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Medicinal properties, pharmacology, and phytochemistry of *couroupita guianensis aubl.*

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Abstract: because of their restorative powers, medicinal plants have made significant contributions to mankind since ancient times. Plant-based medicines' place in healthcare is ensured by key factors such as protection, grade, and performance. The cannonball tree, *couroupita guianensis aubl*, is one of the lecythidaceae family (brazil-nut family). The antibiotic, antiseptic, and anti-inflammatory. The cannonball tree's antipyretic, antifertility, antistress, antiulcer, and antifertility wound healing characteristics have gotten worldwide interest. Almost every part of the tree has been used to treat a variety of ailments in traditional medicine. *C. Guianensis* has been identified to contain a variety of bioactive compounds, including isatin, tryptanthrin, and indirubin. The phytochemistry, ethnopharmacology, morphology, ecology, and toxicological statistics of *c. Guianensis* are all examined in depth in this study. The goal of this observation is to summarise current know-how on *c. Guianensis*' therapeutic effectiveness with the intention to provide a platform for destiny research on antimycobacterial, analgesic, and antiarthritic, antidiarrheal, and anti-biofilm, antimicrobial.

Key-world: couroupita guianensis, phytochemical, pharmacological activity.

Introduction

Traditional remedies are used by approximately 80% of the world's population, according to estimates. Many plants are used as traditional medicine in numerous nations, consisting of india, china, thailand, and sri lanka, to cure a range of diseases. In today's medical studies, plant life is the most vital source of information. Medicinal drug-producing plants may be found all over the international. Almost every component of the plant is being examined for therapeutic benefits, including flowers, fruits, leaves, roots, stems, and seeds. The use of natural goods has become more popular, and energetic plant extracts are regularly evaluated for the development of novel medications[1]. The approach to medicinal plants is largely used in the pharmaceutical, cosmetics, agricultural, and food sectors. Herbal medications are often recommended due to their efficacy, lack of adverse effects, and inexpensive cost. Ayurveda presently employs more than 1000 single medications and over 8000 hybrid compositions with proven efficacy.[2] as a result, indigenous medical systems such as unani, chinese, siddha, and ayurveda have developed.[3]

The plant *couroupita gugianensis aubl.* (family: lecythidaceceae), (figure 1), is well-known for its medicinal and decorative effects. A medicinal herb that is used in popular chinese medicines. Because the cannonball appears in its fruits, it is sometimes referred to as a cannonball tree. It's a tall fleeting tropical evergreen tree with a special flower and fruit that's widely used as a decorative plant.[4] because the bushes have been overexploited for wood, habitation, and agriculture in the past, they are now classified as endangered medicinal plants by the international union for conservation of nature (iucn). It is revered as a holy tree in india. The administration of puducherry, india's union territory, has designated its flower as the state flower only a few *c. Guianensis* reviews have been published thus far (cg).[5] those opinions go through the phytochemistry and pharmacological characteristics of *c. Guianensis* in great depth. A detailed literature review is included in the current study. A search of the databases pubmed, google scholar, science direct, and others on the internet, you may find articles, reviews, and other scientific and literature-related material up to 2018: *c. Guianensis*-related chapters and summaries botanical classification, distribution, and other details are all available here. More recent information on morphology, phytochemistry, biological activity, and study outcomes from *c.guianensis.* The cannonball tree grows in deep tropical rainforests at some stage in northeastern, and south us, specifically inside the amazon basin. This species may be found in important us (costa rica, panama), western south the usa (colombia, peru, ecuador), and brazil.[6] its origins are idea to be in india, sri lanka, and malaysia. It is commonly cultivated over india's unembellished. Its miles are often used as a decorative tree in the botanical garden and as sacred trees in lord shankar temples. The curving staminal shield encircling the pistil of the flower is used in lord shankar worship as it resembles a linga, a holy snake that guards lord shankar.[7] south american shamans, nigerian farmers, and kailasagirikona forest range farmers. The tree is loved by the yanadi community in the seshachalam biosphere restricted wooded area in andhrapradesh, india (chittoor district), and the population of gournadi upazila in bangladesh (barisal district,). It grows along the sides of roadways in a number of bangladeshi areas.[8] *couroupita guianensis* is a large, fast-growing tree that may reach 30-35 meters in height. Leaves are easy, alternating, rectangular or rectangular-ovate, up to 10 cm in length, with a whole to barely serrate margin, a short petiole, and bushy veins under. They may be managed in whorls at the belief of the picture. The cauliflorous inflorescence and racemose of the tree are 3 meters long. The racemose inflorescence that grows from the stem and big branches is seen. The flowers are large and beautiful, with colours ranging from orange to scarlet to pink, with a pleasant perfume that lasts almost all year. They have a strong scent, which is especially noticeable late at night and early in the morning. The fruit is a big, reddish-brown globose that measures 15-24 cm in diameter and has a woody capsule with 200-300 seeds per capsule.[9] the stamens are organized in a ring that begins at the ovary's base and bends over to form a coiled fleshy androphore. Although the bulk of the stamens is fertile, there are a few abortive stamens towards the base of the ovary's ring. There are 5-7 cells in the ovary and a considerable number of ovules. The blossoms mature into big reddish-brown, round, woody, indehiscent amphisarcun (double meaty) resulting in a 15-24 cm diameter hard shell. The tree grows probably 150 culmination and in about 12 months, or more or less 18 months. Every fruit is more or less 360 kilos in weight. The pulp becomes bluish-green when exposed to oxygen. Because of its high sulfur concentration, it has a strong ordo. As a result, fruits are occasionally

consumed, regardless of their taste. The plant is grown from seeds. The seeds, on the other hand, are supposed to be stubborn and have a short lifespan.[10] in india, it is also classified as a rare flower and tree, containers and utensils are made from hard shells. In sri lankan buddhist tradition, cannonball flowers have unique importance. It's known as the nagalingam flower in tamil nadu. The shankar lingam form is apparent in the middle of the blossom, and this flower is known for its snake-shaped pollen and pleasant aroma. Shankar pooja may be performed using this unique flower. The plant is local to the guianas jungle in north-eastern south of the usa; it is a fava decorative inside the caribbean and siuthest asian botanic gardens, and it's far categorized as an unprecedented tree and flower in india. [11]

Figure no. 1 ***couroupita guianensis Aubl***

Tab1: Taxonomical type of ***couroupita guianensis***

Kingdom	Plantae
Sub kingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Lecythidales
Family	Lecythidaceae
Genus	Couroupita
Species	Couroupita guianensis aubl
Synonyms	Couratori pedicellariae, Couroupita froesii, Couroupita idolica, Couroupita membranacea, Couroupita peruviana, Lecythis bracteata, Pekea couroupita

Origin, distribution, and morphology

Fruits are fit for human consumption and seldom eaten, despite the fact that the stench of chicken deters the general public; fruit shells are on occasion used like utensils; various fractions of the stem, bark, and flora suggest an antibacterial hobby. Antioxidants and antimicrobials are investigated in several sections of the plant, including the leaves. Leaves have long been used as an antibacterial and toothache remedy. The fruit pulp, bark, and flowers contain antibacterial and fungal properties and are utilized in medicine. Antifungal, antibiotic, and analgesic antiseptic properties are all found in the cannonball tree. Colds and stomach aches are treated with the trees. The leaf juice is used to heal pores and skin issues, and south american shamans have even applied tree additives to treat malaria.

The insides of the fruit can also disinfect wounds, and the younger leaves assist relieve toothache. It's widely utilized as an anti-inflammatory treatment in ayurveda. The flowers' volatile oils have antibacterial and antifungal qualities. Chemical studies of this species revealed the presence of β-amirin, α-amirin, β-sitosterol, nerol, tryptanthrine, indigo, indirubin, isatin, linoleic acid, carotenoids, and sterols. It's miles one of the substances in many arrangements that remedy gastritis, scabies, bleeding piles, dysentery, scorpion poison, and many more (when triterpenoid esters of fatty acids such as α-amirin palmitate were described, it was feasible to discover eugenol, linalool, and (e, e)-farnesol in flowers. Indirubin is a purple 3,20bisindole that is found in natural indigo.[12]temperature, humidity, rainfall, and light, as well as other factors like soil nutrients, all have an effect on phytochemistry. Bioactive chemicals are synthesized in plants.

Phytochemicals screening

C. Guianensis have been discovered and isolated in investigations from a variety of branches of the tree. Terpenes, flavonoids, and other chemicals are among the compounds found in terpenes. All phytosterols, alkaloids, and phenolic acids are taken into consideration. The cannonball plant is the most frequent sort of component that may be discovered. Couroupitine a was extracted from petroleum ether extract while couroupitine b was obtained from chloroform extract of dried and powdered fruits, but the alkaloid, tryptanthrin, and indirubin content of cannonball trees remains unknown. The chemical composition of the body varies as it matures. Adult fruits, for example, have more anthocyanin than young fruits, while young fruits have more anthocyanin than adult fruits.[13]

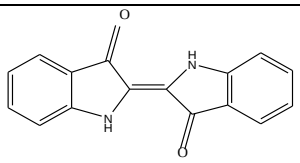
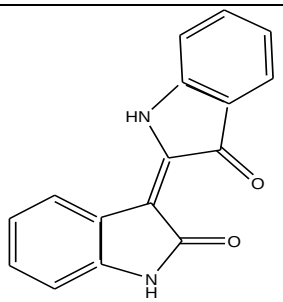
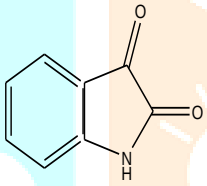
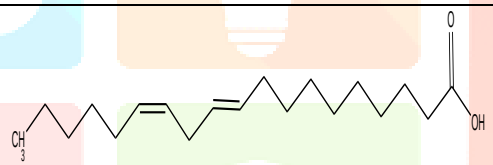
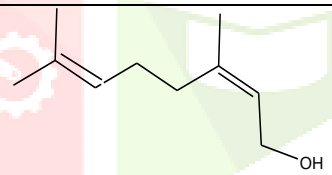
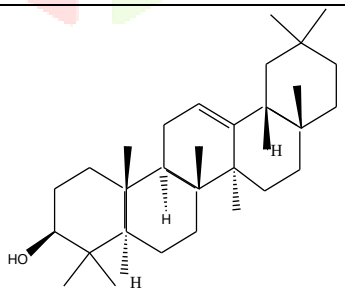
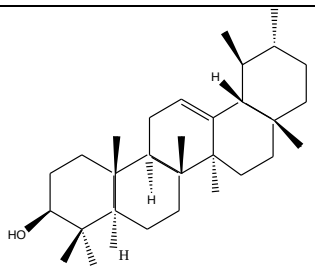
Tab 2: Starting place and developing circumstance of ***Couroupita guianensis***.

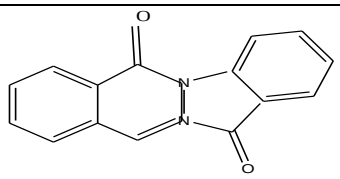
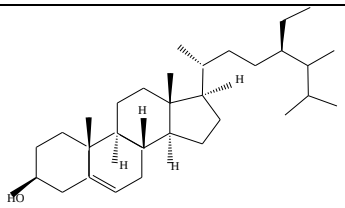
Origin	Honduras to northern South America to Peru
Zone	10a-12b, 28^0 F minimum
Growth rate	Fast
Flowering rate	March- September
Flowering month	Not identified
Leaf persistence	Briefly deciduous
Messiness	high
Salt tolerance	Low
Drought tolerance	medium
Nutritional requirements	Medium
Typical dimensions	70×45’
Uses	Park, shade, specimen

Tab 3: Description of ***Couroupita guianensis***[14]

Part of plant	Description
Leaves	easy, alternate, narrowly elliptic to 10 inches lengthy and 4 inches huge
Flowers	6 petals, orange-red with white central disk held on racemes.
Fruits	Capsules, globose, brown, 4-8 inches in diameter, contains up to 300 seed. The weight of the mature fruit is approximately 1450gm.

Tab 4; chemical name and struturee ***couroupita guianensis***

Chemical name	structurer
indigo	
Indirubin	
Isatin	
Lineolic acid	
Nerol	
β-amyrins	
α-amyrins	

Tryptanthrine	
β-sitosterol	

Biological activities

Anti-inflammatory activity

The ethanol extract of *couroupita guianensis* found that the extract fraction substantially decreased the time spent licking the formalin injected paw within the first and second stages.[15] After carrageenan injection, simplest the higher dosages (30 and 100mg/kg) had been powerful to save you leukocyte migration into the peritoneal hollow space. Simultaneously, the one–hundred mg/kg dosage without a doubt absolutely stopped mobile migration**.** The finding exhibits that the *couroupita guianesis* fraction has an anti-inflammatory effect, that's attributed to a decrease in cellular migration in addition to an inhibition of the era of cytokines and anti-inflammatory mediators.[16] to investigate various floral and bark extracts of *couroupita guianensis aubl* for their potential as an analgesic and anti-inflammatory agent. The reduction in carrageenan-induced hind paw edema was utilized to screen for anti-inflammatory activity and evaluate analgesic effectiveness. The effectiveness of several flower and bark extracts was evaluated in comparison to paracetamol. (200 mg/kg) for analgesic effects and (ii) indomethacin (10 mg/kg) for anti-inflammatory effects. All *couroupita guianensis* formulations had analgesic and anti-inflammatory properties. While the analgesic effect of bark extracts peaked after two hours, that of flowers peaked after one hour. The extracts' strongest anti-inflammatory activity was shown three hours later. C. Guianensis has similar analgesic and anti-inflammatory properties to paracetamol and indomethacin, respectively. Consequently, it can be recommended further[17]

Antimicrobial activity

The antibacterial and antifungal activity of the methanol and aqueous extracts of the *c. Guianensis* leaf was tested using the good diffusion method in opposition to 6 human pathogenic micro-organisms and 4 fungal infections. The zone of inhibition against different kinds of harmful bacteria and fungi. Against bacterial and fungal infections, the methanol extract outperformed the aqueous extract. In the antinociceptive activity generated by cee and butanol fraction, a zone of inhibition against bacterial pathogens was detected.[18] extracts from the tissues of *couroupita guianensis aubl*. Were tested for antibacterial activity against 12 gram-positive, 12 gram-negative, and one protozoan bacteria. The growth of the microorganisms was inhibited by methanol extracts from the plant's leaves, flowers, fruit, stem and root barks, and stem and root

heartwood. This phenomenon was enhanced by further fractionation of the methanol extracts into petrol, dichloromethane, ethyl acetate, and butanol soluble fractions. The flowers, fruit, and stem bark fractions in petrol, ethyl acetate, and dichloromethane, as well as the stem and root bark fractions, saw the most activity. Some stem bark and floral fragments had antifungal properties.[19]

Anti-ulcer activity

The anti-ulcer et al action in the ethanolic extract at a dose of couroupita guianensis 150 and 300 mg/kg exhibited considerable prevention of the stomach lesions created by pylorus ligation-brought on ulcer and ethanol-brought about the gastric ulcer. The creation of an ethanol-induced gastric lesion may be owing to a halt in stomach blood flow, which leads to the development of bleeding and narcotic elements of tissue damage[19]

Immunomodulatory activity

Cg has been shown to affect (suppress or activate) immune system components in both in vitro and in vivo investigations. Both investigations used sheep red blood cells as the antigen and examined methanol extract of cg leaves for hypersensitive responses. It has been discovered that it boosts phagocytosis. It improves neutrophil phagocytic activities and activates both a cell-mediated and humoral-mediated immune response.[20]

Anthelmintic activity

The anthelmintic activity of chloroform, acetone, and ethanolic floral extracts of *couroupita guianensis* against the adult earthworm pheritima posthuma was tested in vitro (indian variety). The activity was measured using a worm motility experiment, which required timing the worms' paralysis and death. The activity of the alcoholic extract was equivalent to that of the standard medication piperazine citrate, and it was shown to be more effective than the chloroform and acetone extracts.[21]

Pharmacological action in the brain activity

The effects of a methanolic extract of *couroupita guianensis* (own family; lecythidaceae) on spontaneous rota-rod performance, motor interest, and phenobarbital drowsing length in mice were investigated in these paintings. The extract contained glycoside, alkaloid, flavonoid, and tannins, in step with the initial phytochemical research. The extract (a hundred 250, and 500mg/kg) extensively reduced spontaneous motor hobby in a dose-dependent way however had no effect on motor coordination as measured with aid of rotarod overall performance. The onset and period of pentobarbitone-induced hypnosis have been likewise decreased through those extracts. These findings suggest that the extract covered an agent than acted on both the central and peripheral neural systems and that the plant’s neuropharmacological homes ought to be investigated further.[22]

Antidiabetic and antihyperglycemic activity

The anti-diabetic efficacy of several components of *couroupita guianensis* was investigated. Alloxan-induced mice were given 100mg/kg body weight of aqueous and ethanolic extracts from flowers.[23] controlling postprandial hyperglycemia, which may be carried out by way of blocking off gastrointestinal carbohydrate hydrolyzing enzymes including alpha-amylase and beta-glucosidase, is one of the remedy alternatives for diabetes.[24]cellular disorder, insulin resistance, reduced glucose tolerance, and type2 diabetes are all thought to be a result of reactive oxygen species. In diabetic rats, gold nanoparticles derived from *couroupita guianensis* leaves boosted lipid peroxidation and antioxidant enzyme pastime consisting of superoxide dismutase, glutathione reductase, and catalase, relieving hyperglycemia. The anti-obesity capacity of *couroupita guianensis* turned into investigated, and a positive result was located. When compared to the usual, atorvastatin, the methanolic extract (a hundred,200mg/kg frame weight) of the plant decreased general blood cholesterol, triglycerides, very-low-density lipoproteins, and raised excessive density lipoproteins and low-density-lipoproteins, in overweight rats. Furthermore, the extract changes into shown to reduce the manufacturing of atherosclerotic plaques.[25]

Healing action for wounds activity

Connective tissue fibroblasts are one of the maximum common cellular types. Underneath everyday physiological situations, those cells are in fee tissue homeostasis. Both fibroblasts and myofibroblasts are critical in wound recovery due to the fact they generate traction and contractile forces, which assist the wound recovery due to fact they generate traction and contractile forces, which assist wound contract. The tactics of force technology in fibroblasts and myofibroblasts, as well as methodologies for measuring such cellular forces, are the situation of this text tissues are injured, fibroblasts become activated and differentiate into myofibroblasts, which produce large contractions and actively produce ecm proteins to aid wound closure. The twin outcomes of fibroblastuncation of repair myofibroblast wound healing processes were selected especially because a suitable amount of pressure technology and matrix deposition is beneficial for wound restoration; but, excessive pressure and matrix manufacturing effects in tissue scarring and even malfunction of repaired tissues. As an end result, knowing how those cells create forces what know of pressure they produce may assist to pressure the introduction of the suitable tactic's for more a success tissue wound remedies in clinical settings.[26]another study found that a hydroethanolic leaf extract containing flavonoids like 2′,4′-dihydroxy6′-methoxy-3′,5′-dimethylchalcone, and 7-hydroxy-5-methoxy-6,8-dimethyl flavanone, as well as the phenolic acid 4-hydroxybenzoic acid, stimulated human skin fibroblast proliferation and promoted uv absorption. By increasing wound contraction, fibroblasts play a crucial role in wound healing .[27]

Anti-stress activity

Investigated *couroupita guianensis's* antistress efficacy in the methanolic extract by using cold restricts stress (rs). They evaluate things like glyceride, sterol, and glucocorticoid levels to see how effective methanolic extract is in reducing stress. While as compared to strain management, animals are given methanolic extracts *couropita guianensis* at doses of one hundred mg/kg,250mg/kg, 500mg/kg considerably reducing all three dosages in a dose-structured manner. At a high dosage of cold restraint stress, the weight of the adrenal glands increased.[28]

Other activities

In addition to the pharmacological activity, several biological properties of *couroupita guianensis's* extracts have been examined, antiarthritic, antidiarrheal, and antifertility, urolithiasis is a commonplace sickness wherein the urogenital tract substance in urinary stones. Stones from uric acid, struvite, and cysteine are much less commonplace. Aqueous extract from couroupita guianensis laves has the capacity to dissolve 40.8,0.032 percentage calcium oxalate in vitro, in accordance with the analysis.[29] a similar study determined that a methanolic extract made from *couroupita guianensis* leaves inhibited the formation of struvite crystals, as assessed by way of a lower crystal weight from 2053g to 0.18g moreover, as compared to edta, aqueous and chloroform extracts received from *couroupita guianensis* leaves validated a more potent anti-coagulant pastime by using growing the prothrombin time.[30]adp-precipitated human platelet aggregation changed into in addition decreased by using *couroupita guianensis* leaves in a dose-dependent way, reducing the risk of atherosclerosis formation and progression synthetic hormones make up most of the people of antifertility pills.[28]those pills are made of progesterone derivatives or an aggregate of progesterone and estragon derivatives. Plant-based anti-fertility drugs are probably a capacity option. To test for anti-fertility results, person female rats has been administered different solvents extracts from *couroupita guianensis* bark and vegetation. Each flower and bark had been mentioned to have an effect on the estrous cycle and decrease the frequency of implantations in pregnant rats by way of interfering with the receptive stage of the uterus and endometrial sensitivity for decidualization. The antidiarrheal impact of *couroupita guianensis* leaves on castor oil-prompted diarrheal became investigated in albino rats using aqueous and methanolic extracts at a concentration of a hundred mg/kg body weight. The test located those diarrheal episodes had been appreciably reduced when compared to the same old treatment, loperamide. Hyperuricemia is a situation that increases the hazard of gout and gouty arthritis. The avital enzyme concerned with the formation of uric acid is a xanthine oxidase. When in comparison to conventional, allopurinol, the degree of inhibition of xanthine oxidase through couroupita guianensis fruit extract become proven to be concentration-established with the most inhibition of 79.97 percent at 400g/ml.[31]

Toxicology of *couroupita guianensis*

The toxicology of *couroupita guianensis* was studied in only some research. The intense toxicity of *couroupita guianensis* methanolic flower extract and ethanolic leaf extract turned into investigated the usage of albino mice. There has been no indication of mortality or behavioral troubles when mice had been fed methanolic flower extract and ethanolic leaf extract orally up to a maximum of 2 g/kg and 3 g/kg, respectively. Consistent with studies, higher doses can be vital, but further studies are wanted to find the proper amount.

Conclusion

This review emphasizes the study's exploration of *couroupita guianensis* in great detail, which will benefit future research efforts. The biological actions described in this look at validating nearly all of the conventional applications of *couroupita guianensis*. *Couroupita guianensis* has a number of bioactive components, including isatin, indirubin, and tryptanthrin, according to phytochemical composition studies. More research is needed to determine its acquired biological activity, particularly on the mechanism of action, the extraction and purification of active components, and pharmacokinetics. Toxicological testing and more in vivo studies also are required to verify its efficacy and protection, which will allow it to be employed as a pharmaceutical source in the near future.

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