

2.7. Nut

Chei thee - *Semecarpus anacardium*

As the specimens were collected from the dealers their morphological descriptions applied only to them on sale in marked. Anatomical studies were made on macerated materials. In the maceration method, equal volume of hydrogen peroxide and acetic acid were employed.

(2) *Saxifraga ligulata* consists of minute vessels and radial diameter about 15 μ m, were observed similar to the description of Metcalfe and Chalk (1953). But instead of Secretory cells with tannins the material consists of reflecting cells, (3) *Thalictrum* composed of vessels with scalariform thickening; (4) *Gentiana* lack of hairs, oil drops but presence of crystals were not in accordance to Metcalfe and Chalk. (5) *Valeriana* having thin-walled fibers and oil cells, absence of yellow atone cells and crystals (6) *Glycyrrhiza* observed as prismatic crystals along the length of fibers, (7) *Plumbago* consists of septate fibers, short vessels, absence of crystals, (8) Large vessels of *Berberis* where as in Metcalfe and chalk (1953) it was stated that vessels are small (9) Vessels with bordered pits and numerous fibers, were in agreement to literature, but large vessel of *Samtalum* was not in agreement (10) *Cinnamomum* elements can be easily detected by their oil and mucilage as it is the family character but in this material they are not found (11) *Soymida* consists of acicular crystals where as in Metcalfe and chalk it was stated that the crystals were rhomboid. Although the above materials can be compared with those of the previous worker, the remaining-Arundo, Embelia, Terminalia and Semecarpus were not observed.

3. Observations on Morphology and Anatomy**3.1. Structural Standardization**

Scientific name	-	<i>Coptis teeta</i> Wall.
Common name	-	Gold Thread
Myanmar	-	Khan-Tauk
Family	-	Ranunculaceae
Plant part	-	Roots and Rhizomes

3.1.1. Morphological character

Rhizomes are cylindrical, obscurely monoliform and usually consists of 8-10 nodes length 2.5-6.0 cm, 3.5 mm in diameter the inter-nodes 1-2 mm in length. Externally the colour is brownish yellow and internally it is deep yellow. The rhizome is covered with scale leaves. Adventitious roots long, slender, arise densely from the lower and lateral sides of the rhizomes. They are hair-like, fibrous, cylindrical and slightly wavy, length about 15 cm and diameter not more than 1 mm, Rhizomes broken with short fracture. Odourless and taste extremely bitter.

3.1.2. Anatomical characters

Fibers non-septate, slender, tips acute length 380-465 μ m, breadth 10-12 μ m, walls 3-5 μ m thick. Fiber tracheids long, length 287-355 μ m, breadth 17-25 μ m, tips

acute or blunt or oblique end wall. Tracheid numerous, length 90-245 µm, breadth 30-47 µm thickenings spiral, helical, partly annular-party helical, pitted end wall, blunt or acute or oblique, or wall streight or wavy about 2.5µ thick-Vessels slender mostly length 90-120 µm, breadth 10-20 µm, perforation plate simple, terminalor lateral, thickenings pitted. Parenchyma cell rounded to polygonal, 16-18 µm in diameter. Starch grains abundant, the grains simple or compound, oval rounded or ellipsoid 2.5-7.0 µm in diameter, most of the cell filled with bright yellow sap.

3.1.3. Uses

Coptis teeta is well known to be broadly useful in medicine especially in south East Asia. They have been used as salve for the eyes, bitter tonic, Jaundice debility, mild dorms of intermittent fevers, antidiabetic, anti-tumour, anti-cancer, depression of blood suger, anti-bacterial, anti diarrhoea and anti cholera and have been proved that the efficacy of rhizome in the treatment of cholera was superior to chloramphenicol in many aspects.

3.2. Structural Standardization

Scientific name	-	<i>Saxifraga ligulata</i> .
Common name	-	Stone breaking plant
Myanmar	-	Nat-say-ga-mon
Family	-	Saxifragaceae
Plant part	-	Rhizomes

3.2.1. Morphological character

Long, cylindrical rhizome, length 17.5 cm- 30.0 cm and 2.0-4.0 cm in diameter. Externally it is dark brown or black and internally cream colour or nearly white. The rhizome is extremely hard, fleshy and strongly woody turgid and smooth surface in T. S. It composed of many nodes and inter-nodes at an interval of 0.5-1.0 cm apart, large and papery-like scale leaves about 1.0 cm long, arise from the node, thus densely covered the rhizome and crowded at the aerial apex. Lateral roots rare about 7 cm long, 1-2 mm in diameter. It is hard, thick, fleshy, odourless, taste bitter. T. S of rhizome reveals, the distinct vascular cylinder and a wide pith. The pith occupies 2/3 of the rhizome.

3.2.2. Anatomical characters

Polygonal cork cells with striated walls. Parenchyma cells oval to rounded, mostly similar in size and shape, length 40 (60-90) µm, breadth 50-70 µm, cell walls brownish color. Starch grains abundant, oval to rounded, number of starch grains-per cell about 2-10-20 per cell, parenchyma cells of the pith are distinct, large and rounded length 40 (70-80-120 µm) breadth 40-(60-80) -100 µm. Fibers long, slender, wavy walls and acute tips, 200-600 µm long, lumen very narrow. Vessels minute, long, spiral or reticulate thickenings, length 120-180 µm, breadth 15-30 µm, perforation plates oblique, with tail at one end of at both ends. Tracheids long, slender, annular or spiral thickenings, length 120-250 µm and breadth 15-30 µm, The most peculiar features are crystal-like reflecting cells, which are irregularly rounded, arrange in a bead-like appearance. Parenchyma cells with 2-3 striations on each cell.

3.2.3. Uses

The root is bitter and acrid, analgesic, removes stone at kidney, piles, tumours, urinary discharges, heart diseases, splenic enlargement, ulcers, diseases of bladder and lungs. It is also used as tonic, remove mucous from the intestine and hydrophobia.

3.3. Structural Standardization

Scientific name	-	<i>Thalictrum foliolosum</i>
Common name	-	Gold Thread
Myanmar	-	Shan Khan-tauk
Family	-	Ranunculaceae
Plant part	-	Roots and Rhizomes

3.3.1. Morphological character

The rhizomes are short or long, length 2-8 cm and diameter 5-7 mm, cylindrical in T. S when fresh, and irregular shape with hollow pith when dry. Externally it is black color where as internally it is yellow. Straight or curve, tortuous species, branchless, Remains of the aerial stems and scale leaves present. Wiry-like rootlets (or) lateral roots arise from the rhizome surface and densely covered it. The lateral roots are numerous. long, hard, thick, cylindrical, about 20 cm long and diameter about 2 mm. Odourless, taste bitter.

3.3.2. Anatomical characters

Cork cells polygonal, length 50-70 µm, breadth, 30-60 µm. Parenchyma cells oval to rounded, length 50-100 µm, breadth 30-60 µm, thin-walled. Starch grains abundant, simple or compound, oval or rounded, about 2.5-7.0 µm in diameter. Tracheids numerous, long, length 90-345 µm, breadth 30-47 µm thickenings spiral, helical, partly annular, partly spiral, pitted, and walls acute or oblique or blunt, cell wall straight or wavy; fiber tracheids long, with pits slit-like end walls mostly acute; lateral walls straight, length 100-300 µm, breadth 17-25 µm; fibers non-septate, slender, length 100-250-450 µm, breadth about 20 µm, tips pointed at both ends. Yellow coloured cells probably including berberine present in all cells. Vessels, long, length 250-300 µm, breadth about 50 µm, end walls oblique or transverse.

3.3.3. Uses

Used as a tonic with slight purgative action. Good remedy for atonic dyspepsia, useful in convalescence after acute diseases and application for ophthalmia, improve eye sight, good in toothache, acute diarrhoea, a good application in piles and renal troubles.

3.4. Structural Standardization

Scientific name	-	<i>Gentiana Kurroo</i>
Common name	-	Felwort, Gentiawood
Myanmar	-	Say palei
Family	-	Gentianaceae
Plant part	-	Roots and Rhizomes

3.4.1. Morphological character

The rhizomes are cylindrical, length 3-8 cm and 0.7-1.5 cm in diameter. Externally it is yellowish-brown and is marked by transverse diameter. Externally it is

yellowish-brown and is marked by transverse closely arranged annulations, scars of fallen leaves, and root-lets. The bark is thin, papery-like appearance, yellowish brown colour with distinct transverse cracks. The drug breaks readily with a short fracture. Internally it is whitish yellow and possesses a heartwood-like central core about 0.5 cm in diameter, texture rough. Odour slight and taste is sweet at first and gradually change to bitter taste.

3.4.2. Anatomical characters

Polygonal cork cells about 20 μ across, some cells consist starch grains and a few oil cells. Parenchyma cell ovoid or irregularly rounded, 100-120 μ m, starch grains and oil cells present. Fibers short or long, length 400-750 μ m breadth 15-20 μ m, cell wall wavy, pits slit-like. Fiber tracheids length about 400 μ m, breadth about 8 μ m with simple pits. Vessels short length 200-350 μ m with 30-50 μ m, vessel walls with opposite pits. The distinct character is that most of the vessel have tails about 100 μ m long. Crystals mostly in a form of large druses, 20-30 μ m a cross and minute prismatic crystals also present.

3.4.3. Uses

Resists putrefaction and poison, strengthens the stomach, help digestion, comforts the heart, and preserves it against faintings. The powder of dry root helps the biting of mad dogs, opens obstruction of the liver and restores the appetite. The herb steeped in wines takes away to cold lodging in the joints, if drunk it helps stitches and gripping pains in the side, it is excellent in all cold diseases. It kills the worms by taking the power with any liquor and also for jaundice debility. It is a favourite bitter tonic.

3.4.4. Adulterants

The rhizomes of *Veratrum album* are occasionally collected in error for gention and are dangerous adulterants.

3.5. Structural Standardization

Scientific name	-	<i>Valeriana officinalis</i>
Common name	-	Valerian
Myanmar	-	Kunt-balu
Family	-	Valerianaceae
Plant part	-	Roots and Rhizomes

3.5.1. Morphological character

The rhizomes is brownish colour and diameter ranges from 1-3 cm, bluntly conical shape. The large rhizomes arrange alternately with small ones by short stolons about 1-2 cm long. The larger ones at the base and the smaller ones attach to it on top, distinct striations are observed along the stolons. Odour unpleasant balsamic character and slightly bitter taste.

3.5.2. Anatomical characters

Parenchyma cells rounded or oblong or sometime polygonal, 6-8 μ m across, containing minute starch grains, group of numerous microcrystal located at the centre of the cell, each crystal rod shape, about 4 μ m long, and presence of light yellow minute droplets of oil. Fibers thin-walled, length 100-200 μ m, breadth 8-10 μ m,

Vessels annular, spiral thickenings, length 250-500 μm , 15-20 μm , most of the vessels have tails at one end. Crystals in the form of druses present. Sclereids absent.

3.5.3. Uses

It is a powerful carminative, stimulant, antispasmodic and is given chiefly in hysteria. Use in all cases of nervous debility and irritation, relief pains and promotes sleep.

3.5.4. Adulterants

Rhizomes of *Veratrum album* have been reported in admixture with Valerian rhizome and poisoning by veratrum when administered as tincture.

3.6. Structural Standardization

Scientific name	-	<i>Arundo donax</i>
Common name	-	
Myanmar	-	Alo kyu
Family	-	Graminae
Plant part	-	Roots and Rhizomes

3.6.1. Morphological character

It is a pale yellowish rhizome, length 5-8 cm diameter 1.5-2.0 cm, cylindrical, straight, fibrous, and horizontal in growth. Hard and thick. Scale leaves and rootlets not found. Distinct nodes and inter-node at an interval of 5-7 mm. The rhizomes shows fibrous nature when broken. Odour and taste nil.

3.6.2. Anatomical characters

Fibers long, slender, length about 999 μm breadth about 28 μm , thin-walled and tips acute, some fibers has strongly thick walls. Fiber tracheids length about 320 μm breadth about 32.6 μm lateral walls wavy with distinct longitudinal striations, and pitted. Tracheids length 160-1000 μm breadth 20-30 μm , thickenings annular, spiral and reticulate. Vessels rarely present, length 80-1000 μm , breadth 20-30 μm . The most peculiar feature is having numerous sclereids of various shapes and sizes, round ovoid, ellipsoid, irregularly rectangle, lumen wide, cell walls shows vertical striations. Numerous septate fibers present, 3-4 septums in each fiber, length 500-1200 μm breadth about 30 μm , large parenchyma cell, ovoid or ellipsoid, length about 1000 μm breadth 400 μm , rounded parenchyma about 500 μm across.

3.6.3. Uses

Diuretic emollient, stimulate menstrual discharge and diminish the secretion of milk, skin allergies and stone at kidney.

3.7. Structural Standardization

Scientific name	-	<i>Glycyrrhiza glabra</i>
Common name	-	Liguorice root
Myanmar	-	New-cho
Family	-	Leguminosae
Plant part	-	Stolon and root

3.7.1. Morphological character

Unpeeled stolons are cylindrical unbrench, brown to reddish-brown colour and length 10-15 cm and diameter range from 1.0 to 2.5 cm. Externally the bark is very thin, not more than 0.5 mm in the thickness, longitudinally wrinkled and slightly curve. Nodes, transverse cracks or stripes, dry buds, scars of rootlets, also present.

Peeled stolons has a yellow colour and slightly fibrous fracture. Odour faint and taste sweet and slight bitter when it is unpeeled.

3.7.2. Anatomical characters

Cork cell polygonal, thin-walled; prismatic and rod-like crystals present in some cork cell. Fibers long, slender, cell wall thick, length 800-1600 um, breadth 20-30 um tips acute. Most of the parenchymatous cells, adjacent along the fibers are small in size and contains a single prisms-measuring 10-30 um in each cell. Other parenchymatous cells contains abundant starch grains, rounded mostly 2-20 um in size. Vessels short, perforation plates transverse, vessel walls consists bordered pits, arrange in opposite rows, short, length 80-170 um, breadth 60-120 um, pits-bordered. Some vessels contains rod shape crystals, end walls oblique or with tail, thickenings spiral to reticulate. In some vessels, prismatic crystals attach to the walls.

3.7.3. Uses

It is used as a demulcent and expectorant. It is also an effective drug for gastritis and duodenal ulcers.

3.8. Structural Standardization

Scientific name	-	<i>Plumbago rosea</i>
Common name	-	Rosy lead wort, Fire Plants
Myanmar	-	Kant Choke Ni
Family	-	Plumbaginaceae
Plant part	-	Stems and Roots

3.8.1. Morphological characters

The black upright stems are long, slander, cylindrical and tortuous pieces. Length about 10 cm and diameter 2.0-5.0 mm. The stem has distinct nodes and internodes at an interval about 1.0 cm Straight longitudinal straitions occur along the internodes and 3 to 6 dry buds on the nodes which later in turns to 3 to 6 upright branches. Roots numerous hair-like thin, slender and wavy, length 8-10 cm, diameter 1-2 mm. Externally, the stem colour is black, but when peeled-off the internal tissue are as light brownish colour. The drug easily breaks with a short fibrous and splintery fracture. Odour and taste nil.

3.8.2. Anatomical characters

The most peculiar feature of the material is having numerous Septate fibers, 3-4-6 septum in each fiber, length about 925.4 um, breadth 15.0 um. Ligriform fibers short, length 350-500 um, breadth 10-150 um, rarely long, if present length 1000-1100 um, pits slit like. Fiber tracheids length 3000-550 um, breadth about 30 um, thickenings annular spiral, reticulate and pitted, lateral walls wavy, end walls oblique or blunt. Vessels short length 150-200 um, breadth about 30 um, bordered pits present, perforation plates oblique and some vessels with tails. Crystal absent.

3.8.3. Uses

Anticancer, antibacteria and antifungal activities. It is acid and poisonous. It can be applied on skin for allergies and leucoderma.

3.9. Structural Standardization

Scientific name	-	<i>Berberis asiatica, B. vulgaris</i>
Common name	-	Jaundice Berry, Maider Berry
Myanmar	-	Say-wah-gyi
Family	-	Berberidaceae
Plant part	-	Stems

3.9.1. Morphological characters

The most distinctive diagnostic character of the material is a deep, wavy, bright yellowish colour of the wood.

The stem is cylindrical, length of the pieces 15 to 20 cm and diameter 2-6 cm. Externally the bark is brown, longitudinal striations distinct, having a rugged and scaly appearance. Cracks and furrows are also observe. The brown cork is very thin, paper-like and all the tissue underlying it are obviously metallic yellow.

The wood which is bright yellow colour, is hard thick and slightly rough in T.S. Annular rings not distinct, odourless, taste bitter.

3.9.2. Anatomical characters

Libriform fibers long, thin, lumen wide, length 300-750 um, breadth 20-30 um, pits slit-like tips acute sometimes with fork ends. Fiber tracheids long, slender, straight, length 300-500 um breadth 15-30 um, end wall oblique or sometimes blunt, thickenings spiral reticulate and pitted.

Vessels large, distinct transverse perforation plates present, length 200-300 um, breadth 100-130 um, vessel walls pitted, some vessels have tail at one end. Tetragonal prismatic crystal numerous. Sclereids, rounded or irregularly rounded, diameter 10-12 um.

3.9.3. Uses

The bark of the stem and root is tonic, cathartic, diuretic, febrifuge and antiseptic. It is particularly used as bitter tonic in dyspesia, jaundice, liver disorder, diarrhoea. The decoration of the bark is a mouth-wash for ophthous condition and lotion for skin eruption. The leaves are antiscerbutic dysentery, sore throat and scurvy. The berries contain citric and malic acids. They are astrigent and given in haemorrhage, fevers, typhoid bilious disorders.

3.10. Structural Standardization

Scientific name	-	<i>Santalum album</i>
Common name	-	Sandal wood
Myanmar	-	Nant tha phu
Family	-	Santalaceae
Plant part	-	Wood

3.10.1. Morphological characters

Materials on sale are found to be the heart wood only. The colour is yellowish to faint reddish yellow. The wood is hard dense and can easily split. The surface of the wood is smooth with alternating light and dark areas in T. S. Odour fragrant and taste bitter.

3.10.2. Anatomical characters

Fibers, long, slender, length 800-1400 um breadth 15-20 um. Fibers walls wavy, rarely smooth, tips acute and some are oblique with wavy ends, sometimes as fork. Some fibers have projections along the cells wall. Vessel short, length 150-500 um, breadth 15-60 um, perforation plates distinct, end walls transverse or oblique, tail at one end or both ends, tail 80-100 um long, pits bordered, arrange in opposite rows. Parenchyma cells irregularly rounded, about 100 um in diameter consist of simple starch grain mostly rounded, about 2.5 um in diameter.

3.10.3. Uses

The wood is used as a source of volatile oil. It is a stimulant and disinfectant of the whole gienito-urinary tract. The essential oil from the wood is used as antiseptic, demulcent and diuretic. It is commonly used in gonorrhoea, chronic catarrh of the bladder, urethral haemorrhages, chronic foetid bronchitis and intermittent fever. The oil is a useful application over scabies and other skin diseases.

3.11. Structural Standardization

Scientific name	-	<i>Cinnamomum obtusifolium</i>
Common name	-	
Myanmar	-	Na-lin-kyaw
Family	-	Lauraceae
Plant part	-	Wood and bark

3.11.1. Morphological characters

The bark is brown. Externally and slightly smooth. Bark very thin about 3 mm. Cracks and furrows not distinct, unequal shrinkage, and a few transverse striation present. The scare of the twigs and numerous small spots are observed. Internally, there are longitudinally striation, smooth and the color appear as shining metallic grey. Fracture short and fibrous. Odour and taste nil. Transverse section reveals a light brown color and fibrous nature of the wood. Which occupy 4/5 of the stem.

3.11.2. Anatomical characters

Long fibers length 600-1200 um and 20-30 um in breadth. End walls oblique, walls wavy or acute. Vessels of various shapes and size with opposite bordered pits length, 200-450 um and breadth 50-120 um, most of the vessels are short, end walls transverse or oblique with distinct tails. Parenchyma cells are irregularly rectangle length 50-100 um, breadth 15-30 um, short fibers tare. If present they are not more than 300 um.

3.11.3. Uses

It is a useful liniment in rheumatism headache and toothache.

3.12. Structural Standardization

Scientific name	-	<i>Carallia licuda</i> , <i>C. brachiata</i>
Common name	-	
Myanmar	-	Maniawga
Family	-	Rhizophoraceae
Plant part	-	Bark

3.12.1. Morphological characters

Shape of pieces are deeply channelled some observe as single grills or flats, length range from 5.0 cm to 8.0 cm and thickness 3.0 mm to 6.0 mm. Externally light brown to light greyish colour, rigid, lack of crack and furrows, possessing corky warts. Inner surface light-reddish brown with distinct striations, rough texture, and splintery fracture. Odour and taste nil.

3.12.2. Anatomical characters

Lignified polygonal cork cells present. Fibers long slender, length about 816 um breadth 24.6 um, cell walls smooth, tip acute, pits simple, oblique. Fiber tracheids length 300-600 um, breadth 10-20 um, cell wall mostly wavy, pits slit-like, single prismatic crystal occur in some cells end wall blunt or oblique. Tetragonal or monoclinic crystal present abundantly, length 20-25 um, mostly equal in length, druses present. Starch grain numerous, simple or compound oval to rounded about 2.5 um. Sclereids rare, lumen wide, cell wall lignified, 10-15um thick with distinct striation, and projection on the wall outer wall.

3.12.3. Uses

It is use in conjunctivitis, contiguous disease, allergies and can applied on skin sores also.

3.13. Structural Standardization

Scientific name	-	<i>Soymida febrifuga</i>
Common name	-	Indian Red-wood
Myanmar	-	Dantdakuni
Family	-	Meliaceae
Plant part	-	Bark

3.13.1. Morphological characters

Pieces are flat or slightly curve, length do not more than 8.0 cm and thickness 2.0 cm. Externally it is brown with patches of cork appear as whitish grey spots, lack of carrugation and fissured except slight furrows here and there. Internally the colour is deep reddish brown, inner surface smooth, with fair striations. Odour and taste nil. The most significance of the wood is light density, possessing white patches or white large areas, intermingle with reddish brown areas. The wood is very light and broken with fibrous or splintery fracture.

3.13.2. Anatomical characters

Fibers extremely long, slender, length 2000-3200 um, breadth about 30 um breadth, tips acute, pits oblique, cell wall thin, lumen wide. Fiber tracheids length 1500-2000 um breadth about 30 um. Pits oblique. Acicular crystal about 50 u in length, single or in bundles located in parenchyma cells which are rounded to ovoid,

about 100 µm across. Ray parenchyma cells rectangular in shape about 80 µm in length and breadth about 50 µ. Starch grain present but rare.

3.13.3. Uses

Resistance to termites. Bark considered febrifugal.

3.14. Structural Standardization

Scientific name	-	<i>Embelia ribes</i>
Common name	-	
Myanmar	-	Eik-Mwe thee, Eik-Mwe-Nwe
Family	-	Myrsinaceae
Plant part	-	Furits

3.14.1. Morphological characters

Fruits simple, dry, indehiscent, shape globular or ovoid, size about 2.0 mm in diameter. Externally it is smooth, brownish black colour, woody texture with persistent pedicel (fruit stalk). Endocarp dark brown. Unilocular ovary, contain only one seed in the locule.

3.14.2. Anatomical characters

Fibers short, length 150-450 µm, breadth about 6 µm, thick-walled, tips acute, fiber tracheids length 200-400 µm, breadth 100-150 µm, pite slit-like, sclereids very distinct, thick-walled, lumen narrow, various shape and size, shape oval, rounded, polygonal, triangular and rectangular. Parenchyma cells mostly round 200-300 µm in diameter contain numerous starch grains, simple or compound, 10-40 µm across. Prismatic crystals present.

3.14.3. Uses

The fruit is used as appetizer and can cure gastritis. It can be applied on sores also. Bark and leaves of *Emblein robusta* is acid and astringent taken for boils and other skin diseases.

3.15. Structural Standardization

Scientific name	-	<i>Terminalia citrina, T. chebula</i>
Common name	-	Myrobalon
Myanmar	-	Kyazu
Family	-	Combretaceae
Plant part	-	Seed

3.15.1. Morphological characters

The seed is ovoid or ellipsoid with 5 distinct longitudinal ridges, straight or slightly curved. Seed tip sometimes acute at one end. Externally the seed coat is dark brown or black and internally light brown, length 1.0-3 cm long, 0.5-1.3 cm in breadth, and thickness 1.0 mm to 3.0 mm. Endosperm present 0.5 to 2.0 cm long. Colour white. Odour less and taste sub acid.

3.15.2. Anatomical characters

Polygonal cells with starch grains and amorphous crystals. 2-5 in each polygonal cell; Fiber walls wavy, long, slender, length 300-500 um, breadth 40-50 um. Fiber tracheid very short, length about 100 um, breadth about 40 um, with annualr, spiral, reticulate thickening. The long hyaline fiber-like cell, length about 700 um, breadth 20 um, consists of unknown particles.

3.15.3. Uses

Carminative, antiasthmatic, and as astringent. Decoction of the seed can use as eye salve and can be applied on sores also.

3.16. Structural Standardization

Scientific name	-	<i>Semecarpus anacardium</i>
Common name	-	Marking nut tree
Myanmar	-	Chei-thee
Family	-	Anacardiaceae
Plant part	-	Nut

3.16.1. Morphological characters

The shrink led fruit in black is colour, consist of tow distinct parts, (1) the large, paper-shaped stalk, which is juicy and astringently acid when fresh. (2) the small kidney-shaped, grey or brown nut, which is black about 3 cm long. It has an edible kernel.

3.16.2. Anatomical characters

Fibers rare, if present they have wavy, thick walls and blunt end walls and blunt end walls. Vessels are not found. The most distinct elements are numerous starch grains, simple sometimes compound in a group of there to many, mostly rounded in shape diameter 10-40 um. Crystal tetragonal type, length 200-250 um, breadth 100-150 um. Druses present about 20-70 um. Sclereids rare 2 to 3 in groups each sclereid 5-10 um long and 2-4 um wide. Reticulate parenchyma present, mostly ovoid to elliptic, length 300-350 um breadth 180-200 um.

3.16.3. Uses

All of the parts of fruit are of various use in native medicine. A gum obtained from the tree is obnoxious, disagreeable to insects and is recommended for book-binding. The juice from incisions made in the bark forms an indelible ink. Fruit is used in the treatment of rheumatism, skin disease, pile, dysentery, loss of appetite, urinary discharges and asthma.

The shell of the nut is acrid and poisonous. It had to be removed carefully before use.

4. Discussion

Sixteen materials studied in this research were collected mainly from Mandalay and their morphological descriptions applied to them on sale in market, except Natsaygamon (*Saxifraga ligulata*), Khan Tauk (*Coptis teeta*) and Shan Kan-Tauk (*Thalictrum foliosum*).

Of the sixteen materials, 7 are found to be roots and underground stems (rhizome), 2 are aerial stem, 2 kinds of bark and wood each, and 1 materials each from fruits, seed and nuts.

The morphology of materials have been limitedly described by Eames (1947) Esau (1953) Metcalfe and Chalk (1953) Wallis (1960) and Trease and Evans (1966). These were the only available literatures for comparative study of this work. Most of the morphological and anatomical descriptions made in this work could thus be recorded as the first preliminary survey for the medicinal for the medicinal plant-parts on sale.

The anatomical characters were found to be in agreement with Metcalfe and Chalk (1953) and whereas some are not. The characters were identified as follows. Macerate elements of *Coptis teeta* reveals that, parenchyma cells filled with yellow sap, rare vessels, various thickening of tracheids were in accordance to the literature.

5. Conclusion

The morphological and anatomical studies were carried out on 16 plant-parts used in indigenous medicine. Fourteen of them were collected from the dealers in Mandalay and one was collected from Haka (Chin State) and one from Mount Popa.

It is quite obvious from this work, that identifications and detection of adulterations can be done by studying the morphological and anatomical features.

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