

Guazuma tomentosa: A Valuable Medicinal Plant

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ABSTRACT

The use of medicinal plants as therapeutic agents presumably predates the earliest documented history. *Guazuma tomentosa* is one of very important medicinal plant. It is also known as *Guazuma umbifolia* (commonly known as *mutamba* or *guacimo*) belonging to family Sterculiaceae. It is widely found in areas such as the Caribbean, South American, Central America, Mexico and some parts of India. More or less all of the parts of tree, containing diverse chemical constituents, were used in the treatment of various indications and pathophysiological disorders. In last few decades extensive research work had been carried out on this valuable medicinal plant. The present publication deals with up-to-date phytochemical and pharmacological review on *Guazuma tomentosa*.

Key words: *Guazuma ulmifolia*, *Guazuma tomentosa*, Baster cedar, Pundraaksha, Rudraakshi

INTRODUCTION

From the history of civilization herbal medicines were used to cure human ailments in every possible condition. Majority of population of developing country still rely on herbal medicine for primary health care. In modern era we have the option to use them over the synthetic molecules because herbal drugs have lesser side effects. Herbal drug are getting popularity day by day and their acceptability is increasing in developed country also¹. *Guazuma ulmifolia* is a plant native to tropical America, Ecuador and Colombia. Traditionally whole plant is used for its multipurpose benefits, e.g. As astringent, in cold, in cough, in diarrhoea, as diuretic, in dysentery, in venereal diseases, etc. Its non-medicinal uses involves, as a fuel wood, in making of charcoal, ropes (bark and stem; because of their tough and fibrous nature). Despite of its ethno-pharmacological uses, presently it is proven to have many therapeutic valuable uses because of the presence of many phyto-constituents e.g. colistin, colatannins, catechins, caffeine, kaempferol, procyanidin B-2, procyanidin B-5, procyanidin C-1, tartaric acid, theobromine, xanthan gum, etc. The proven pharmacological activities involve, anti-diabetic, anti-hypertensive, anti-microbial, anti-oxidant, anti-ulcer, neurological, anti-secretory, cytotoxic, uterine stimulating activity and as a hair growth promoter. The present review will give an up to date work done on this valuable plant²⁻⁷.

Macroscopy (Morphology)

Guazuma tomentosa is a tall tree having a height of 25 m approximately, which generally has brown colored, rough bark. Description regarding the various parts of the plant is as follow:

Leaves:

(i) Arrangement: Flattened arrangement, alternate in two rows.

(ii) Shape and Dimensions: Apex: Acuminate, Base: Cordate (Unequally), 5-7 nerved, Breadth: 2-6 cm, Length: 3-21 cm, Margin: Serrate, beneath Pubescent, Ovate/Oblong/Lanceolate, Simple, Tomentosa

(iii) Petioles: Length: 0.5-2 cm, Main veins (5 to 7) runs on it from the unequal base.

(iv) Leaf Stalk: Characteristic Feature: Tiny star shaped hairs cover them, Length: 6-12 mm, Shape: slender¹⁰

Flower:

(i) Arrangement: Small, Branched, in clusters.

(ii) Color: Purple or Yellow

(iii) Cymes: Length: 2-4cm, Number: 8, Type: Auxiliary thyriform

(iv) Sepals: Number: 5 (first one is spatheous)

(v) Petals: Number: 5, Length: 2-4 cm (across terminal cymes)¹⁰

Fruit:

(i) Color: Purple- Black

(ii) Shape and characteristics: 5 Celled, globose/ellipsoid, indehiscent, tubercled and woody

(iii) Dimensions: Length: 1.2 - 4cm, Breadth: 1.2 - 2.5cm¹¹

Seed:

(i) Color: Black (on ripening)

(ii) Shape: Ovoid

(iii) Dimensions: Length: 2.5- 4mm, Breadth: 1.8- 2mm^{10,11}

Microscopy

Transverse section (T.S.) of leaf of *Guazuma tomentosa* shows Upper and Lower epidermis. Upper and lower epidermis was single continuous layer with polygonal cells, Mesotome sheath is situated in between vascular bundle and bundle sheath, Mesophyll: Palisade cell single layer, compact oval in shape, Vascular bundle : Contain Xylem & phloem, Xylem 5-7 Non lignified & Phloem is lignified, Intercellular air space in present in mesophyll, Parenchymatous cell: Parenchymatous cell present above

Vernacular names

Bengali	Nipaltunth
English	Baster cedar, Honey fruit tree, Musket tree
Guajarati	Bhadraksha
Kannada	Bhadrakshi mara, Bucha rudrakshi
Malayalam	Rudraksham, Uttharaksham
Oriya	Debodura
Sanskrit	Pundraaksha, Rudraakshi
Siddha system	Rudraksham
Tamil	Rudrasam, Tenbachai, Thenmaram, Tubakki
Telegu	Rudraksha ⁸

Taxonomical classification ⁹

Kingdom	Plantae
Subkingdom	Tracheobionta
Order	Malvales
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Family	Sterculiaceae
Genus	<i>Guazuma</i>
Species	<i>Guazuma tomentosa</i>

vascular bundle is oval or circular in shape, Trichomes: The epidermal cell gets modified in to stellate types of trichomes (star shaped), numerous in number and lignified,

Palisade: Single layer, cylindrical in shape, Bundle sheath is single layer lignified shape Irregular, Powder microscopy of leaf of *Guazuma tomentosa* .

Powder microscopy of leaf shows fibres with calcium oxalate crystal, large prismatic crystals are found scattered in the powder, Parenchymatous cells contain single large prisms of calcium oxalate and the epidermal cell gets modified in to stellate types of trichomes, numerous in no and lignified.

Ethno pharmacological importance

Table 1 shows the ethnopharmacological utilization of the plant. Almost all the parts of the plant were used in the treatment of vast array of diseases and pathophysiological disorders ranging from anti dysenteric to styptic to sudorific, etc ^{9, 12}

Chemical Constituents

Pharmacological Activity

Anti-diabetic activity

Alarcon- Aguilera (1998) processed *Guazuma tomentosa* and administered intragastrically to hyperglycemic rabbits and found decline in hyperglycemic peak and area under glucose tolerance curve. This from these results a conclusion was drawn that *Guazuma tomentosa* can be used in treatment of diabetes mellitus. Alonso- Castro et al (2008) in their study on *Guazuma tomentosa* shows that this plant can be used in treatment of type-II diabetes. Study was performed with aqueous extract of the plant in order to test the effect of *Guazuma tomentosa* in 3T3-F442A preadipose cell line on the process of adipogenesis and 2-NBD-glucose uptake ¹¹⁻¹².

Anti-hypertensive and vasorelaxing activity



Figure 1: Different part of *Guazuma tomentosa* (A: whole plant, B: Stem and bark, C: Stem and bark, D: Leaf with flower, E: Leaf with flower, F: Leaf with fresh fruit, G: Dried fruit)

Table 1: Various Ethnopharmacological uses of *Guazuma tomentosa*^{9, 12}.

Serial No	Parts of <i>Guazuma tomentosa</i>	Various diseases in which it can be used and other functions
1.	Bark	Alopecia, Bruises, Cough, Hemorrhage, Infections, Leprosy, Nephritis, Asthma, Child Birth, Dermatitis, Hemorrhoids, Influenza, Liver problem, Pneumonia, Bronchitis, Constipation, Grippe, Hypertension, Kidney problems, Malaria, Prostate problems, Skin conditions, Stomach inflammation, Stomachache, Syphilis, Wound and Uterine pain.
2.	Fruit	Diarrhoea, Infection, Uterine pain, Hemorrhage.
3.	Leaf extract	Corpulence reduction.
4.	Leaves	Alopecia, Dermatitis, Fever, Liver diseases, Skin diseases, Sores, Skin eruptions, Inflammation, Dysentery, Asthma, Bruises, Kidney diseases, Wounds and Ulcers.
5.	Roots	Child Birth.
6.	Seed	Constipation, Diarrhoea, Astringent and in Stomach troubles.

Magos et al (2008) performed a study to test the anti-hypertensive activity of *Guazuma tomentosa* based on the observation that traditionally the bark of the plant was used to treat the hypertension. In the study the 10mg/kg acetone extract of bark containing procyanidin fraction was used to test both in vitro and in vivo activity using sugar feeded hypertensive rats. The result reveals decline in both systolic pressure and heart rate. Carbachol was used as a positive control during the study. Procyanidin oligomers are present in the plants which are responsible for such activity¹³.

Anti-microbial activity

Navarro MC et al (2003) used methanolic and aqueous extracts of five traditionally used plants in testing of their potential to treat microbial infections. Tests were performed to examine their ability to scavenge free radicals generated in body as the result of microbial infection, their ability to inhibit lipid peroxidation and effect they have on the infectious agent. *Guazuma tomentosa* was found to be active¹⁵.

Anti-ulcer activity

Berenguer et al (2007) examine the anti ulcerogenic effect of ethanolic extracts (125, 250 & 500mg/kg from flower and leaves of the plant using omeprazole as reference and diclofenac as ulcerating agent, on wister rat and found extracts shows dose dependent action¹⁶.

Hair growth promoter

Tsutsumi et al (1991) perform their study to examine depilatory inhibitor effect of the plant using *Haspilocarpus jaborandii*. Result reveals *Guazuma tomentosa* inhibit epilation and thus promote hair growth with some additional benefits like no foul odor will be produced by the scalp and no injury to it will occur with the use of the plant¹⁷.

Nakaguchi et al (2001) performed the study on a formulation containing *Guazuma tomentosa* as one of the component and the formulation also showed positive results¹⁸.

Percutaneous penetration

Rocha et al (2007) in their study over procyanidin rich extract of *Guazuma tomentosa* for that procyanidin have significant penetration enhancer ability¹⁹.

Neurological activity

Neurological activity was tested against glutamate induced neuronal death in cultured cerebella cells containing

granules. Constituent responsible for the activity was Proanthocyanidin B-2 by inhibiting the flux of calcium ions²⁰.

Table 2: Various chemical constituents present in *Guazuma tomentosa*^{8, 11, 12, 13, 14}.

Serial number	Class of compounds	Various chemical constituents of each class
1	Acids	Tartaric acid, Kaurenoic acid, Asparaginic acid
2	Flavonoids	Kaempferol, Procyanidin B-2, Procyanidin B-5, Procyanidin C-1
3	Gums	Xanthan gum
4	Purines	Theobromine, Caffeine
5	Tannins	Catechins, Colatannins
6	Miscellaneous	Octacosanol, Friedelin-3 α , 3 β -ol, β -sitosterol, Friedelin, Farnesol, Taraxerol, Colistin.

Anti-secretory activity

Effect of *Guazuma tomentosa* were studied against cholera toxin induced secretion. Under this study the stem bark was extracted using ethanol as solvent and the extract in the concentration of 40 μ g/ml. Rabbit colon was used for study. Positive results were obtained²¹.

Cytotoxic activity

Kashiwada (1992) performed in vitro cytotoxicity study on human oral epidermoid carcinoma cell using leaf of *Guazuma tomentosa* & found 97.3 % growth inhibitions²².

Anthelmintic activity

Anthelmintic activity of aqueous, alcoholic and dichloromethane extract of leaves of *Guazuma tomentosa* were evaluated separately on adult earth worm and compared that with Albendazole. It was found that extract exhibited, dose dependent action and inhibition of spontaneous motility (paralysis) and death of earth worm. Alcoholic and DCM extract were found to be potential source of natural anthelmintic compound²³.

Hepatoprotective activity

Enhanced lipid peroxidation may result in hepatitis. As *Guazuma tomentosa* is rich in flavonoids and tannins so leaves of *Guazuma tomentosa* is selected for screening of leaves for hepatoprotective activity. The ethanolic, dichloromethane (DCM) and aqueous extracts of *Guazuma*

tomentosa leaves were subjected to phytochemical evaluation, assay for flavonoid and tannin content. Evaluation for its protective effect on CCl₄-induced liver damage in Albino wistar rats. As oxidative stress is directly related to hepatotoxicity so in-vitro antioxidant activity was determined using DPPH assay. In-vivo anti-oxidant activity was also determined by estimation of TBARS and GSH. Serum biochemical parameters viz. serum glutamine oxaloacetate transaminase (SGOT), serum glutamine pyruvate transaminase (SGPT), serum alkaline phosphatase (SALP) and total protein (TP) were also estimated. The ethanolic and dichloromethane extracts were found to be potential source of hepatoprotective agent²⁴.

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