

Article

Rescuing the Forgotten Flora: Proposal of an Ornamental Native Plant Collection for a Botanical Garden in an Industrial Zone

Alejandro Torres-Montúfar ^{1,*} , Mayte Stefany Jiménez-Noriega ² and Karla Quiñones-Molina ³

¹ Herbario FES-Cuautitlán, Departamento de Ciencias Biológicas, Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México (FESC-UNAM), Carretera Cuautitlán Teoloyucan Km 2.5, San Sebastián Xhala, Cuautitlán Izcalli 54714, Mexico

² Laboratorio de Botánica Estructural, Departamento de Ciencias Biológicas, Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México (FESC-UNAM), Carretera Cuautitlán Teoloyucan Km 2.5, San Sebastián Xhala, Cuautitlán Izcalli 54714, Mexico; mayte.jimenez@cuautitlan.unam.mx

³ Coordinación de Ingeniería Agrícola, Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México (FESC-UNAM), Carretera Cuautitlán Teoloyucan Km 2.5, San Sebastián Xhala, Cuautitlán Izcalli 54714, Mexico

* Correspondence: montufar@comunidad.unam.mx

Abstract

The Metropolitan Area of the Valley of Mexico (MAVM), home to more than 20 million inhabitants, faces intense urban and industrial pressures that have led to habitat loss, fragmentation, and a decline in native vegetation. Within this context, botanical gardens are key institutions for ex situ conservation, ecological restoration, education, and cultural preservation. This study proposes the establishment of a collection of native and endemic ornamental plants in the Botanical Garden of the Facultad de Estudios Superiores Cuautitlán (FESC-UNAM), the only botanical garden located in an industrial zone of Mexico. To design this proposal, we conducted an extensive review of taxonomic, floristic, ethnobotanical, and horticultural literature, with special reference to the Flora Fanerogámica del Valle de México, and complemented it with exploratory field visits. The resulting collection comprises 35 native species across 26 families, including 17 endemic species, all adapted to xerophilous scrubland. The discussion highlights that beyond aesthetic value, many species have medicinal and cultural significance, strengthening the link between biodiversity conservation and social engagement. We conclude that this proposal enhances the dual role of the FESC Botanical Garden in preserving regional flora and promoting sustainable alternatives for urban landscaping in industrialized environments.

Keywords: conservation; Cuautitlan; endemic flora; ornamental



Academic Editor: Gianni Bedini

Received: 22 September 2025

Revised: 16 October 2025

Accepted: 17 October 2025

Published: 20 October 2025

Citation: Torres-Montúfar, A.; Jiménez-Noriega, M.S.; Quiñones-Molina, K. Rescuing the Forgotten Flora: Proposal of an Ornamental Native Plant Collection for a Botanical Garden in an Industrial Zone. *J. Zool. Bot. Gard.* **2025**, *6*, 54. <https://doi.org/10.3390/jzbg6040054>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The Metropolitan Area of the Valley of Mexico (MAVM) is home to more than 20 million inhabitants and functions as the political, economic, and industrial center of Mexico [1]. This intense human activity has resulted in profound ecological transformations, including air pollution, habitat fragmentation, soil degradation, and loss of native vegetation. The surrounding natural ecosystems, such as temperate forests, xerophilous scrublands, and wetlands, have been progressively reduced and degraded, with many species facing increasing risks of local extinction [2]. Nevertheless, classic floristic estimations highlight that this region still harbors high levels of plant diversity with more than 2000 species of vascular plants, diversity largely explained by its complex topography, climatic heterogeneity, and transitional biogeographic position [3,4].

For plant preservation, botanical gardens have emerged as key institutions that integrate *ex situ* conservation, scientific research, ecological restoration, and environmental education [5,6]. The history of botanical gardens in Mexico is closely linked to both indigenous traditions and colonial scientific enterprises. Pre-Hispanic cultures such as the Mexica developed sophisticated gardens that combined utilitarian, ornamental, and ceremonial functions, including the celebrated royal gardens of Tetzcotzinco and many other pre-Hispanic Gardens [7,8]. Following the Spanish conquest, interest in documenting and cultivating the native flora intensified, most notably through the botanical garden established in Mexico City in 1788 under the direction of Martín de Sessé and José Mariano Mociño, as part of the Royal Botanical Expedition of New Spain [9].

Modern Mexican botanical gardens emerged during the 20th century, beginning with the foundation of the Jardín Botánico of the Instituto de Biología at the Universidad Nacional Autónoma de México (UNAM) in 1959 [10]. Today, Mexico hosts 47 officially recognized botanical gardens [11,12]. Institutions that became centers for research, conservation, and environmental education.

In botanical gardens, ornamental plants play a fundamental role in shaping the aesthetic character, providing color, texture, and structural diversity that enhance the overall visitor experience [13,14]. Their visual appeal makes them essential components of garden design, where they serve as focal points and create harmonious landscapes that attract and engage the public [13]. Ornamental plants are generally characterized by features that enhance their visual and aesthetic appeal, making them attractive for cultivation in gardens and landscapes [15]. Among the most valued traits are foliage with distinctive shapes, textures, or variegated patterns, which provide year-round interest even in the absence of flowers. The color, size, and abundance of flowers are also central, with vibrant or unusual tones often being a decisive factor in ornamental value [16,17].

Botanic gardens are increasingly recognized as catalysts of applied conservation, where horticultural propagation serves as a strategic instrument to enhance resilience and promote the sustainable use of native flora [11]. Integrating propagation programs and strengthening greenhouse infrastructure can transform *ex situ* collections into dynamic resources for urban green infrastructure and local economies. Collaboration with local nurseries is essential to achieve large-scale propagation and distribution, bridging scientific expertise with production capacity. This perspective reflects the principles of the International Agenda for Botanic Gardens in Conservation [18] and aligns with the framework of “collaborative conservation” [19], positioning botanic gardens as mediators between biodiversity conservation and sustainable development.

The Botanical Garden of the Faculty of Higher Studies Cuautitlán (Facultad de Estudios Superiores Cuautitlán—FESC) is the only one located in an industrial zone, in the region of Cuautitlán, and represents a unique case of conservation within one of the most highly urbanized and industrialized landscapes of Mexico [20] (Figure 1). Despite its placement in a heavily modified environment, the garden maintains a diverse collection that includes numerous endemic elements of the Mexican flora, particularly cacti, together with many exotic plants of economic and educational value. However, the representation of species strictly native to the Metropolitan Area of the Valley of Mexico remains limited. For this reason, the objective of our work is to develop, at least initially as a theoretical proposal, the establishment of a collection of potentially ornamental native and endemic plants of the Valley of Mexico.

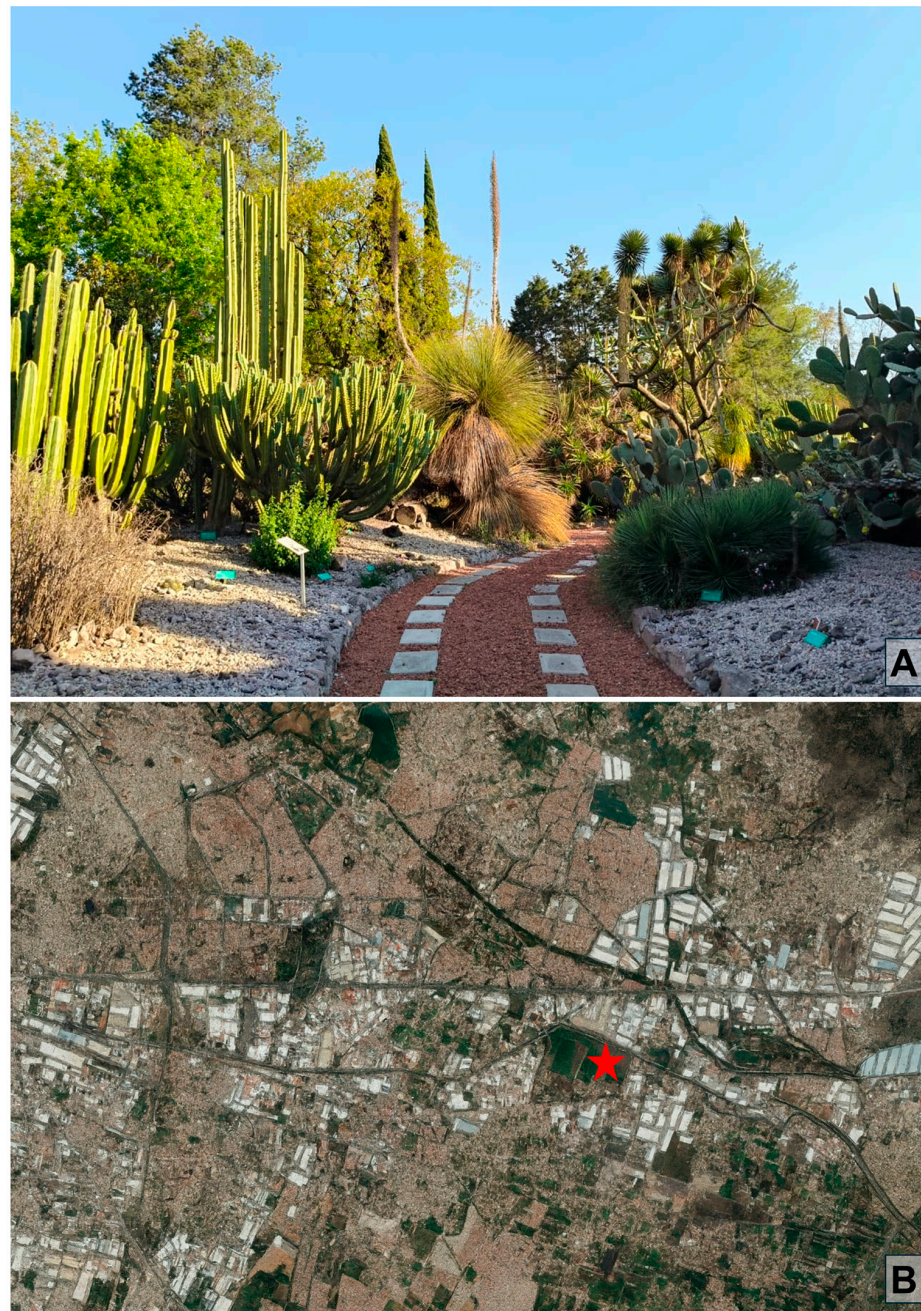


Figure 1. Botanical Garden at FES-Cuautitlan: (A) Main public collection of cacti (photograph by Alejandro de la Rosa Tilapa). (B) Location of the Botanical Garden at FES-Cuautitlan in the highly urbanized and industrial zone of Cuautitlan, Mexico (red star).

2. Materials and Methods

To generate a proposal for a collection of native plants of the Valley of Mexico suitable for a botanical garden, we conducted an extensive review of scientific, taxonomic, and ethnobotanical literature. More than 50 specialized works were consulted, including floristic inventories, ethnobotanical databases, pharmacological studies, and horticultural references. Particular emphasis was placed on the Flora Fanerogámica del Valle de México [4], which served as the primary taxonomic framework for determining the regional species pool.

Our approach aims to design a plant collection that is both scientifically robust and socially relevant, maximizing its impact on conservation, education, and local identity. The

species considered for inclusion in the proposed collection were evaluated according to the ornamental potential defined as species with notable aesthetic attributes (e.g., striking flowers, foliage, or growth form) or with a history of horticultural use, but also with plants with cultural relevance, associated with the traditions, symbolism, or identity of communities in the Valley of Mexico and medicinal importance.

Additionally, exploratory visits were conducted in the surrounding areas of the Botanical Garden of FES-Cuautitlan. These field explorations allowed for the direct observation of native vegetation and facilitated the selection of candidate species to be incorporated into the proposed collection. During these excursions, a photographic record of each species was systematically obtained.

3. Results

The proposed ornamental collection comprises a total of 35 species, distributed across 26 families and 34 genera (Figures 2–4). The majority of the taxa are perennial (32 species), while only three species are annuals: *Cosmos bipinnatus*, *Tagetes lunulata*, and *Eryngium carlinae*. Among the plants proposed, 17 species (48%) are endemic to Mexico (Table 1). With respect to life forms, herbaceous plants represent the majority with 18 species (51%), followed by shrubs with 14 species (40%), while vines and trees are comparatively scarce, represented by two species and one species, respectively (Table 1).



Figure 2. Species proposed for native plant collection at Botanical Garden at FES-Cuautitlan: (A) *Milla biflora*. (B) *Hymenocallis harrisiana*. (C) *Zephyranthes fosteri*. (D) *Sprekelia formosissima*. (E) *Echeandia nana*. (F) *Eryngium carlinae*. (G) *Prionosciadium thapsoides*. (H) *Asclepias linaria*. (I) *Agave filifera*. (J) *Manfreda scabra*. (K,L) *Pittocaulon praecox*. (M,N) *Tagetes lunulata*. (O) *Cosmos bipinnatus*. (P) *Begonia gracilis*. Photographs by Alejandro Torres-Montúfar.



Figure 3. Species proposed for native plant collection at Botanical Garden at FES-Cuautitlan: (A,B) *Tecoma stans*. (C) *Bursera cuneata*. (D) *Bursera fagaroides*. (E) *Ipomoea stans*. (F,G) *Sedum oxypetalum*. (H) *Dioscorea galeottiana*. (I) *Euphorbia radicans*. (J,K) *Brongniartia intermedia*. (L) *Erythrina leptorhiza*. (M) *Quercus frutex*. (N) *Hypoxis mexicana*. (O) *Tigridia vanhouttei*. (P) *Salvia mexicana*. Photographs by Alejandro Torres-Montúfar.

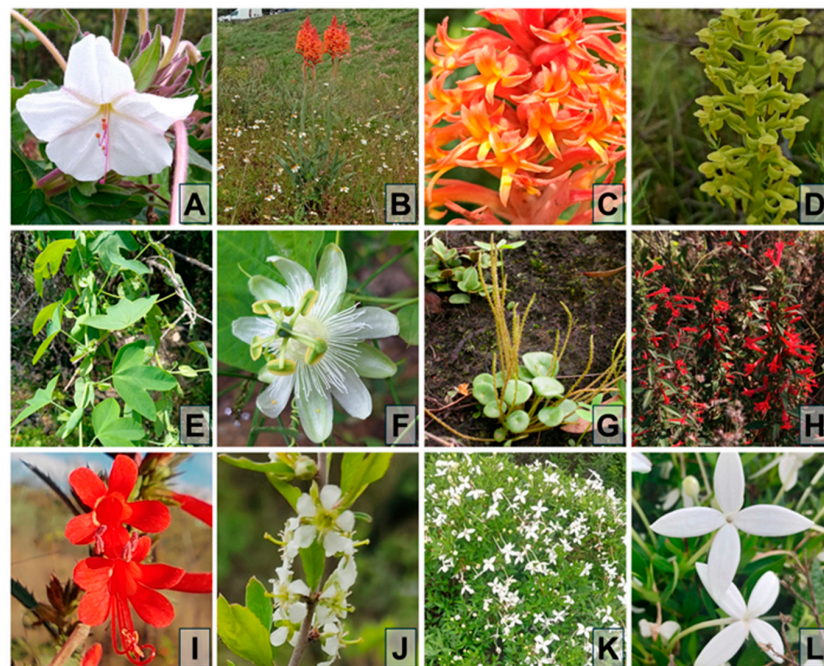


Figure 4. Species proposed for native plant collection at Botanical Garden at FES-Cuautitlan: (A) *Mirabilis longiflora*. (B,C) *Dichromanthus cinnabarinus*. (D) *Habenaria strictissima*. (E,F) *Passiflora subpeltata*. (G) *Peperomia umbilicata*. (H,I) *Loeselia mexicana*. (J) *Prunus microphylla*. (K,L) *Bouvardia longiflora*. Photographs by Alejandro Torres-Montúfar.

Table 1. Species list proposed to the ornamental plant collection for the Botanical Garden at FES-Cuautitlan, UNAM. Endemic species are marked by an asterisk (*).

Family	Species	Life Form	Phenology
Alliaceae	<i>Milla biflora</i> Cav.	Herbaceous	Perennial
Amaryllidaceae	* <i>Hymenocallis harrisiana</i> Herb.	Herbaceous	Perennial
Amaryllidaceae	* <i>Zephyranthes fosteri</i> Traub.	Herbaceous	Perennial
Amaryllidaceae	<i>Sprekelia formosissima</i> (L.) Herb.	Herbaceous	Perennial
Anthericaceae	* <i>Echeandia nana</i> (Baker) Cruden	Herbaceous	Perennial
Apiaceae	<i>Eryngium carlinae</i> F. Delaroche	Herbaceous	Annual
Apiaceae	<i>Prionosciadium thapsoides</i> (DC.) Mathias	Herbaceous	Perennial
Asclepiadaceae	<i>Asclepias linaria</i> Cav.	Shrub	Perennial
Asparagaceae	* <i>Agave filifera</i> Salm-Dyck	Herbaceous	Perennial
Asparagaceae	<i>Manfreda scabra</i> (Ortega) McVaugh	Herbaceous	Perennial
Asteraceae	* <i>Pittocaulon praecox</i> (Cav.) H. Rob. & Brettell	Shrub	Perennial
Asteraceae	* <i>Tagetes lunulata</i> Ortega	Herbaceous	Annual
Asteraceae	<i>Cosmos bipinnatus</i> Cav.	Herbaceous	Annual
Begoniaceae	<i>Begonia gracilis</i> Kunth	Herbaceous	Perennial
Bignoniaceae	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Shrub	Perennial
Burseraceae	* <i>Bursera cuneata</i> (Schltdl.) Engl.	Tree	Perennial
Burseraceae	* <i>Bursera fagaroides</i> (Kunth) Engl.	Shrub	Perennial
Convolvulaceae	* <i>Ipomoea stans</i> Cav.	Shrub	Perennial
Crassulaceae	* <i>Sedum oxypetalum</i> Kunth	Shrub	Perennial
Dioscoreaceae	<i>Dioscorea galeottiana</i> Kunth	Vine	Perennial
Euphorbiaceae	<i>Euphorbia radians</i> Benth.	Herbaceous	Perennial
Fabaceae	* <i>Brongniartia intermedia</i> Moric. ex Ser.	Shrub	Perennial
Fabaceae	* <i>Erythrina leptorhiza</i> DC.	Shrub	Perennial
Fagaceae	* <i>Quercus frutex</i> Trel.	Shrub	Perennial
Hypoxidaceae	* <i>Hypoxis mexicana</i> Schult. & Schult. f.	Herbaceous	Perennial
Iridaceae	* <i>Tigridia vanhouttei</i> Roetzl ex Van Houtte	Herbaceous	Perennial
Lamiaceae	* <i>Salvia mexicana</i> L.	Shrub	Perennial
Nyctaginaceae	<i>Mirabilis longiflora</i> L.	Shrub	Perennial
Orchidaceae	<i>Dichromanthus cinnabarinus</i> (Lex.) Garay.	Herbaceous	Perennial
Orchidaceae	<i>Habenaria strictissima</i> Rchb. f.	Herbaceous	Perennial
Passifloraceae	<i>Passiflora subpeltata</i> Ortega	Vine	Perennial
Piperaceae	<i>Peperomia umbilicata</i> Ruiz & Pav.	Herbaceous	Perennial
Polemoniaceae	<i>Loeselia mexicana</i> (Lam.) Brand.	Shrub	Perennial
Rosaceae	* <i>Prunus microphylla</i> (Kunth) Hemsl.	Shrub	Perennial
Rubiaceae	<i>Bouvardia longiflora</i> (Cav.) Kunth	Shrub	Perennial

Most species initiate or peak their flowering between June and September, when overlapping periods create the highest richness of simultaneous blooms. Fewer species flower in the dry months of December to February, although some, such as *Tecoma stans*, maintain flowering almost year-round (Figure 5).

Most of the species (20) are evergreen and maintain their epigeal structures throughout the year. In contrast, eight species lack epigeal structures for several months annually, particularly between December and March, while they develop and maintain vegetative/reproductive structures mainly from June to October (Figure 6).



Figure 5. Phenology of selected native species for native plant collection at Botanical Garden at FES-Cuautitlan. Periods of flowering (yellow) and fruiting (purple) are shown throughout the year. * The flowering/ fruiting of this plant depends on its maturity and does not conform to a specific period.



Figure 6. Presence of epigeal structures in the selected native species for native plant collection at Botanical Garden at FES-Cuautitlan.

4. Discussion

The creation of a collection of native and endemic ornamental plants in botanical gardens has a dual relevance: it strengthens conservation strategies while also expanding the cultural and educational functions of these institutions. In regions with strong anthropogenic pressures, such as Cuautitlan, Mexico, one of the biggest industrial zones in Mexico, the role of botanical gardens becomes particularly significant [21,22]. This area is characterized by rapid urban growth, industrial expansion, and fragmentation of natural habitats, circumstances that limit the survival of native vegetation remnants. Within this context, the botanical gardens can serve as refuges for biodiversity and as platforms for raising awareness among local communities about the ecological and cultural value of their flora [23].

Currently, the Botanical Garden of the Faculty of Higher Studies Cuautitlan (FESC) already houses an ornamental section with numerous species [20]. However, the majority of these ornamentals are exotic and cultivated plants, including the African lily (*Agapanthus*; Amaryllidaceae), roses (*Rosa*; Rosaceae), and lilies (*Lilium*; Liliaceae), species that are widely recognized and appreciated for their beauty, and their presence contributes to the aesthetic appeal of the garden, fulfilling educational and recreational functions. Nevertheless, the predominance of exotics reveals a limitation: while they add ornamental value, they do not contribute to the conservation of local biodiversity. By introducing native and endemic ornamentals into the collection, the garden can fill this gap, combining the ornamental and aesthetic functions with biodiversity preservation.

The species proposed for this new collection are particularly valuable because most of them possess remarkable floral traits, such as intense colors, distinctive morphologies, and seasonal blooming patterns. Importantly, most of the proposed species correspond to herbs and shrubs, which are life forms representative of the xerophilous scrubland that surrounds the region. Additionally, all the proposed species are heliophilous; therefore, their establishment is considered potentially suitable. This ecological alignment ensures that the proposed species are well adapted to local climatic conditions, requiring minimal irrigation and care. Such ecological suitability is a strong advantage for long-term management, particularly in regions with limited water resources and high levels of environmental stress due to industrial activity.

The phenological patterns reveal a continuous turnover of flowering species throughout the year, many of which produce conspicuous and showy flowers that enhance their ecological visibility. Most species concentrate their flowering during the rainy season, particularly between June and September, when resource availability and pollinator activity are at their peak. However, the data also highlight the presence of species that bloom during the driest months, such as December and January, demonstrating contrasting strategies of phenological adaptation. This combination of rainy-season synchrony and dry-season exceptions underlines the functional diversity of reproductive timing within the community, ensuring floral resources are available across different seasonal windows. For a botanical garden, this temporal diversity in flowering is especially valuable, as it guarantees a dynamic and attractive display for visitors throughout the year while also providing continuous opportunities for environmental education, pollinator conservation, and the promotion of native plant diversity.

Another critical feature of the proposed assemblage is the predominance of perennial species. Perennials ensure the persistence of living collections within the garden across multiple seasons, minimizing the need for continuous replacement or reintroduction. This attribute guarantees that the garden maintains its aesthetic appeal and educational function with relatively low maintenance costs. In contrast, annual species, though valuable for their colorful and abundant flowering, require regular reintroduction to maintain their presence.

While this implies additional logistical efforts, it can also be considered an opportunity: annuals allow for dynamic changes within the collection, offering visitors a renewed visual experience and promoting public interest through seasonal variation.

The data on the persistence of epigeal structures show that most species maintain visible vegetative parts throughout the year, reflecting their perennial character and capacity to withstand seasonal changes. This continuous presence ensures that the garden remains structurally and visually dynamic, providing foliage and form even outside peak flowering periods. Nonetheless, a smaller group of species lose their epigeal structures during certain months, mainly in the dry season, indicating adaptive strategies to cope with water stress. This variation in vegetative persistence is relevant for our collection, as it allows for the combination of evergreen species with those exhibiting marked seasonal cycles.

Beyond the internal value for the Botanical Garden of FESC, the inclusion of native and endemic ornamentals also holds a broader socio-environmental potential. The project envisions not only the establishment of a collection but also the implementation of a structured propagation program for these species. Such an initiative aligns with the principles outlined in the International Agenda for Botanic Gardens in Conservation [18], which emphasizes the active role of botanic gardens in linking plant conservation with sustainable use. By promoting the large-scale propagation of native ornamentals, the FESC Garden could provide a viable and sustainable alternative to the prevailing reliance on exotic species for landscaping and restoration projects.

Moreover, by supplying propagated native plants to neighboring communities, public parks, and urban green spaces within the industrial zone of Cuautitlan, the garden would contribute simultaneously to biodiversity conservation and to the ecological restoration of degraded urban-industrial landscapes. This integrative approach reflects the concept of *collaborative conservation* [19], positioning botanic gardens as agents of social transformation capable of bridging biodiversity preservation with local development. In doing so, the FESC Botanical Garden would also help restore the cultural connection between local inhabitants and their native flora, reinforcing the perception of plants as both ecological and cultural heritage.

In addition, the introduction of native and endemic ornamentals into urban and industrial landscapes may provide ecosystem services that go beyond aesthetics. These include the attraction of pollinators, microclimate regulation, and contributions to urban biodiversity [24]. By integrating such species into local green infrastructure, the Botanical Garden of FESC positions itself not only as a center for education and research but also as an active participant in the promotion of sustainable urban planning.

Most of the species proposed for the collection are either endemic to Mexico or have distributions that extend only slightly into neighboring countries as Guatemala or the United States of America, reflecting the unique floristic identity of the region. This high proportion of narrow-range taxa underlines the importance of their inclusion in living collections, as they are particularly vulnerable to habitat loss and urban expansion. In contrast, only a few species exhibit broader geographic distribution, such as *Passiflora subpeltata* (Passifloraceae), widely dispersed in the Neotropics, and *Tecoma stans* (Bignoniaceae), a species distributed from the southern United States to northern Argentina, but are included as these plants are representative of the Mexican flora.

Moreover, the collection will not only include plants of ornamental value, but also species of medicinal importance, as exemplified by *Eryngium carlinae* (Apiaceae), a species valued for its distinctive morphology, including rigid, spiny leaves and showy inflorescences. Beyond its ornamental value, *E. carlinae* has been widely documented in traditional medicine in Mexico [25]. It is commonly used as a remedy for diabetes, kidney ailments, and gastrointestinal disorders, with both the epigeal parts and roots prepared in infusions

or decoctions [26]. Pharmacological studies have confirmed its hypoglycaemic properties, supporting its traditional use in the treatment of diabetes mellitus [27]. In addition, the species contains secondary metabolites such as flavonoids and saponins, which may explain its antioxidant and anti-inflammatory activity [28]. Thus, *E. carlinae* represents an excellent example of a plant that bridges ornamental horticulture and ethnomedicine. Its cultivation in a collection in the botanical garden would not only contribute aesthetic value but also highlight the cultural and pharmacological importance of native Mexican flora.

Similarly, *Tagetes lunulata* Ortega (Asteraceae) exemplifies the dual ornamental and medicinal significance of native flora. This species, endemic to Mexico, is highly attractive due to its bright yellow flowers, which provide substantial ornamental value and are frequently cultivated in home gardens and local festivities [29]. In addition to its ornamental role, *T. lunulata* has well-documented medicinal applications. It has traditionally been used in Mexican ethnomedicine to treat gastrointestinal disorders, respiratory ailments, and as an anti-inflammatory remedy [30–32]. The integration of *T. lunulata* into a botanical garden collection, therefore, not only enriches its aesthetic dimension but also underscores the conservation of a culturally and pharmacologically valuable endemic species.

To ensure the sustainable management of medicinal species within the collection, a continuous propagation program has been planned. This will prevent the depletion of individuals due to the removal of plant parts for traditional uses and will also allow for the production of surplus plants to be offered for sale through authorized channels, thus discouraging extraction from the garden. In addition, educational information sheets will accompany each medicinal species, clearly indicating its traditional uses and warning that inappropriate dosages may cause adverse effects. These measures aim to balance the educational and cultural value of the collection with the safety and conservation of the represented species.

An ecologically important example is that of *Prunus microphylla* (Rosaceae), an endemic shrub of central Mexico, remarkable for being one of the few dioecious species within the genus *Prunus* [4]. Its dioecious condition, relatively rare in the family Rosaceae, makes it of particular biological and evolutionary interest, as it offers opportunities to study reproductive strategies and their ecological implications in arid and semi-arid environments. Despite its relevance, *P. microphylla* is known from relatively few herbarium collections, which highlights its apparent rarity and possible vulnerability. The limited number of records suggests that the species may have restricted populations or fragmented distributions, raising questions about its conservation status. Including *P. microphylla* in a living collection would therefore not only contribute to the aesthetic and educational value of the garden but also ensure the ex situ conservation of an endemic and scarcely represented taxon, while providing material for further studies on dioecy, ecology, and conservation biology in Mexican flora.

Botanic gardens, particularly those situated in urban environments, generally maintain a limited number of individuals per species due to spatial, logistical, and management constraints. This design reflects their dual focus on education and scientific research, prioritizing taxonomic representation and public display over population-scale conservation. Consequently, the primary value of urban botanic gardens lies mainly in their educational purpose, as they serve to illustrate plant diversity, ecological processes, and conservation challenges to a broad audience. In this sense, their role is largely didactic and demonstrative, functioning as visible platforms that connect the public, policymakers, and the scientific community with the broader goals of biodiversity conservation.

5. Conclusions

The proposal of an ornamental native plant collection not only enhances the role of the Botanical Garden of FESC as a center for academic and public engagement but also contributes directly to the preservation and dissemination of the unique natural heritage of the Valley of Mexico.

Author Contributions: Conceptualization, M.S.J.-N.; methodology, A.T.-M. and K.Q.-M.; investigation, K.Q.-M., A.T.-M. and M.S.J.-N.; data curation, A.T.-M.; writing—original draft preparation, A.T.-M.; writing—review and editing, M.S.J.-N., K.Q.-M. and A.T.-M.; visualization, K.Q.-M.; supervision, M.S.J.-N.; project administration, M.S.J.-N. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study.

Acknowledgments: The authors would like to thank the authorities of the Facultad de Estudios Superiores Cuautitlán (FESC-UNAM) for the institutional support and facilities provided during the development of this work. We are also grateful to the local communities surrounding the FESC, whose collaboration and interest in the conservation of native flora have been invaluable for the conception of this proposal. We would like to express our sincere gratitude to M. en C. Alejandro de la Rosa Tilapa, the academic person responsible for the Botanical Garden of FESC, for his invaluable support, dedication, and careful stewardship of the plant collections.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Mendoza-Ponce, A.; Estrada, F.; Campo, J.; Calderón, Ó.; del Carmen, M.A.; Ramírez, A. Historic Land-Use Dynamics and Future Projections in Mexico's Valley Megalopolis. *J. Land Use Sci.* **2025**, *20*, 98–116. [\[CrossRef\]](#)
2. Meléndez-Jaramillo, E.; Sánchez-Castillo, L.; Martínez, M.T.D.J.S.; Sánchez-Reyes, U.J. Vegetation Changes along an Urbanisation and Atmospheric Pollution Gradient in Mexico. *Nat. Conserv.* **2023**, *54*, 179–202. [\[CrossRef\]](#)
3. Rzedowski, J.; Calderón de Rzedowski, G. Sinopsis numérica de la flora fanerogámica del Valle de México. *Acta Bot. Mex.* **1989**, *8*, 15–30. [\[CrossRef\]](#)
4. Calderón de Rzedowski, G.; Rzedowski, J. *Flora Fanerogámica del Valle de México, 1a Reimp.*; Instituto de Ecología, A.C.; CONABIO: Pátzcuaro, Michoacán, México, 2005.
5. Cibrian-Jaramillo, A.; Hird, A.; Oleas, N.; Ma, H.; Meerow, A.W.; Francisco-Ortega, J.; Griffith, M.P. What Is the Conservation Value of a Plant in a Botanic Garden? Using Indicators to Improve Management of ex Situ Collections. *Bot. Rev.* **2013**, *79*, 559–577. [\[CrossRef\]](#)
6. Mounce, R.; Smith, P.; Brockington, S. Ex situ Conservation of Plant Diversity in the World's Botanic Gardens. *Nat. Plants* **2017**, *3*, 795–802. [\[CrossRef\]](#)
7. Granziera, P. Concept of the Garden in Pre-Hispanic Mexico. *Gard. Hist.* **2001**, *29*, 185–213. [\[CrossRef\]](#)
8. Avilés, P. Seven Ways of Looking at a Mountain: Tetzcotzingo and the Aztec Garden Tradition. *Landsc. J.* **2006**, *25*, 143–157. [\[CrossRef\]](#)
9. Achim, M. Urban Science in 18th-Century Mexico City. In *A Companion to Viceregal Mexico City, 1519–1821*; McCaa, R., Ed.; Wiley-Blackwell: Hoboken, NJ, USA, 2021; Volume 3, p. 353.
10. Silva, M.T.P.; Cardona, C.C. La Etnobiología en México Vista a la Luz de las Instituciones de Investigación. *Etnobiología* **2021**, *19*, 6–28.
11. Viccon-Esquivel, J.; Arias Montes, S.; Cristians Niizawa, S.; Hernández Peña, M.A.; Castro Castro, A.; Cetzal Ix, W.; Rivas Avendaño, M.; Escalante Castro, J.R.; Luna Zúñiga, J.G.; Díaz Toribio, M.H. *México Megadiverso Visto a Través de sus Jardines y sus Protagonistas*; AMJB/CONAHCYT: México City, México, 2023.
12. Asociación Mexicana de Jardines Botánicos. Available online: <https://amjb.abaco2.org/> (accessed on 15 October 2025).
13. Błaszak, M.; Rybska, E.; Tsivitanidou, O.; Constantinou, C.P. Botanical Gardens for Productive Interplay between Emotions and Cognition. *Sustainability* **2019**, *11*, 7160. [\[CrossRef\]](#)

14. Girmay, M. Roles of Botanical Gardens for Conservation and Requirements for Their Establishment. *Daagu Int. J. Basic Appl. Res.* **2023**, *5*, 182–192.
15. Britton, N.L. Botanical Gardens. *Science* **1896**, *4*, 284–293. [[CrossRef](#)] [[PubMed](#)]
16. Kendal, D.; Williams, K.J.; Williams, N.S. Plant Traits Link People's Plant Preferences to the Composition of Their Gardens. *Landsc. Urban Plan.* **2012**, *105*, 34–42. [[CrossRef](#)]
17. Hůla, M.; Flegr, J. What Flowers Do We Like? The Influence of Shape and Color on the Rating of Flower Beauty. *PeerJ* **2016**, *4*, e2106. [[CrossRef](#)]
18. Wyse Jackson, P.S.; Sutherland, L.A. *International Agenda for Botanic Gardens in Conservation*; Botanic Gardens Conservation International: Surrey, UK, 2000.
19. Raschke, A.B.; Pegram, K.V.; Melkonoff, N.A.; Davis, J.; Blackwell, S.A. Collaborative Conservation by Botanical Gardens: Unique Opportunities for Local to Global Impacts. *J. Zool. Bot. Gard.* **2022**, *3*, 463–487. [[CrossRef](#)]
20. Jiménez-Noriega, M.; De la Rosa Tilapa, A. El Jardín Botánico de la Facultad de Estudios Superiores Cuautitlán: Espacio de Conservación y Enseñanza para la Zona Norte del Valle de México. In *México Megadiverso Visto a Través de sus Jardines y sus Protagonistas*; Viccon-Esquivel, J., Arias Montes, S., Cristians Niizawa, S., Hernández Peña, M.A., Castro Castro, A., Cetzal Ix, W., Rivas Avendaño, M., Escalante Castro, J.R., Luna Zúñiga, J.G., Díaz Toribio, M.H., Eds.; AMJB/CONAHCYT: México City, México, 2023; pp. 146–153.
21. Almagro, A.C.; Davison, J.O.; Caloca, O.R. Viejos Patrones y Nuevos Esquemas de Concentración. *Anál. Econ.* **2002**, *17*, 161–183.
22. Rojas, L.R.; Enciso, J.A.G. Evolución y Cambio Industrial en las Zonas Metropolitanas del Valle de México y de Toluca, 1993–2008. *Anál. Econ.* **2016**, *31*, 115–146.
23. De la Rosa Tilapa, A.; Jiménez-Noriega, M.S. Jardín botánico de la Facultad de Estudios Superiores Cuautitlán: Centro de conservación de polinizadores y visitantes florales en el norte del valle de México. *Herreriana* **2023**, *5*, 21–26. [[CrossRef](#)]
24. Langellotto, G.A.; Melathopoulos, A.; Messer, I.; Anderson, A.; McClintock, N.; Costner, L. Garden Pollinators and the Potential for Ecosystem Service Flow to Urban and Peri-Urban Agriculture. *Sustainability* **2018**, *10*, 2047. [[CrossRef](#)]
25. Cárdenas-Valdovinos, J.G.; García-Ruiz, I.; Angoa-Pérez, M.V.; Mena-Violante, H.G. Ethnobotany, Biological Activities and Phytochemical Compounds of Some Species of the Genus *Eryngium* (Apiaceae), from the Central-Western Region of Mexico. *Molecules* **2023**, *28*, 4094. [[CrossRef](#)]
26. Aguilar-Contreras, A.; Camacho Pulido, J.R.; Chino-Vargas, S.; Jacquez-Rios, P.; López-Villafranco, M.E. *Plantas Medicinales del Herbario IMSS*; Instituto Mexicano del Seguro Social: México City, México, 1998.
27. Pérez-Muñoz, E.P.; Antunes-Ricardo, M.; Martínez-Ávila, M.; Guajardo-Flores, D. *Eryngium* Species as a Potential Ally for Treating Metabolic Syndrome and Diabetes. *Front. Nutr.* **2022**, *9*, 878306. [[CrossRef](#)] [[PubMed](#)]
28. Lemus-De la Cruz, J.; Trejo-Hurtado, M.; Landa-Moreno, C.; Peña-Montes, D.; Landeros-Páramo, J.L.; Cortés-Rojo, C.; Saavedra-Molina, A. Antioxidant Effects of Silver Nanoparticles Obtained by Green Synthesis from the Aqueous Extract of *Eryngium carlinae* on the Brain Mitochondria of Streptozotocin-Induced Diabetic Rats. *J. Bioenerg. Biomembr.* **2023**, *55*, 123–135. [[CrossRef](#)] [[PubMed](#)]
29. García-Sánchez, F.; López-Villafranco, M.E.; Aguilar-Rodríguez, S.; Aguilar-Contreras, A. Ethnobotany and Comparative Morpho-Anatomy of *Tagetes* Used in Nicolas Romero, State of Mexico. *Bot. Sci.* **2012**, *90*, 221–232. [[CrossRef](#)]
30. Armas, K.; Rojas, J.; Peña, J. Características Botánicas, Distribución Geográfica y Propiedades Biológicas de Varias Especies del Género *Tagetes* L. (Asteraceae). *Rev. Fac. Farm.* **2013**, *55*, 26–42.
31. Sánchez-Alejo, R.; Rangel-Villafranco, M.; Cristóbal-Sánchez, G.; Martínez-García, A.; Pérez-Mondragón, M. Sistematización del Conocimiento Tradicional Asociado al Uso de las Plantas Medicinales en una Comunidad Mazahua. *Rev. Iberoam. Cienc.* **2016**, *3*, 153–160.
32. Martínez-López, G.; Palacios-Rangel, M.I.; Guízar Nolasco, E.; Villanueva Morales, A. Usos Locales y Tradición: Estudio Etnobotánico de Plantas Útiles en San Pablo Cuatro Venados (Valles Centrales, Oaxaca). *Polibotánica* **2021**, *52*, 193–212. [[CrossRef](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.