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The Comprehensive Review On Multifaceted Nature Of *Merremia Dissecta*

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1. Abstract:

This report provides a comprehensive review of the current research on Merremia dissecta (Jacq.) Hallier a perennial vine belonging to the Convolvulaceae family. The analysis reveals a plant of profound paradox, simultaneously revered for its ornamental and medicinal qualities while concurrently classified as a high-risk invasive species. Historically used as a condiment and a traditional medicine across various cultures, recent scientific investigations have begun to validate its ethno botanical uses through a detailed examination of its rich phytochemistry. Key findings include the presence of a wide array of bioactive compounds, such as alkaloids, glycosides, and then over compound 1α, 4β, 8β, 9β-eudesmane-tetrol-1-O-β-D-glucopyranoside. Pharmacological studies have demonstrated significant antimicrobial, antioxidant, and, most notably, anti-pathogenic properties via the disruption of bacterial quorum sensing. Despite these promising discoveries, the report highlights critical research gaps, including the lack of human clinical trials, the need for further elucidation of its mechanisms of action, and a paucity of research on effective management strategies to control its invasive spread.

Keywords: *Merremia dissecta*, Convolvulaceae, Botany, Ethno botany, Phytochemistry, Pharmacology, Medicinal plants, Antimicrobial, Antioxidant, Traditional, Invasive, Bioactive compounds, Cyanogenic glycosides, Ornamental plant.

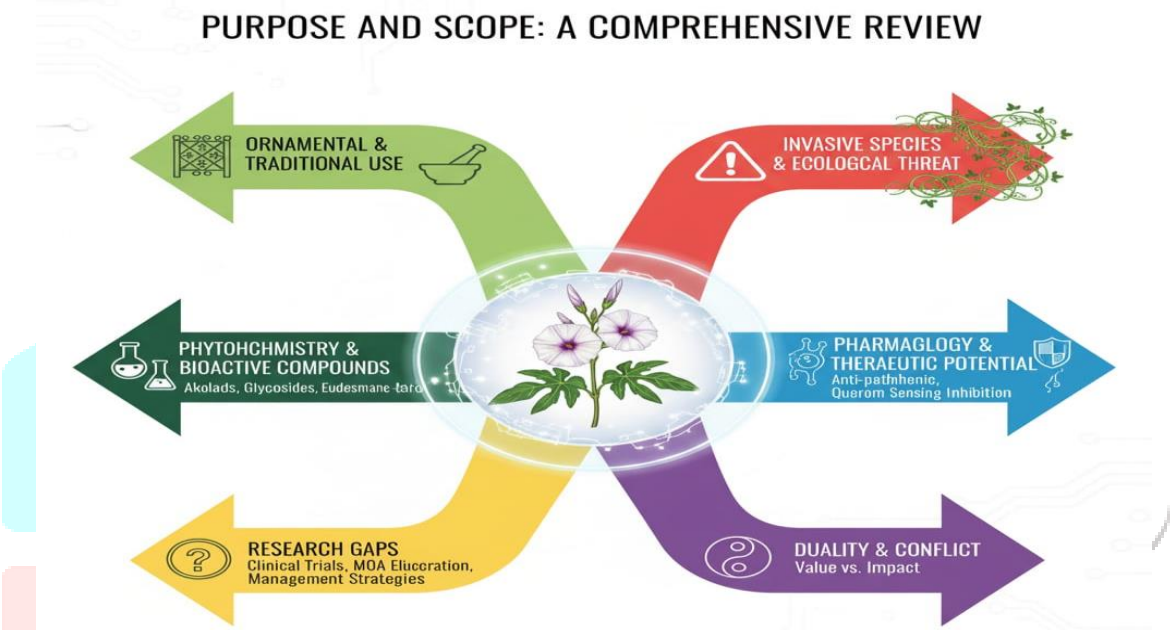
2. Introduction

A. Background on Merremia dissecta

Merremia dissecta, commonly known as Alamo vine or Noyau vine, is a prominent member of the morning glory family, Convolvulaceae. The plant's identity is defined by a striking dichotomy: it is simultaneously a prized ornamental and a plant with a long history of traditional medicinal use, while also being a documented aggressive, high risk invasive species.[5] This complex duality valued for its aesthetic and therapeutic properties on one hand and deemed an ecological threat on the other frames the central narrative of this report. The widespread use of the plant and its ability to escape cultivation underscore a critical conflict between its human perceived value and its environmental impact.[7]

B. Purpose and Scope of the Report

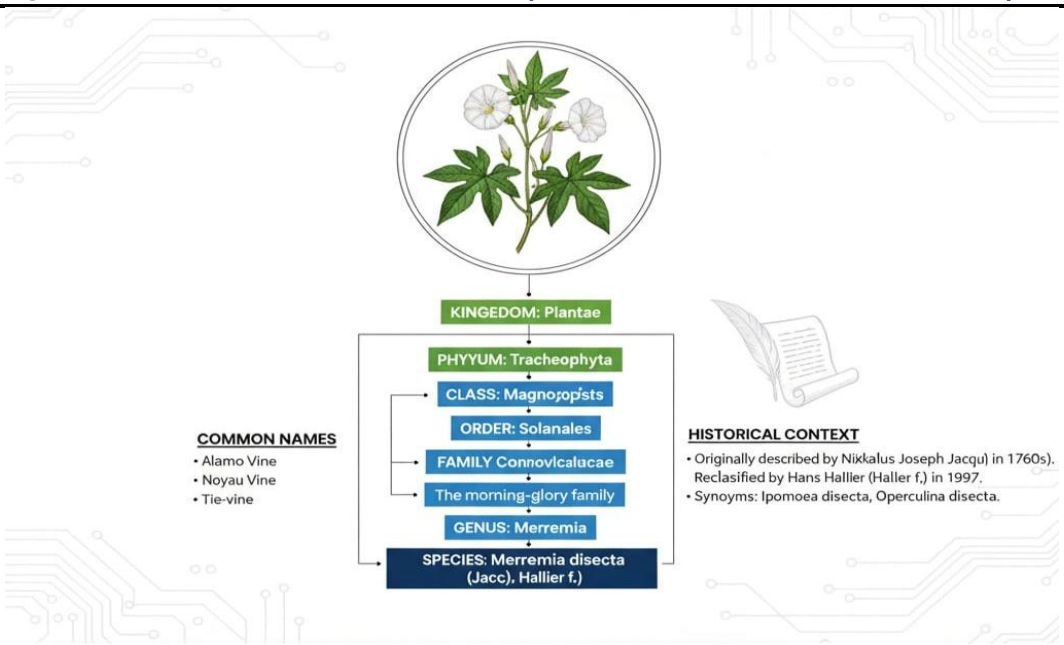
The objective of this report is to provide a detailed, evidence-based synthesis of the available research on Merremia dissecta. It aims to integrate fragmented information from various disciplines including botany, taxonomy, ecology, ethno botany, phytochemistry, and pharmacology into a cohesive and expert level analysis. The scope includes a thorough review of its morphological characteristics, geographical distribution, and the historical contex of its human interaction. Furthermore, the report delves into the modern scientific findings that have begun to validate its traditional uses, specifically focusing on its chemical composition and biological effects. A forward looking analysis of identified research gaps and future directions concludes there port, offering a comprehensive perspective designed for an audience seeking announced understanding of this remarkable species.



3. Taxonomy and Botanical Profile

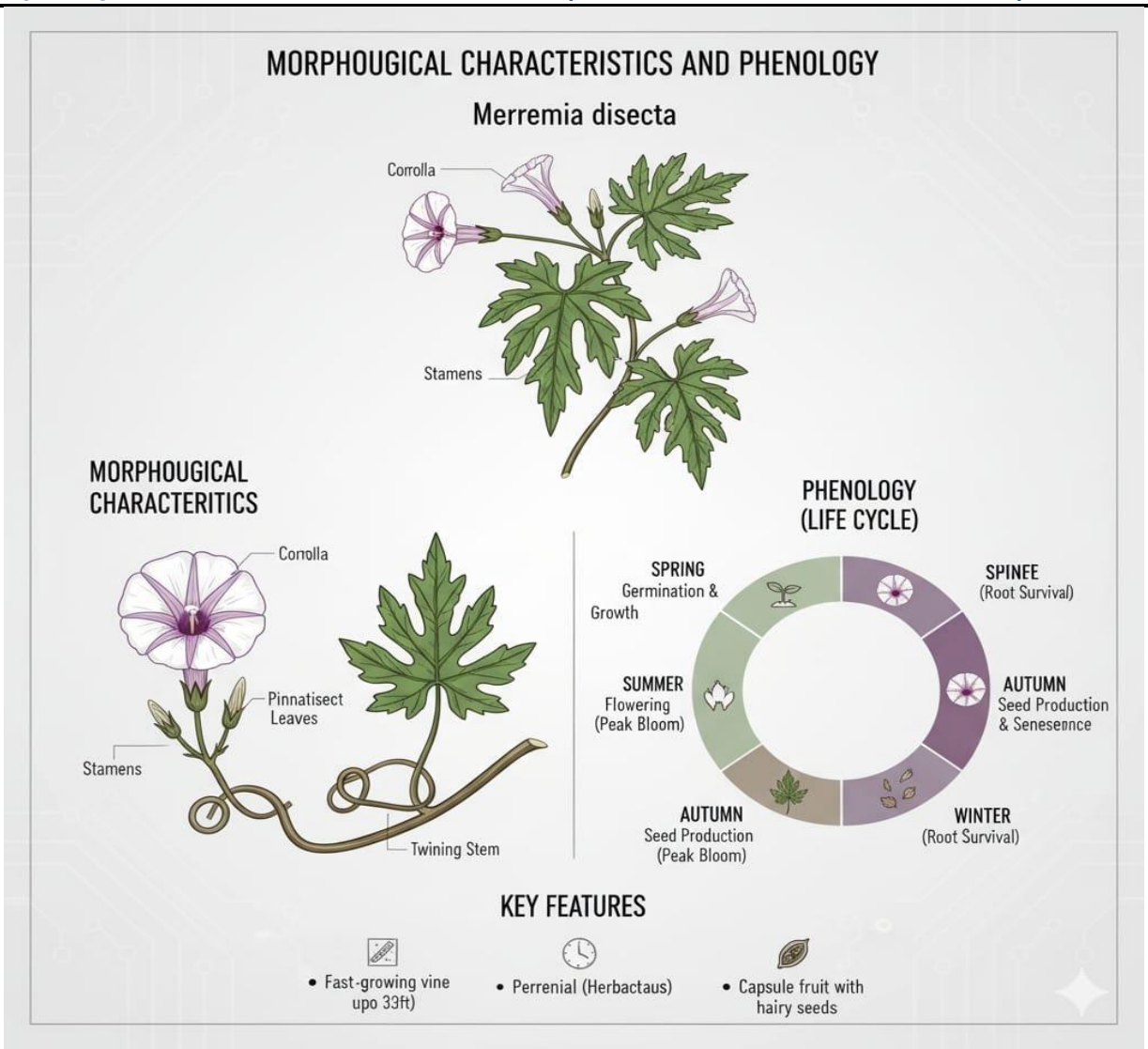
A. Nomenclatural History and Classification

Merremia dissecta is classified within the taxonomic hierarchy as follows: Kingdom Plantae, Subkingdom Tracheobionta, Superdivision Spermatophyta, Division Magnoliophyta, Class Magnoliopsida, Order Solanales, Family Convolvulaceae, Genus *Merremia*, and Species *Merremia dissecta*. Its nomenclatural history begins with its discovery in the Caribbean by Nicolaus Joseph von Jacquin between 1755 and 1759, who named it *Convolvulus dissectus* in his 1767 publication, *Observationum Botanicarum*. The plant's current accepted scientific name is *Merremia dissecta* (Jacq.) Hallier f., a designation that recognizes both Jacquin's original description and Hallier's subsequent classification. Other recognized synonyms include *Convolvulus dissecta*, *Distimake dissectus*, and *Ipomoea sinuata*. The genus *Merremia* is commonly known as woodroses, a name also applied to *M. dissecta* in some contexts.[1-5]



B. Morphological Characteristics and Phenology

Merremia dissecta is a perennial, twining vine with stems that can grow up to 12 feet long. Its foliage is particularly distinctive: the leaves are simple but" deeply palmately 7 lobed," described as intricately divided and dark green. The foliage is also noted for its unusual, almond like scent. The plant's reproductive structures are equally notable. Its large, conspicuous flowers are white with a purple or dark burgundy throat, and they are diurnal, opening in the morning and lasting until the evening. Following flowering, the plant produces a brown, spherical capsule. The fruiting calyx is much enlarged, measuring approximately 5 cm wide, and is often described as resembling a flower itself, contributing to the plant's ornamental appeal. The plant's flowering and fruiting phonology varies by region, occurring from spring through fall (May to November) in some areas, and from September to March in others.[1-7, 12, 16]

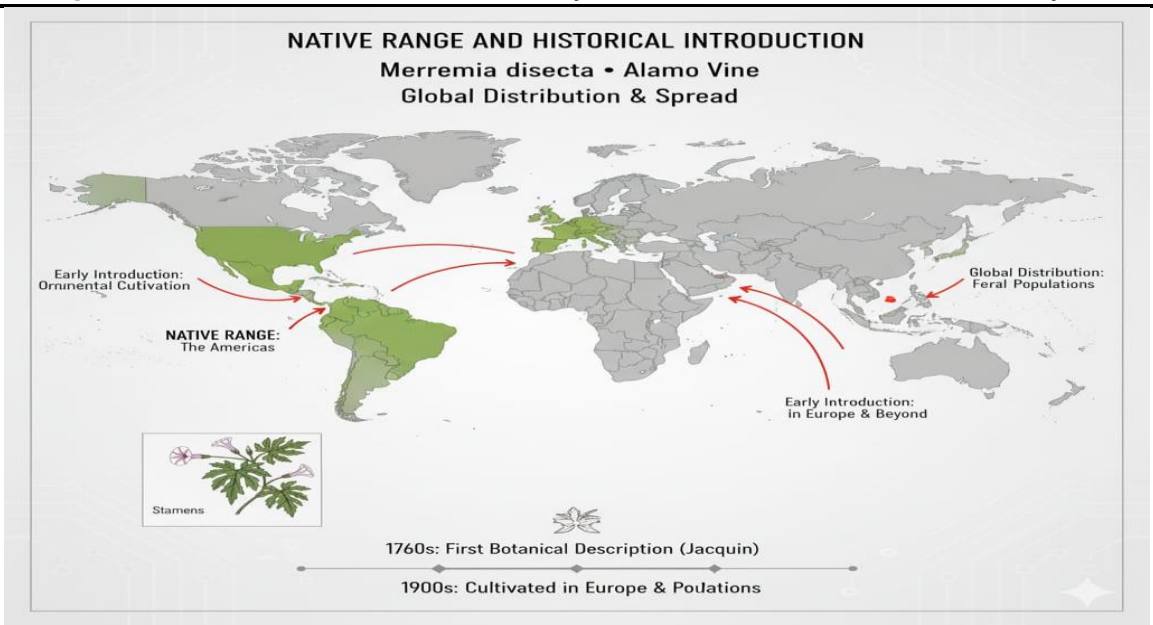


4. Geographical Distribution and Ecological Status

A. Native Range and Historical Introduction

The native range of *Merremia dissecta* is rooted in the Americas, encompassing the Caribbean, Florida, and Mexico, with documented presence in Texas, Louisiana, and Georgia. There is, however, an ongoing botanical debate about its true native status in the southern United States. While some botanists consider it native to this region, others argue it is an alien species that was introduced early on, possibly by humans, as its discovery by Europeans occurred long after its initial presence.

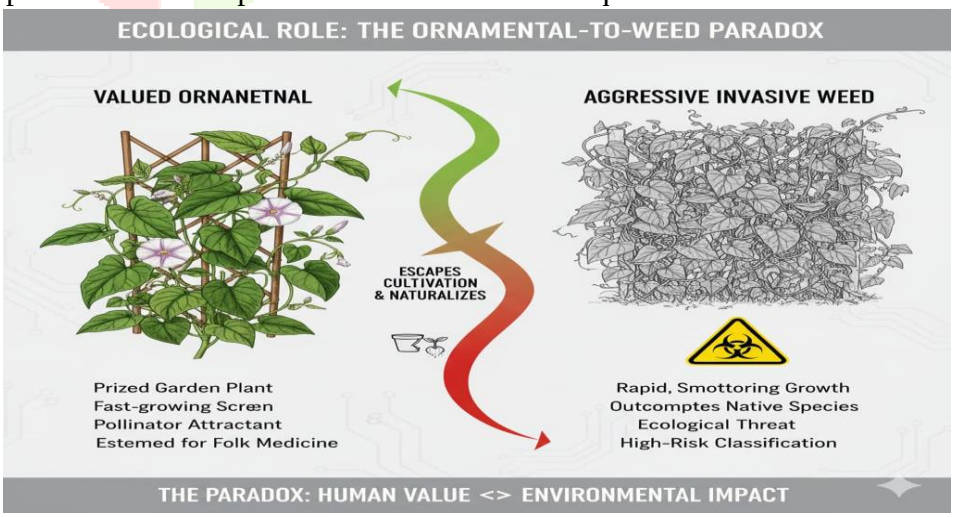
Regardless of its disputed nativity in some regions, its global spread is well documented. The plant was introduced to the "Old World" and has since become naturalized in various tropical regions, including Australia and specific states in India, such as Andhra Pradesh, Kerala, Tamil Nadu, and Maharashtra. This worldwide distribution highlights its remarkable adaptability and the efficiency of its dispersal mechanisms.[6]



B. Ecological Role: The Ornamental-to-Weed Paradox

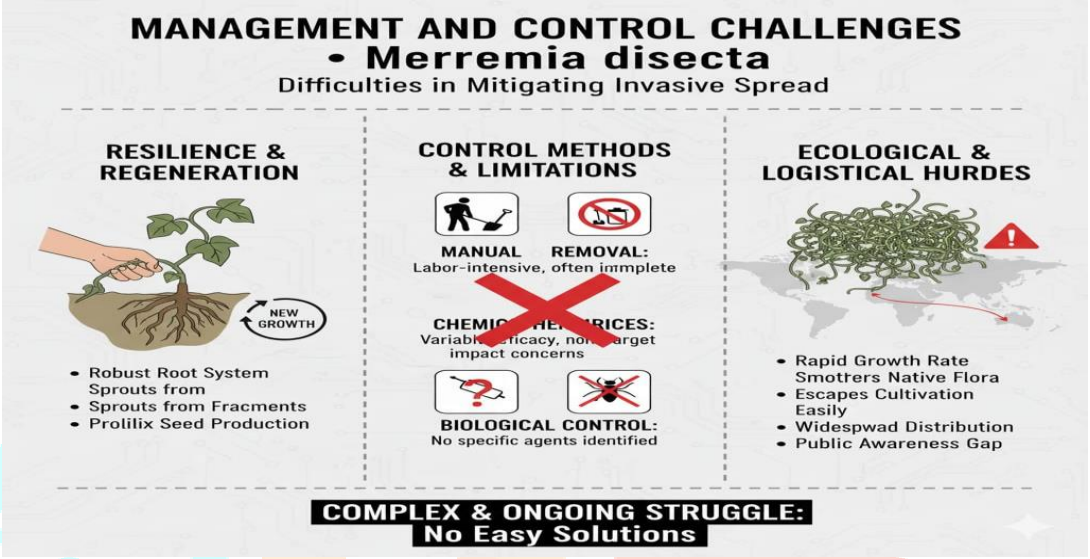
A significant paradox defines the ecological role of *Merremia dissecta*: it is highly valued as an ornamental plant while concurrently being a documented, aggressive invasive weed. This seemingly contradictory status is, in fact, a direct result of its biological traits. The very characteristics that make it desirable its conspicuous flowers, interesting foliage, and vigorous growth habit are the same traits that enable its ecological disruption.

The plant's popularity as an ornamental has led to its widespread cultivation and intentional introduction into new environments. Its inherent reproductive and growth strategies, including continuous flowering and fruiting, prolific self-seeding, and aggressive vegetative spread through deep-running rhizomes, allow it to easily escape from controlled garden environments. Once established in the wild, its ability to colonize and dominate disturbed habitats is significant. The plant can form "virtual monocultures" that exclude native flora, covering large areas, including road sides, fence lines, and native shrubs and trees. This ecological impact has led the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) to classify it as a "High Invasion Risk" species, with are commendation that it not be used in landscapes. The fact that it continues to be sold as an ornamental in regions where it is considered a pest underscores a fundamental disconnect between human aesthetic preferences and a plant's environmental consequences.[5, 6, 7, 16]



C. Management and Control Challenges

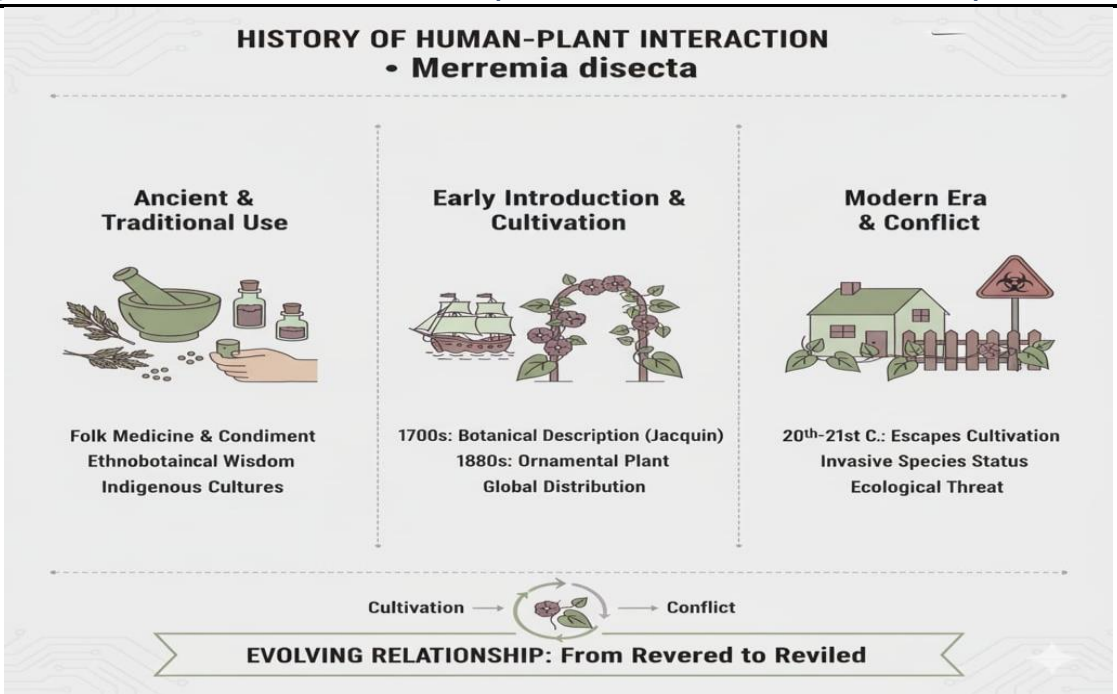
The plant's biology presents considerable challenges for management and control. The deep and extensive root system makes manual removal in effective, as even a small piece of root left behind can lead to the plant's regrowth. The plant's invasive potential is so significant that a research gap has been explicitly identified in the literature, which emphasizes the critical need for studies on its reproductive biology to develop effective management strategies. At present, there is a notable absence of specific, documented control methods for *Merremia dissecta* within the provided sources, a key point of concern given its high invasion risk and widespread naturalization.



Ethno botanical and Traditional Uses

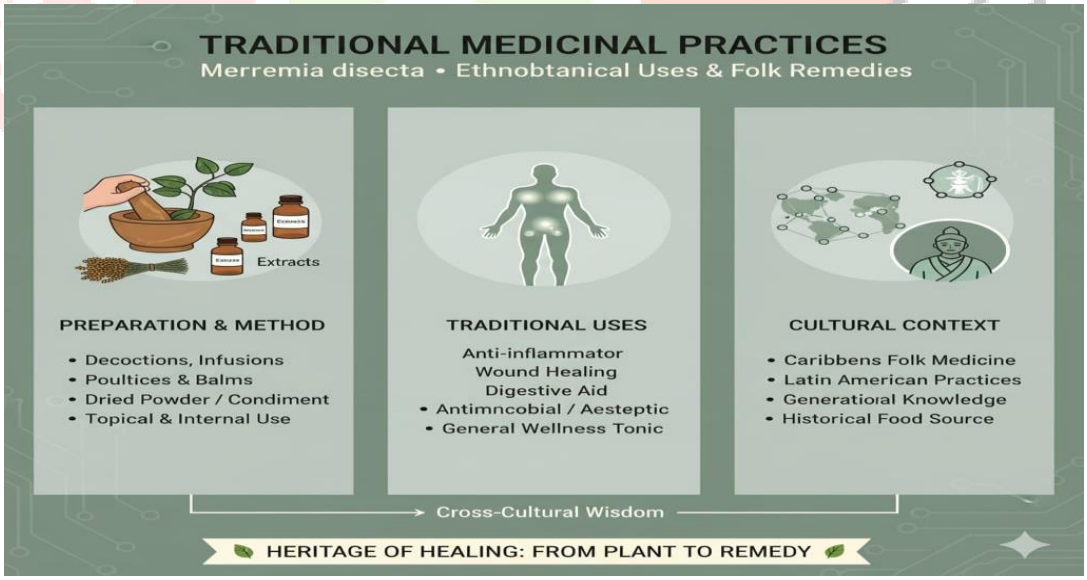
D. A History of Human-Plant Interaction

For centuries, *Merremia dissecta* has been a part of various cultures, serving as a condiment, a medicinal plant, and an ornamental. This long history of human plant interaction is not arbitrary; it is deeply tied to the plant's chemical composition, demonstrating an ancient, empirical understanding of its biological effects. Traditional use of the plant for external skin ailments, such as scabies and itches, is an example of this. These applications align with modern research that has confirmed the presence of compounds with known antimicrobial properties, suggesting that traditional remedies were effective due to the plant's inherent chemistry. The ethno botanical record, therefore, provides a valuable roadmap for modern pharmacological inquiry, guiding researchers to ward specific therapeutic applications.



E. Traditional Medicinal Practices

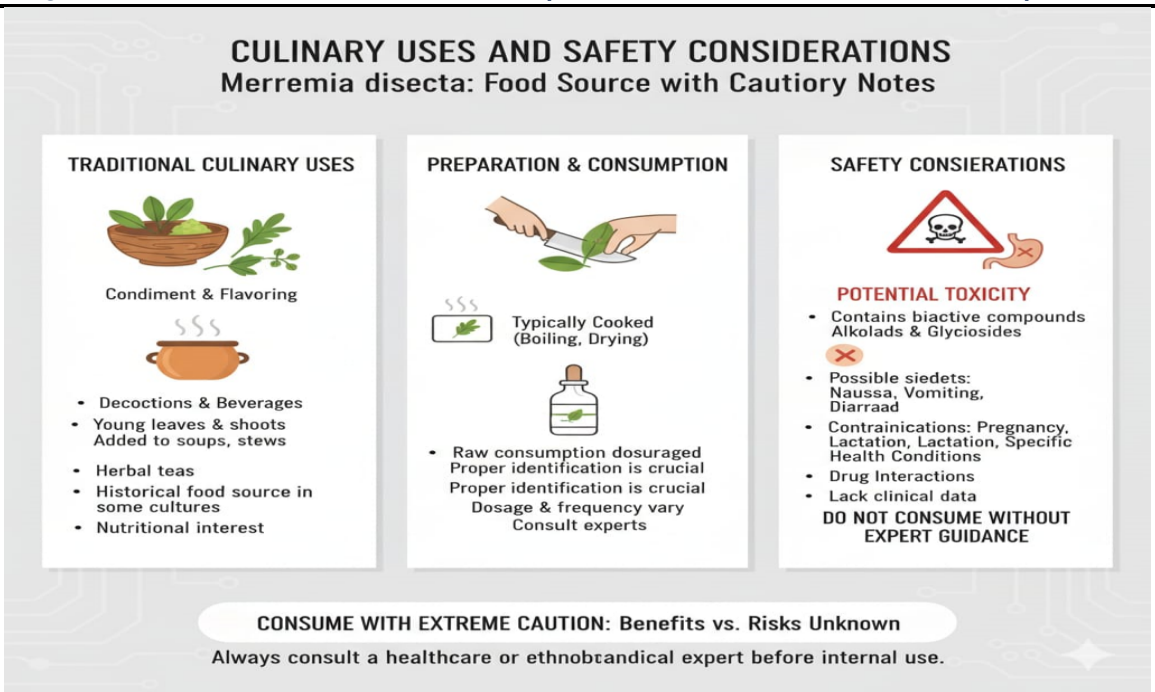
The plant has been used to treat a wide range of ailments, with different parts of the plant being used for specific purposes. An infusion of the leaves has been taken as a sedative and to treat urinary tract infections. A cold infusion was historically used as a remedy for giddiness and intoxication, while a hot infusion was used for urinary infections. The leaves, when crushed and applied as poultice, have been used as a sedative and for treating inflammations. A decoction of the whole plant was used as an external wash for scabies and other skin diseases. The plant's use for a variety of conditions, including chest complaints, sprains, and snake bites, further highlights its perceived therapeutic versatility in folk medicine.



F. Culinary Uses and Safety Considerations

In addition to its medicinal applications, *M. dissecta* has been used as a food source. The roots of *M. dissecta var. edentata* are still consumed by some indigenous groups in Argentina.

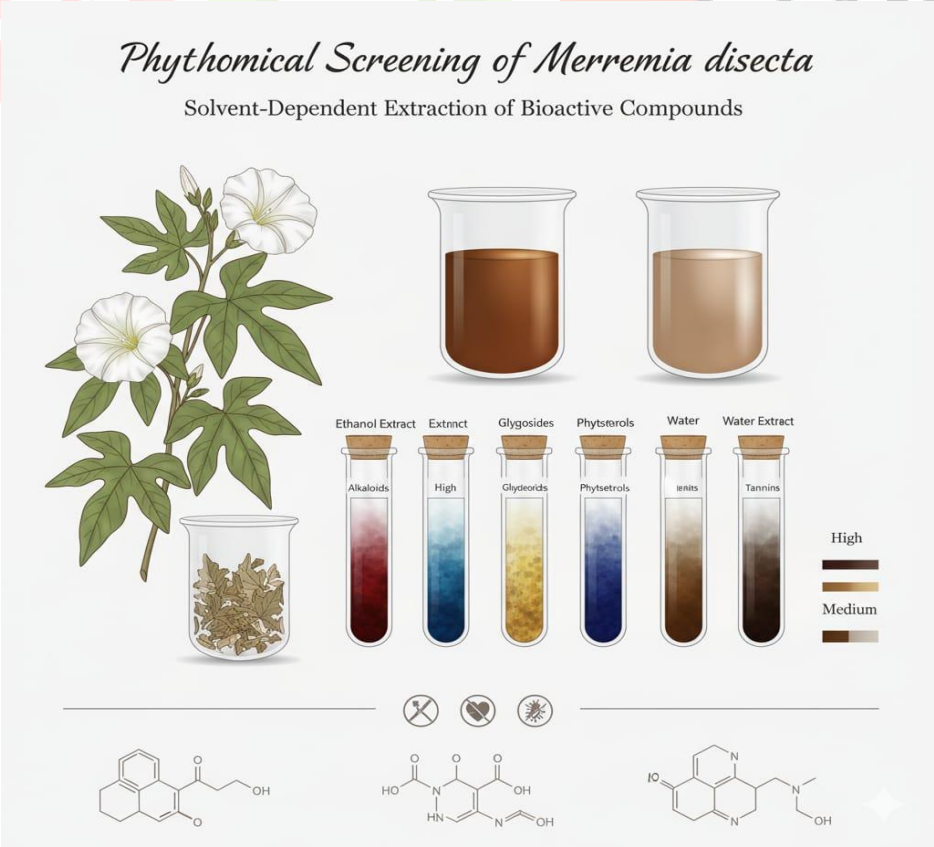
However, this culinary use comes with a significant safety caveat. The plant contains cyanogenic glycosides, and the roots must be properly prepared to remove cyanide before consumption. This requirement underscores a critical link between the plant's chemical composition and its human use, demonstrating that traditional knowledge includes empirical methods for managing potential toxicity.[7, 17]



Phytochemical and Chemical Composition

G. Comprehensive Phytochemical Screening

Preliminary phytochemical screening of *Merremia dissecta* has revealed the presence of a diverse range of bioactive compounds. Studies on leaf extracts have consistently shown the presence of alkaloids, glycosides, saponins, tannins, phytosterols, and steroids. The concentration of these compounds varies depending on the solvent used for extraction. For instance, alkaloids are found in medium concentration in ethanol extracts and low concentration in water extracts. Similarly, high concentrations of glycosides are found in ethanol extracts, while tannins are present in high concentrations in water extracts. The presence of these compounds, which are known to have various pharmacological properties, provides a scientific basis for the plant's traditional medicinal uses.



H. Analysis of Specific Isolated Compounds

The presence of specific, well defined compounds is a pivotal step in validating the plant's traditional uses. Among the most significant chemical findings is the presence of cyanogenic glycosides, specifically prunasin sand 6′-O-malonylprunasinin leaves, and amygdalin derivatives in seeds. These compounds are a part of the plant's biochemical defense mechanism against herbivores, which explains its moderate deer resistance. The same compounds, which can be toxic if consumed improperly, are also linked to the plant's antimicrobial properties. This dual role underscores a sophisticated interplay between the plant's chemistry and its biology, where a single class of compounds provides both a protective mechanism and a potential therapeutic effect for humans.

Research has also led to the isolation of several other important compounds, including the volatile metabolite (+) spathulenol, along with tyrosol, hydroxy pinoresinol, scopoletin, and a newly isolated compound, 1α, 4β, 8β, 9β-eudesmane-tetrol-1-O-β-D-glucopyranoside.The discovery of these compounds, some of which are reported for the first time in the *Merremia* genus or the Convolvulaceae family, highlights the plant's rich and under explored phytochemical potential.[7,17]

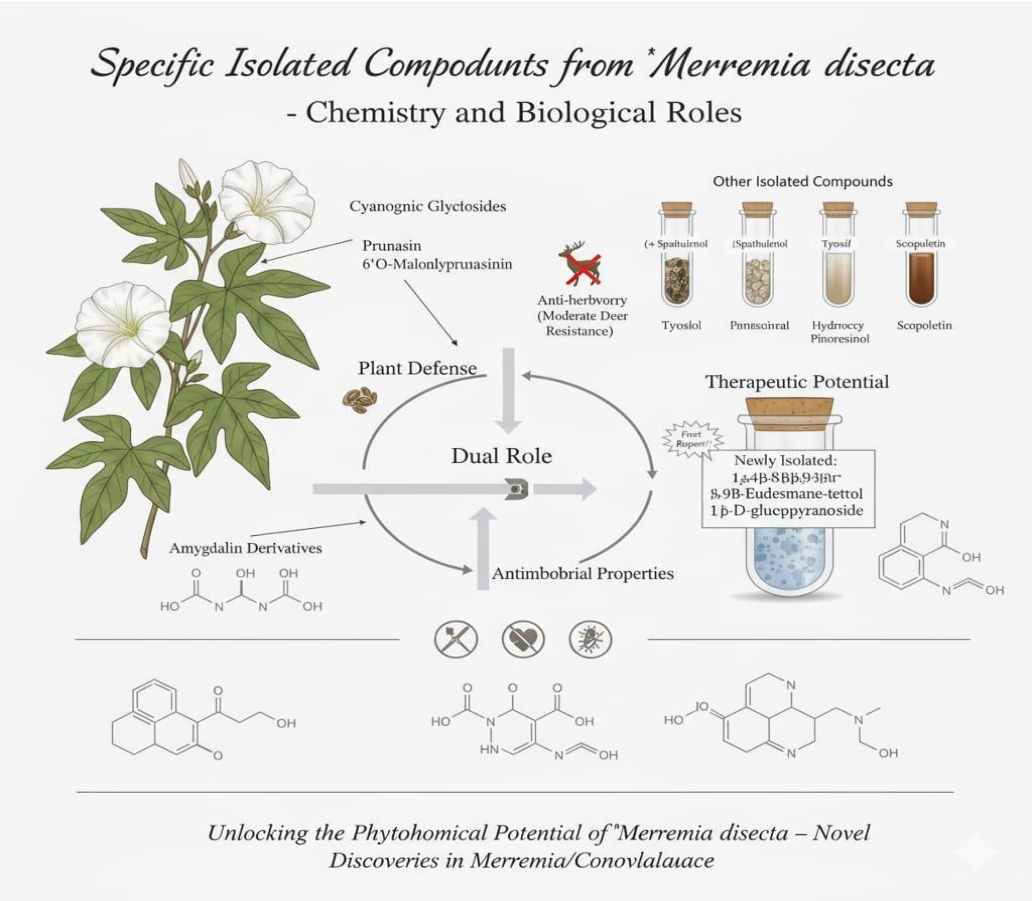


Table1: Key Phytochemicals and Associated Activities

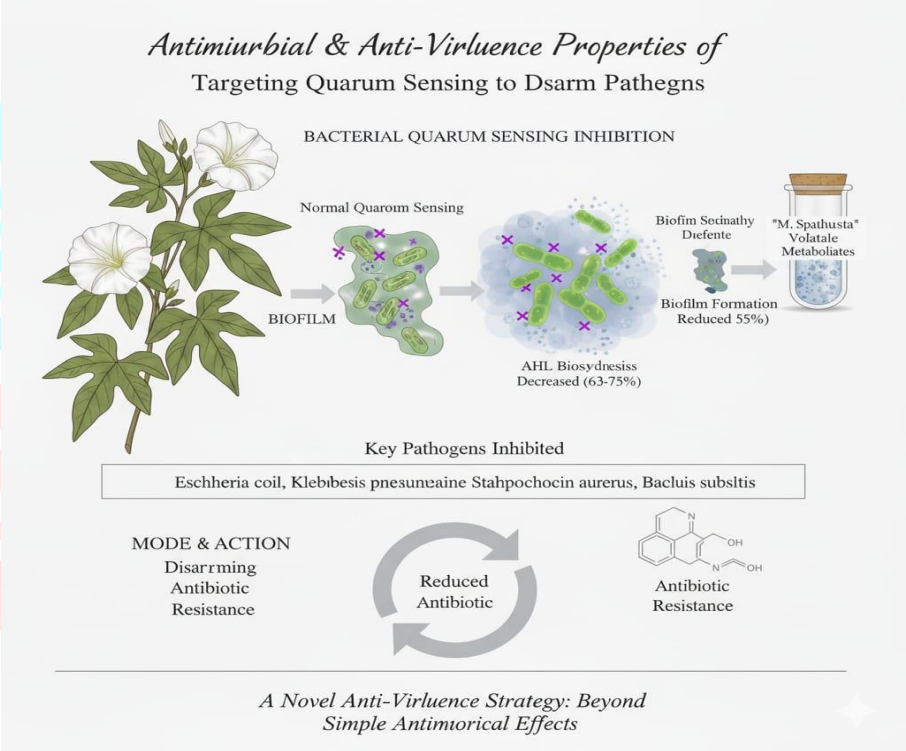
Compound Class/Compound	Chemical Description	Reported Activities
Alkaloids	Nitrogen-containing organic compounds	Antimicrobial
Glycosides	Compounds with a sugar Molecule attached	Antimicrobial
Cyanogenic Glycosides	Glycosides that release hydrogen cyanide upon hydrolysis	Antimicrobial, Anti-herbivore defense, Toxicity
Saponins	Soap-like glycosides	Antimicrobial
(+) Spathulenol	A volatile sesquiterpenoid alcohol	Anti pathogenic, Anti-virulence
Tannins	Polyphenolic compounds	Astringent, Antimicrobial

5. Pharmacological Activities and Biological Effects

A. Antimicrobial and Anti pathogenic Properties

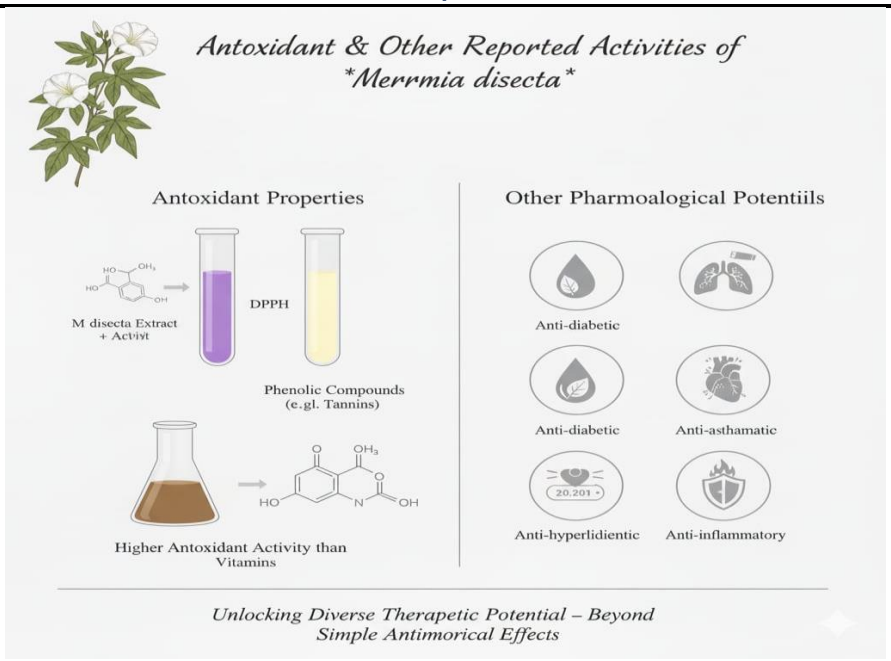
Merremia dissecta has demonstrated significant antimicrobial efficacy against arrange of human pathogens, including *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Pseudomona aeruginosa*. The plant's oil has also shown good activity against *Bacillus subtilis*in a separate study.

The most advanced pharmacological finding, however, is the plant's ability to interfere with bacterial quorum sensing (QS), a sophisticated communication system used by bacteria to coordinate virulence. Volatile metabolites from *M. dissecta* have been shown to significantly decrease N-acyl homoserine lactone (AHL) biosynthesis in *Pseudomonas aeruginosa* by 63% to 75%. This disruption of bacterial communication attenuates the expression of virulence factors, such as bio film formation, by 55%. This is a crucial finding that moves beyond simple anti microbial effects. Bio films make bacteria more resistant to conventional antibiotics and host defenses. By targeting the QS system, the compounds from *M. dissecta* could represent a new therapeutic strategy that disarms pathogens rather than killing them, a mechanism less likely to promote antibiotic resistance. This anti-virulence property elevates the plant's medicinal potential to a modern, sophisticated level.[7]



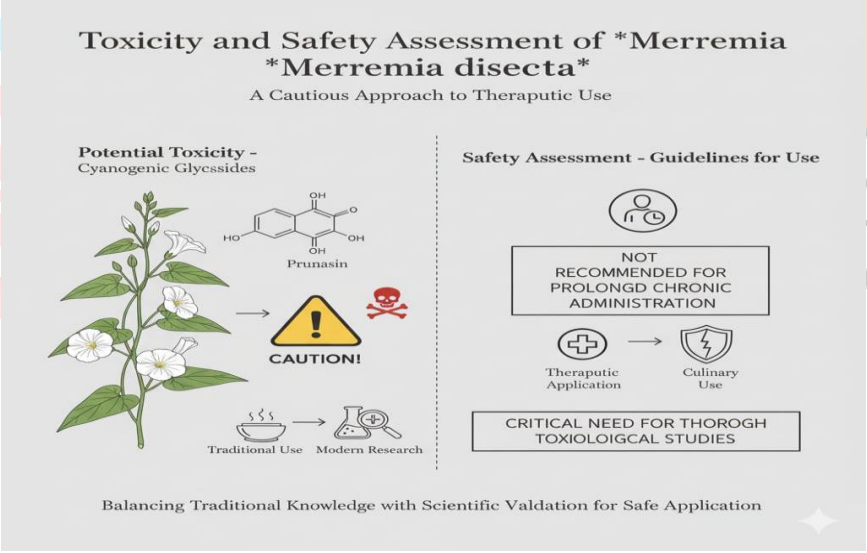
B. Anti oxidant and Other Reported Activities

Beyond its antimicrobial effects, the plant has also shown significant antioxidant properties, as demonstrated by its activity in the DPPH bioassay. The presence of phenolic compounds, such as tannins, may contribute to this activity, as they are known to have higher antioxidant activities than conventional vitamins. Other reported pharmacological potentials include antidiabetic, anti-asthmatic, anti-hyperlipidic, and anti-inflammatory effects.[7]



C. Toxicity and Safety Assessment

The presence of cyanogenic glycosides necessitates a cautious approach to the plant's medicinal and culinary use. While some traditional uses involve preparing the plant to mitigate toxicity, modern research has noted that while most *Merremia* species appear safe, they are not recommended for "prolonged chronic administration". This is a critical point for any potential therapeutic application and underscores the need for thorough toxicological studies.

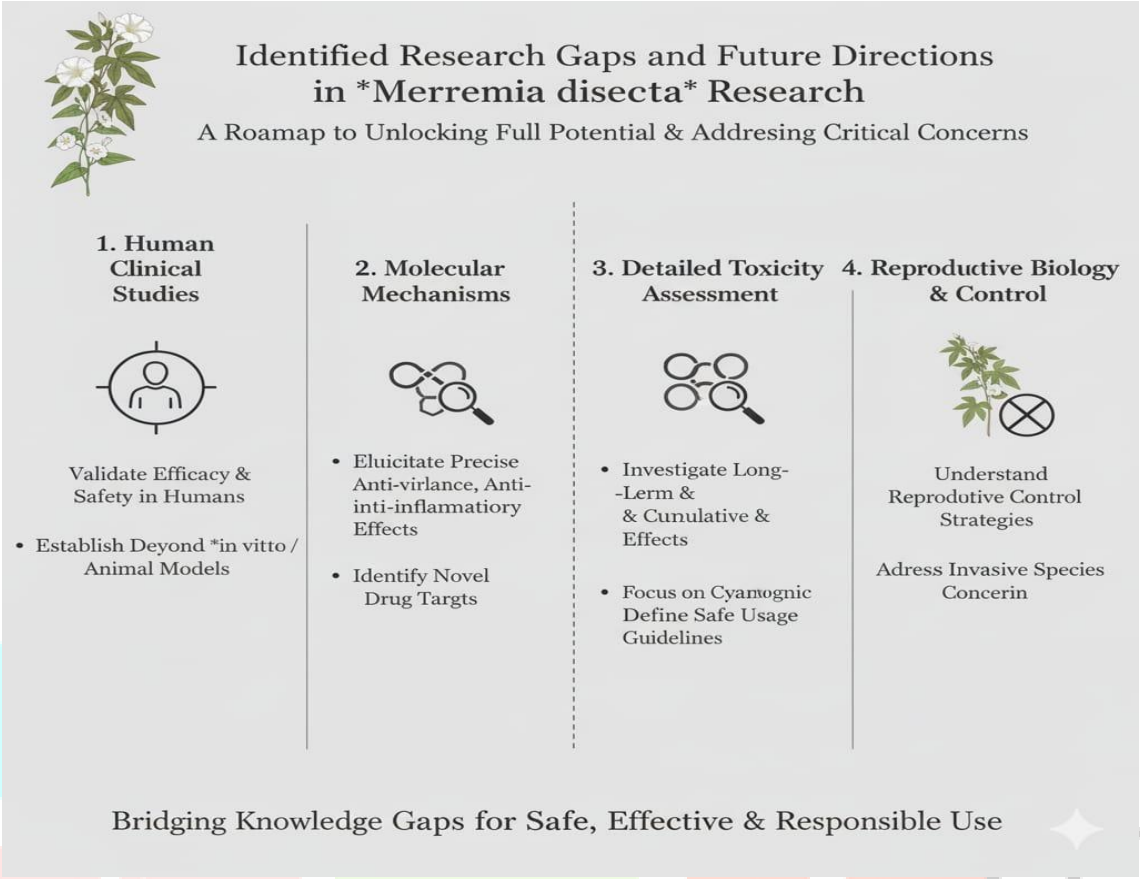


6. Identified Research Gaps and Future Directions

There search on *Merremia dissecta* has made significant strides, but critical gaps remain that must be addressed to fully realize its potential First and for most is the lack of human clinical studies. The reported bioactivities of the plant have been largely demonstrated in *in-vitro* or animal models. Clinical trials are essential to validate the efficacy of these activities in humans and to establish proper dosage, administration, and safety profiles.

Second, a deeper understanding of the molecular mechanisms is required. While research has identified key compounds and their effects, the precise molecular pathways and targets through which these compounds exert their antimicrobial, anti pathogenic, and anti-inflammatory effects have not been fully elucidated. Further research in this area could uncover new drug targets and lead to the development of novel pharmaceuticals. Third, detailed investigations into the plant's toxicity are

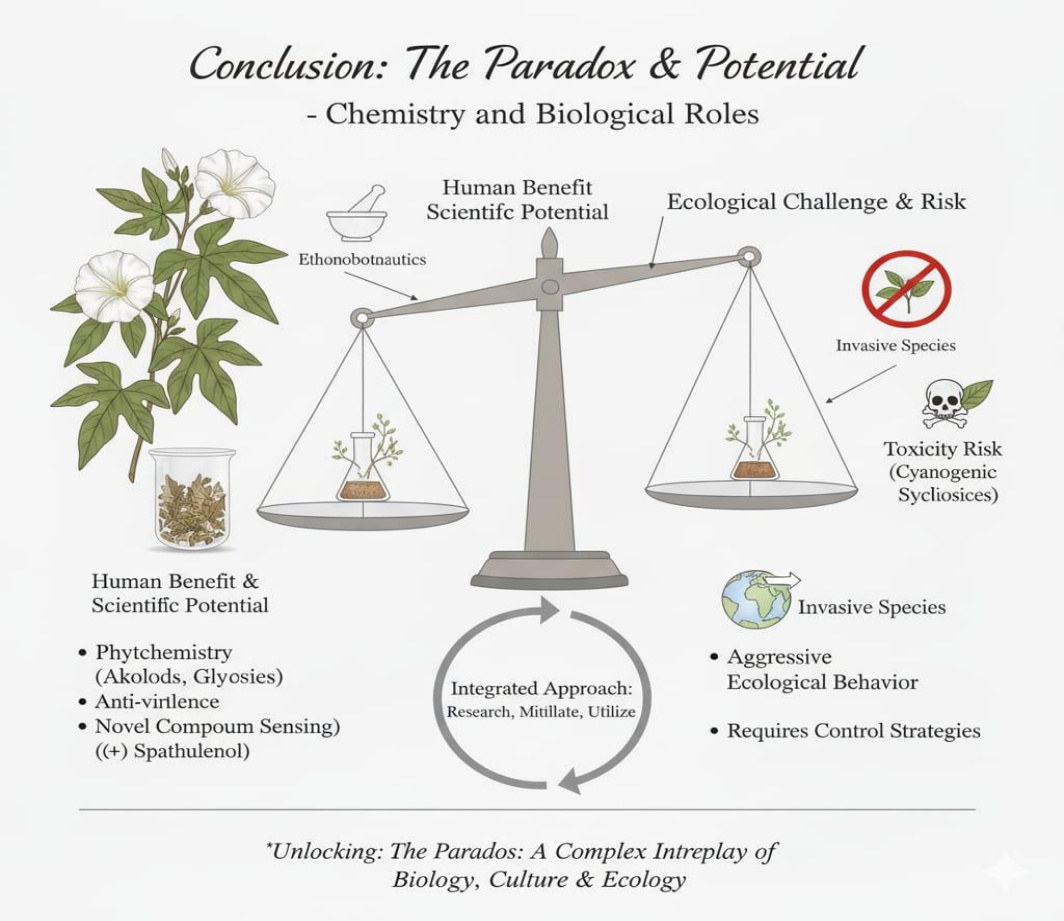
necessary, particularly regarding long-term use and potential cumulative effects of chronic administration. This is especially important for a plant containing cyanogenic glycosides. Finally, in the context of its invasive nature, there is a clear and pressing need for dedicated research on its reproductive biology to develop effective and environmentally sound management and control strategies. The current lack of documented control methods for this high-risk invasive species is a significant concern for environmental conservation.



7. Conclusion

Merremia dissecta is a species of significant scientific and cultural interest defined by its multifaceted nature. Its rich ethno botanical history of use as a condiment, ornamental, and medicine has been increasingly validated by modern phytochemical and pharmacological research. The plant's complex chemical composition, including alkaloids, glycosides, and unique compounds like (+) spathulenol, provides a strong scientific foundation for its traditional uses and points toward its potential as a source of novel therapeutic agents. The discovery of its ability to disrupt bacterial quorum sensing is a particularly promising finding that offers a new avenue for developing anti-virulence drugs in an era of growing antibiotic resistance.

Simultaneously, the plant's aggressive ecological behavior presents a clear and undeniable challenge. Its status as a high risk invasive species, fueled by the very traits that make it desirable, underscores critical environmental issue. A balanced and comprehensive approach is required, one that leverages its potential for human benefit through rigorous scientific inquiry while also developing effective strategies to mitigate its environmental risks. Ultimately, *Merremia dissecta* stands as a compelling case study of the complex interplay between plant biology, human culture, and ecological impact, inviting further exploration to fully understand its potential and its paradox.



REFERENCES

1. Merremia dissecta (Alamo vine) | Native Plants of North America, https://www.wildflower.org/plants/result.php?id_plant=medi2

2. Classification for Kingdom Plantae Down to Species Merremia dissecta (Jacq.) Hallier f. - USDA Plants Database, https://plants.usda.gov/classification/53101

3. Merremia dissecta - Alamo Vine - Plant Lust, https://plantlust.com/plants/50495/merremia-dissecta/

4. Merremia dissecta (Convolvulaceae): Condiment, Medicine ..., https://www.researchgate.net/publication/225684515_Merremia_dissecta_Convolvulaceae_Condiment_Medicine_Ornamental_and_Weed-A_Review

5. Merremia dissecta - UF/IFAS Assessment - University of Florida, Institute of Food and Agricultural Sciences, https://assessment.ifas.ufl.edu/assessments/merremia-dissecta/

6. Merremia dissecta - Useful Tropical Plants, https://tropical.theferns.info/viewtropical.php?id=Merremia+dissecta

7. Merremia dissecta (Convolvulaceae): Condiment, Medicine, Ornamental, and Weed—A Review1 - Your Page Title, http://oldsite.econbot.org/webmaster/factoids/14_merremia/ebot-61-02-109.pdf

8. Merremia dissecta (Jacq.) Hallier f. - Herbarium JCB, https://indiaflora-ces.iisc.ac.in/FloraPeninsular/plants.php?name=Merremia%20dissecta

9. Merremia dissecta - India Flora Online - Indian Institute of Science, https://indiaflora-ces.iisc.ac.in/herbsheet.php?id=7783&cat=13

10. Merremiadissecta-Lucid key, https://keyserver.lucidcentral.org/weeds/data/media/Html/merremia_dissecta.htm
11. Merremia-Wikipedia,https://en.wikipedia.org/wiki/Merremia
12. Merremiadissecta-|Center for Aquatic and Invasive Plants ..., https://plant-directory.ifas.ufl.edu/plant-directory/merremia-dissecta/
13. www.researchgate.net,https://www.researchgate.net/publication/225684515_Merremia_dissecta_Convolvulaceae_Condiment_Medicine_Ornamental_and_Weed-A_Review#:~:text=Abstract,by%20an%20array%20o f%20cultures.
14. Five Fingers Merremia dissecta | Dutch Caribbean Species Register, https://www.dutchcaribbeanspecies.org/linnaeus_ng/app/views/species/nsr_taxon.php?id=178159
15. How can I control field bindweed (Convolvulus arvensis)? | NPIN, https://www.wildflower.org/expert/show.php?id=3761
16. Merremia dissecta - Alamo Vine - Native Plant Society of Texas, https://www.npsot.org/posts/native-plant/merremia-dissecta/
17. Preliminary Phytochemical Analysis of Merremia Dissecta (JACQ ..., https://www.ijcps.org/0Site/SP3/P1.pdf
18. A Review on Pharmacological Use and Phytochemical Screening of Merremia Dissecta,https://www.ijaresm.com/a-review-on-pharmacological-use-and-phytochemical-screening-of-merremia-dissecta
19. Noyau Vine | Treasure Coast Natives - WordPress.com, https://treasurecoastnatives.wordpress.com/2015/03/19/noyau-vine/
20. detection and quantitativeestimationofprussicacidinsomemembersoffamily-convolvulaceaefromnanded.IJNRD,https://www.ijnrd.org/papers/IJNRD2409274.pdf
21. Merremia dissecta (Convolvulaceae): Condiment, Medicine, Ornamental, and Weed—A Review Research Gate, https://www.researchgate.net/publication/304300378_Merremia_dissecta_Convolvulaceae_Condiment_Medicine_Ornamental_and_Weed-A_Review
22. 2456-3315 Impact Factor: 8.14 and ISSN APPROVED, Journal Starting Year (ESTD) : 2016 - ijrti, https://ijrti.org/viewpaperforall.php?paper=IJRTI2506018
23. The Pharmaceutical and Chemical Journal, 2021, 8(1):140-145 Research Article GC-MS Analysis, Antimicrobial and Antioxidant Activ,http://tpcj.org/download/vol-8-iss-1-2021/TPCJ2021-08-01-140-145.pdf
24. Volatilesfrom Subtropical Convolvulaceae That Interfere with Bacterial Cell-to-Cell Communication as Potential Antipathogenic Drugs - PMC, https://pmc.ncbi.nlm.nih.gov/articles/PMC4893445/
25. Biological Activity of Merremia emarginata Crude Extracts in Different Solvents, https://scialert.net/fulltext/?doi=rjmp.2009.134.140
26. (PDF) GC-MS Analysis of Bioactive Compounds in Methanolic Extracts of Stem and Seed Samples of Distimake spp. - ResearchGate, https://www.researchgate.net/publication/377682868_GCMS_Analysis_of_Bioactive_Compounds_in_Methanolic_Extracts_of_Stem_and_Seed_Samples_of_Distimake_spp
27. Olatunji T.L*, Adetunji A.E, Chijioke Olisah, Idris O.A, Saliu O.D and Frances Siebert. Research Progression of the Genus Merremia: A Comprehensive Review on the Nutritional Value, Ethnomedicinal Uses, Phytochemistry, Pharmacology, and Toxicity, Pubmed;2021 Oct; 10(10): 2070
28. Bannan Muthi, atul Af-idah, Muhammad Hanafi, Berna Elya. Antioxidant and alpha glucosidase inhibitor screening of *Merremia peltata* L. as potential traditional treatment for diabetes mellitus. *Pharmacogn J*. 2021;13(4):905–908.
29. Maske A.S, Dr.Mandade R.J, Kamble S.M, review on pharmacological uses of merremia dissecta, journal of pharmacy and pharmaceutical sciences, 2022; Volume 11, Issue 7, 1001-1010.

30. Jawad A, Abu B.A Hazrat Bilal*. Qualitative Phytochemical Screening of Merremia dissecta (Sepals & Fruit), Phytopharmacology Research Journal (PRJ), Vol.1, Issue, 1. January 2022, pp. 23-33.

31. Syed Sabiha v. Critical evaluation of the potent antidiabetic drug plant *Gymnema sylvestre* (Retz) R. Br. of Asclepidaceae and *Merremia dissecta* (Jacquin) Hallier f. of Convolvulaceae. *Bioscience Discovery, 6(1): 54-58, Jan – 2015*

32. Karuppusamy Arunachalam, Thangaraj Parimelazhagan. Antidiabetic activity of aqueous root extract of *Merremia tridentata* (L.) Hall. f. in streptozotocin-induced diabetic rats. *Asian Pacific Journal of Tropical Medicine (2012)175-179*

33. B. Yuvaraj, M. Sathish. In vitro and in vivo antidiabetic activity of leaves of *Merremia hederacea* (Burm. f.) Hallier f. *International Journal of Green Pharmacy. Oct-Dec 2019. 13 (4) | 384*

34. Ridhi Joshi, Rishikesh M et al, Comparative phytochemical analysis of bioactive constituents present in in vitro and in vivo plant parts of Merremia aegyptia and Merremia dissecta, journal of pharmacognoy and phytochemistry, E-ISSN: 2278-4136,P-ISSN: 2349-8234 JPP 2018; 7(1): 679-684

35. www.jcu.edu.au/discover-nature-at-jcu/plants/nq-weeds-by-scientific-name2/merremia-dissecta.

36. Austin, D. F. and Huaman, Z. 1996. A synopsis of Ipomoea (Convolvulaceae) in the Americas. Taxon 45:5.

37. Wikipedia, www.jstor.org/stable/4257193.

38. Website, flora-peninsula-indica.ces.iisc.ac.in/herbsheet.php?id=2894&cat=7.

39. Babu A.V, Rao R.S.C, Kumar K.G, Babu B.H et al, Biological Activity of Merremia emarginata Crude Extracts in Different Solvents, Year: 2009 | Volume: 3 | Issue: 4 | Page No.: 134-140.

40. Devhade J.B, Devhade M.J, Kalwaghe S.S. Preliminary Phytochemical Analysis of Merremia Dissecta (JACQ) Hall a Member of Convolvulaceae. International Journal of Chemical and Physical Sciences, 2015; 4: 01-06.

41. Wadgama, A A., Mandade RJ and Jangid, P R. Therapeutic review on medicinal plant merrimia dissecta, International Journal of Recent Scientific Research Vol. 11, Issue, 02 (D), pp. 37466-37470, February, 2020.