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A SYSTEMIC REVIEW ON PHARMACOGNOSY, PHYTOCHEMISTRYAND PHARMACOLOGICAL SCREENING OF GUAIACUM OFFICINALE

C. Saravanan*, G. Mirunalini, S. Sandhiya and S. Sangeetha

Aadhibhagawan College of Pharmacy, Randham, Vembakkam-604 407, Tamil Nadu.

***Corresponding Author: C. Saravanan**

Aadhibhagawan College of Pharmacy, Randham, Vembakkam-604 407, Tamil Nadu.

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ABSTRACT

Homeopathy, also known as homeopathic medicine, is a medical system that was developed in Germany more than 200 years. It's based on 2 unconventional theories "like cures like" - the notion that a disease can be cured by a substance that produces similar symptoms in healthy person. Guaiacum officinale is the well known homeopathic medicine. The resin used in chronic gout and rheumatism. Aerial parts were used for anti fertility effects. Leaf, seed, twig extract has anti-cancer and anti-infective properties. Rough bark lignum-vitae were listed as an endangered species by the IUCN in 2009. It has been over exploited for its valuable wood and medicinal products. International trade of this species is restricted because of its placement in CITES appendix II. This review article is a sincere effort to put forward the medicinal importance and chemical detail about the plant.

KEYWORDS: Guaiacum officinale, anticancer, anti fertility, anti infective, gout and rheumatism.

INTRODUCTION

A medicinal plant is any kind of plant in which one or more of its organ contains substances that can be used for prevention and treatment of various diseases. Those medicinal plants are used as precursors for the synthesis of useful drugs. Guaiacum officinale is the national flower of Jamaica. It is the genus of flowering plants in the caltrop family. Officinale is a medivel latin epithet means mainly plants that is used in medicine, herbalism, cookery. The genus name originated in Taino.[1-3]

Taxonomy (scientific classification)

Kingdom	:	Plantae
Clade	:	Tracheophytes
Clade	:	Angiosperms
Clade	:	Eudicots
Clade	:	Rosids
Order	:	Zygophyllales
Family	:	Zygophyllaceae
Sub family	:	Larreoideae
Genus	:	Guaiacum
Species	:	Officinale

Fig. 1: Aerial View of Guaiacum officinale.

Synonym: Lignum vitae, Guaiac wood, Guaiac tree, Guaiacum, Guayacan, commoner lignum vitae.

Geographical source: Guaiacum officinale is a native of the West Indian island and South America. It is found in the cost of Venezuela and Colombia and in the West Indies. It is also found in Trivandrum.

Morphology: It is very slow growing small tree, reaching about 10m (33feet) in height with a trunk diameter of 60cm (24inch).The tree is essentially evergreen throughout most of its native range. The leaves

are compound, 2.5 -3 cm (0.98-1.18 inch) in length, and 2 cm (0.79inch) wide. The blue flowers have five petals that yield a bright yellow orange fruit with red flesh and black seeds.

Leaves abruptly paripinnate, with 2 -3 pairs of sessile 1.5- 4.5 cm long, 1.0 – 2.5 broad, elliptic –rotund or obovate, obtuse leaflets, uppermost pair largest leaflets of lowest pair unequal. Flowers showy 2.5 cm across, bluish purple, fading to white, pedicel 1.5 -2 cm long, disc annular, fleshy with nectariferous glands, sepals 5, 2 outer broad, ovate, 3 inner broadly oblong, hairy, purplish green, petals 5, shortly clawed, 12 to 13 mm long, 6-7 mm broad, obovate, mucronate, hairy, bluish purple. Stamens 10, free, equal, filament 6 -7 mm long, bluish purple, 2 loculed, laterally compressed, clavate, with 2 lateral ridges and 2 central furrows; Style twisted, capsule compressed, winged, orange yellow, somewhat retuse, mucronate, 1 seeded by abortion` seeds pendulous, perisperm reddish black.[4]

Pharmacognosy of Guaicum

Total phenolic content, Triterpenoids, saponins, total phenolic contents, azulene, guaiazulene, sodium guaiazulene sulfonate.[6-9]

Total phenolic contents

Plant parts: bark, twig, leaf extracted using different solution (ethyl acetate water and ethanol)

Determination: determined by folin-ciocalteu colorimetry method

Highest phenolic contents: in ethanol acetate twig extracts (20.3+0.0031)

Officigenin: Acidic hydrolysate of the Guaiacum officinale saponins isolate officigenin (a new sapogenin)

Spiracyclicliglignans: Guaiacum officinale heartwood extracts led to identification of four row spiracyclicliglignans named ramonanins A-D.[1-4]

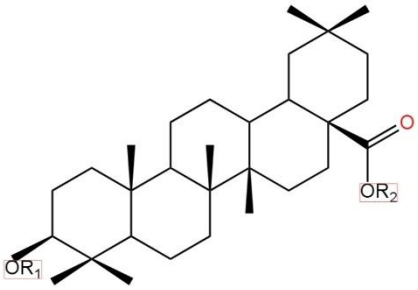

Fig. 2: Oleanolic Acid.

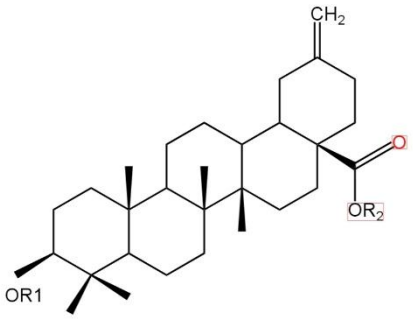

Fig. 3: Akebonic Acid.

Table 1: Phytoconstituents of Guaiacum officinale.[9-15]

COMPOUNDS	R1	R2	R1	R2
Guaianin A	-	-	Rha(1-2) Ara	H
Guaianin A1	-	-	Rha(1-3)Ara	H
Guaianin A2	-	-	Rha(1-2)Ara	H
Guaianin B	-	-	Rha(1-3)Glc	Glc
Guaianin C	Rha(1-3) Glc(1-3) Ara	Glc	-	Glc
Guaianin D	-	-	Rha(1-2)Rha(1-2) Ara(3-1)Glc Rha(1-3)Rha(1-2)	H
Guaianin E	-	-	Ara(3-1)Glc Rha(1-3) Rha(1-2) Ara(3-1)Glc	Glc
Guaianin F	-	-	-	Glc(1-6)Glc
Guaianin P	Rha (1-3) Rha(1-2) Glc (1-3) Ara	Glc	Rha(1-3)Glc(1-3) Rha(1-2)Ara Rha(1-3)Glc(1-3)	
Guaianin Q	-	-	Rha(1-2)Ara	H
Guaianin R	-	-	-	Glc
Guaianin G	Rha (1-3) Rha(1-2) Ara(3-1) Glc Rha (1-3) Glc(1-3)	Glc(1-6) Glc	-	-
Guaianin H	Ara Rha(1-2) Rha(1)	H	-	-
Guaianin I	Ara(1-3) Glc U Ara (1-3) Glc	Glc(1-6)Glc	-	-

Guaianin J	Glc U	Rha(1-2) Rha(1-4) Glc(1-6)Glc Rha(1-2)Rha(1-2) [Glc(1-3)]Ara(1-3)Glc	-	-
Guaianin K	Glc (1-4)	Rha(1-6)Glc(1-6)Glc	-	-
Guaianin L	Glc (1-4) Glc U (3-1)Ara	-	-	-
Guaianin M	-	-	-	-
Guaianin N	Glc(1-3) Ara	H	-	-
Guaianin O	Rha (1-2)[Glc(1-3)]Ara	Glc	-	-
Guaianin S	Glc(1-2) Ara	H	-	-
Guaiacin A	-	-	-	-
Guaiacin B	Glc(1-3)Ara	Glc	-	-
Guaiacin C	-	-	-	-
Guaiacin D	-	-	-	-
Guaiacin E	-	-	-	-
Guaiacin F	Glc (1-2)[Glc(1-2)] Ara	Glc	-	-

Table 2: Extracted saponins from plant parts.

Parts used for extractions	Compounds
 Fig No: 4 Bark of guaiacum officinale	Guaianin A Guaianin A1 Guaianin A2 Guaianin B Guaianin C Guaianin D Guaianin E Guaianin F Guaianin P Guaianin Q Guaianin R
 Fig No:5 Flowers of guaiacum officinale	Guaianin O Guaianin N Guaianin S
 Fig No: 6 Leaves of guaiacum officinale	Guaiacin A Guaiacin B Guaiacin C Guaiacin D Guaiacin E Guaiacin F
 Fig No:7 Fruits of guaiacum officinale	Guaiacin G Guaiacin H Guaiacin I Guaiacin J Guaiacin K Guaiacin L

Pharmacological properties of guaiacum officinale
Anti fertility properties of the hot aqueous extract of Guaiacum officinale
The hot aqueous extract of the aerial part (leaves, flowers, fruits, and tender branches) of Guaiacum officinale Linn (zygophyllaceace) was evaluated for anti fertility effects.

It was observed in more than 50 occasions to induce abortions in rats and mice.

Anti HIV 1 activity of the crude extracts of Guaiacum officinale
A crude extract of leaves, seed, twig of Guaiacum officinale using ethanol as a solvent at room temperature for 48 hrs prove to have an anti HIV properties.

Thrombolytic activity of guaiacum officinale
Guaiacum officinale on in vitro laboratories study reports the thrombolytic activity and the chloroform ethanol extracts of leaves on in vitro laboratory studies report antioxidant activity.

Antibacterial properties of Guaiacum officinale
Active extracts of Guaiacum officinale in ethanol has the antimicrobial potential against pathogenic bacteria.

Anti diabetic properties of Guaiacum officinale
Bark extract of G.officinale is used to treat type 2 diabetes in rats. It significantly improves the level of pancreatic amylase and lipase.

Anti rheumatoid activity of guaiacum officinale
Gua mother tincture (prepared from the latex part of the plant) was administered to make albino wistar rats to treat rheumatoid arthritis induced by freund's complete adjuvant examined through physical urinary serum parameters.

Wound healing potential of guaiacum officinale
Lignum vitae extract was administered topically in an excision wound model of normal and streptozotocin induced type 1 diabetic rats. It resulted in a 47% normal rats and 40.5% (diabetic rats) reduction

Anti cancer property of guaiacum officinale
For the cytotoxic effect MTT assay was used on normal (BHK) and cancerous (HepG2) cell lines.n-Hexane chloroform and ethanol extract of Guaiacum officinale showed absence of toxic effect in normal cell lines. Safer for cancer therapy.

Anti inflammatory activity of Guaiacum officinale
The aqueous ethanolic extract of Guaiacum officinale was only active at 200mg/kg administered before the induction of adjuvant arthritis. The extract reversed the course of adjuvant induced rat paw swelling.

Umbilical endometriosis effect of guaiacum officinale
Guaiacum officinale is used as a homeopathic medicine. In this polytriterpenoids and saponins may influence on hormonal balance. This is used to treat in high efficacy of umbilical endometriosis.

Syphilis treatment by guaiacum officinale
From the guaiac tree a decoction is made, the resulted potion was boiled and the patient was assumed to consume the mixture daily for 30 days. These plants acted as sudoration, diarrhea and the increase in urinary dept.

Treatment of Atopic Dermatitis, Dermatophytes, and syphilis
The leaves of guaiac tree (guaiacum officinale) were boiled into tea, mixed with several other herbs and concentrated. The solution induces diaphoretic and laxative effect.

RESULTS
Over 120 phytochemicals compounds have been characterized and isolated from the leaves, twig, seeds, and various parts of the plant organs, including lignans, phenols, saponins, sapogenins, azulene, guaiazulene, triterpenoids, and sugars using analytical techniques. All the reports pharmacological activities like antioxidant, anti diabetic, thrombolytic,anti HIV,anti fertility, antibacterial, anticancer, wound healing, umbilical endometriosis, syphilis, atopic dermatitis dermatophytes are due to the virtue of these phytochemical compounds.

CONCLUSION
This review mainly highlights the botanical aspect of Guaiacum officinale and its phytochemical constituents, ethnomedinical uses, different pharmacological activities followed by ongoing clinical trials and future prospects. Guaiacum officinale has great importance in homeopathic medicine which is further supported of modern pharmacological studies especially in anti fertility, inflammation and diabetes. Several researches have suggested that Guaiacum officinale extracts and isolated compounds could have a wide therapeutic potency range. More research is needed to uncover key features of Guaiacum officinale in medicinal practice.

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