Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 16s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Monstera deliciosa: A Comprehensive Review on Its Phytochemical and Pharmaceutical Activity

A Ramkumar[1], Suresh Nimushakavi[1], Rajesh E Jesudasan[*1]

[1]The Assam Kaziranga University, Jorhat 785006, India

Cite this paper as: A Ramkumar, Suresh Nimushakavi, Rajesh E Jesudasan, (2025) Monstera deliciosa: A Comprehensive Review on Its Phytochemical and Pharmaceutical Activity. *Journal of Neonatal Surgery*, 14 (16s), 68-72.

ABSTRACT

Monstera deliciosa, a tropical climber from the Araceae family, has attracted increasing attention in pharmacognosy due to its rich phytochemical profile and promising pharmacological activities. Traditionally valued for its ornamental appeal and edible fruit, recent scientific investigations reveal its antioxidant, antibacterial, cytotoxic, and anticancer properties. This review comprehensive analysis of the phytochemical constituents of *M. deliciosa* and critically evaluate its pharmacological significance across various studies, emphasizing its potential contributions in drug discovery and nutraceutical applications.

1. INTRODUCTION

Plants have long been revered as sources of therapeutic agents. With over 3000 species, the Araceae family has been traditionally used for both ornamental and medicinal purposes (Sindhu *et al.*, 2023). Among these, *Monstera deliciosa* stands out for its morphological uniqueness and ethnobotanical importance. Native to tropical Central America, it is now cultivated globally as a ornamental plant and occasional fruit crop. Known by names such as the "Swiss Cheese Plant" or "Mexican Breadfruit," it holds potential beyond aesthetics, serving as a source of bioactive compounds (Cedeno-Fonseca *et al.*, 2020).

The resurgence of natural products in pharmacological research, driven by their chemical diversity and biological potential. In this context, *M. deliciosa* has emerged as a versatile species growing scientific interest, demonstrating a broad spectrum of health benefits, drawing from both ethnomedicine and modern phytochemical studies (Anwar *et al.*, 2024).

2. BOTANICAL DESCRIPTION AND DISTRIBUTION

M. deliciosa is a large epiphytic climber characterized by its iconic perforated, fenestrated leaves and prominent aerial roots (Benzing, 2012). It grows up to 20 meters high, anchoring on trees in its native habitat. Its spadix develops into a distinctive, corn-like fruit with hexagonal plates, which fall off to reveal aromatic, edible pulp. Successful cultivation has been documented regions like Australia, India, and Europe demonstrates its adaptability.

The plant belonging to the genus Monstera, which comprises 22 species and 3 varieties. According to Madison's taxonomic revision, the genus is characterized by its unique perforated leaves, the absence of a perianth in its flowers, and its epiphytic growth habit. *M. deliciosa* has also been shown to adaptaility to various soil types and light conditions, allowing it to thrive beyond its native tropical environments (Zuluaga *et al.*, 2018).

3. PHYTOCHEMICAL PROFILE

Comprehensive phytochemical studies conducted using various solvent extracts—including ethanol, methanol, chloroform, and hexane—from the stems, leaves, and fruit kernels of *M. deliciosa* have revealed a rich profile of bioactive compounds. These findings underscore substantiate the plant's therapeutic potential and validate its traditional use in herbal medicine (Yeoh *et al.*, 2024).

Among the key phytochemicals identified in *M. delicious* alkaloids stand out for their significant pharmacological properties (EL-Sakka *et al.*, 2010). These nitrogen-containing compounds are well known for their antimicrobial activity, effectively inhibiting the growth of various pathogenic microorganisms (Valenca *et al.*, 2021). They also exhibit anti-inflammatory effects, making them valuable in the treatment of inflammation-related conditions, and possess neuroprotective benefits that may support cognitive function and prevent neurodegenerative diseases (Krause and Muller, 2010).

Flavonoids, another major group of compounds detected in *M. delicious* extracts, are recognized for their potent antioxidant activity, which helps neutralizing harmful free radicals and reducing oxidative stress (Sindhu *et al.*, 2023). In addition to their antioxidant properties, flavonoids have shown promising anti-inflammatory and anticancer effects, contributing to the prevention and management of chronic diseases such as cancer and cardiovascular disorders (Garcia-Lafuente *et al.*, 2009).

Tannins, which are polyphenolic compounds, contribute to the plant's antimicrobial properties by disrupting microbial cell walls and inhibiting enzyme activity (Scalbert, 1991). They also possess astringent properties, which can aid in wound healing and the treatment of diarrhea by contracting body tissues.

Saponins also found in the *M. delicious* extracts, are known for their wide-ranging health benefits. These compounds exhibit hypocholesterolemic activity by reducing cholesterol levels in the blood, as well as antifungal properties that inhibit the growth of fungal pathogens. Furthermore, their immunomodulatory effects support the regulation and enhancement of immune system responses (Yanagisawa *et al.,* 2022).

Phenolic compounds, which include a broad class of plant-based antioxidants, play a crucial role in maintaining cellular health by combating oxidative damage. Their presence in the extracts supports the plant's potential in reducing the risk of degenerative diseases such as cancer and heart disease.

Steroids identified in the plant extracts exhibit anti-inflammatory and analgesic (pain-relieving) effects, making them relevant in the managing conditions such as arthritis and other inflammatory disorders (Rajalekshmi and Agrawal, 2024).

Glycosides, compounds formed from sugars and other functional groups, are important for their cardiotonic properties. These compounds help regulate heart function and are used in the treatment of heart failure and arrhythmias (Guntert and Linde, 1977).

Coumarins, another class of phytochemicals present in *M. delicious*, have demonstrated anticoagulant properties, that help prevent blood clot formation. They also exhibit antimicrobial activity, contributing to the plant's defense mechanisms against infectious agents.

Finally, carbohydrates detected in the plant contribute to its nutritional value, serving as a primary energy source and supporting overall metabolic functions (Singh *et al.,* 2017).

Overall, the diverse phytochemicals profile of *M. delicious* is identified in different parts of the plant reflects its immense potential as a source of natural therapeutic agents. These compounds offer a multifaceted approach to health promotion and disease prevention, supporting the continued exploration of the plant in pharmacological and nutraceutical applications (Rao *et al.,* 2015).

TLC and column chromatography of fruit kernel extracts revealed two active antioxidant compounds with significant radical scavenging activity. Comparative solvent extraction indicated ethanol as the most effective for extracting bioactive metabolites.

4. PHARMACOLOGICAL ACTIVITIES

4.1 Antioxidant Activity

Multiple studies demonstrated robust antioxidant potential of *M. deliciosa* (Kavita and Shukla, 2025). DPPH assays confirmed that ethanolic and methanolic extracts, especially from fruit kernels and stems, exhibit higher free scavenging activity than ascorbic acid at comparable concentrations. The total phenolic content ranged from 34.56 to 92.34 mg GAE/g, indicating potent free radical neutralization capacity. Additionally, antioxidant enzymes such as catalase and superoxide dismutase were upregulated in treated models, suggesting effect on oxidative stress reduction (Chan *et al.*, 2006).

4.2 Antibacterial and Antifungal Activity

Volatile compounds from *M. deliciosa* displayed antimicrobial effects against *Staphylococcus epidermidis*, *Escherichia coli*, and *Candida albicans* (Kavita and Shukla, 2025). Ethyl acetate extracts from the stem showed stronger activity against *Serratia marcescens* compared to the streptomycin (Rao *et al.,* 2015). Seasonal studies suggest increased efficacy during periods of intense vegetative growth. The action mechanism includes cell membrane disruption and enzyme inhibition, leading to bacteriostasis or bacteriolysis (Kavita and Shukla, 2025).

4.3 Cytotoxic and Anticancer Potential

Methanolic extracts of *M. deliciosa* displayed significant cytotoxicity in brine shrimp lethality assays indicating potential anticancer activity (Lira *et al.,* 2014). *In vivo* studies utilizing the Ehrlich ascites carcinoma (EAC) model in Swiss albino mice, demonstrated notable tumour growth inhibition, increased survival time, and a reduction in ascitic fluid volume following treatment with *M. deliciosa* methanol extract (Prosanta *et al.*, 2015). Histopathological analysis of treated tumour tissues revealed decreased in mitotic activity and an increase in apoptotic bodies. These findings suggest the plant's potential as an anticancer agent, emphasizing the need for further molecular docking studies and clinical validation (Lira *et al.,* 2014).

4.4 Anti-inflammatory and Antidiabetic Effects

Preliminary screenings and ethnomedicinal reports indicate potential anti-inflammatory activity and possible regulation of blood glucose levels (Sindhu *et al.,* 2023). Plant sterols and saponins may modulate inflammatory cytokines such as TNF-alpha, IL-6, as well as regulation of glucose metabolic enzymes. However, *in vivo* studies using diabetic models are necessary to validate these antihyperglycemic effects (Lai *et al.,* 2024).

4.5 Nanotechnology Applications

Green synthesis of gold nanoparticles using Monstera leaf extracts has been successfully demonstrated. These nanoparticles exhibited biocompatibility and potential for drug delivery application. Characterization using UV-Vis, SEM-EDS, and FTIR confirmed the capping of the nanoparticles by bio-reductants, such as flavonoids and phenols. Although they did not exhibit antimicrobial activity, their non-toxic profile makes them suitable for controlled-release drug delivery systems (Shirsul *et al.,* 2024).

5. NUTRITIONAL AND VOLATILE COMPOSITION

The ripe fruit pulp of *M. deliciosa* is rich in nutritional and volatile components that contribute to its health benefits and overall quality. It primarily consists of water, making up about 87.8% of its total content, which highlights its hydrating nature and freshness. Carbohydrates are present at 9.4%, providing a source of energy and contributing to the fruit's natural sweetness and flavour profile (Barros *et al.,* 2018).

Vitamin C, an essential antioxidant supporting immune function, skin health, and iron absorption, is found at a concentration of 9 mg per 100 grams of pulp. In addition to macronutrients and vitamins, the pulp contains important inorganic components like ash, which indicates the presence of various minerals. Dietary fiber is another vital constituent, aiding in digestive health and contributing to a feeling of fullness (Barros *et al.,* 2018).

Moreover, the pulp is a rich source of essential minerals including potassium, which is crucial for maintaining heart and muscle function; calcium, important for bone health and metabolic processes; and sodium, which plays a role in fluid balance and nerve function. These elements collectively enhance the nutritional value of the ripe fruit pulp and making it a beneficial addition to a balanced diet.

Gas chromatography-mass spectrometry (GC-MS) analysis identified over 80 volatile organic metabolites (VOMs), mainly esters and lactones such as ethyl butanoate, ethyl hexanoate, and linalool. These compounds contribute to its banana-pineapple aroma, supporting its use in flavoured beverages and desserts (Peppard, 1992; Barros *et al.,* 2018).

Peppard’s study detected over 400 components, including linalool, ethyl crotonate, and methyl butanoate which are key contributors to the fruit’s exotic aroma. Ethylene production during ripening has been shown to correlates with flavour release.

6. TOXICOLOGICAL CONSIDERATIONS

Unripe fruits contain of *M. deliciosa* calcium oxalate crystals that can cause severe irritation. However, studies have confirmed that the ripe pulp and juice are safe with respect to saponins, oxalic acid, and hydrocyanic acid (Kavita *et al.,* 2025). Peters and Lee (1977) noted that the juice can enhance fruit juice blends at 8–15% concentration without including adverse effects.

7. TRADITIONAL AND ETHNOMEDICINAL USES

The traditional and ethnomedicinal uses of *M. deliciosa* reflect a rich cultural heritage and a deep understanding of its healing properties, passed down through generations across various region. In Mexico and Martinique, the plant has long been valued for its effectiveness in treating arthritis, a condition characterized by joint inflammation and pain (Kavita *et al.,* 2025). Its use for snake bites in these regions suggests potential anti-venom or anti-inflammatory properties that may reduce the toxic effects of venom and manage pain and swelling.

In Brazil, the plant is commonly applied for wound healing. Its usage indicating potential antiseptic, anti-inflammatory, and tissue-regenerative properties, which aid in the repair of skin and soft tissue injuries. Traditional healers often use topical preparations made from leaves or extracts to accelerate the healing process and prevent infections (Antonio *et al.,* 2023).

In Chinese folk medicine, root infusions are particularly noted for treating coughs and fevers. This practice aligns with the plant’s presumed expectorant, antipyretic, and antimicrobial qualities. The infusion of roots into medicinal teas or decoctions is a common method of administering herbal remedies in traditional Chinese healing systems.

Moreover, indigenous communities worldwide have employed the plant to manage fever, bruises, and inflammation. Its ability to reduce body temperature and soothe bruised or inflamed tissue indicates the presence of potent bioactive compounds capable of modulating immune and inflammatory responses. These communities typically rely on fresh plant parts or traditional preparations such as poultices, infusions, or decoctions, depending on the ailment (Kumar *et al.,* 2018).

Notaly, these ethnobotanical records are not merely anecdotal; they are increasingly supported by modern pharmacological studies, both *in vitro* (in controlled lab environments) and *in vivo* (in living organisms). These studies have confirmed the presence of compounds with anti-inflammatory, antimicrobial, antioxidant, and analgesic properties, which closely align with the traditional uses. This correlation strengthens the scientific validity of ethnomedicinal knowledge and highlights the plant's potential for further exploration in the development of natural therapeutics.

8. TAXONOMIC AND HISTORICAL NOTES

Madison's 1977 revision established a formal classification of the Monstera genus, comprising 22 species and highlighting the significance of *M. deliciosa* as the most widely cultivated and studied species. Historical records trace back to Plumier (1693), with Linnaeus later describing it under the genus Dracontium. Its current classification emerged from Schott's work in the 19th century.

Conclusions and Future Prospects

M. deliciosa is a pharmaceutically valuable plant enriched with a wide range of bioactive compounds. Its well-established antioxidant, anticancer, antimicrobial, and nutritional properties not only validate traditional medicinal uses but also highlight its potential for modern therapeutic applications. These beneficial attributes necessitate further research and innovation (Shirsul *et al.*, 2024).

Key directions for future investigation include the isolation and structural characterization of novel compounds, which may lead to the discovery of new drug candidates. Additionally, mechanistic studies focusing on its anticancer and antidiabetic activities are crucial for elucidating the molecular pathways involved. Clinical trials are essential to evaluate its safety, efficacy, and dosage in humans, facilitating the formulation of nutraceuticals and functional health products (Jing *et al.*, 2023).

Sustainable utilization of *M. deliciosa* requires the development of eco-friendly cultivation and harvesting models to ensure long-term availability without compromising ecological balance. Furthermore, its potential application in green nanotechnology offers a novel avenue for the environmentally safe synthesis of nanoparticles with biomedical applications. The plant also shows promise in the formulation of functional foods, which combine nutritional value with health benefits (Shirsul *et al.*, 2024).

The broad biological activity spectrum exhibited by *M. deliciosa* positions it as a strong candidate in integrated drug development pipelines, spanning from natural compound discovery to therapeutic product development. This also reinforces the critical need for conserving medicinal biodiversity, as plants like *M. deliciosa* hold immense promise for the future of medicine and sustainable health solutions.

REFERENCES

[1] Antonio Pereira, I., Judah Cury, B., Kaio Silva Nunes, R., & Mota da Silva, L. (2023). Traditional plants used in southern Brazil as a source to wound healing therapies. *Chemistry & Biodiversity*, *20*(2), e202201021.

[2] Anwar, T., Qureshi, H., Shahzadi, S., Siddiqi, E. H., Ali, H. M., Abdelhamid, M. M., & Nazim, M. (2024). Exploring the benefits of wild plants in dietary nutrition: investigating perspectives, choices, health impacts and sustainable practices. *BMC Complementary Medicine and Therapies*, *24*(1), 86.

[3] Barros, T., Galego, L., & Pires-Cabral, P. (2018). Monstera deliciosa fruit: physicochemical characterization and potential for distillate production. *Journal of Food Measurement and Characterization*, *12*(4), 2874-2882.

[4] Benzing, D. H. (2012). *Air plants: epiphytes and aerial gardens*. Cornell University Press.

[5] Cedeño-Fonseca, M., Jiménez, P. D., Zuluaga, A., & Blanco, M. A. Tornelia (Araceae). Aroideana VOL 43 NOS 1&2.

[6] Chan, S. H., Tai, M. H., Li, C. Y., & Chan, J. Y. (2006). Reduction in molecular synthesis or enzyme activity of superoxide dismutases and catalase contributes to oxidative stress and neurogenic hypertension in spontaneously hypertensive rats. *Free Radical Biology and Medicine*, *40*(11), 2028-2039.

[7] García-Lafuente, A., Guillamón, E., Villares, A., Rostagno, M. A., & Martínez, J. A. (2009). Flavonoids as anti-inflammatory agents: implications in cancer and cardiovascular disease. *Inflammation research*, *58*(9), 537-552.

[8] Güntert, T. W., & Linde, H. H. A. (1977). Cardiac glycosides: Prerequisites for the development of new cardiotonic compounds. *Experientia*, *33*(6), 697-703.

[9] Jing, Y., Beleski, D., & Vendrame, W. (2023). Micropropagation and Acclimatization of Monstera deliciosa Liebm.'Thai Constellation'. *Horticulturae*, *10*(1), 1.

[10] Kavita, K., & Shukla, S. D. (2025). Phytochemistry and pharmacological potential of Monstera deliciosa: A comprehensive review. Indian Journal of Applied & Pure Biology, 40(1), 228-243.

[11] Krause, D. L., & Müller, N. (2010). Neuroinflammation, Microglia and Implications for Anti-Inflammatory Treatment in Alzheimer′ s Disease. *International journal of Alzheimer's disease*, *2010*(1), 732806.

[12] Kumar, S., Saini, R., & Patil, S. M. (2019). Scientific study & antioxidant activity of mature fruit kernels of the

plant Monstera deliciosa Liebm. International Journal of Science and Research (IJSR), 8(9), 1243-1249.

[13] Lai, S., Shen, N., Zhou, C., Lai, X., Wang, Y., Shen, L., & Jia, Y. (2024). Saponins alleviate intestinal inflammation and regulate intestinal metabolic disorders induced by dextran sulfate sodium: TNF-α protein action. *International Journal of Biological Macromolecules*, *280*, 135728.

[14] Lira, D. N., Uddin, M. A., Uddin, M., & Rouf, A. S. S. (2014). Assessment of cytotoxic activities of Phyllanthus amarus and Monstera deliciosa. *Journal of Applied Pharmaceutical Science*, *4*(7), 110-113.

[15] Madison, M. (1977). A revision of Monstera (Araceae). Contributions from the Gray Herbarium of Harvard University, No. 207.

[16] Pal, P., Chakraborty, M., Karmakar, I., & Haldar, S. (2015). Evaluation of anticancer activity of methanol extract of Monstera deliciosa in EAC induced Swiss albino mice. ResearchGate Publications.

[17] Pal, P., Chakraborty, M., Karmakar, I., & Haldar, S. (2015). In vitro antioxidant activity and total phenolic content of Monstera deliciosa. International Journal of Pharmacognosy and Phytochemical Research, 7(3), 587-590.

[18] Peppard, T. L. (1992). Volatile flavor constituents of Monstera deliciosa. Journal of Agricultural and Food Chemistry, 40(2), 257-262.

[19] Peters, R. E., & Lee, T. H. (1977). Composition and physiology of Monstera deliciosa fruit and juice. School of Food Technology, University of New South Wales, Research Note.

[20] Prosanta, P., Mainak, C., Indrajit, K., Sagnik, H., Avratanu, D., & Kanti, H. P. (2015). Evaluation of anticancer activity of methanol extract of Monstera deliciosa in EAC induced Swiss albino mice. *Int. J. Toxicol. Pharmacol. Res*, *7*, 165-170.

[21] Rajalekshmi, R., & Agrawal, D. K. (2024). Therapeutic Efficacy of Medicinal Plants with Allopathic Medicine in Musculoskeletal Diseases. *International journal of plant, animal and environmental sciences*, *14*(4), 104.

[22] Rao, V. U., Viteesha, V., Suma, K., & Nagababu, P. (2015). Evaluation of phytochemical constituents, antibacterial and antioxidant activities of Monstera deliciosa Liebm. stem extracts. World Journal of Pharmacy and Pharmaceutical Sciences, 4(11), 1422-1433.

[23] Scalbert, A. (1991). Antimicrobial properties of tannins. *Phytochemistry*, *30*(12), 3875-3883.

[24] Shirsul, J., Tripathi, A., & Ankamwar, B. (2024). Green biosynthesis of silver nanoparticles utilizing Monstera deliciosa leaf extract and estimation of its antimicrobial characteristics. *Particle & Particle Systems Characterization*, *41*(12), 2400043.

[25] Shirsul, N., Shinde, S., Sutar, S., & Jadhav, P. (2024). Eco-friendly synthesis and characterization of gold nanoparticles using leaf extract of Monstera deliciosa. BIO Web of Conferences, 37, 00074.

[26] Sindhu DK, Mr. Ananda V., Dr. D. Visagaperumal, Dr. Vineeth Chandy. (2023). Evaluation of phytochemical constituents, in-vitro antidiabetic activity of extracts from Monstera deliciosa liebm leaves. International Journal for Innovative Research in Multidisciplinary Field. Vol. 9 (10).

[27] Sindhu, D.K., Anandu V., Visagaperuma., D., Vineeth chandv. (2023). Monstera deliciosa Liebem (Araceae): a review on its plant profile and pharmacological activities.International Journal For Innovative Researchj in Multidisciplnary Field, 9 (5).

[28] Singh, P., Kesharwani, R. K., & Keservani, R. K. (2017). Protein, carbohydrates, and fats: Energy metabolism. In *Sustained Energy for Enhanced Human Functions and Activity* (pp. 103-115). Academic Press.

[29] Spínola, V., Llorent-Martínez, E. J., Gouveia-Figueira, S., & Castilho, P. C. (2015). Monitoring the seasonal variation of volatile metabolites from Monstera deliciosa using headspace solid-phase microextraction and GC-MS. Food Chemistry, 172, 251-260.

[30] Valença, C. A., Barbosa, A. A., Souto, E. B., Caramão, E. B., & Jain, S. (2021). Volatile nitrogenous compounds from bacteria: Source of novel bioactive compounds. *Chemistry & Biodiversity*, *18*(11), e2100549.

[31] Yanagisawa, R., He, C., Asai, A., Hellwig, M., Henle, T., & Toda, M. (2022). The impacts of cholesterol, oxysterols, and cholesterol lowering dietary compounds on the immune system. *International Journal of Molecular Sciences*, *23*(20), 12236.

[32] Yeoh, L. L., Lee, X. N., Lee, W. Y., Goh, B. H., & Maran, S. (2024). Avocado Fruit and Leaf Bioactive Phytochemicals and Cosmeceutical Applications: A Scoping Review. *Journal of Pharmacy*, *4*(2), 186-208.