Ritual plants and local economies: The use of plants in Todos Santos Celebrations in a Chinantec community of Oaxaca, Mexico

J. Alejandro Rios-Solis
Unidad Oaxaca, Instituto Politécnico Nacional, Santa Cruz Xoxocotlán
María de Jesús Jiménez Hernández
Universidad Intercultural del Pueblo
Mariana Sánchez-Barradas
Universidad Intercultural del Pueblo
Auri Castillo-Antonio
Universidad Intercultural del Pueblo
Cornelio Cristóbal-Regules
Universidad Intercultural del Pueblo
Manuel Gerardo Chávez-Ángeles
Licenciatura y Posgrado en Gestión Cultural, Universidad Autónoma Benito Juárez de Oaxaca
Luicita Lagunez-Rivera
Unidad Oaxaca, Instituto Politécnico Nacional, Santa Cruz Xoxocotlán
Rodolfo Solano
asolano@ipn.mx

Unidad Oaxaca, Instituto Politécnico Nacional, Santa Cruz Xoxocotlán

Research Article

Keywords: Dioon spinulosum, ethnobotany, floral arches, Senna spectabilis, sustainable management, traditional ecological knowledge

Posted Date: November 5th, 2025

DOI: https://doi.org/10.21203/rs.3.rs-7429091/v1

Additional Declarations: No competing interests reported.

Abstract

In Mexico, plants hold profound ceremonial significance, reflecting the biocultural relationship between local communities and their environment. This study explores the ritual use, wild harvesting, and socioeconomic value of *Dioon spinulosum*, *Senna spectabilis*, and other plant species during the Day of the Dead (Todos Santos) in San José Chiltepec, Oaxaca in the construction of floral arches. Using semi-structured interviews and market observations, nine species were documented in 2024, generating approximately USD $4,683 in local sales. *Celosia argentea* and *D. spinulosum* emerged as the most economically valuable. The harvesting activity is predominantly carried out by men, with traditional ecological knowledge transmitted orally within a framework of solidarity and cooperation. Local norms restrict collection to the festive period (October 27-November 5), and management practices integrate both *in situ* and *ex situ* strategies, emphasizing techniques that protect renew plant structures. Despite *D. spinulosum* being classified as endangered in Mexico and listed as vulnerable by the IUCN, its use remains sustainable under community-based governance systems.

INTRODUCTION

Mexico is home to over 23,000 species of vascular plants, ranking fourth globally (Villaseñor 2016). Many of these species are essential to rural communities, serving purposes such as food, medicine, fuel, construction, ornamentation, and ceremonial use (Aparicio et al. 2021; Putri et al. 2014). It is estimated that between 5,000 and 7,000 plant species are harvested for various uses, often treated as common-pool resources (Casas et al. 2016; Estrada-Castillón et al. 2022; Martínez-López et al. 2021).

The ceremonial use of plants is deeply embedded in Mexican traditions and reflects a biocultural relationship between people and plants (Haeckel 2008; Solano et al. 2010; Viveros 2007; Williams 1993). Plants are central to religious offerings, with floral arches being a prominent example (Cox-Tamay and Cervantes-Uribe 2016; Pérez-Farrera and Vovides 2006). While many of these arches incorporate cultivated species, wild taxa are also harvested in regions such as Chiapas and Veracruz (Flores-Palacios and Valencia-Díaz 2007; Haeckel 2008; Jiménez-López et al. 2019). Previous studies have documented the use of species such as *Chamaedorea elegans* Mart. (Arecaceae), *Dasylirion acrotrichum* (Schiede) Zucc. (Asparagaceae), *Epidendrum radicans* Pav. ex Lindl. (Orchidaceae), *Heliconia rostrata* Ruiz & Pav. (Heliconiaceae), *Pinus* spp. (Pinaceae), *Tillandsia eizii* L.B. Sm., *Tillandsia guatemalensis* L.B. Sm., *Tillandsia imperialis* É. Morren & André, *Tillandsia lucida* É. Morren in Baker, and *Tillandsia viridiflora* Baker (Bromeliaceae) in floral arch construction.

Other plants used ceremonially for similar purposes include cycads (Zamiaceae). In Mexico this family is represented by 55 species, mostly endemic (Martínez-Domínguez et al. 2016). In northern Oaxaca *Dioon spinulosum* Dyer ex Eichler (locally known as “jicalito” or “chicalito”) is valued for its durable, glossy fronds and is used in floral arches during the Todos Santos (Day of Dead) celebration. Beyond its ritual use, the species is also used ornamentally (Moreno et al., 2018), medicinally (Mena-Rejón et al. 2009), and has demonstrated cytotoxic, antimicrobial, and antioxidant properties (Elekhnawy et al. 2022; Elghondakly et al. 2020). Another species used ceremonially in the northern region of Oaxaca is *Senna spectabilis* (DC.) H.S. Irwin &. Barnaby, a member of the Fabaceae family. It is a fragrant, yellow-flowering tree commonly used in urban landscaping, but also as traditional medicine, firewood, and living fences (Duarte-Vargas et al, 2021; Matulevich-Pelaez et al. 2021; Zembele and Ngulube 2022).

In the municipality of San José Chiltepec, located in northern Oaxaca, both wild and managed plant species, including *Dioon spinulosum* and *Senna spectabilis*, are used during the Todos Santos celebrations to construct floral arches for home altars. These plants are harvested from surrounding ecosystems and agroecosystems, contributing to local livelihoods. The objective of this study was to document and analyze the ceremonial use of *Dioon spinulosum* and *Senna spectabilis* during the Todos Santos celebration in San José Chiltepec. This approach allows us to understand how traditional knowledge, cultural identity, biological resource management, and local governance contribute to biodiversity conservation within the community.

METHODS

Study site

Fieldwork was conducted in San José Chiltepec, Oaxaca, Mexico (Fig. 1). This community comprises 3,480 inhabitants across 949 households, with an average educational attainment of 9.16 years. The native language spoken is Chinantec (INEGI, 2021). San José Chiltepec lies within an agricultural matrix dominated by extensive livestock farming, followed by sugarcane cultivation. The municipality also maintains a 200-hectare communal conservation area, where the predominant vegetation is tropical evergreen rainforest. Two major annual festivities are celebrated in this community: Todos Santos (October 31–November 2) and Saint Joseph's Day (March 19).

Data collection

Between October 28 and November 4, 2024, semi-structured interviews were conducted with local collaborators the San José Chiltepec regarding the management and ceremonial use of *Dioon spinulosum* and *Senna spectabilis*. Households with publicity visible altars were identified through direct observation, and permission was requested to interview a family member. Of the 345 households approached (36.3% of the total), 247 (26%) agreed to participate, meeting the eligibility criteria of possessing knowledge about the harvest of these plant species, the construction of Todos Santos floral arches, and the cultural history of the tradition. A total of 247 individuals S were interviewed. 144 were women and 103 men, ranging in age from 18 to 90. Among them, 160 reported having participated in the construction of Todos Santos floral arches for at least 35 years. All participants identified as Catholic religion; 70% spoke the Chinantec variant of the Valle Nacional language, and the average educational level was secondary school. Interviewees provided information on age, sex, plants species used in the elaboration of the floral arches, plant parts used, economic value, management practices, and harvest sites.

In order to document the management of wild plants used in the construction of floral arches, particularly *Dioon spinulosum*, permission was requested from local harvesters to accompany them during their trips to harvest sites. This participation enabled direct observation of the criteria used for selecting individuals and the techniques applied for extracting the plant parts intended for use. The observation continued through the return of the harvesters and the subsequent construction of the altars.

In addition to *Dioon spinulosum* and *Senna spectabilis*, the construction of floral arches involves the use of various other plant species, both wild and cultivated (Table 1). Some of these plants are sold locally, either at the municipal market or directly from home gardens. In the case of wild species, certain individuals are harvested specifically for commercial purposes. For all identified species, data were information collected on market prices, which vary depending on the plant part being sold, as well as estimated of sales volumes. For each species used in the construction of floral arches and traded in the community for this purpose, the following information was collected: number of plant units used (NUU), mean price per plant unit (MPPU), and estimated earnings (EE) from the sale of those plant units, which was calculated multiplying MPPU by NUU (Table 1). Depending on the species, the plant unit was defined as a frond, branch, or seedling. The sum of EE values for all species reflects the economic impact that plant trade generates in the community during the Todos Santos festivities. To present the results in a universally recognized currency, all monetary values originally recorded in Mexican pesos were converted to U.S. dollars using the exchange rate in effect on November 1, 2024.

For each species used in the construction of floral arches, a voucher specimen was collected, taxonomically identified with the assistance of specialists, herborized, and deposited in the OAX Herbarium collection, acronym according to Thiers (2025). Information on the voucher specimens is presented in Table 1.

All participants were informed of the study's objectives and gave their consent to be interviewed. Ethical considerations concerning anonymity, privacy, dignity, and confidentiality were strictly upheld throughout the research. Authorization to conduct the study was formally requested during an assembly with the agrarian and municipal authorities of San José Chiltepec. During this meeting, the objectives of the project were presented, and it was clearly stated that all information collected would be used exclusively for academic and research purposes. The semi-structured interview form included a statement outlining the purpose of the study and requesting informed consent from participants. The research adhered to the ethical guidelines of Mexico's National Institute of Medical Sciences and Nutrition Salvador Zubirán (INCMNSZ 2014), based

on the World Medical Association's Declaration of Helsinki (WMA 2025), and the Code of Ethics for Research and Ethnobotanical Collaboration in Latin America (Cano-Contreras et al. 2016).

RESULTS

Plant used. Nine plant species were recorded as being used in the construction of the altars and floral arches, primarily for their leaves or branches (Table 1). Of these, three species are collected directly from their natural habitats. The most frequently used species were *Dioon spinulosum*, *Chamaedorea tepejilote* Liebm., and *Codiaeum variegatum* (L.) Blume, based on the estimated number of units used for decorative purposes. Twenty-eight interviewees reported collecting these plants or their parts directly from the wild for use in floral arch construction, while 219 purchased fronds of *Dioon spinulosum* and *Chamaedora tepejilote* at the local market. Overall, 54% of respondents used *Dioon spinulosum* fronds in their altars, while the remaining 46% used *Chamaedora tepejilote*.

Economic impact. The trade of floral arches during the Todos Santos festivities generated estimated local earnings of $4,683 US. This revenue was distributed among individuals involved in harvesting, cultivation, sales, and intermediary trade of the plants. Among the plants used for the altar decoration, *Celosia argentea* (L.) yielded the highest earnings ($1,664.96 USD), followed by *Dioon spinulosum* ($1,100.75 USD). This income is generated in 10 days, which is the duration of the festivities, which begin on October 27 and end on November 5.

Management practices. Sixteen harvest sites for *Dioon spinulosum* and *Chamaedora tepejilote* fronds were identified in the surrounding areas of San José Chiltepec (Fig. 2). Collectors walk between 1 and 10 kilometers to reach these sites. Harvesting typically occurs on October 27, beginning at 5:00 a.m. to avoid the midday heat. Upon arrival, collectors perform a ritual prayer to God and Mother Nature, asking for permission to harvest and for protection from harm. Failing to perform this ritual is believed to bring misfortune.

Harvesters typically select the tallest individuals of *Dioon spinulosum* and *Chamaedora tepejilote* for harvest. Using ropes and machetes, they cut the fronds while taking care not to damage the apical meristem, which is essential for plant's regeneration. A single collector can harvest up to 150 fronds in one day. *Dioon spinulosum* is preferred for its durability, vivid coloration, and glossy appearance, traits that are highly valued in the construction of floral arches. However, *Chamaedora tepejilote* is increasingly used as a substitute due to its softer, spineless fronds, which reduce the risk of injury during handling. These two species are never used together in the same arch.

Senna spectabilis grows in local agricultural fields and pasture areas and is present in several plots within San José Chiltepec. However, only nine families actively harvest this species in the community. Collection involves cutting 40–50 cm long branches, which are bundled and used in floral arches. Due to the fragility of the branches, harvesting is typically performed by young men using machetes and climbing ropes. The aromatic fragrance of *Senna spectabilis* serves as an alternative to the more commonly used *Tagetes erecta* L.

Seventy-four percent of respondents cultivate *Codiaeum. variegatum* and *Tagetes erecta*. These species are typically grown in lowland areas or home gardens for household use, although surplus harvests may be sold or bartered. Seeds are broadcast-sown in June and ritually blessed on May 15, the feast day of San Isidro Labrador, as part of traditional ceremony intended to ensure soil fertility and agricultural abundance.

A total of 137 individuals of *Dioon spinulosum* were recorded growing in home gardens and agricultural areas within San José Chiltepec. These cultivated or tolerated specimens provide fronds for the celebrations, reducing the need for wild collection. On average, these plants are 28 years old. Being younger and more accessible, their fronds are easier to harvest without climbing. Additionally, *Dioon spinulosum* is valued for its ornamental appeal, and many home gardens maintain multiple plants for both aesthetic and ritual purposes. An average of four fronds are removed from each individual to avoid damaging the plant and to ensure its survival.

Making of the floral arch. This ceremonial structure is built using cedar wood (*Cedrela odorata* L.), and its construction begins on the night of October 27. The arch is covered with fronds of *Dioon spinulosum* and *Chamaedora tepejilote*. In some cases, bouquets of *Senna spectabilis*, *Codiaeum variegatum*, and *Murraya paniculata* (L.) Jack. are added as decorative elements. Finally, it is adorned with flowers of *Tagetes erecta* and *Celosia argentea*, giving it a colorful and vibrant appearance. This activity is locally known as weaving the arch ("tejer el arco" in Spanish). Due to the risk of injury involved in handling the fronds, it is mostly carried out by men. However, some families choose to hire specialized individuals to perform this task in exchange for payment. The construction of the floral arch is a central practice during the Todos Santos celebrations and reflects traditional knowledge regarding the symbolic and aesthetic use of various plant species in ritual contexts.

DISCUSSION

In Mexico, the ritual use of plants in traditional celebrations is well documented across various communities. For instance, in Puebla, *Ceratozamia totonacorum* Mart.-Domínguez & Nic.-Mor. is used to create floral arches for Day of Dead altars (Fuentes et al. 2023). In Chiapas, *Dioon merolae* De Luca, Sabato & Vázquez Torres is featured prominently in the Day of the Santa Cruz (Holy Cross) festivities on May 3rd (Pérez-Farrera and Vovides 2006).

These ceremonial practices highlight the profound interconnection between cultural identity and ecological knowledge, illustrating how communities respond to seasonal plant availability while embedding principles of environmental stewardship into their rituals. Beyond their symbolic significance, the harvesting and commercialization of ceremonial plants provide short-term economic opportunities that support rural livelihoods. This seasonal trade model represents a sustainable economic strategy rooted in biocultural resources. By valuing native plant species, communities not only preserve their cultural heritage but also stimulate local economies. In Oaxaca, for example, the sale of ceremonial plants generates temporary income, strengthens household economies, and fosters social cohesion through collective efforts in cultivation, harvesting, and marketing (Rodrígues et al. 2021). Moreover, the adoption of sustainable agricultural practices in the production of ornamental and ritual plants enables economic utilization without compromising biodiversity. Agroecological approaches have proven effective in conserving ecosystems while simultaneously enhancing food security and economic resilience in rural areas (Gou et al. 2020).

In the context of these religious traditions, the construction of floral arches is predominantly a male-led activity (Haeckel 2008). According to participants in this study, adult men are typically responsible for this task due to the physical demands associated with harvesting *Dioon spinulosum* fronds, particularly given their spiny morphology. Nevertheless, in the community of San José Chiltepec, individuals who collect *Dioon spinulosum* in its natural habitats often share their harvest with relatives who are unable to participate directly due to age or physical limitations. A comparable expression of solidarity in plant gathering has been documented in Santa María Ixcatlán, Oaxaca (Rangel-Landa et al. 2016). This practice of resource sharing not only reinforces social cohesion but also ensures equitable access to ceremonial plant materials among all households engaged in ritual activities. Such mechanisms reflect a deeply embedded socio-ecological management system, wherein cultural practices are interwoven with principles of reciprocity, sustainability, and communal responsibility.

Dioon spinulosum is classified as endangered species under Mexican legislation NOM-059-SEMARNAT-2010 (SEMARNAT 2010) and as vulnerable species by the International Union for Conservation of Nature (Vovides et al. 2022). In the study region, its habitat of this species has been impacted by livestock expansion, agricultural development, and illegal extraction for ornamental trade, often carried out by individuals from outside the local community. In response to these pressures, local harvesters have adopted both *in situ* and *ex situ* management practices aimed to conserving the species while maintaining its availability for ceremonial use. Some community members have transplanted individual from wild populations into cultivated plots, ensuring a reliable supply of fronds for ritual use. Others have chosen to preserve *Dioon spinulosum* specimens standing after clearing agricultural fields, as the species is not considered a weed (Casas et al. 2016b).

These practices reflect an understanding of ecological processes and demonstrate the integration of traditional knowledge into agroecosystem management. Production units such as milpas, acahuales, and home gardens contribute significantly to the diversity of species used in religious rituals (Villanueva-Figueroa et al. 2021). By combining ecological knowledge with

practical cultivation and tolerance strategies, communities effectively reduce harvesting pressure on wild populations and promote the long-term persistence of culturally significant species. Moreover, the establishment of predictable supplies of ceremonial plant materials supports seasonal economic cycles, enhancing the socio-economic resilience of rural households. These adaptive strategies, implemented within anthropogenic and agroecological landscapes, exemplify sustainable resource use and underscore the role of local ecological knowledge in fostering biodiversity conservation and cultural continuity (Perfecto and Vandermeer 2008).

In San José Chiltepec, knowledge related to the management of plants used in floral arch construction has been acquired empirically and transmitted orally across generations, as reported in other studies (Estrada et al. 2007; García-Flores et al. 2019). This body of knowledge, deeply rooted in daily interactions with the natural environment, is recognized as Traditional Ecological Knowledge (Narváez-Elizondo et al. 2021; Toledo and Barrera-Bassols 2008). In this context, knowledge regarding the use of *Dioon spinulosum* and *Senna spectabilis* is predominantly held by adult men. The gender- and age-based distribution of traditional knowledge has also been documented in other ethnobotanical studies (Beltrán-Rodríguez et al. 2014), Furthermore, the participation of younger generations in these practices facilitates the transmission of ancestral knowledge, particularly regarding the properties, uses, and spiritual significance of ceremonial plants (Galvis et al. 2025). This intergenerational exchange not only reinforce the community's cultural identity but also ensures the continuity of sustainable harvesting techniques and *ex siu* conservation methods. By learning from elders, youth acquire ecological knowledge and ritual expertise, contributing to the preservation of cultural traditions and biodiversity.

During harvesting process, collectors take care to avoid damaging the apical meristem, which they recognize as essential for the growth and regeneration of *Dioon spinulosum*. This practice, also observed in traditional palm harvesting, reflects an empirical understanding of plant reproductive biology (Rangel-Landa et al. 2016). Such meticulous techniques exemplify a sophisticated awareness of plant life cycles and underscore the important role of traditional ecological knowledge in species conservation. By applying these practices in both natural and managed habitats, local communities contribute to the sustainable use and long-term viability of culturally significant plant resources.

San José Chiltepec operates under a system of local governance rooted in indigenous customary law. These communal statutes encompass the norms, practices, and organizational structures that regulate collective life and resource management. Formally approved through community assemblies and recognized by the Mexican Constitution (Boege 2010), such frameworks play a important role in guiding sustainable interactions with the local environment.

Among these practices are those regulations concerning the management of communal natural resources. Specifically, the collection of plants for ceremonial purposes (such as the construction of floral arches) is permitted exclusively during the Todos Santos celebration. This temporal restriction reflects a culturally embedded approach to resource governance, ensuring that harvesting aligns with traditional values and ecological rhythms. This governance systems exemplify the principles of responsible and culturally appropriate management of common-pool resources (Ostrom 1990). The integration of communal regulations with *ex situ* conservation strategies and seasonal economic incentives illustrates the resilience of local socio-ecological systems. Within this framework, cultural traditions, biodiversity conservation, and rural livelihoods are compatible and mutually reinforcing.

CONCLUSION

The ceremonial use of *Dioon spinulosum* and *Senna spectabilis* in San José Chiltepec represents a manifestation of traditional ecological knowledge closely tied to the community's cultural identity. The ritual practice of constructing floral arches during the Todos Santos celebration illustrates the integration of ancestral knowledge with ecological management strategies and social cooperation.

The community employs a dual system of plant resource management, combining *in situ* conservation (regulated harvesting and community norms that limit extraction periods) with *ex situ* practices (cultivation and tolerance of ecologically and

culturally significant species in home gardens and agricultural plots). This approach ensures sustainable availability without compromising wild populations.

These practices play a key role in generating seasonal income, thereby strengthening rural livelihoods and contributing to the community's socio-ecological resilience. The intergenerational transmission of knowledge regarding the uses and meanings of plants ensures both cultural continuity and biodiversity conservation.

The study also highlights the importance of community-based governance systems as effective mechanisms for the responsible management of common-pool resources. Communal regulation of ceremonial plant use, combined with economic incentives and agroecological practices, forms a resilient system that harmonizes cultural continuity, ecological integrity, and economic sustainability.

To the community of San José Chiltepec, Oaxaca, for their valuable support in carrying out the interviews. Manuel Adrián Cuéllar Martínez for preparing the map. JARS thanks the Secretariat of Science, Humanities, Technology and Innovation (SECIHTI) for the scholarship to pursue doctorate studies, IDEA WILD for the equipment grant awarded in 2024, and the Institutional Scholarship Program for Research Training (BEIFI) of the Instituto Politécnico Nacional.

Declarations

Acknowledgments

To the community of San José Chiltepec, Oaxaca, for their valuable support in carrying out the interviews. Manuel Adrián Cuéllar Martínez for preparing the map. JARS thanks the Secretariat of Science, Humanities, Technology and Innovation (SECIHTI) for the scholarship to pursue doctorate studies, IDEA WILD for the equipment grant awarded in 2024, and the Institutional Scholarship Program for Research Training (BEIFI) of the Instituto Politécnico Nacional.

Author Contributions Statement

Conceptualization: J.J.R.S., R.S. & M.G.C.A. Methodology: J.J.R.S., R.S., & M.G.C.A. Investigation: J.J.R.S., M.J.J.H., M.S.B., A.C.A. & C.C.R. Taxonomic validation: J.J.R.S. & R.S. Data analysis: J.J.R.S., M.J.J.H., M.S.B., A.C.A. & C.C.R. Visualization: J.J.R.S. & R.S. Supervision: R.S. & M.G.C.A. Writing main manuscript text: J.J.R.S., R.S., M.G.C.A. & L.L.R. Funding acquisition: J.J.R.S, R.S. & L.L.R. All authors reviewed the manuscript and agree the final version.

Competing interests: All authors declare no competing interest.

Funding: Instituto Politécnico Nacional (projects SIP-20240944, SIP-20231610, and SIP-20241893), Idea Wild Program 2024.

Ethics Approval and Consent to Participate.

This research was conducted with full respect for individual liberty, local customs, and cultural beliefs. Prior to initiating the study, we presented its objectives to the municipal authorities and to each potential participant, obtaining their formal authorization. Informed consent was secured from all individuals before administering the questionnaire. Only those who voluntarily agreed to participate were interviewed.

Data Availability

The datasets used aor analyzed in the current study are available from the corresponding author on reasonable request.

References

1. Aparicio, J. C., R. A. Voeks, and L. Silveira Funch. 2021. Are Mixtec forgetting t plants? Intracultural variation of ethnobotanical knowledge in Oaxaca, Mexico. Economic Botany 75(3): 215–233. https://doi.org/10.1007/s12231-021-09535-2
2. Beltrán-Rodríguez, L., A. Ortiz-Sánchez, N. A. Mariano, B. Maldonado-Almanza, and V. Reyes-García. 2014. Factors affecting ethnobotanical knowledge in a mestizo community of the Sierra de Huautla Biosphere Reserve, Mexico. Journal of Ethnobiology and Ethnomedicine 10(1): 14. https://doi.org/10.1186/1746-4269-10-14
3. Boege, E. 2010. El Patrimonio Biocultural de los Pueblos Indígenas de México: Hacia la Conservación in situ de la Biodiversidad y Agrodiversidad en los Territorios Indígenas. Ciudad de México, México: Instituto Nacional de Antropología e Historia, Comisión Nacional para el Desarrollo de los Pueblos Indígenas.
4. Cano-Contreras, E. J., A. Medinaceli, O. L. Sanabria-Diago, and A. Argueta-Villamar. 2016. Código de etica para la investigación, la investigación-acción y la colaboración etnocientífica en América Latina. Etnobiología 14(supplement 1): 5–6.
5. Casas, A., J. Blancas, and R. Lira. 2016a. Mexican Ethnobotany: Interactions of People and Plants in Mesoamerica. In Ethnobotany of Mexico: Interactions of People and Plants in Mesoamerica, eds. R. Lira, A. Casas and J. Blancas. 179–206. New York: Springer.
6. Casas, A., R. Lira, I. Torres, A. Delgado, A. I. Moreno-Calles, S. Rangel-Landa, J. Blancas, C. Larios, L. Solís, E. Pérez-Negrón, M. Vallejo, F. Parra, B. Farfán-Heredia, Y. Arellanes, and N. Campos. 2016b. Ethnobotany for Sustainable Ecosystem Management: A Regional Perspective in the Tehuacán Valley. In Ethnobotany of Mexico: Interactions of People and Plants in Mesoamerica, eds. R. Lira, A. Casas and J. Blancas. 179–206. New York: Springer.
7. Cox-Tamay, L. D. and J. S. Cervantes-Uribe. 2016. Laelias: Flores mágicas y ceremoniales. Desde el Herbario CICY 8: 122–127.
8. Duarte-Vargas, J. H., O. Melo, J. Mora-Delgado, R. Castañeda-Serrano, and H. Váquiro. 2021. Pod production, and dasometric variables, of the tree *Senna spectabilis* (Fabaceae) in a tropical dry forest. Revista de Biología Tropical 69(1): 218–230. https://doi.org/10.15517/rbt.v69i1.42792
9. Elekhnawy, E., W. A. Negm, M. El-Aasr, A. A. Kamer, M. Alqarni, G. E. Batiha, A. J. Obaidullah, and H. M. Fawzy. 2022. Histological assessment, anti-quorum sensing, and anti-biofilm activities of *Dioon spinulosum* extract: *in vitro* and *in vivo* approach. Scientific Reports 12(1): 180. https://doi.org/10.1038/s41598-021-03953-x
10. Elghondakly, M., A. Moawad, and M. Hetta. 2020. Cytotoxicity and chromatographic analysis of *Dioon spinulosum*, family Zamiaceae. Journal of Applied Pharmaceutical Science 10(12): 075–082. https://doi.org/10.7324/JAPS.2020.101210
11. Estrada, E., J. A. Villarreal, C. Cantú, I. Cabral, L. Scott, and C. Yen. 2007. Ethnobotany in the Cumbres de Monterrey National Park, Nuevo León, México. Journal of Ethnobiology and Ethnomedicine 3(1): 8. https://doi.org/10.1186/1746-4269-3-8
12. Estrada-Castillón, E., J. A. Villarreal-Quintanilla, L. G. Cuéllar-Rodríguez, M. March-Salas, J. A. Encina-Domínguez, W. Himmeslbach, M. M. Salinas-Rodríguez, J. Guerra, M. Cotera-Correa, L. M. Scott-Morales, R. J. Friesen, P. Garza-Zambrano, J. R. Arévalo-Sierra, H. Garate-Escamilla, M. Gutiérrez-Gutiérrez, and T. V. Gutiérrez-Santillán. 2022. Ethnobotany in Iturbide, Nuevo León: The traditional knowledge on plants used in the semiarid mountains of northeastern Mexico. Sustainability 14(19): article 19. https://doi.org/10.3390/su141912751
13. Flores-Palacios, A. and S. Valencia-Díaz. 2007. Local illegal trade reveals unknown diversity and involves a high species richness of wild vascular epiphytes. Biological Conservation 136(3): 372–387. https://doi.org/10.1016/j.biocon.2006.12.017
14. Fuentes, T. E., C. L. Binnqüist, F. B. Peña, N. Velázquez-Rosas, F. Nicolalde-Morejón, L. Martínez-Domínguez, and J. Blancas. 2023. Ritual use of *Ceratozamia totonacorum* (Zamiaceae) leaves in Santiago Ecatlán, Puebla, Mexico: Perspectives on conservation. Journal of Ethnobiology 43(4): 317–327. https://doi.org/10.1177/02780771231211386

15. Galvis, M., R. Hernandez, and Q. Sanabria. 2025. Plantas ceremoniales tradicionales: el valor cultural en dos plazas de mercado de la ciudad de Tunja, Boyacá, Colombia. Revista Interamericana de Investigación, Educación y Pedagogía 18(1): 119–147.
16. García-Flores, J., M. González-Espinosa, R. Lindig-Cisneros, and A. Casas. 2019. Traditional medicinal knowledge of tropical trees and its value for restoration of tropical forests. Botanical Sciences 97(3): 336–354. https://doi.org/10.17129/botsci.2122
17. Gou, Y., Z. Li, R. Fan, Z. Qiu, L. Wang, C. Wang, and Y. Wang, 2020. Ethnobotanical survey of plants traditionally used against hematophagous invertebrates by ethnic groups in the mountainous area of Xishuangbanna, Southwest China. Plant Diversity 42: 415–426. https://doi.org/10.1016/j.pld.2020.07.009
18. Haeckel, I. B. 2008. The "Arco Floral": Ethnobotany of *Tillandsia and Dasylirion* spp. in a Mexican religious adornment. Economic Botany 62(1): 90–95. https://doi.org/10.1007/s12231-008-9009-8
19. INCMNSZ (Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán). 2014. Comité de Ética en Investigación. México City: Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán. https://www.incmnsz.mx. Accessed 15 June 2025.
20. INEGI (Instituto Nacional de Estadística y Geografía). 2021. México en Cifras. Instituto Nacional de Estadística y Geografía. Mexico City: https://www.inegi.org.mx/app/areasgeograficas/. Accessed 05 June 2025.
21. Jiménez-López, D. A., J. V. Solórzano, H. Vibrans, A. Espejo-Serna, and C. Peralta-Carreta C. 2019. Ceremonial Use of Bromeliads and Other Vascular epiphytes in cemeteries of two indigenous communities of Las Margaritas, Chiapas, Mexico. Economic Botany 73(1): 127–132. https://doi.org/10.1007/s12231-019-09445-4
22. Martínez-Domínguez, L., F. Nicolalde-Morejón, F. Vergara-Silva, and D. W. Stevenson. 2016. Integrative taxonomy of Mexican cycads: Biogeography, morphology and DNA barcoding corroborate a new sympatric species in *Ceratozamia* (Zamiaceae). Phytotaxa 268(1): 25–45. https://doi.org/10.11646/phytotaxa.268.1.2
23. Martínez-López, G., M. I. Palacios-Rangel, E. Guízar-Nolasco, and A. Villanueva-Morales. 2021. Usos locales y tradición: Estudio etnobotánico de plantas útiles en San Pablo Cuatro Venados (Valles Centrales, Oaxaca). Polibotánica, 52: 193–212. https://doi.org/10.18387/polibotanica.52.13
24. Matulevich-Pelaez, J. A., W. F. Castrillon-Cardona, L. M. Rodríguez-Renuma, and J. P. Medina-Doncel. 2021. Estudio fitoquímico y evaluación de la capacidad antioxidante de flores de *Senna spectabilis* obtenidas en la región andina colombiana. Revista Científica 42: 315–327. https://doi.org/10.14483/23448350.17592
25. Mena-Rejón, G., E. Caamal-Fuentes, Z. Cantillo-Ciau, R. Cedillo-Rivera, J. Flores-Guido, and R. Moo-Puc. 2009. *in vitro* cytotoxic activity of nine plants used in Mayan traditional medicine. Journal of Ethnopharmacology 121(3): 462–465. https://doi.org/10.1016/j.jep.2008.11.012
26. Moreno, Y. M., E. S. Castañeda, and M. I. B. Domínguez. 2018. Comercialización de cícadas mexicanas (Zamiaceae) en Atlixco, Puebla. Un estudio exploratorio. Revista Mexicana de Ciencias Agrícolas 5(4): 633–644. https://doi.org/10.29312/remexca.v5i4.924
27. Narváez-Elizondo, R. E., M. González-Elizondo, A. Castro-Castro, M. S. González-Elizondo, J. A. Tena-Flores, and I. Chaires-Hernández. 2021. Comparison of traditional knowledge about edible plants among young Southern Tepehuans of Durango, Mexico. Botanical Sciences 99(4): 834–849. https://doi.org/10.17129/botsci.2792
28. Ostrom, E. 1990. Governing the Commons. The Evolution of Institutions for Collective Action. Cambridge: Cambridge University Press.
29. Perez-Farrera, M. A. and A. P. Vovides. 2006. The ceremonial use of the threatened "espadaña" cycad (*Dioon merolae*, Zamiaceae) by a community of the central depression of Chiapas, Mexico. Boletín de la Sociedad Botánica de México 78: 107–113.
30. Perfecto, I. and J. Vandermeer. 2008. Biodiversity conservation in tropical agroecosystems. Annals of the New York Academy of Sciences 1134(1): 173–200. https://doi.org/10.1196/annals.1439.011
31. Putri, R. I., J, Supriatna, and E. B. Walujo. 2014. Ethnobotanical study of plant resources in Serangan Island, Bali. Asian Journal of Conservation Biology 3(2): 135–148.

32. Rangel-Landa, S., A. Casas, E. Rivera-Lozoya, I. Torres-García, and M. Vallejo-Ramos. 2016. Ixcatec ethnoecology: Plant management and biocultural heritage in Oaxaca, Mexico. Journal of Ethnobiology and Ethnomedicine 12(1): 30. https://doi.org/10.1186/s13002-016-0101-3
33. Rodrigues, J., C. Neto de Carvalho, M. Ramos, R. Ramos, A. Vinagre, and H. Vinagre, 2021. Geoproducts – Innovative development strategies in UNESCO Geoparks: Concept, implementation methodology, and case studies from Naturtejo Global Geopark, Portugal. Geoproducts, International Journal of Geoheritage and Parks 9(1): 1–12. https://doi.org/10.1016/j.ijgeop.2020.12.003
34. Solano, R., G. Cruz-Lustre, A. Martínez-Feria, and L. Lagunez-Rivera. 2010. Plantas utilizadas en la celebración de la Semana Santa en Zaachila, Oaxaca, México. Polibotánica, 29: 263–279.
35. Thiers, B. 2025 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih/
36. Toledo, V. M. and N. Barrera-Bassols. 2008. La Memoria Biocultural: La Importancia Ecológica de las Sabidurías Tradicionales. México City: Icaria Editorial.
37. Villaseñor, J. L. 2016. Checklist of the native vascular plants of Mexico. Revista Mexicana de Biodiversidad 87(3): 559–902. https://doi.org/10.1016/j.rmb.2016.06.017
38. Villanueva-Figueroa M. L., H. Colin-Bahena, R. Monroy-Martínez, A. García-Flores, and C. Monrroy-Ortiz. 2021. Etnobotánica de los rituales vinculados al ciclo agrícola y su función en la conservación biocultural en Coatetelco, Morelos, México. Polibotanica Núm. 52: 241–264.
39. Viveros, D. D. 2007. Plantas de interés ceremonial en dos comunidades indígenas de la región Centro-Montaña del estado de Guerrero, México. Un enfoque territorial. Revista Brasileira de Agroecologia 2(2): 475–478. https://www.aba-agroecologia.org.br/revista/cad/article/view/2398
40. Vovides, A. P., J. Chemnick, and T. Gregory. 2022. *Dioon spinulosum* (errata version published in 2023). The IUCN Red List of Threatened Species 2022: e.T42149A243387612. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T42149A243387612.en
41. Williams, D. E. 1993. *Lycianthes moziniana* (Solanaceae): An underutilized Mexican food plant with new crop potential. Economic Botany 47(4): 387–400.
42. WMA (Ethical Principles for Medical Research Involving Human Participants). 2025. The World Medical Association. https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/
43. Zembele, E. R. and E. S. Ngulube. 2022. Effect of seed pretreatment methods on germination and early seedling growth of *Senna spectabilis*. International Journal of Forestry Research 2022(1): article 6731479. https://doi.org/10.1155/2022/6731479
44. Caption Legends

Tables

Table 1

Plant species used in the construction of floral arches during the Todos Santos celebration in San José Chiltepec, Oaxaca, Mexico. NUU = number of plant units, MPPU = mean plant unit value, EE = estimated earnings, NA = data no available.

Plant family	Species	Common name	Used part	NUU	MPPU (USD)	EE (USD)	Origin	Voucher
Zamiaceae	Dioon spinulosum Dyaer ex Eichler	Jicalito	Fronts	2,566	$0.43	$1,100.75	Wild / Management	JARS 2 (OAX)
Arecaceae	Chamaedora tepejilote Liebm.	Tepejilote	Fronts	2,344	$0.27	$628.45	Wild	JARS 3 (OAX)
Fabaceae	Senna spectabilis (DC.) H.S. Irwin & Barneby	Todo santos	Branches	220	$1.07	$412.00	Management	JARS 66 (OAX)
Asteraceae	Tagetes erecta L.	Cempaxuchitl	Branches	327	$2.68	$876.72	Cultivate	JARS 67 (OAX)
Amaranthaceae	Celosia argentea L.	Moco de pavo	Branches	621	$2.68	$1,664.96	Cultivate	JARS 68 (OAX)
Euphorbiaceae	Codiaeum variegatum (L.) Blume	Croto	Branches	5	NA	NA	Management	JARS 69 (OAX)
Rutaceae	Murraya paniculata (L.) Jack	Limonaria	Branches	4	NA	NA	Management	JARS 70 (OAX)
Zamiaceae	Dioon edule Lindl.	Cícada	Fronts	16	NA	NA	Management	JARS 65 (OAX)
Poaceae	Zea mays L.	Maíz	Seedlings	6	NA	NA	Cultivate	NA

Figures

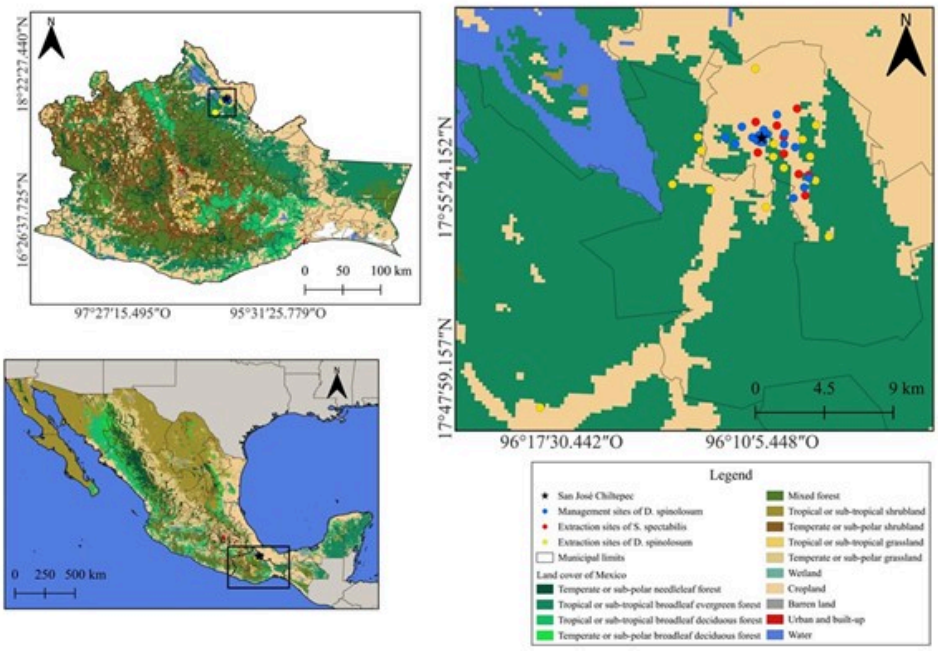

Figure 1

Location of San Jose Chiltepec, Oaxaca, Mexico and extraction sites for *Dioon spinulosum* and *Chamaedora tepejilote*fronds identified in the surrounding areas.

Figure 2

a) Cutting of fronds from *Dioon spinulosum*, b) gathering of fronds from *D. spinulosum*, c) base for the construction of the floral arch, d) decoration of the floral arch with *Tagetes erecta* and *Celosia argentea*, e) finished floral arch with *Chamaedorea tepejilote* and f) finished floral arch with *D. spinulosum*. All photographs by A. Ríos-Solís