

A Review of the Bioactive Compounds and Therapeutic Potential of *Couroupita Guanensis* Aubl.

Vijay V. Lokhande^{1*}, Dr. Uday A. Deokate², Lalit R. Bhoje³, Vinod D. Kulkarni⁴, Govind H. Kokani⁵

^{1,3,4}Student, Department of Pharmaceutical Chemistry, Government college of pharmacy, Karad

²Associate Professor, Department of Pharmaceutical Chemistry, Government college of pharmacy, Karad

⁵Student, Department of Pharmaceutics, Government college of pharmacy, Karad

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ABSTRACT

The species *Couroupita guianensis* Aubl is identified. It is not extensively utilized within Ayurvedic and traditional healing practices yet possesses numerous applications. Reap health advantages alongside enjoying an abundance of beneficial compounds found in plants. The objective of this critique is to gather information on various topics. Currently known for their medicinal uses and active chemical components. The profoundly healing effect of therapy is immense. Benefits of the cannonball tree include its medicinal properties such as antibacterial, antimicrobial, and analgesic effects. antimicrobial, antimycobacterial, analgesic, anti-arthritic, anti-biofilm, antidiarrheal, antifertility, antipyretic, reducing stress, combating tumors, soothing ulcers, treating fungal infections, promoting tissue repair, and enhancing immune function. The plant species *C. guianensis* contains significant amounts of substances such as isatin, quercetin, tryptanthrin, and indirubin. Under illumination. Amongst those discussed earlier in the text, this document focuses on current research concerning the therapeutic benefits of substances. And compounds within *Couroupita guianensis*, such as various active components, possess numerous applications.

Keywords: *Couroupita guianensis* Aubl., Bioactive compounds, Anticancer activity, Quercetin, Nerol.

INTRODUCTION

Medicinal plants have played a crucial role in meeting human healthcare needs since ancient times. In addition to basic necessities such as food, clothing, and shelter, plants have maintained a continuous association with human life due to their therapeutic potential. Traditional systems of medicine such as Ayurveda, Unani, and Siddha have extensively utilized plant-based remedies, supported by centuries of empirical evidence and practice. These systems incorporate thousands of herbal formulations and natural drugs, demonstrating the significance of medicinal plants in healthcare. Sharma & Kumar, 2018; World Health Organization, (2019). Among medicinal plants, *Couroupita guianensis* Aubl., belonging to the family Lecythidaceae, is recognized for its notable pharmacological importance. Commonly known as the cannonball tree and referred to as Nagalingapushpa in Tamil, it is widely distributed in tropical regions including South India. The plant is a large deciduous tree reaching up to 20 meters in height, characterized by its distinctive cauliflorous flowering pattern, where fragrant reddish-orange flowers bloom directly from the trunk and major branches.

Various parts of the plant, including leaves, flowers, fruits, and bark, have been traditionally used for the treatment of numerous ailments. Phytochemical investigations have revealed the presence of important bioactive compounds such as glycosides, alkaloids (including isoquinoline derivatives), polyphenols, and other secondary metabolites. These constituents contribute to its diverse biological activities, supporting its traditional use in herbal medicine. Patel et al., (2020). Historically, plant-based preparations such as dried powders and extracts have been employed for treating a wide range of diseases. The continued use of *Couroupita guianensis* in traditional medicine highlights its therapeutic relevance and potential for further scientific validation and drug development.

Plant Profile

Figure 1: *Couroupita guanensis* Aubl



Synonyms of Cannon ball tree

- *Couroupita pedicellaris* Rizzini.
- *Couroupita acrensis* R. Knuth.
- *Couroupita antillana* Miers.
- *Couroupita froesii* R. Knuth.
- *Couroupita guianensis* var. *surinamensis* Eyma.
- *Couroupita idolica* Dwyer.
- *Couroupita membranacea* Miers.
- *Couroupita peruviana* O. Berg.
- *Couroupita saintcroixiana* R.Knuth.
- *Couroupita surinamensis* Mart. ex Berg.
- *Courupita venezuelensis* R. Knuth.
- *Lecythis bracteata* Willd.
- *Pekea couroupita* Juss. ex DC., nom. Inval.^[4]

Vernacular names ^[5]

Table: 1

Languages	States	Name
Common name	-	Cannon ball tree, Snake flower
Hindi	-	Tope Gola, Naglinga, Ayahuma
Gujrati	Gujrat	Kailasapati, Shivalingi

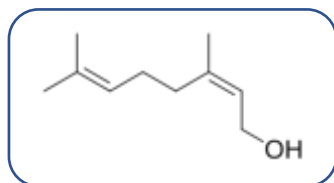
Kannada	Karnataka	Tope Gola, Naglinga, Ayahuma
Malayalam	Kerala	Kailasapati, Shivalingi
Marathi	Maharashtra	Kailasapati, shivalingam
Odia	Orissa	Nagakesara, Nageshwara
Sanskrit	-	Not mentioned
Tamil	Tamil Nadu	Naglingam
Bengali	Bengal	Kaman Gola
Assameses	Assam	Naglingam, Nag-Champa
Telugu	Andra Pradesh	Mallikarjuna, Nagamalli
Telangana	Telangana	Nagalingam

Table: 2

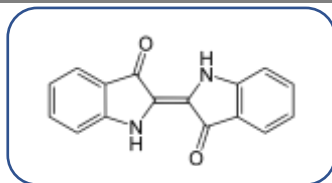
Kingdom	Plantae
Sub Kingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Lecythidales
Family	Lecythidaceae
Genus	Couroupita
Species	Couroupita guanensis Aubl.

CLASSIFICATION OF BIOACTIVE CONSTITUENTS AND THEIR STRUCTURES Priyanka J. (2022)

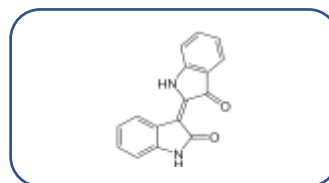
Class of secondary metabolites	Bioactive constituents
Alkaloids	Tryptanthrin, Indurubin, Isatin
Flavonoids	Quercetin
Terpenoids/triterpenoids	Nerol, β -Amyrin, α -Amyrin
Indole derivatives	Indigo, Indirubin



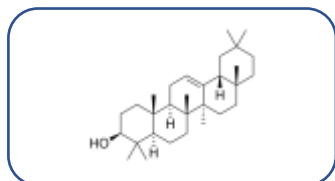
Nerol



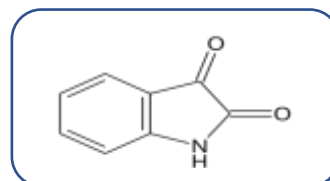
Indigo



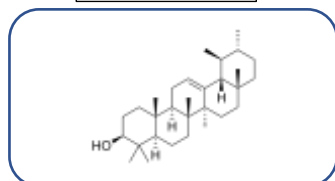
Indirubin



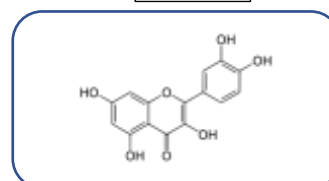
β -Amyrin



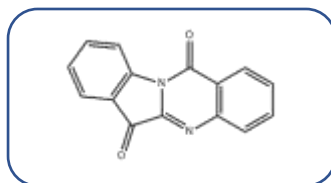
Isatin



α -Amyrin



Quercetin



Tryptanthrin



Pharmacological Potential

Sr.No	Name of the activity	Description
1	Pharmacological action in the brain activity Manimegalai S, (2014).	Those investigations analyzed how an alcohol-based compound impacted outcomes in experiments. <i>Couroupita guianensis</i> (own family: Lecythidaceae) on motor interest, phenobarbital drowsing length, and spontaneous rota-rod performance in mice. According to the preliminary phytochemical studies, the extract contains tannins, flavonoids, alkaloids, and Starches. The dosage of 100 mg/kg, 250 mg/kg, and 500 mg/kg exhibited notable effects. A decrease in voluntary movement activities occurs gradually as dosage increases. Its impact was negligible in terms of improving motor skills measured through the rod test performance. Additionally, those extracts have reduced the

		<p>duration. The introduction of hypnotic effects resulting from pentobarbital administration began. This outcome suggests. The substance in question had an influence on both the cerebral and peripheral systems. The peripheral nervous system requires additional investigation in future studies. The neuropharmacological properties of the plant.</p>
2	<p>Anticancer activity Ajith Kumar et al. (2025)</p>	<p>Employing the MTT test method, researchers analyzed the aqueous alcoholic solution derived from <i>Couroupita guianensis</i> leaves (HAECGL) was tested for cytotoxicity against Human colon adenocarcinoma cells derived from the HCT-116 line. In terms of cells. Viability, proliferation, and cytotoxicity, this colorimetric assay looks At cellular respiration processes. Following a twenty four hour course of therapy, The extract underwent testing across concentrations spanning from 1 to 1000 micrograms per milliliter. Percentage of viable cells was calculated.</p>
3	<p>Wounds healing activity Uppala Pk, (2016), Elumalai A, (2012)</p>	<p>Cells known as connective tissue fibroblasts constitute some of the most abundant varieties found in biological systems. Organisms. In these tissues, which maintain cellular balance under typical conditions, reside specific cell types physiological conditions. Because they provide traction and Mechanical stresses promoting closure of wounds involve contractility driven by cells such as fibroblasts. Myofibroblasts play a crucial role in tissue repair after injury. In cases where cells form aggregates, damaged, fibroblasts become activated and differentiate into myofibroblasts, which produce massive contractions and actively Synthesize ECM components for promoting tissue healing at the injury site. Herein lies the situation. Introduce force technologies into both fibroblasts and myofibroblasts simultaneously. Methods employed in quantifying these molecular interactions. Two outcomes emerged simultaneously. Fibroblastuncation of repair myofibroblast wound healing processes They were selected specifically due to their positive impact on tissue healing processes. Appropriate pressure technology and matrix deposition; however, excessive pressure and matrix manufacturing causes tissue scarring And despite repairs on damaged organs. An ethanol extract of plant leaves. extract containing flavonoids such as 2',4'-dihydroxy6'-methoxy 3',5' dimethylchalcone and 7-hydroxy-5-methoxy-6,8-dimethyl Flavonoids such as flavanones were also present alongside hydroxycinnamic acids like caffeic acid in this compound. Was found capable of stimulating growth in human skin cells called fibroblasts UV absorption. Therefore, understanding how those cells generate Entities capable of implementing suitable approaches will assist in introducing these measures. Effective treatments for wounds within medical facilities. Cells responsible for producing connective tissue fibers proliferate in response to stimuli. essential for wound healing because they promote wound contraction.</p>

4	Anti-stress activity (Geetha M, 2005)	Investigated the stress-reducing properties of <i>Couroupita guianensis</i> on individuals. A methanol-based extract applied at low temperatures mitigates stress responses. Lipid class: glyceride, cholesterol. And cortisol concentrations are assessed to evaluate efficacy. A methanol-based compound alleviates anxiety symptoms. Unlike stress control measures,. Mice receive oral doses of <i>Couroupita guianensis</i> extract in ethanol solution. A dosage regimen consisting of 100 mg/kg, 250 mg/kg, and 500 mg/kg shows notable effects. Gradually reducing each of the dosage levels systematically. The load. The levels of adrenals increased in response to administering cold restraint stress. in large doses.
5	Antidiabetic or antihyperglycemic activity Ramyasai M, (2013), Li B, (2011), Desai Sd, (2018)	A number of <i>Couroupita guianensis</i> components' anti-diabetic properties were examined. Mice given alloxan were administered Floral compounds dissolved in both aqueous and ethanol forms administered at a dosage equivalent to 100 milligrams per kilogram of body weight. weight. Alpha-amylase and beta-glucosidase are two gastrointestinal Enzymes responsible for breaking down carbohydrates which can be inhibited to control metabolism. postprandial hyperglycemia. Type 2 diabetes, insulin resistance, cellular dysfunction, and decreased glucose tolerance are It is widely thought to result from free radicals. Precious metal known for its value and rarity. Nanoparticles made from the leaves of <i>Couroupita guianensis</i> increased lipid peroxidation and antioxidant enzyme activity, including catalase, glutathione reductase, and superoxide dismutase, in diabetic rats, reducing hyperglycemia. The study assessed an individual's ability to avoid becoming obese, revealing a positive result. Discovered. A 100-gram per kilogram of body mass concentration of the plant's methanol solution is being referred to here reduced triglycerides, very-low-density lipoproteins, and general blood cholesterol while increasing excessive density lipoproteins and The levels of low-density lipoprotein cholesterol increase significantly among obese rodents as opposed to lean counterparts. Standard atorvastatin. Additionally, the extract has been demonstrated to decrease the production of atherosclerotic plaques.
6	Anti-ulcer activity M. R. Khan, (2003)	Various treatments for ulcers. Impact observed within an ethanol based solution at concentrations of 150 milligrams per liter. A dosage equivalent to 300 milligrams per kilogram demonstrated notable therapeutic efficacy in <i>Couroupita guianensis</i> . The presence of alcohol-related gastritis leads to these lesions in the digestive tract. Pyloric ligation-produced sores. An interruption of gastric blood supply could occur. The genesis of an ethanol-related gastritis condition may lead to complications. bleeding and narcotic components of tissue destruction.
7	Anthelmintic activity Kim Ym, (2005)	Experiments in test tubes evaluated the antiparasitic efficacy. Among ethanol, acetonitrile, and dichloromethane extractives derived from <i>Couroupita guianensis</i> against the adult

		earthworm <i>Pheritima posthuma</i> (Indian Variation). An investigation into an organism's movement speed was conducted by measuring its locomotion duration. The worms' inability to move indicated their state of being inactive. An alcoholic extract demonstrated superior efficacy compared to chloroform. And acetone's extraction method is effective as well; it exhibits similar efficacy compared to other substances'. common drug piperazine citrate.
8	Immunomodulatory activity Morankar Pg, (2013)	Numerous investigations both within cell culture environments and living organisms indicate that compound CG exerts an influence. (suppresses or activates) immune system components. In both Research revealed that an antibody reacted specifically with sheep red blood cells in conjunction with methanol as a reagent. A sample containing Chinese gallnut leaves underwent testing for allergic responses. Has been found to enhance phagocytosis. Both cell mediated and humoral-mediated immune responses are triggered, and neutrophil phagocytic activity is enhanced.
9	Anti-inflammatory activity Mariana M.G, (2013), Pradhan D, (2009)	<i>Couroupita guianensis</i> ethanol extract was observed to significantly Cut down on the duration devoted to grooming the paws treated in formalin. Throughout both phases of the process. The optimal approach is prevent leukocyte migration into the peritoneal hollow space Following the administration of carrageenan injections involved increasing the dosage levels to 30 mg per dose. And an intake of 100 milligrams per kilogram. At the same time, an intake of 100 milligrams per kilogram was administered. Unquestionably completely prevented mobile migration. The results Prove that the <i>Couroupita guianensis</i> fraction possesses anti-inflammatory properties. The effect, attributed to decreased cell movement, can be understood through two mechanisms: reduced cellular migration. And reduction in cytokine production and inflammatory mediator suppression.
10	Antioxident activity Ajith Kumar et al. (2025)	Employing the H ₂ O ₂ -scavenging technique alongside vitamin C. Compared to conventional benchmarks, this substance exhibits superior antioxidant activity. hydroalcoholic extract of <i>Couroupita guianensis</i> leaves (HAECGL) Was evaluated. The test has been proven effective in determining this information. To what extent do biologically active compounds inhibit hydrogen peroxide? Species capable of inducing oxidative stress and cell injury. Certainly! Here's an appropriately version of your input: The extraction demonstrated an increase in its capacity based on concentration levels. scavenge hydrogen peroxide.
11	Antibacterial and Antifungal activity Khan MR, (2003), Al-Dhabi NA, (2012)	The effectiveness of antibacterial and antifungal properties was confirmed for every member of the <i>C. guianensis</i> preparations. Using the disc diffusion method, <i>C. guianensis</i> leaf extract had encouraging effectiveness against bacteria And mold. Each component demonstrates its efficacy in combating bacteria and fungi. The letter S is known for its

		<p>sharp pointy appearance. Aureus exhibited the greatest inhibition when exposed to the chloroform extract derived from leaves among all tested substances. Sections. In comparison to gram-negative bacteria, <i>C. guianensis</i> leaves exhibit distinct characteristics. The extraction method proved superior in its efficacy against gram-positive pathogens. A great many. Studies reveal that gram-positive microorganisms predominate in certain environments. More susceptible to medicinal plants compared to Gram-negative microorganisms. The numbers twenty-one through twenty-two inclusive have been mentioned previously. The chloroform extract exhibited enhanced antimicrobial properties; thus, this might be true. Constituted by the characteristics of the extracting agent. Effectiveness against microorganisms in leaves. Observations of additional activities were noted as well in this report various microorganisms. The antibacterial properties found in an ethanolic extract derived from <i>C. guianensis</i> fruits was also reported.</p>
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CONCLUSION

The species *Couroupita guianensis* Aubl Is identified by this botanical name. It is an herb of medicinal significance containing numerous active chemical components like. Flavonoids, alkaloids, polyphenols, and terpenes contribute significantly to their diverse array of medicinal properties. Previous research indicates these properties: antioxidative, anti-inflammatory, antibacterial, and antitumoral effects. Verifying its historical therapeutic application. Moreover, additional research will concentrate on establishing standards and assessing safety measures. Clinical verification is necessary.

In summary, *Couroupita guianensis* demonstrates significant promise as a source of novel pharmacologically active compounds. However, its integration into mainstream medicine necessitates extensive multidisciplinary research, including phytochemical standardization, mechanistic studies, preclinical validation, and clinical evaluation. Bridging these gaps will be essential to substantiate its therapeutic claims and promote its rational utilization in modern healthcare systems.

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