Terminalia bellirica (Gaertn.) Roxb. (သစ်ဆိမ့်)

1. Scope

This Standard prescribes the specification and identification for quality criteria of *Terminalia bellirica* (Gaertn.) Roxb. (သစ်ဆိမ့်) dried mature fruit powder to be used as a single agent or as an ingredient in the traditional medicine formulations.

2. Definition

Terminalia bellirica (Gaertn.) Roxb. (Belliric Myrobalan, Bastard Myrobalan, Baheda Fructus) belongs to the family Combretaceae; its dried mature fruit is used in Traditional Medicine.

3. Description

3.1. Macroscopic Characteristics

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

3.2. Microscopic Characteristics

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

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

the cells rectangular 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

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

3.3. Characters of the powdered drug

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

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

4. Specification

4.1. Physiochemical Data

- Loss on drying at 105 ℃ : 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%

5. Identification

5.1. Phytochemical test

A) One drop of aqueous extract of sample is taken and spotted on 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 the oven at 110°C for five minutes. The spot colour is changed to purple colour.

B) Two millilitres of aqueous extract of the sample is added to 1 ml of a mixture of equal parts 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 colour 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, the 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 are added to the filtrate. The white precipitate is produced.

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

F) Dissolve a few mg of alcoholic extract of the powder in 5mL of distilled water, add 2M hydrochloric acids until an acid reaction occurs, then add 1mL 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 0.3mL of acetic anhydride followed by a few drops of concentrated sulphuric acid. A red colour is formed.

5.2. TLC analysis

Extract 0.5 g of crude powder drug in 5 mL of methanol 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

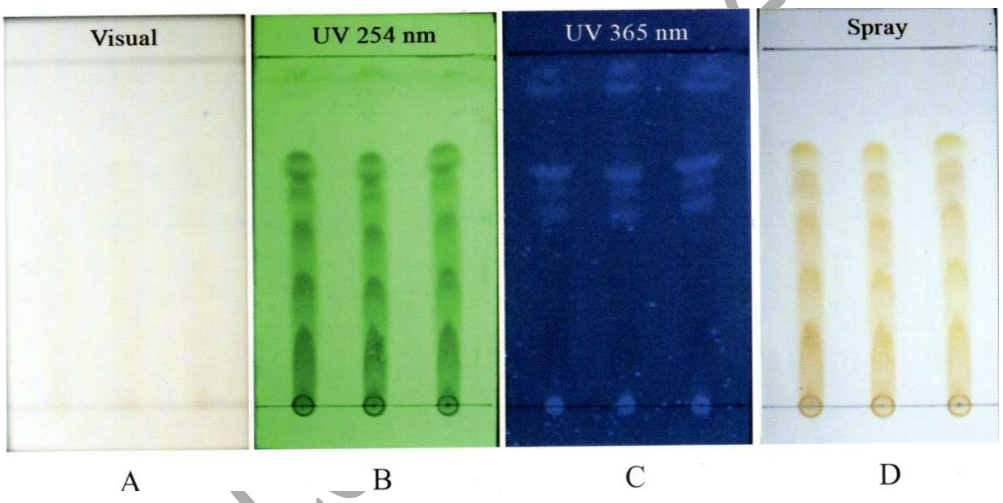

Fig.1. Thin-layer Chromatogram of Methanol extract of the dried fruits of *Terminalia bellirica* (Gaertn.) Roxb.

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

R_f	Visual	UV254 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

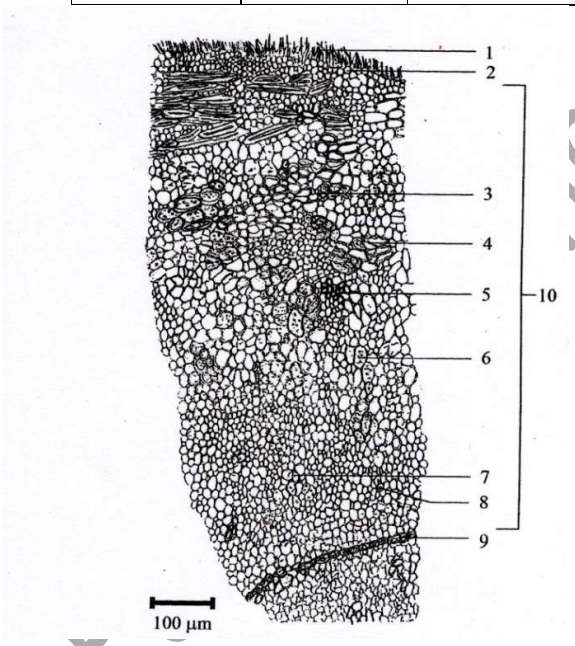

Fig.2. Transverse section of *Terminalia bellirica* (Gaertn.) Roxb. Mature fruit

1. Trichomes
2. Epidermal cell of epicarp
3. Porous parenchyma
4. Stone cell

5. Vascular bundle
6. Starch grains
7. Rosette calcium oxalate crystals containing parenchyma cells
8. Stone cell
9. Endocarp
10. Mesocarp

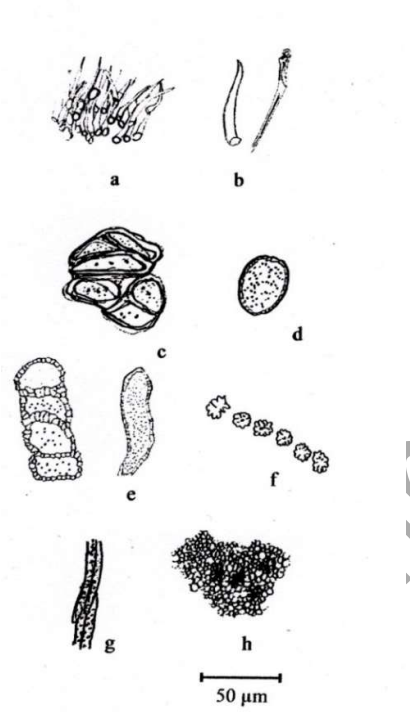

Fig.3. Characters of powdered drug

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

6. Reference

Department of Traditional Medicine, Ministry of Health. Myanmar Herbal Pharmacopoeia. VOLUME II, Nay Pyi Taw, Myanmar; 2018. Pg 19 - 24