

A brief review on phytochemical and pharmacological profile of *Guazuma tomentosa* L

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Abstract

Guazuma tomentosa L is belonging to the family Sterculiaceae and commonly called Bastard cedar in Sanskrit Rudraakshi, medium-sized tree that grows up to 20 m height. *Guazuma tomentosa* is indigenous to tropical America on both continents and found throughout the Amazon rainforest. *Guazuma* is called *guasima* or *guacima* in Mexico, where it has a very long history of indigenous use. Ethnobotanical uses of *Guazuma tomentosa* are Antidysenteric, antibacterial, anti-inflammatory, antifungal, astringent, antimicrobial, diaphoretic, depurative, febrifuge, hepatoprotective, emollient, pectoral, stomachic, refrigerant, sudorific and styptic. Phytochemically plant contains steroids, fatty acids, flavanoids, glycosides, tannins, carbohydrates, mucilage. *Guazuma tomentosa* holds a place in herbal medicine systems in many tropical countries. *Guazuma tomentosa* long history of effective uses in herbal medicine propelling. Researchers to begin studied its properties and activities in the laboratory. It has been the subject of numerous researches since. In the first study examined using various *in-vitro* and *in-vivo* research study on experimental animal models (rats, rabbits, guinea pigs, cats and insects). Pharmacological evaluation on plant demonstrate till date are anti-diabetic action, anti-hypertensive, anti-microbial action, anti-oxidant, antiulcer action, hair growth promoter, weight loss agent. The plant appears to have a broad spectrum of activity on several ailments.

Keywords: *Guazuma Tomentosa* L, Baster Cedar, Phytochemicals, Ethnopharmacological, Traditional Medicine.

1. Introduction

Guazuma ulmifolia/tomentosa commonly known as bastard cedar or West Indian elm or bay cedar, is a medium sized tree normally found in pastures and disturbed forests. This flowering plant belonging to family sterculiaceae/ malvaceae it is also known as *Guazuma umbifolia* (commonly known as *mutamba*) grows up to 30m in height and 30–40 cm in diameter. It is widely found in areas such as the Central America, South American, Mexico, and Caribbean serving a number of uses that varies from its value in carpentry to its utility in medicine. *Guazuma ulmifolia* is a plant native to tropical America, Colombia and Ecuador traditionally whole plant is used for its multipurpose to treat traditionally. 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., catechins, caffeine, kaempferol. Colistin, colatannins, procyanidin B-5, procyanidin B-2, procyanidin C-1, tartaric acid, xanthan gum. The proven pharmacological activities involve, anti-oxidant, anti-hypertensive, anti-microbial, anti-diabetic, neurological, anti-secretary, cytotoxic, anti-ulcer, uterine stimulating activity and as a hair growth promoter. The present review will give an up to date work done on this valuable plant.

1.1 Geographical distribution

Guazuma tomentosa is normally found in the Caribbean, Central America, Mexico and Colombia, Peru, Ecuador, Bolivia, Argentina, Paraguay, And Brazil. Places such as India have been cultivating them or more than 100 years. They are native to places such as: Antigua and Barbuda, Argentina, Bahamas, Barbados, Bolivia, Brazil, Colombia, Cuba, Dominica, Dominican Republic, Ecuador,

Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands, Nicaragua, Costa Rica, Panama, Paraguay, Peru, Puerto Rico, St Kitts And Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago, Virgin Islands (Us).

Native: Jalisco, Michoacán, Nayarit, Oaxaca, Puebla, Queretaro.

Reported here: Antarctica, Antigua, Argentina, Argentina: Buenos Aires, Argentina: Rio Negro, Aruba, Bahamas, Barbados, Belize, Bolivia, Brazil, British Virgin Islands, Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, French Guiana, Gabon, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, India, Jamaica, Liberia, Martinique, Mexico, Mexico: Jalisco, Mexico: Michoacan, Mexico: Oaxaca, Mexico: Puebla, Mexico: Veracruz, Mozambique, Nicaragua, Panama, Paraguay, Peru, Saint Kitts And Nevis, Saint Vincent And The Grenadines, Trinidad And Tobago, Turks And Caicos Islands, United States, Venezuela.

Table 1: Vernacular (common) names of *Guazuma tomentosa* [3]

| Language / region | Vernacular name |
|-------------------|---|
| English | Baster cedar, honey fruit tree, musket tree |
| Sanskrit | Pundraaksha, rudraakshi |
| Tamil | Rudrasam, tenbachai, thenmaram, tubakki |
| Guajarati | Bhadraksha |
| Malayalam | Rudraksham, uttharaksham |
| Bengali | Nipaltunth |

1.2 Ethnopharmacological use [4-5]:

The leaves, bark, fruit, root, stem bark have been traditionally used by herbal medicine practitioners for their following properties antidiarrhetic: antibacterial, anti-inflammatory, astringent, antifungal, antimicrobial, depurative, diaphoretic febrifuge, hepatoprotective, emollient, Pectoral, stomachic, refrigerant, styptic, sudorific and vulnerary.

Bark: Asthma, bruises, burns, alopecia, constipation, bronchitis, dermatitis, dermatitis, coughs, diarrhoea, dysentery, fevers, childbirth, fractures, gastrointestinal pain, elephantiasis, gonorrhoea, grippe, hypertension, infections, hemorrhoids, haemorrhage, influenza, leprosy, liver problems, malaria, nephritis, kidney problems, pneumonia, prostate problems, pulmonosis, skin conditions, stomach inflammation, stomach ache, syphilis, ulcers, uterine pain, wounds.

Fruit: Haemorrhage, infection, diarrhoea, uterine pain.

Seed: diarrhoea, constipation, astringent, and in stomach troubles.

Leaves: Asthma, alopecia, bruises, skin diseases, dermatitis, ulcers, dysentery, erysipelas, fevers, inflammation, kidney diseases, liver diseases, skin eruptions, sores, wounds.

Root: Childbirth.

Stem bark: Diarrhoea.



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)

2. Literature review

2.1 Preliminary Phytochemical Screening [6-9]:

Ethyl acetate, dichloromethane and alcoholic extract of *Guazuma tomentosa* was prepared by Soxhlet extraction. Aqueous extract was prepared by reflux method. All the extracts were subjected to phytochemical screening for qualitative analysis for presence and absence of secondary metabolite information about given extractive value of *Guazuma tomentosa* extract containing phytoconstituents soluble in particular solvent presence study shows Alcohol soluble extractive is more as

compared to aqueous extractive value suggesting alcoholic extract would be more beneficial as compared to aqueous extract for therapeutic aspect.

2.2 Phytochemical Profile [10,11]

Leaves: contain octacosanol, taraxerol-oac, friedelin-3- α -oac, \hat{a} -sitosterol, and Friedelinol-3-acetate. Heartwood: kaempferol.

Fruit: Sweet edible mucilage. When eaten in excessive quantities it is reported to cause diarrhoea

Bark: contains friedelin, betulin, \hat{a} -sitosterol.

Table 2: Various chemical constituents present in *Guazuma tomentosa* [12-15]

| Serial No. | Class of compounds | Various chemical constituents of each class |
|------------|--------------------|---|
| 1 | Acids | Tartaric acid, kaurenoic acid, asparaginic acid |
| 2 | Gums | Xanthan gum |
| 3 | Flavonoids | Kaempferol, procyanidin b-2, procyanidin b-5, procyanidin c-1 |
| 4 | Tannins | Catechins, colatannins |
| 5 | Purines | Theobromine, caffeine |
| 6 | Miscellaneous | Octacosanol, friedelin-3 α , 3 β -ol, β -sitosterol, friedelin, farnesol, taraxerol, colistin. |

Table 3: Phytochemical Screening of Different Extract of *Guazuma Tomentosa*[16]

| Phytochemical | Ethyl acetate extract | Dichloromethane extract | Ethanol extract | Aqueous extract |
|---------------------------------|-----------------------|-------------------------|-----------------|-----------------|
| Alkaloids | | | | |
| Wagner's test | + | + | + | - |
| Hager's test | + | + | + | - |
| Mayer's test | + | + | + | - |
| Dragendroff's test | + | + | + | - |
| Carbohydrates | | | | |
| Molisch's test | - | - | + | + |
| Fehling's test | - | - | + | + |
| Glycosides | | | | |
| Borntrager's test | - | - | - | - |
| Modified Borntrager's test | - | - | - | - |
| Saponin | | | | |
| Froth test | - | - | - | - |
| Phytosterols | | | | |
| Salkowski's test | + | + | + | - |
| Liebermann Burchard's test | + | + | + | - |
| Fixed oil & fats | | | | |
| Stain test | - | - | - | - |
| Phenols | | | | |
| Ferric chloride test | + | + | + | + |
| Flavonoids | | | | |
| Alkaline reagent test | + | + | + | + |
| Lead acetate test | + | + | + | + |
| Diterpenes | | | | |
| Copper acetate test | - | - | + | + |
| Tannins | | | | |
| Gelatin test | + | + | + | + |
| Protein & amino acid | | | | |
| Ninhydrin test | - | - | + | + |
| Resins | + | + | + | - |

2.3 Pharmacological evaluation of plant

2.3.1 Hepatoprotective Activity [17]

Prasad *et al* has studied *guazuma tomentosa* lam., member of sterculiaceae family issued in folk medicine because of its antioxidant, antimicrobial and anti-hypertensive properties. Most of the research work carried out on this plant, 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. 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 agent

2.3.2 Antihypertensive and Vasorelaxing Activity [18]

Magos *et al* performed a study was to investigate the in vivo and in vitro cardiovascular activity of a procyanidin fraction (PCF) obtained from acetone extract of *Guazuma ulmifolia* bark which has traditionally been used as an antihypertensive agent. 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 activity. 10 mg/kg PCF doses orally administered to sugar-fed hypertensive rats decreased both the systolic arterial pressure and the heart rate, whereas the same doses intravenously administered induced arterial hypotension which was attenuated by ng-nitro-l-arginine methylester (l-name 31 mg/kg) pre-treatment. In these experiments we employed carbachol as a positive control test. *Guazuma ulmifolia* bark possesses long-lasting antihypertensive and vasorelaxing properties linked to the endothelium related factors, where nitric oxide is involved.

2.3.3 Cytotoxic Activity [19]

Kashiwada *et al* performed the *in-vitro* cytotoxicity study on human oral epidermoid carcinoma cell using leaf of *Guazuma tomentosa* were evaluated for their cytotoxicities against human tumor cell lines, including malignant melanoma, lung carcinoma, ileocecal adenocarcinoma, epidermoid carcinoma, malignant melanoma, and medulloblastoma cell lines. Selective cytotoxicities against the melanoma cells were also observed for strictinin, pedunculagin, eugeniin,

elaecarpusin, punicacortein C, casuarinin, sanguin h-6, procyanidin b-2 3,3'-di-o-gallate, procyanidin C-1 3,3',3"-tri-o-gallate, and cinnamtannin B1 with ED₅₀ values of 1-4 micrograms/ml. All of the tannins were found to be inactive (greater than 10 micrograms/ml) against lung carcinoma (a-549), ileocecal adenocarcinoma (hct-8), epidermoid carcinoma of nasopharynx (kb), and medulloblastoma (te-671) tumor cells & found 97.3 % growth inhibitions.

2.3.4 Antisecretory Activity [20]

Research study examined antisecretory activity of *Guazuma ulmifolia* bark was examined in rabbit distal colon mounted in a using chamber. Effects 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 40µg/ml. Preliminary phytochemical examinations showed that the most active fraction contains procyanidins with a degree of polymerisation higher than. Rabbit colon was used for study. Positive results were obtained.

2.3.5 Neurological Activity [21]

This research study examine 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 ions. These results suggest that the oral administration of cse or use provides a protective effect against transient ischemia-induced delayed neuronal death by reducing oxidative damage to neurons.

2.3.6 Gastroprotective Activity [22]

The aim of this study was to assess the gastroprotective effects of an aqueous suspension of the ethanolic extract from leaves and flowers of *Guazuma ulmifolia* in a model of acute gastric ulcer induced by diclofenac as ulcerogenic agent, using the proton pump inhibitor omeprazole as a protection reference. This research study shows 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 action. We conclude that the aerial parts of *guazuma ulmifolia* protect gastric mucosa against the injurious effect of NSAIDS mainly by anti-inflammatory and radical-scavenging mechanisms.

2.3.7 Cardiovascular Activity [23,24]

This research study examine hypotensive activity may be due to the ability of bark extracts to inhibit the binding of angiotensin ii to the AT1 receptor. Binding has been inhibited by as much as 50%. This activity is thought to be due to the proanthocyanidins containing epicatechin units. In addition the compound procyanidin b-2 has been documented with blood pressure lowering activity through a decrease of sympathetic tone and direct vasodilatation.

2.3.8 Uterine Stimulant Activity [25]

This research study examines uterine stimulant activity due to the ability of bark ethanol and water extracts have demonstrated uterine stimulant activity in pregnant and non-pregnant animal (rat) studies.

2.3.9 Anti Diabetic Activity [26]

Guazuma ulmifolia Lam (sterculiaceae) is a plant extensively used in Mexico for the empirical treatment of type 2 diabetes. *In vitro* research study on *Guazuma tomentosa* shows that this plant can be used in treatment of type-II diabetes. Study was performed with non-toxic concentrations of *Guazuma ulmifolia* aqueous extracts (GAE) were assayed on adipogenesis and 2-nbdglucose uptake in the murine 3T3-F442a preadipose cell line. Adipocytes and by 24% in insulin-resistant adipocytes, with respect to the incorporation showed by insulin-sensitive adipocytes stimulated with the hormone. *Guazuma ulmifolia* exerts its anti-diabetic effects by stimulating glucose uptake in both insulin-sensitive and insulin-resistant adipocytes without inducing adipogenesis.

2.3.10 Anthelmintic Activity [27]

To evaluate anthelmintic activity of leaf extract of *Guazuma tomentosa*. Anthelmintic activity of alcoholic, aqueous and dichloromethane extract of leaves of *Guazuma tomentosa* were evaluated separately on adult earth worm and compared that with albendazole. The present study provides evidence that the ethanolic and dichloromethane extract of *Guazuma tomentosa* is a potential source of natural anthelmintic compound. Anthelmintic activity may be due to presence of flavanoids, purines and tannins in *Guazuma tomentosa* but further work should be done on the isolation and identification of anthelmintic compound of *Guazuma tomentosa*. Among the three extracts, dcm and alcoholic extracts were found to be potential source of natural anthelmintic compounds as paralysis and death time of this extract is found to be close to albendazole.

2.3.11 Antioxidant Activity [28]

This research study shows antioxidant property of phyllostictasp isolated from *Guazuma tomentosa*. Culture filtrate extracted with ethanol was evaluated *in vitro*. Abts and dpph radicals were used to evaluate their antioxidant activity. Antioxidant components like total phenol and flavonoid were also determined. The ethanolic extract of *Phyllosticta* sp. showed potent antioxidant activity against both abts and dpph radicals with the EC₅₀ value of 580.02 ± 0.57 µg/ml and 2030.25 ± 0.81 µg/ml respectively. Total amount of phenol and flavonoid quantified were of 18.33 ± 0.68 gallic acid equivalents per gram and 6.44 ± 1.24 µg/mg of quercetin equivalent respectively. In conclusion, the culture filtrate of *Phyllosticta* sp. may have potential source of natural antioxidant. In the study demonstrated that endophytic fungus have phenolic and flavonoid content

showed excellent activity of against abts and dpph radicals, could be a source of natural antioxidants.

2.3.12 Anti-Viral Activity [29]

These research studies examine anti-viral activity of methanolic leaf extract of *Guazuma ulmifolia*. A methanol leaf extract at 100 mcg/ml demonstrated *in vitro* weak antiviral activity against the herpes simplex 1 virus. Were prepared and screened for their inhibitory effects on the plaque formation of herpes simplex virus-1 in vero cells.

2.3.13 Anti-Fungal Activity [30]

To evaluate *in vitro* studies ethanol extracts of the bark and fruit between 10 - 25 mcg, demonstrated activity against *Cladosporium cucumerinum* and *Penicillium oxalicum*. After separation of these extracts between CH₂Cl₂ and H₂O the resulting phases were also evaluated.

2.3.14 Anti-Bacterial [31,32]

Bark, leaf and fruit extracts have shown antibacterial activity at a range of concentrations of *Guazuma tomentosa* extract, from 10 mcg - 50 mg or 10 ml - 50 ml. Bacteria the extracts have shown activity against include: *S. Aureus*, *B. Cereus*, *B. Subtilis*, *M. Luteus*, *N. Gonorrhoea*, *E. Coli*, *P. Aeruginosa*, *S. Dysenteriae*, *S. Typhosa*, *S. Pneumoniae* and *S. Pyogenes*. Ethanol extracts demonstrated the greatest activity.

2.3.14 Smooth Muscle Relaxant [33]

This research study examines *Guazuma tomentosa* bark water and ethanol extracts have demonstrated smooth muscle relaxant activity in the rabbit and guinea pig small intestine.

3. Contraindications

Guazuma tomentosa bark has been examined to have uterine stimulant activity and it should not be taken during pregnancy.

Guazuma tomentosa leaves have Examine *in vivo* hypoglycemic effects (in rabbits). People with hypoglycemia or diabetes should only use this plant with the guidance and advice of a health care practitioner.

Guazuma tomentosa leaves contain a small amount (0.14%) of naturally-occurring caffeine. Those sensitive to or allergic to caffeine should not use *Guazuma tomentosa* leaves. *Guazuma tomentosa* bark has not been documented to contain caffeine.

4. Conclusion

Guazuma Tomentosa L. widely distributed throughout India. The plant appears to have a broad spectrum of activity on several ailments. Various parts of plant have Documented Properties and pharmacological evaluation antidiarrhetic, Antibacterial, antifungal, antihyperglycemic, antimicrobial, astringent, anti-

inflammatory, antioxidant, antiulcerogenic, cytotoxic, cardiogenic, diaphoretic, depurative, emollient, febrifuge, hypotensive, hepatoprotective, refrigerant, smooth muscle relaxant, stomachic, styptic, sudorific, vulnerary. Phytochemically plant contains steroids, fatty acids, tannins, flavanoids, glycosides, carbohydrates, essential oil and mucilage. The pharmacological studies reported in this review prove therapeutic value of *Guazuma tomentosa* Lam. However, less information is available regarding clinical and toxicity properties of this plant. Several phytochemical studies have been reported but still it needs to progression. With availability of primary information further studies can be carried out like Pharmacological evaluation, toxicity evaluation and phytochemical screening. The plant is preclinically evaluated to some extent .if these claims are scientifically evaluated clinically, and then it can provide good remedies and help mankind in various ailments.

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