A PHARMAGONOSTICAL STUDY OF TERMINALIA ARJUNA

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INTRODUCTION

Since vedic kala and Samhita kala even, our Acharyas have stressed on proper identification of the drug before use. In Nighantu kala, Raj Nighantukar has given 7 methods for identification of drug, these are Rudhi, Swabhav, Desh, Lancha, Upama, Virya and Atidesh. But later on with the increasing in number of the drugs and Nighntu, which are hotchpotch of synonyms, drugs became controversial. Moreover today, in the age of globalization, raw drugs collection is done by unskilled persons causes doubt in the genuineness and possible adulteration. Unlike the traditional methods the participation of traders in the chain of procurement of drugs, adulteration is increasing day by day when the original genuine material is not available in sufficient quantity; the allied species of plant with proven efficacy or similar chemical constituents can be used as substitute and in such instances efforts should be made for a systematic identification by pharmacognostical methods. The term pharmacognosy is derived from two Greek words ‘Pharmacen’ means drugs and Gignosco or Gnosis - to acquire knowledge. The original and basic approach towards pharmacognosy includes study of morphological system, study of the cell structures and organization and study of tissue system, which still holds a key in identification and the better understanding of the correct species of the plant and also to help us to differentiate between closely related species of the same genus. It is also the first step to standardize a drug, which is the need of today.
Arjuna is generally non controversial drug. Though two varieties are taken as Arjuna now a days i.e. *Terminalia arjuna* and *Terminalia tomentosa*. Among them, *Dalbergia sissoo* Roxb. is accepted all over as Shinshapa. In this study, stem bark of *Dalbergia sissoo* Roxb. is taken. To authenticate that the stem bark which have been used in the study is original and not adulterated or confused with any other drug, pharmacognostic study is undertaken.

**Aims and objectives**

1. To evaluate stem bark and powder of *Terminalia arjuna* for their organoleptic characters.
2. To study morphological features of stem bark of the drugs.
3. To study microscopic characters of stem bark of drugs.

**Pharmacognostical Study of Arjuna**

1. **Organoleptic Study Arjuna**

Organoleptic characters of stem bark and powder of *Terminalia arjuna* are tabulated below.

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*Abbreviations*

T a w = *Terminalia arjuna* wild
T a c = *Terminalia arjuna* cultivated
T t w = *Terminalia tomentosa* wild
T t c = *Terminalia tomentosa* cultivated

2. **Macroscopic Study** (*Terminalia arjuna*)

**Family – Combretaceae**

Trees, or shrubs often climbers, leaves alternate subopposite or opposite, some times ternate, Petioled, entire, simple (in Illigera 3 foliolate), stipules O. Flowers bracteolate at base in the tribe gyrocarpeae cymose; in the combretaceae spicate or racemose (the racemus often panicled); not rarely polygamomnoecious. Calyx-tube adnate to the ovary and produced above it (sometimes to a great lenght), the limb of 4-7 valvate lobes. Petals 4-5 or 0 (Rarely 6-7). Stamens 4-5 or 8-10 on the calyx; in the Gyrocarpeae the filaments have staminodes attached at the base and the anthers dehisce by recurved lateral valves. Ovary altogether...
inferior 1-celled; style- simple, stigma- simple or in Illigera sinuate almost lobed; ovule 1-7 (usually 2-3) Pendulous from the apex of the cell. Fruit coriaceous or drupaceous, generally indehiscent, ovate, angular or very commonly winged; in calycopteries and gyrocarpus crowned by the greatly enlarged calyx. Seed 1, without albumen; cotyledons in Terminalia and others convolute; in combretum and others plano-convex.

**Distribution:** Species 240, in the tropics of the whole world; and in South Africa out side the tropic.

**Terminalia, Linn.**

Large trees. Leaves alternate or subopposite, exstipulate, entire or slightly Crenulate, often with glands on the petiole or near the base of the mid rib beneath. Flowers small spicate, the racemes spikes sometimes panicked, hermaphrodite or the upper flower on the racemes males, a narrow bract at the base of each flower, soon deciduous. Calyx-tube produced above the ovary with a campanulate mouth, limb of 5 short valvate triangular lobes, deciduous. Petals 0. Stamens 10 inserted on the calyx-tube, epigymous disc with in them densely hairy. Ovary 1-celled, inerior, style long, simple, ovules 2 or 3, Pendulous from the summit of the cell. Fruit ovoid, very various in size, smooth or angular or winged with 2-5 wings, indehiscent, coriaceous. Seed solitary exalbuminous, cotyledons convolute.

**Distribution:** species 80; in the tropic of the whole world, less numerous in America.

**Terminalia arjuna Wight & Arn.**

**Taxonomy**

Terminalia arjuna (Roxb. Ex DC ) Wight & Arn.

Combretaceae.

**Synonyms**

Terminalia arjuna, Pentaptera arjuna, Pentaptera glabra, Pentaptera angustifolia.

**Vernacular Names**

Distribution
The tree is common throughout the greater part of the Indian Peninsula along rivers, streams, ravines and dry water-courses, reaching a large size on fertile, alluvial loam. It is rare in Karnataka, but is fairly plentiful in Tirunelveli and on the West coast. It extends North-wards to the sub-Himalayan tract, where it is distributed along the banks of streams; in Punjab, it is a cultivated tree. It is common in Chota Nagpur, Orissa and in the Northern Circars. It is extensively planted in India for shade or ornament in avenues or parks, even in dry and hot regions. In favourable localities, especially along the banks of streams, the tree attains very large size. Two trees, 8.6 m. and 10.6 m. in girth, have been recorded in Jammu [Kadambi,- Indian For.,1954, 80, 692; Troup, II, 530; Bor, 212; Chaturvedi, Indian Fmg, N.S., 1958-59, 8(1), 9].

Description
A large, evergreen tree, with a spreading crown and drooping branches, common in most parts of India and also planted in many parts for shade and ornament. Stems rarely long or straight, generally always buttressed and often fluted; bark very thick, gray or pinkish green, smooth, exfoliating in large, thin, irregular sheets; leaves sub-opposite, oblong or elliptic, coriaceous, usually 10-15 cm. long, occasionally 25 cm., cordate, shortly acute or obtuse at the apex; flowers in panicked spikes; fruits 2.5-5.0 cm. long, nearly glabrous, ovoid or ovoid-oblong, with 5-7 hard, winged angles.

*Terminalia tomentosa* Wight & Arn.

English name : Indian Laurel
Synonyms : Terminalia alata, Terminalia elliptica, Terminalia tomentosa
Family : Combretaceae

Other Common Names: Tawkkyan (Burma), Sadar, Matti, Asan, Marda (India).

Distribution : Widely distributed in India and Burma. The Tree May reach a height of 100 ft and more; with clear, straight boles to 70 ft; trunk diameters about 3 ft.

Morphology of Arjuna
It is a large ever green tree, attains 60-80ft. with huge often buttressed trunk and horizontally spreading or drooping branches.

**Bark:** Smooth, grey outside, flesh coloured inside flaking off in large flat thin pieces. Heart wood dark brown, very hard, variegated with dark coloured streaks.
Stem rarely long or straight, often fluted.

**Leaves:** Simple usually sub opposite hard 10/15/4-7 cm. oblong or elliptic oblong, obtuse or subacute coriaceous, some times spathulate, pale dull green above, pale brown beneath, shallowly crenate, serrate in the upper part or some times through out. Base rounded to cordate, main nerves arcuate, 10 to 15 pairs. Shortly acute or obtuse at the apex, blade 3-6, often unequal sided, main nerves arcuate, 10-15 pairs, veins reticulate, pellucid. Petioles -6-10mm long, often very short with one or usually two prominent glands at the top immediately below the leaves.

**Flower:** Sessile, white in short axillary spikes or in terminal panicles.

**Bracteoles** - Linear-Lanceolate, shorter than the flowers, cauducous.

**Calyx** – Glabrous, teeth, triangular, nearly glabrous both within and without.

**Ovary** – Quite glabrous, disk clothed with yellowish or reddish hairs.

**Young ovary** –very short, covered with crisped brown or rufous hair.

**Drupe**-2.5cm, ovoid or obovoid – oblong, fibrous-woody, glabrous, dark brown with 5-7 hard projecting wings striated with numerous curved wings. Wings of the fruite usually truncate or suddenly narowed at the top.

**Sapwood**-Reddish white.

**Distribution**
Throughout the greater part of India. In the sub-Himalayan tract of the North west region, common on the banks of rivers, streams and dry water courses in Central India and South Bihar, Chota Nagpur, parts of Bombay and Madras.

By the passage of the time, the Latin Name of Arjuna has changed with the advancement in Taxonomy.

1814: Roxberghian named it as *Pentaperta angustifolia*

1841: Hord called it as *Pentaperta glabra.*

1843: Finally Wight and arnott, called it *Terminalia arjuna,* W &A which is still continuing.

Latin Name: *Terminalia Arjuna,* W & A.

Family: Combretaceae.
Microscopic Character (Terminalia arjuna)

Microscopic study of the drug provides diagnostic characters. Under the microscopic study Transverse section was studied different varieties of Arjuna.

Transverse section of Terminalia arjuna:

⇒ Cork consisting of 9-10 layers of tangentially elongated cells.
⇒ Cortex regions consist of wide parenchymatous cells filled with brown colouring matter and Rosette crystals of calcium oxalate, simple and compound starch grains scattered as such through out this region.
⇒ Secondary phloem occupies with phloem parenchyma, phloem fibres, mucilage cells, Rosette crystals of calcium oxalate, simple and compound starch grains and traversed by medullary rays, usually uniseriate but biseriate rays also occasionally seen. Schlerenchymatous fibres are also present in phloem region.

Transverse section of Terminalia tomentosa

⇒ Cork is multilayer made up of 25-30 layers of rectangular shape cork cells. Cork cells are of two types, one is broad rectangular shape cells with highly suberised cell walls and other rectangular narrow and compressed cells, walls are light whitish in colour and not suberised. Therefore the cork is stratified. This region is called rhytidoma.
⇒ Rosette crystals of calcium oxalate and their broken fragments of varying size and shape, simple and compound starch grains scattered as such through out cortex, the cells of this region filled with reddish brown content.
⇒ The abundant simple and compound starch grains, Rosette crystals of calcium oxalate of varying size and shape, very long non-lignified phloem fibres, mucilage cells, some Schlerenchymatous fibres are also present in phloem parenchymatous cells. This region traversed by medullary rays which are uniseriate but biseriate rays also sometimes and this entire region filled with reddish brown content also.

DISCUSSION OF STUDY

Macросcopic Characters

Terminalia arjuna a large, evergreen tree, with a spreading crown and drooping branches, common in most parts of India and also planted in many parts for shade and ornament. Stem rarely long or straight, generally always buttressed and often fluted; bark very thick, gray or pinkish green, smooth, exfoliating in large, thin, irregular sheets; leaves sub-opposite, oblong
or elliptic, coriaceous, usually 10-15 cm. long, occasionally 25 cm., cordate, shortly acute or obtuse at the apex; flowers in paniced spikes; fruits 2.5-5.0 cm. long, nearly glabrous, ovoid or ovoid-oblong, with 5-7 hard, winged angles.

During the study it was found that Sterculia urens is botanically completely different from the other two species. Terminalia arjuna having small leaf gland while T. tomentosa is having long and cylindrical leaf glands. The same way, leaves of T. tomentosa are comparatively larger in size then of T. arjuna.

As per botanical and Pharmacognostical view, all the three varieties differ from each other but no change found in wild and cultivated variety. Macroscopically, S. urens is slightly curved while other two are flat in shape. In transverse section, T. arjuna and S. urens shows both big and small rosette crystals, but T. tomentosa having only big ones. Cork is multi layered in T. tomentosa in comparison with other two species. Rhytidoma is seen only in T. tomentosa. Stem bark and powder were studied organoleptically, macroscopically and microscopically. Organoleptically, Colour of stem bark was pinkish white internally and white externally. While colour of powder was pinkish white. Odour of bark and powder was nothing special. Taste of bark sample and powder was same respectively (kasaya rasa).

**Microscopic Study**

- Cork consisting of 9-10 layers of tangentially elongated cells.
- Cortex regions consist of wide parenchymatous cells filled with brown colouring matter and Rosette crystals of calcium oxalate, simple and compound starch grains scattered as such through out this region.
- Secondary phloem occupies with phloem parenchyma, phloem fibres, mucilage cells, Rosette crystals of calcium oxalate, simple and compound starch grains and traversed by medullary rays, usually uniseriate but biseriate rays also occasionally seen. Schlerenchymatous fibres are also present in phloem region.

**CONCLUSION OF STUDY**

The samples were authenticated pharmacognostically with the help of macroscopic and microscopic characters. General conditions of the drug, size, shape, surfaces are noted.
Terminalia arjuna: a large, evergreen tree, with a spreading crown and drooping branches, common in most parts of India and also planted in many parts for shade and ornament. Stem: rarely long or straight, generally always buttressed and often fluted; bark: very thick, gray or pinkish green, smooth, exfoliating in large, thin, irregular sheets.

**Parameters** | **Terminalia arjuna wild** | **Terminalia tomentosa wild**
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Size | Varying size up to 10-15 cm in length, 4-8 cm width and 0.5-2 cm in thickness | Varying size up to 30 cm in length, 4-8 cm width and 2-3 cm in thickness
Shape | Flat | Flat
Surfaces | Outer surface is pinkish in colour and smooth. Internal surface is finely striated and having light colour | The outer part of the bark consist of rhytidoma about 1 cm thick. The outer surface is rough showing many crack and fissures. The inner surface is dark brown, smooth and longitudinally striated
Fracture | Short in internal and laminated in external part | Granular

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