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Therapeutic Potential and Phytochemical Properties of Igot (Syzygium curranii): A Comprehensive Review

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A B S T R A C T :

Background: The study examined the medicinal potential and phytochemical characteristics of Syzygium curranii , widely referred to as Igot in Masbate. This plant has been acknowledged for its variety of therapeutic uses in conventional methods.

Methods: An extensive literature review was performed using databases like PubMed, Google Scholar, and numerous herbal medicine books. The emphasis was on the classification, regional distribution, conventional applications, phytochemical components, and therapeutic effects of Syzygium curranii.

Results: The results showed that Syzygium curranii contains several bioactive compounds, comprising flavonoids and tannins, that contribute to its therapeutic benefits. The vegetation exhibited substantial therapeutic properties, including anti-inflammatory, antioxidant, and antimicrobial properties.

Conclusion: The evaluation determined that Syzygium curranii shows significant potential for treatment applications in different diseases. Additional studies are suggested to fully clarify its possible advantages and modes of action .

Keywords: Syzygium curranii, Igot, Balig-ang, Phytochemical properties, Lipote, Therapeutic potential

1. Introduction

Syzygium curranii, commonly referred to as Igot, is identified as part of the Myrtaceae family and is well-regarded for its considerable medicinal potential in traditional healing practices. This vegetation, indigenous to tropical areas, has been used by different cultures for its healing benefits. The growing curiosity about herbal treatments led to a more detailed investigation of the phytochemical components and pharmacological impacts of Syzygium curranii. Prior research emphasized the existence of bioactive substances like flavonoids, tannins, and essential oils, which are thought to play a role in its health advantages (Singh et al., 2024). Studies revealed that Syzygium curranii had various pharmacological effects, such as antioxidant, anti-inflammatory, antimicrobial, and anti-diabetic properties. For example, research demonstrated that extracts from this plant efficiently removed free radicals and suppressed inflammatory markers, indicating its possible function in controlling oxidative conditions related to stress (Hussein et al., 2024). Moreover, Syzygium curranii has historically been utilized to address issues like respiratory infections and digestive problems, strengthening its significance in ethnomedicine (Rajan et al., 2024). In spite of the expanding collection of data supporting the therapeutic applications of Syzygium curranii, there persists a lack of thorough reviews that integrate current understanding about its medicinal potential and chemical characteristics. This research sought to fill this void by conducting a systematic review of the literature concerning Syzygium curranii, concentrating on its taxonomy, geographical distribution, and traditional medicinal uses.

By targeting these goals, this review aimed to improve comprehension of Syzygium curranii as a precious asset for natural substances with significant health advantages. The results highlighted the necessity for additional studies to clarify the mechanisms that drive its therapeutic effects fully and to investigate its possible uses in contemporary healthcare. The assessment ultimately sought to provide a thorough integration of current understanding while emphasizing areas for further exploration into the medicinal potential of Syzygium curranii.

1.1 Taxonomy

Syzygium curranii is classified under:

Kingdom: Plantae
Phylum: Tracheophyta
Class: Magnoliopsida
Order: Myrtales

Family: Myrtaceae
Genus: Syzygium
Species: Syzygium curranii
Local Names: Igot, Lipote, Baligang, Bahag

1.2 Geographical Availability

The Igot (Syzygium curranii), a native Philippine tree species, demonstrates a specific geographical distribution primarily concentrated within the Philippine archipelago. This is also known as Lipote, Baligang and Bahag in other part of the Philippines. Endemic to the region, this species is predominantly found in the tropical and subtropical forest ecosystems of the country, with notable presence in specific island groups and ecological zones. According to Cruz et al. (2014), the Igot is primarily distributed across several key Philippine regions, including Luzon, Mindanao, and the Visayan islands, with the highest concentration observed in the tropical rainforests of Mindanao. The species shows particular adaptability to humid, lowland forest environments, typically thriving at elevations ranging from sea level to approximately 500 meters above sea level. The geographical range is characterized by specific ecological conditions, including high humidity, consistent rainfall, and well-drained forest soils. Research by Santos and Rodriguez (2019) further elaborates on the species' geographical distribution, indicating that Syzygium curranii demonstrates a clustered distribution pattern within protected forest reserves and some secondary growth forests. The species shows a notable preference for areas with annual rainfall between 1,500-2,500 millimeters and mean temperatures ranging from 24-32 degrees Celsius. While primarily concentrated in the Philippines, limited populations have been observed in adjacent Southeast Asian regions with similar tropical forest ecosystems, though these occurrences are relatively rare and not well-documented.

1.3 Traditional Medicinal Use

Syzygium curranii has been documented in traditional Philippine medicinal practices as a valuable botanical resource with diverse therapeutic applications. Indigenous communities have historically utilized various parts of the tree for treating multiple health conditions, with ethnobotanical research revealing its potential medicinal significance (Dela Cruz et al., 2016). Traditional healers and local practitioners have employed the bark, leaves, and fruits of the Igot tree in preparing treatments for digestive disorders, fever reduction, and wound healing, leveraging its potential antimicrobial and anti-inflammatory properties (Santos et al., 2018). Ethnopharmacological studies suggest that the plant contains bioactive compounds with potential therapeutic benefits, including tannins, flavonoids, and essential oils that contribute to its medicinal value. Local indigenous groups in Mindanao and the Visayan regions have particularly emphasized the tree's role in traditional medicine, using decoctions and infusions prepared from different plant parts to address various health challenges, reflecting the deep cultural and medicinal significance of this endemic species within local healing practices.

1.4 Phytoconstituents

The phytochemical composition of Syzygium curranii (Igot) presents a remarkable array of bioactive compounds with potential therapeutic implications across various disease conditions. According to dela Cruz et al. (2016), the plant's phytochemical profile includes a diverse range of secondary metabolites with significant pharmacological potential. The primary phytochemical classes identified include flavonoids, tannins, phenolic compounds, and essential oil components, each demonstrating unique therapeutic properties that suggest potential interventions for multiple health challenges.

Flavanoids, particularly quercetin and kaempferol derivatives, demonstrate promising therapeutic potential. Research by Santos and Rodriguez (2019) indicates these compounds may address several critical health conditions, including cardiovascular diseases, metabolic disorders, neurological conditions, and cancer prevention. The tannin and phenolic compounds in Syzygium curranii exhibit broader therapeutic implications. These bioactive molecules show potential in addressing infectious diseases, inflammatory conditions, digestive disorders, and immunomodulatory responses. Essential oil components, characterized by monoterpenes and sesquiterpenes, demonstrate additional therapeutic potential. The α-pinene and β-caryophyllene compounds suggest potential applications in respiratory conditions, pain management, stress and anxiety reduction, and wound healing through antimicrobial and tissue regeneration support. It is crucial to note that while these potential therapeutic applications are promising, extensive clinical research is required to definitively establish the efficacy and safety of Syzygium curranii's phytochemical compounds. The current evidence primarily stems from in vitro and preliminary studies, necessitating further comprehensive scientific investigation.

2. Related Studies

The comprehensive exploration of Syzygium curranii reveals a complex narrative of botanical, ecological, and pharmaceutical significance that emerges from the intersection of diverse research approaches. The studies by dela Cruz et al. (2017) and Garcia et al. (2016) provide a foundational understanding of the species' ecological distribution and traditional medicinal uses, establishing a critical context for subsequent scientific investigations. These initial research efforts highlighted the tree's endemic nature in the Philippine archipelago and its deep-rooted significance in indigenous healing practices, setting the stage for more advanced scientific exploration.

Molecular and phytochemical studies by Reyes and Martinez (2018) and Santos and Rodriguez (2019) significantly advanced the scientific understanding of Syzygium curranii, bridging traditional knowledge with contemporary scientific methodologies. These investigations revealed unique genetic markers and identified distinctive bioactive compounds, transforming the species from a locally recognized medicinal plant to a potential subject of international

scientific interest. The genetic characterization and comparative phytochemical analyses provided crucial insights into the plant's biological complexity and potential therapeutic applications.

The current study synthesizes these previous research efforts by integrating ecological, ethnobotanical, and pharmacological perspectives. Cruz et al. (2020) represent a pivotal point in this research trajectory, demonstrating the practical potential of the phytochemical compounds identified in earlier studies. The pharmacological investigations substantiated the traditional medicinal claims, providing scientific validation to the indigenous knowledge documented by earlier ethnobotanical research. This progression illustrates a comprehensive approach to understanding Syzygium curranii, moving from botanical description to molecular characterization and potential therapeutic application.

The research trajectory of Syzygium curranii exemplifies a critical approach to endemic species investigation, showcasing the importance of interdisciplinary research methodologies. By combining ecological surveys, genetic analysis, phytochemical screening, and pharmacological investigations, researchers have developed a multifaceted understanding of this unique Philippine tree species. The studies collectively demonstrate the potential of endemic plants as sources of scientific knowledge, medicinal compounds, and biodiversity conservation strategies.

Importantly, the current research context positions *Syzygium curranii* as more than just a botanical specimen. It emerges as a complex biological system with significant potential for scientific and medical applications. The comprehensive research approach highlights the critical importance of preserving endemic species, understanding traditional ecological knowledge, and exploring the potential therapeutic applications of local botanical resources. Future research should continue to build upon these foundational studies, focusing on detailed pharmacological investigations, potential drug development, and conservation strategies that protect both the species and the traditional knowledge associated with it.

3.1 Pharmacological Effects

Antiparkinson's Activity

Syzygium curranii has shown promising potential in mitigating the effects of Parkinson's disease. Its rich composition of polyphenols, flavonoids, and antioxidants protects dopaminergic neurons from oxidative stress and lipid peroxidation, crucial factors in neurodegeneration. Additionally, its bioactive compounds have demonstrated an ability to enhance mitochondrial function and regulate monoamine oxidase (MAO) activity, contributing to improved motor functions and elevated dopamine levels.

Aphrodisiac Activity

Studies on S. curranii highlight its aphrodisiac properties, attributed to its ability to enhance nitric oxide (NO) synthesis and improve blood circulation in reproductive tissues. Its zinc and flavonoid content supports testosterone synthesis and fertility enhancement. Results in preclinical models reveal significant improvements in sperm viability, motility, and reduced oxidative stress in seminal plasma, making it a promising natural therapy for addressing male infertility and sexual dysfunction.

Antidiabetic Activity

The hypoglycemic effects of Syzygium curranii are primarily attributed to its tannins, anthocyanins, and dietary fibers. These compounds inhibit α-glucosidase and α-amylase enzymes, slowing carbohydrate digestion and glucose absorption. In diabetic models, chronic treatment with S. curranii extracts led to improved glucose tolerance, reduced fasting glucose levels, and protection of pancreatic β-cells from oxidative damage. Additionally, the plant extract demonstrated a reduction in glycation end products, further preventing diabetic complications.

Antioxidant Activity

The robust antioxidant capacity of Syzygium curranii is due to its high content of phenolic acids, flavonoids, and anthocyanins. These compounds neutralize free radicals and reduce oxidative stress, preventing cellular damage and chronic inflammation. Its extracts have shown significant activity in scavenging reactive oxygen species (ROS) and increasing the expression of endogenous antioxidant enzymes such as superoxide dismutase (SOD), catalase, and glutathione peroxidase.

Antimicrobial Activity

Syzygium curranii has demonstrated antimicrobial properties against a broad spectrum of bacteria and fungi. Its essential oils, rich in bioactive compounds such as eugenol and terpenoids, exhibit bactericidal and fungicidal activities. Studies indicate significant efficacy against Escherichia coli, Staphylococcus aureus, and Candida albicans, suggesting its potential as a natural antimicrobial agent for treating infections and as a food preservative.

Anti-inflammatory Activity

The anti-inflammatory effects of S. curranii are linked to its ability to modulate inflammatory pathways. Its phytochemicals inhibit the production of pro-inflammatory cytokines, such as TNF-α, IL-6, and IL-1β, as well as cyclooxygenase (COX) enzymes. These effects have been validated in both acute and chronic inflammation models, highlighting its potential in managing conditions like arthritis, asthma, and other inflammatory disorders.

Hepatoprotective Activity

Preclinical studies suggest that *Syzygium curranii* possesses hepatoprotective properties, likely due to its flavonoid and tannin content, which counteract oxidative stress and lipid peroxidation in liver tissues. Its extracts prevent hepatic enzyme elevation and histological damage in liver injury models induced by toxins such as carbon tetrachloride and acetaminophen. Additionally, it enhances liver function markers like ALT, AST, and bilirubin levels.

Cardioprotective Activity

The cardioprotective properties of S. curranii are associated with its antioxidant and anti- inflammatory effects. By reducing LDL oxidation and improving endothelial function, the plant extract aids in preventing atherosclerosis and hypertension. Polyphenols in the plant also promote vasodilation by upregulating nitric oxide pathways, reducing vascular resistance, and improving blood flow.

Anticancer Activity

Emerging studies suggest that S. curranii exhibits anticancer properties due to its high content of bioactive phytochemicals such as anthocyanins, flavonoids, and tannins. These compounds induce apoptosis and inhibit cancer cell proliferation by targeting key signaling pathways, such as PI3K/Akt and MAPK. Its extracts have shown efficacy in reducing the growth of cancer cell lines, including breast, colon, and prostate cancers.

3.2 Toxicological Studies

Toxicological studies on *Syzygium curranii* reveal a favorable safety profile, highlighting its potential for therapeutic applications. Acute toxicity evaluations in animal models showed no mortality or significant adverse effects at doses up to 2000 mg/kg, indicating a high safety margin for short-term use. Sub-acute and chronic toxicity studies, involving repeated administration over 28 to 90 days, demonstrated no significant changes in hematological, biochemical, or histopathological parameters, suggesting no hepatotoxic or nephrotoxic effects at doses up to 500 mg/kg. Genotoxicity and mutagenicity assays, such as the Ames test and micronucleus assay, confirmed that *S. curranii* extracts are non-genotoxic. Preliminary reproductive toxicity studies showed no adverse effects on fertility or fetal development at therapeutic doses, though high doses may cause mild oxidative stress-related alterations. Cytotoxicity studies also revealed selective action against cancer cell lines, with minimal toxicity to normal cells, supporting its potential in anticancer therapy. While these findings are promising, further research is needed to evaluate long-term safety, potential herb-drug interactions, and clinical tolerability to ensure its safe and effective use in humans.

3. Conclusion

Syzygium curranii emerges as a promising medicinal plant with substantial therapeutic potential, supported by its rich phytochemical composition and diverse pharmacological activities. Its traditional medicinal uses, backed by modern scientific studies, highlight its efficacy in managing conditions such as diabetes, inflammation, oxidative stress, and microbial infections. The plant also shows potential in specialized therapeutic areas, including neuroprotection, hepatoprotection, and anticancer applications. Toxicological studies further underscore its favorable safety profile, with minimal adverse effects observed in preclinical models. Despite these encouraging findings, the need for comprehensive clinical trials remains critical to fully elucidate its therapeutic mechanisms and ensure its safety for human use. Future research should focus on exploring its bioactive compounds, long-term toxicological effects, and potential applications in drug development to realize the full medicinal potential of *Syzygium curranii*.

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