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Pharmacognostic and phytochemical evaluation of *Antiaris toxicaria* (Pers). Lesch

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Abstract
Background: *Antiaris toxicaria* (Pers). Lesch. (Moraceae) historically has been used as arrow poison and also for a variety of medicinal purposes. Despite the popular medicinal utilization, still no conclusive study has been reported so far regarding the pharmacognostical standardization.
Aim: Thus, the present study was focused to scientifically establish a standard monograph of *Antiaris toxicaria* (Pers). Lesch on the basis of pharmacognostical and phytochemical parameters.
Materials and methods: The detailed macroscopic and qualitative as well as quantitative microscopic characters and phytochemical characters of *Antiaris toxicaria* (Pers). Lesch were analysed.
Results: The morphological characters of *Antiaris toxicaria* were established. The transverse section of leaf shows adaxial epidermis has mucillagenous hairs, the palisade is single layered, the cells are wide and columnar. Calcium oxalate crystals are abundant in the ground cells of the petiole. Phytochemical parameters of *Antiaris toxicaria* (Pers). Lesch showed loss on drying 7.01% and total ash 4.97%.
Conclusion: The present study provided useful information about its correct identity and evaluation. It helps to diagnose drugs from the plant.

Keywords: Pharmacognostic, phytochemical evaluation, *Antiaris toxicaria* (Pers). Lesch

Introduction
Antiaris toxicaria (Pers). Lesch belonging to the family Moraceae, commonly known as Mara-uri. *Antiaris toxicaria* is a tall tree recorded from western ghats at altitudes of 300m height. Leaves oval, oblong, obtuse or rather acute unequally cordate when young toothletted and hairy on both sides, peduncle simple. Fruit fleshy one seeded drupe. *Antiaris toxicaria* is distributed in Western Ghats of Tamil Nadu and Andaman Nicobar Islands. *Antiaris toxicaria* is reported to have antioxidants, antibacterial antifungal and anti-inflammatory activity. The plant is highly poisonous. Female flowers are one of the most virulent of known poisons some persons are exposed to danger when they only approach the trees. Four persons sent a man up into a tree he became very ill, his body swelled for several days, he suffered severely by vertigo nausea and vomiting others nevertheless experience on inconvenience from the exhalations of the tree. The bark, leaf and seeds of *Antiaris toxicaria* is useful for the treatment of febrifuge and dysentery. The milky sap contains the poisonous glycosides antiarin and antiosidin which exerts a rapid and aggressive action on the heart. *Antiaris toxicaria* contains glycosides, saponins, various phenolic compounds, volatile oil, tannin, fatty acids, triterpenes, protein starch, glucose and minerals. As far as phytochemistry and pharmacognosy of *Antiaris toxicaria* is concerned large number of scientific data is available but a pharmacognostical standardization study is still lacking. Hence, the present study was focused to investigate pharmacognostical and phytochemical properties of *Antiaris toxicaria*.

Materials and Methods
Plant Collection
Antiaris toxicaria was collected in the flowering stage from the way to Chirtaruvi in Courtallam, Western Ghats, Tamil Nadu, India. During June 2012. According to Beddome, it is the largest tree of the evergreen forests of Western Ghats.

Chemicals and Instruments
All reagents and chemicals used for pharmacognostic screening were analytical grade, compound light microscope was used for the study. The photography was done by using microscope camera. Camera lucida was used for determination of quantitative microscopical

characters. Fluorescent analysis of the leaf powder in different solvents were carried out according to the methods of Chase and Pratt. Physicochemical characters were determined by standard methods.

Morphology and Microscopy

The morphological characters such as shape, size, colour, odour, taste, surface and fractures were determined. Microscopic features of *Antiaris toxicaria* were evaluated by preparing thin hand section. The sections were cleared with alcohol and stained. Histo chemical reactions were applied with various chemicals and photomicroscopy was performed with camera. The leaf constants were measured using Camera lucida.

Powder Microscopy

The powder photomicroscopy of shade dried *Antiaris toxicaria* was carried for identification of the powder characteristics by using camera.

Results

Morphological Characteristics

Morphological studies shows (Fig. 1) that the leaf was simple, leathery, bifarious, penninerved, glossy on the upper surface, short- stalked, oval with an asymmetrical, heart shaped base and softly spiny at the top. Leaf margin is irregular and wavy. The tree has a straight cylindrical trunk. The flowers are arranged in catkins at the tips of the branches. Flowers monoecious, more crowded on the surface of an axillary pedunculate receptacle, surrounded by confluent imbricating bracts, 3-4 spathulate imbricate sepals, having a large number of stamens and longer stalks than the female flowers. Female flowers minute solitary in an involucres of many confluent bracts without a perianth, ovary adnate to involucres, style arms recurved. The fruit is an elongate berry covered with fleshy scales and containing a hard pit, seed exalbuminous, testa hard, embryo globose, cotyledons equal, radicle small (Fig. 1).

Qualitative microscopically characteristics

Transverse section of leaf

The leaf has prominent midrib projecting both adaxially and abaxially and their lamina. The lateral veins are not prominent. The lamina is dorsiventral smooth and even. The adaxial epidermis has mucillagenous hairs (Fig 2). The cells are rectangular to squarish and vary in size. Cuticle is fairly thick. The lamina is 100µm thick. The palisade cells are 40µm in height. The cells are wide and columnar. The spongy mesophyll consist of 2 layers of lobed and spherical cells. The lateral vein has circular collateral vascular strand with parenchymatous bundle sheath.

Midrib

The midrib is 1µm thick and 800µm in breadth. It has an adaxial thick and blunt hump and abaxial broad hemispherical body. The outline is wavy bearing thick walled sparsely distributed trichomes. The vascular bundles occur in two strands; there is a wide abaxial bowl shaped main strand and another adaxial thick and flat accessory strand (Fig. 3). The xylem elements occur in regular radial files and phloem in thin abaxial arc. Calcium oxalate crystals (druses or sphero crystals) are abundant in ground cells of the petiole (Fig. 3). The mesophyll crystals are arranged in the form of petals (Fig. 3).

Stomata

Stomata occur only on the abaxial side and are anomocytic type (Fig. 3). The epidermal cells are much lobed. The anticlinal walls are highly wavy or thin walled and smooth (Fig. 2 and 3). The epidermal cells from which the trichome originates are circular, thick walled and lignified (Fig. 3).

Veination

The lateral veins are fairly thick with distinct Veinlets. The vein islets are not distinct. The vein terminations are long and thin; they are either simple or branched once or twice (Fig. 3). Crystals mostly secreted in the form of clusters. Structures resembling cystoliths also occur in the tips or suspended from the walls of the hairs in species of *Antiaris* (Metcalf and Chalk, 1972). Silicified pegs attached to the outer walls of the epidermal cells.

Preliminary Phytochemical Screening

The preliminary phytochemical screening with the various qualitative chemical tests and fluorescence analysis were carried out. The results were shown in Table 1, 2 and 3.

Table 1: Determination of physical constants:

Sl. No	Parameters	Results (%w/v)
1.	Total ash	4.91
2.	Water soluble Ash	1.16
3.	Acid insoluble Ash	0.33
4.	Loss on drying at 105^0 C	6.01
5.	Water soluble extractives	15.10
6.	Alcohol soluble extractives	9.9
7.	Extractive value (Successive extraction)	
	Hexane	1.2
	Petroleum ether	2.6
	Chloroform	2.9
	Ethyl alcohol	5.1

Table 2: Preliminary phytochemical screening of ethanolic extract of *Antiaris toxicaria* (Pers). Lesch.

Components	Results
Steroid	Positive
Triterpenoid	Positive
Flavonoid	Positive
Furan	Negative
Sugar	Positive
Coumarin	Positive
Quinone	Positive
Alkaloid	Positive
Tannin	Positive
Phenol	Positive
Acid	Negative
Saponin	Positive

Table 3: Fluorescence analysis of the leaf of *Antiaris toxicaria* (Pers). Lesch.

Sl. No	Treatment	Under visible light	Under UV 265 nm	Under UV 365 nm
1.	Powder	Dark Green	Dark Green	Dark Brown
2.	Powder +Petroleum ether	Dark Green	Brown	Black
3.	Powder + Hexane	Dark Green	Brown	Blackish Brown
4.	Powder + Chloroform	Brown	Black	Black
5.	Powder + Ethylacetate	Pale green	Dark Green	Black
6.	Powder + Ethyl alcohol	Brown	Dark green	Brown
7.	Powder + Distilled water	Light green	Pale green	Dark green
8.	Powder + 1N NaOH	Reddish Brown	Dark green	Blackish Brown
9.	Powder + 1N HCL	Light brown	Pale green	Dark brown

Fig 1: *Antiaris toxicaria* (Pers.) Lesch. Leaf

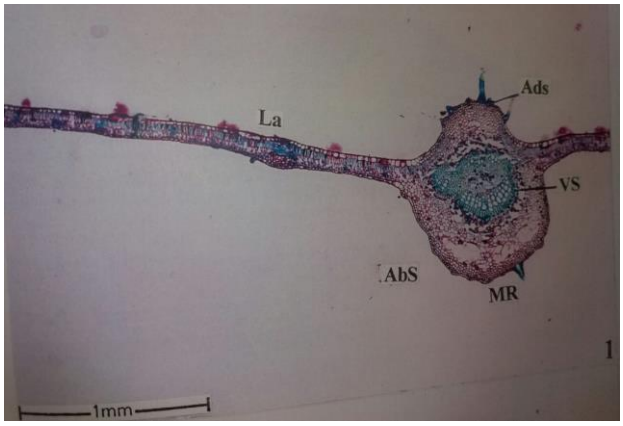

Fig 2: T.S. of leaf

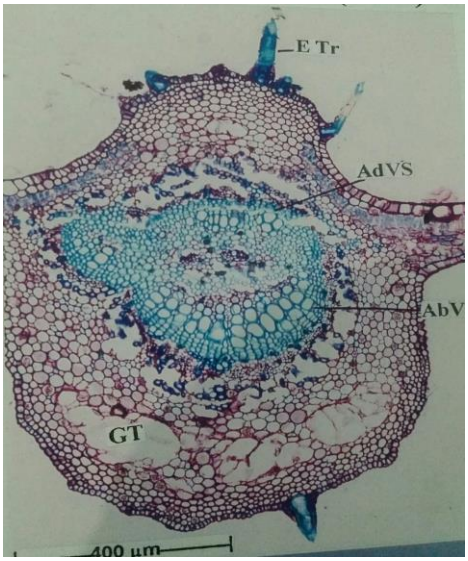

Fig 3: T.S. of Midrib

Discussion

Standardization is an important tool in identifying crude drug correctly. For establishing the correct identity of source materials, microscopic method is one of the simplest and best methods. Therefore, the results of the present study, may serve as a basis for identification, collection and standardization of the plant.

Microscopical study the leaf showed the presence of mucillagenous hairs on the adaxial epidermis. The spongy mesophyll consist of 2 layers of lobed and spherical cells. He lateral vein has circular collateral vascular strand with parenchymatous bundle sheath. The vascular bundles occur in two strands, there is a wide abaxial bowl shaped main strand and another adaxial thick and flat accessory strand. The xylem elements occur in regular radial files and phloem in thin abaxial arc. Calcium oxalate crystals are abundant in ground cells of the petiole. The vein islets are not distinct. The vein terminations are long and thin. These characters constitute the reliable features for botanical identity of the plant.

Physicochemical parameters of *Antiaris toxicaria* (Pers.) Lesch showed loss on drying

6.01% and total ash 4.91%, the weight of the ash left behind after the combustion is of important parameter for the standardization of drug. Every part of the plant provides a particular amount of ash. The weight of total ash therefore gives information whether it is adultered with any other organic or inorganic materials. *Antiaris toxicaria* contains the acid insoluble ash 0.33% and water soluble ash 1.16%. The acid insoluble ash gives an idea about the earthy matter and other impurities which might be present along with drug.

Extractive values of the plant with different solvents give a preliminary picture of the percentage of the compounds extracted. In *Antiaris toxicaria* extractive value was found with ethanol (4.2%) minimum (1.02%) with hexane.

This result shows the solvent ethanol is preferable to other solvent for the yield of more of the compounds.

The extract of *Antiaris toxicaria* is exposed to UV light, it exhibits fluorescent effects, that provides evidence for the presence of fluorescent compounds.

Qualitative tests carried out in the leaf of *Antiaris toxicaria* confirmed the presence of various pharmacologically important plant constituents like triterpenoid, phenol, flavonoid, coumarin, quinine, glycosides, sugars, alksloids, steroids and saponins. Furan and acids are absent in the extract. For instance, the presence of tannins may be responsible for ability of *Antiaris toxicaria* to cure diseases like diabetes, diarrhea, sore throat, skin ulcer and dysentery. The presence of flavonoids in *Antiaris toxicaria* may be responsible for its uses to cure cancer, inflammations and allergies. The presence of alkaloids may be useful to cure heart diseases.

Conclusion

The present study provided useful information about its

correct identity and evaluation. It helps to differentiate from the closely related species of *Antiaris*. This is also useful for the future identification of the plant, and serves as a standard monograph for identification and evaluation of plant.

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