

CONTROVERSIES REGARDING ARJUNA (*TERMINALIA ARJUNA*) IN AYURVEDA

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ABSTRACT

India is a very vast country with different languages, climatic conditions, and different people with different dietary habits. So, naturally plants are known by different names in various parts of the country. And it has created controversies among plants. Controversial plants have their roots in past. For ex. *Arka* is a name of sun, mantra, food and plant. Thus one word *arka* has got many meanings. Likewise a synonym *bhadra* has been used for 7 different plants. This legacy has resulted in the controversies of plants in Ayurveda. In present era Proper identification is a major problem facing by Ayurveda system. There are no definite rules given for proper identification and for a single drug various synonyms are given which lead a controversial situation. Here in this article the controversies related *Arjuna*, has been tried to clarify.

Keywords: controversial drugs, *Arjuna*, Ayurveda.

INTRODUCTION: Among the various medicinal substances described in ancient India in medieval literature, we often come across with doubtful identification particularly with regard to the drugs of vegetable kingdom. Proper identification of medicinal plants has a significant impact on the finished product and therapeutics so; it is very much needed to critically analyze these drugs from various aspects. Proper identity of drug should be revealed on the basis of their morphological characteristics described in nighantu, therapeutic uses given in samhitas and pharmacognostic and phytochemical standarad set by reseachers.

There are so many reasons behind this

1. **Translation system:** In *Vedas* single name was assigned to a single drug but in post *Vedic* period teacher recites and students learn it by hearing. They noted it on barks of trees which were translated later on. All these leads to condition of

controversy as various synonyms were assigned to a single drug.

2. **Urbanization:** Because of urbanization, deforestation, geographical variations drugs which were available in ancient times are not available in present. Therefore in case of some controversial drugs whatever morphological description has been given in our literature is not found in botanically identified species of the same.

3. **Commercialization of Ayurveda drugs:** Because of urbanization getting raw drug from forest became difficult, so, dependency on drug supplier increased, which leads the use of substitutes in place of original drugs.

4. **Lack of identification knowledge in classics:** In ancient times *Acharyas* resides in forests so they were in direct touch of plants. Therefore in description they stressed on their therapeutic uses and assigned maximum synonyms on the basis of that only. This raised a critical situation for Ayurveda in terms of identification.

Arjuna

Arjuna is a very reputed drug for all types of heart diseases and it is used by the *vaidyas* of India in their medicines in the form of *asava*, *ghrita*, *kshirpaka*, powder and in various ways.

In *Nighantu snagraha* attempt was made to determine the *Ayurveda* drugs. The author has given the names in various languages including the scientific name in Latin. It has shown here that *Arjuna* means

white and *Sterculia urens* being white should be accepted as *Arjuna* another species named as *Terminalia glabra* is accepted as *Arjuna* in *Gujarat*. In markets also the bark of *Terminalia tomentosa* is available as *Arjuna*. There is yet no uniformity of opinion amongst the *vaidyas* about the correct identification of *Arjuna* as there are others who still regard *Lagerstroemia flos regina* as *Arjuna* in some parts.

<i>Terminalia Arjuna</i>	<i>Combretaceae</i>	Central India and south India
<i>Terminalia tomentosa</i>	<i>Combretaceae</i>	Deciduous forests in southern India
<i>Sterculia urens</i>	<i>Malvaceae</i>	Maharashtra region, deciduous forests
<i>Lagerstroemia flos reginae</i>	<i>Lythraceae</i>	West Bengal region

***Sterculia urens*:**

A large tree, trunk erect, straight, bark white, smooth papery; the outer surface thin peeling off, the inner coat fibrous and netted. Leaves 20-30 cm dia; crowded at the ends of the branches, palmately lobed, glabrous or nearly so above, velvety beneath; lobes 5 cordate- acuminated, base cordate, petioles terete, 12.5-25 cm. long, velvety- tomentose. Flowers yellow, numerous small. The hermaphrodite or female mixed with many males in much branched glandular- pubescent terminal panicles, appearing before the leaves at the ends of the branches, calyx campanulate hairy on both surfaces, lobes oblong, acute, about as long as the tube, with a small hairy gland at the base of lobe, male flowers; stamens column short, filaments 10. Hermaphrodite flowers: carpel's usually 5, on a short stout gynophores, style short thick, hairy, stigma 5. Stamens in a ring round the carpels. Follicles 4-6, ovoid- oblong, 2-5 cm. long, densely, pubescent, the pubescence mixed with stinging hairs. Seed 3-6 oblong, black.

Most of the species yield gums in considerable quantity, most of which resemble tragacanth in their appearance and properties. Gum is largely used in medicine.

Distribution: *Gujarat*, *Konkani*, *Deccan*, *N.Kanara*, *Rajputana*, *Central India*.

Lagerstroemia flos reginae

It is a small to medium- sized tree growing to 20 meters tall, with smooth, flaky bark. The leaves are deciduous, oval to elliptic, 8-15 cm long and 3-7 cm broad, with an acute apex. The flowers are produced in erect panicles 20-40 cm long, each flower with six white to purple petals 2-3.5 cm long. The flowers in this plant bloom only once in a year at the peak of summer.

The wood is of good quality, considered to be one of the best timber trees in *Myanmar* and *Assam*, and is often traded. One of the most strikingly showy of flowering trees, and a good shade tree, it is commonly cultivated in gardens or along the sides of roads for its brightly colored mauve or pink flowers with crinkled petals.

***Terminalia tomentosa*:** It is a tree growing to 30 m tall, with a trunk diameter of

1m. the fruit is ovoid, 3cm long, with five wings not extending beyond the fruit apex. The bark is fire resistant and 15-20mm thick, surface grey-black, very rough, deeply vertical fissured, horizontally cracked, forming tessellated, thick flakes; blaze red. Leaves simple, opposite to sub opposite, estipulate; petiole 10-20 mm long, stout, grooved above, glabrous; lamina 1-20x 5-13 cm oblong, oblong-ovate, elliptic-oblong or elliptic-ovate; base oblique; apex acute, round, or obtuse, margin entire or crenulated, glabrous, coriaceous, midrib with 2 stalked glands near the base beneath; lateral nerves 10-20 pairs, parallel, prominent, intercourse scalariform prominent. Flowers bisexual and dull yellow in color. It is casually known as crocodile bark tree due to the characteristics bark pattern. The wood is coarse, fairly straight grained; dull to somewhat lustrous and without any smell or taste. The heartwood varies from light brown with few markings to dark brown or brownish black and figured with darker streaks. The sapwood is reddish white and sharply differentiated. The heartwood is moderately durable and sapwood is liable to powder-post beetle attack.

Terminalia Arjuna

It is large, deciduous/evergreen, up to 6-15 (-25) m tall, often having a buttressed trunk, and a broad, oval crown with drooping branches. It is mostly found near water banks. The leaves are simple (undivided), oblong-elliptic, 7-18 (-25) cm long with short petioles, arranged opposite (sub-opposite) on the stem and often coriaceous (leathery) at maturity. Each leaf has a pair of knob-like glands on the dorsal (lower) side at the junction between the petiole and the lamina. The dorsal surface has downy hair but the ventral surface is smooth. The flowers are greenish white or

creamy and have a sweet scent. They are borne at the ends of shoots or in the axils of leaves in inflorescences. Lacking pedicels (and hence sessile), they are directly attached to the inflorescence axis. The flowers are greenish white or creamy and have a sweet scent. They are borne at the ends of shoots or in the axils of leaves in inflorescences. Lacking pedicels (and hence sessile), they are directly attached to the inflorescence axis. Calyx is cuplike, 5-lobed and constitutes the most prominent component of the flower.

There are no petals. The 10 stamens are attached to the calyx cup. The ovary is encased in a disc with yellowish or reddish hairs. Flowers have a sweet scent. The fruit is ovoid, up to 6 cm long, and at maturity, hard and woody. It has five wings in which the veins curve upwards from the axis. *Arjuna* fruit is botanically described as a drupe. A drupe is a fruit that never splits open to release seed. The bark is thin, smooth, shiny, and greenish-grey from outside and peels off in large flat pieces regularly. It is also of considerable importance in Ayurveda.

Macroscopic characters of *Terminalia Arjuna*

Bark: pale, externally flesh colored, internally smooth, flaky. Taste is bitter.

Flowers: opposite, short petiole, glabrous beneath, oblong or elliptic in old trees, two glands on midrib beneath near the base. Leaf is slightly astringent and mucilaginous.

Spikes: paniculate, fruits with 5 sub equal acute wings marked with much ascending striations. The fruit is slightly sour, bitter and astringent.

Microscopical characters:

Leaves are dorsiventral, single layered, cuticularised. Upper and lower epidermis bear unicellular glandular and non-glan-

dular trichomes and the lower epidermis is provided with ranunculaceous stomata. In the midrib region, inside the epidermis several layers of thick-walled collenchymatous and thin-walled parenchymatous tissues surround the central vascular cylinders. Vascular bundle is open, b collateral i.e. xylem surrounded by phloem. Few secretary canals are observed in the parenchymatous tissue and in the central regions.

Abundant cluster crystals of calcium oxalate are noted in phloem and parenchymatous tissues. Mesophyll is composed of palaside and spongy cells. Palaside is double layered. Stomatal index is 14-15.5. Vein-islet numbers are 11-19 sq.mm. And palaside ratio varies from 7-12.

Dry matter and moisture content of the different parts of *Terminalia Arjuna*.

	Dry matter	Moisture content
Leaf	32.64	67.36
Stem bark	46.66	53.34
Fruit	29.65	70.35

Preliminary phytochemical tests for the presence of active constituents

Extractive	Alkaloid	Glycoside	Reducing sugar	Sterol
Petroleum ether	-	-	-	+
Benzene	-	-	-	+
Chloroform	-	+	+	-
Alcohol	-	+++	+++	-

Macroscopical characters of *Terminalia tomentosa*

The bark consists of flat or curved pieces of varying sizes up to 30 cm. in length and 8 cm in width and 3 cm in thickness. The outer part of the bark consists of rhytidoma about 1 cm thick. The outer surface is rough showing many cracks and fissures and dark brown in color, the rhytidoma portion is pale brown. The inner surface is dark brown to black, smooth and longitudinally striated. Fracture is granular in the outer part and laminated in the outer part. Taste is astringent.

Stem bark: the young stem shows typical combretaceous type of hair having swollen base and tapering apex. Transverse section of the bark shows cork, thin walled parenchymatous ground tissue with embedded crystals of calcium oxalate and secondary phloem with patches of sclerenchyma of fibers and tanniniferous cells.

Mature bark shows a broad zone of phloem consisting of ceratenchyma, phloem parenchyma, phloem fibers and crystal fibers. The later contains rosette crystals of calcium oxalate.

Fruit: transverse section shows epidermis and hypodermis. Secretary canals, ducts and vascular supply are present. The seeds are composed of stone cells, fibers and vascular supply.

Physical constant values:

Microscopical characters:

The outer bark consists of rhytidoma which is composed of alternate layers of periderm and secondary phloem which is more or less crushed. Medullary rays in the phloem of the rhytidoma are irregular. Cork consists of numerous layers of collapsed reddish brown cells which are suberised and lignified. The cork is composed of alternating layers of big and small cells. Phellogen is one or two layered, phellogen consists of 4-6 rows of tangentially elongated cells. The remaining part of the bark consists of broad second-

ary phloem fibers transverse by medullary rays. Sieve tubes are usually collapsed. Phloem fibers occur in groups arranged tangentially. In surface view they are elongated, lignified with pointed tapering ends. Medullary rays are uni-seriate sometimes biserrate, 2-18 cells high, 4-12 cells being more common.

Cell contents: calcium oxalate crystals occur in great abundance throughout the phloem region. They occur either in clusters or sphaerulites. Cluster crystals are arranged in tangential rows by the side of the tangential band of phloem fibers as well as scattered in other parenchyma cells. Cluster crystals also occur in crystal fiber, which is a vertical row of isodiametric parenchymatous cells all containing

calcium oxalate crystals. The sphaerulite crystals are found in tangential rows and scattered in the phloem parenchyma.

Identification method

1. Organoleptic parameter: Among all the five organoleptic characters the difference occurs in *rupa*. *Terminalia Arjuna* has pinkish white outer bark, *T. tomentosa* has pinkish grey outer bark while that of *Sterculia urens* is silvery white.

2. Synonym based: As the bark of *Sterculia urens* is more whiter so it resembles more with synonym *Dhawal*. But with synonym *nadirsha* *Terminalia Arjuna* relates more as it is found near river banks whereas *Sterculia urens* is xerophyte in nature.

3. Microscopic characters:

Parameter	<i>Terminalia Arjuna</i>	Terminalia tomentosa	<i>Sterculia urens</i>
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	Varying size up to 10-30 cm in length, 3-8 cm width and 0.5-3 cm in thickness
Shape	Flat	Flat	Slight; y curved
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.	External surface is yellowish white, rough and curved outwards. Inner surface is full of coarse and strong fibres, which strip off in broad flakes, having a net-like appearance

DISCUSSION: The bark of *Sterculia urens* is cream colored and very smooth. The gum oozing from the bark is known as *karai goud*, which is used as a medicine. Although it is not reported to have properties similar to those of *Arjuna* bark. It is used in north & western India but it cannot

be considered as substitute. The bark of *Lagerstroemia flos reginae* is reported to have purgative properties, but no cardio-tonic effect is ascribed to it. In some regions in eastern zone of India it is used as *Arjuna* bark which is questionable. The bark of *Terminalia tomentosa* is often used

instead of *Arjuna* bark but it can be treated only as an adulterant. The bark of this tree is cream colored and very smooth. This species store water in dry season. A survey conducted at *BANDIPUR NATIONAL PARK, INDIA* showed that a proportion of trees store water and there is girth dependent increase in frequency and amount of water storage. The mechanism and eco physiological significance of this water storage is not known.

Diagnostic characters- leaves opposite, short petiole with the two glands on midrib beneath near the base. Bark pale externally, flesh colored internally and flaky. Fruits with 5 sub-equals acute winged, marked with much ascending striations.

Modern botanists identified *Arjuna* as *Terminalia Arjuna*.

CONCLUSION: In Sanskrit the meaning of *Arjuna* is white. Even *Terminalia Arjuna* is white in comparison of other *Terminalia*'s and other vegetation of the forest. It is great that specific name *Arjuna* is retained in its botanical name. Here the local names Arjanio and *Arjuna* come to our help here. As we all know that *Arjuna* is a herbal hero of heart. So for such type of important drug it is very much necessary that the drug should be properly identified and no other substitute or adulterant should be used. *Terminalia Arjuna*, more or less, is sufficiently available across the country. The only thing which is needed is to identify properly, and it is possible when we are aware of all the other species characteristics which are used as adulterant or substitute of *Arjuna*.

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