

THE ANNONACEAE FAMILY IN MEXICO: INTRODUCTION TO THE SPECIAL ISSUE

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Abstract

Annonaceae, the most diverse lineage of Magnoliidae, comprises 110 genera and more than 2,500 species of trees, lianas, and shrubs. As dominant elements of tropical forests, they sustain pollination and dispersal networks while providing cultural and economic value. Many species are used in traditional medicine and noted for their diverse phytochemistry. In Mexico, despite high endemism and significant research efforts, studies remain dispersed across disciplines. Without an integrative synthesis, the state of knowledge, relative to global advances, remains unclear, underscoring the need for comprehensive approaches to consolidate information and guide future research. This special issue of *Botanical Sciences*, brings together nine contributions spanning taxonomic, ecological, phytochemical, cultural, pharmacological, and evolutionary perspectives. Collectively, they provide an integrated synthesis of current knowledge, highlight understudied areas and methodological challenges, and establish a foundation for future research on this diverse and significant family.

Keywords: Ecology, evolution, pharmacology, phytochemistry, taxonomy

Resumen

Annonaceae, el linaje más diverso de Magnoliidae, comprende 110 géneros y más de 2,500 especies de árboles, lianas y arbustos. Como elementos dominantes de los bosques tropicales, sostienen redes de polinización y dispersión y desempeñan un papel ecológico fundamental. Al mismo tiempo, para las comunidades que habitan estas regiones, constituyen recursos de gran valor cultural y económico. Muchas especies se emplean en la medicina tradicional y se distinguen por su diversidad fitoquímica. En México, pese al elevado número de especies endémicas y a la considerable trayectoria de investigación sobre la familia, la información disponible sobre las Annonaceae permanece dispersa entre distintas disciplinas. Sin una síntesis integradora, el estado del conocimiento sobre los avances globales permanece poco definido, lo que resalta la necesidad de enfoques integrales que consoliden la información existente y orienten futuras investigaciones. Este número especial de *Botanical Sciences* reúne nueve contribuciones que abarcan perspectivas taxonómicas, ecológicas, fitoquímicas, culturales, farmacológicas y evolutivas. En conjunto, proporcionan una síntesis integrada del conocimiento actual, destacan áreas poco estudiadas y desafíos metodológicos y establecen una base para futuras investigaciones sobre esta familia diversa y significativa.

Palabras clave: Ecología, evolución, farmacología, fitoquímica, taxonomía.

This special issue of *Botanical Sciences*, published by the Botanical Society of Mexico, is dedicated to the family Annonaceae. Globally, Annonaceae are the most species-rich family within Magnoliidae, comprising 110 genera and more than 2,500 species of trees, lianas, and shrubs, and they are structurally dominant in tropical forests worldwide (Nge *et al.* 2024). Their trimerous flowers, differentiated perianth, and numerous stamens and carpels sustain diverse pollination networks, while their varied fruits promote dispersal by birds, mammals, and other vertebrates, underscoring their ecological importance (Gottsberger 2012, Onstein *et al.* 2019). Beyond their ecological role, Annonaceae also hold substantial cultural and economic value, with many species cultivated for edible fruits and widely used in traditional medicine. Furthermore, the phytochemistry of Annonaceae is highly diverse: some species produce essences used in perfumery and food flavouring, while others biosynthesise secondary metabolites of pharmaceutical and agronomic relevance.

The contributions gathered in this issue encompass taxonomic, ecological, phytochemical, cultural, pharmacological, and evolutionary studies, reflecting the breadth of approaches currently applied to the Annonaceae family in Mexico. Specifically, the volume includes nine outstanding papers that together provide an integrated synthesis of knowledge on Annonaceae in the country, while situating these efforts within broader global advances. At the same time, the collection highlights understudied areas, open questions, and methodological limitations, thereby guiding future research. In this sense, the special issue can be regarded as a critical tool for consolidating current understanding and for charting the future course of knowledge on this family in Mexico.

In this special issue, we present for the first time a commented checklist of the species and genera of Annonaceae occurring in Mexico, together with analyses of their distribution patterns, richness, and endemism, as well as the identification of priority areas for conservation. Hurtado-Reveles *et al.* (2026) report that Mexico harbors 11 genera and 75 species of Annonaceae, including 44 endemic species, five of which remain undescribed. Alarming, 35 species are considered Endangered and 31 Critically Endangered. Species richness and endemism are concentrated in humid tropical regions, particularly in southern Mexico, underscoring both the ecological significance of these forests and the urgent need for conservation efforts.

Complementing these contributions, five review articles explore diverse aspects of Annonaceae biology. Dela-Cruz-Chacón *et al.* (2026) provide a comprehensive synthesis of the current state of knowledge on secondary metabolites in Mexican Annonaceae, highlighting acetogenins, alkaloids, phenols, and terpenes as the most numerous groups. Sixteen species across six genera have been studied, with *Annona* standing out due to its importance in fruit production. These compounds, reported in varying numbers of species, are notable for their potent biological activities, including insecticidal, anticancer, antimicrobial, and antioxidant properties. In this regard, Schlie-Guzmán & Ramos-Morales (2026) examine extracts and secondary metabolites of Mexican Annonaceae and their potential as chemotherapeutic agents against cancer, reporting numerous bioactive compounds isolated from different plant organs. Similarly, Durán-Ruiz & González-Esquínca (2026) synthesize research on insecticidal activity, identifying acetogenins as particularly effective molecules toxic to 21 insect species, with *Aedes aegypti* and *Spodoptera frugiperda* being the most frequently evaluated. Ferreira *et al.* (2026) review studies on seed germination, focusing on seed formation, dormancy, and germination mechanisms in 15 species, mostly *Annona*, providing a valuable framework for reproductive biology. Meanwhile, Amancio *et al.* (2026) synthesize current knowledge on reproductive ecology, emphasizing floral morphology, phenology, pollination systems, and seed dispersal. They show that Mexican Annonaceae possess protogynous flowers, are primarily insect-pollinated, and exhibit seasonal flowering linked to rainfall, with vertebrates playing a central role in seed dispersal.

This special issue also includes articles focused on particular species. Vargas-Simón *et al.* (2026) present a comprehensive review of *Annona reticulata*, addressing its botanical description, anatomy, physiology, phytochemistry, propagation, associated diseases and pests, agronomic management, and economic significance. In turn, Sánchez-García *et al.* (2026) provide a thorough synthesis of the biological, ecological, and ethnobotanical aspects of *A. glabra*, assessing its role as a key wetland species and exploring its potential applications in medicine, ecological restoration, and climate change adaptation.

Finally, Ortiz-Rodríguez *et al.* (2026) present an evolutionary study using Annonaceae as a model lineage to reconstruct Mesoamerica's evolutionary trajectories. Their high-resolution phylogenomic framework, encompassing more than 80 % of the ~2,500 species in the family, reveals consistent patterns of floristic and evolutionary differentiation, as well as sharp contrasts between northern Mesoamerica (MegaMexico 2 and the Caribbean) and southern regions. These findings challenge the traditional view of Mesoamerica as a single evolutionary unit and demonstrate that its tropical forests are dynamic systems, repeatedly shaped by cycles of climatic change and geographic isolation.

Taken together, the contributions in this special issue provide the most comprehensive synthesis to date of Annonaceae research in Mexico. While the genus *Annona* emerges as the most studied across most of the evaluated topics, particularly due to its economic importance, other genera and species remain scarcely represented in the literature. By integrating taxonomic, ecological, phytochemical, cultural, and evolutionary perspectives, this volume not only consolidates current knowledge but also underscores the urgent need to expand research efforts beyond *Annona* species. Such expansion is essential to foster a more balanced understanding of the family's diversity, ecological functions, evolutionary trajectories, phytochemical properties, and cultural significance in Mexico. In this sense, the special issue serves both as a reference point and as a call to broaden the scope of future studies.

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