



# First record of *Triphora hassleriana* (Orchidaceae, Triphoreae, Triphorinae) in Colombia

## Primer registro de *Triphora hassleriana* (Orchidaceae, Triphoreae, Triphorinae) en Colombia

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### Abstract:

**Background and Aims:** *Triphora hassleriana*, an orchid with a history of inaccurate documentation, is known from Argentina, Ecuador, Mexico, Paraguay and USA, based on verified herbarium specimens. Although some secondary sources mention its presence in other tropical American regions, such as Brasil or the Caribbean, these reports lack voucher support. This study aims to report the first formal documentation of the species in Colombia and to provide a precise description and illustration based on fresh material, thereby correcting prior inaccuracies.

**Methods:** Material from a newly discovered population in Valle del Cauca was collected and subsequently analyzed. A voucher specimen was deposited in the VALLE herbarium. The morphological study included dissection, photography, and a comparison with national and foreign herbarium specimens. We provide a comparative morphological analysis with *T. amazonica* to clarify diagnostic floral characters and contribute to the understanding of species limits and geographic patterns within the genus, drawing upon critical literature.

**Key results:** *Triphora hassleriana* is formally recorded in Colombia for the first time. Our analysis of the fresh specimen confirms that, contrary to some previous reports, the flowers are white and feature a labellum with three warty keels. A new, accurate description and detailed illustrations are presented based on these findings.

**Conclusions:** The known geographical distribution of *Triphora hassleriana* is now extended to include Colombia. The description and illustrations provided here, based on direct specimen examination, serve to correct previous accounts, which should consequently be regarded with caution.

**Key words:** Epidendroideae, Neotropics, taxonomy, terrestrial orchid.

### Resumen:

**Antecedentes y Objetivos:** *Triphora hassleriana*, una orquídea con una historia de documentación inexacta, se conoce de Argentina, Ecuador, México, Paraguay y USA, basado en especímenes de herbario verificados. Si bien algunas fuentes secundarias mencionan su presencia en otras regiones tropicales de América, como Brasil o el Caribe, estos informes carecen de documentación de referencia. Este estudio pretende documentar formalmente la especie en Colombia y proporcionar una descripción precisa y una ilustración basadas en material fresco, corrigiendo así inexactitudes anteriores.

**Métodos:** Se recolectó y posteriormente analizó material de una población recién descubierta en el Valle del Cauca. Se depositó un ejemplar de referencia en el herbario VALLE. El estudio morfológico incluyó la disección, la fotografía y una comparación con ejemplares de herbarios nacionales y extranjeros. Proporcionamos un análisis morfológico comparativo con *T. amazonica* para clarificar los caracteres florales diagnósticos y contribuir a la comprensión de los límites de las especies y los patrones geográficos dentro del género, basándonos en literatura crítica.

**Resultados clave:** *Triphora hassleriana* se registra formalmente en Colombia por primera vez. Nuestro análisis del espécimen fresco confirma que, contrario a algunos reportes previos, las flores son blancas y presentan un labelo con tres quillas verrugosas. Con base en estos hallazgos se presenta una nueva descripción e ilustraciones detalladas.

**Conclusiones:** La distribución geográfica conocida de *Triphora hassleriana* se amplía ahora para incluir a Colombia. La descripción y las ilustraciones que aquí se ofrecen, basadas en el examen directo de especímenes, sirven para corregir descripciones previas, que por consiguiente deben considerarse con cautela.

**Palabras clave:** Epidendroideae, Neotrópico, orquídea terrestre, taxonomía.

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## Introduction

The genus *Triphora* Nutt., comprising approximately 24 species of geophytic orchids, spans a vast distribution from southeastern Canada to northern Argentina and the Caribbean islands (Johnson, 2001; Pridgeon et al., 2003; Rothacker, 2005; Ferreira et al., 2010; Vieira et al., 2017; Soto-Calvo et al., 2021; Figueroa et al., 2023). Together with *Monophyllorchis* Schltr. and *Psilochilus* Barb. Rodr., *Triphora* belongs to the subtribe Triphorinae within the megadiverse subfamily Epidendroideae (Dressler, 1979; Pridgeon et al., 2003; Chase et al., 2015).

*Triphora* is distinguished morphologically from other Triphorinae by its thick, fleshy tubers with glabrous roots (these sometimes absent), and the relatively small leaves. The plants seem to undergo periodic dormancy, with fluctuation in the number of individuals that emerge in a given season (Rothacker, 2005; Carnevali, 2010). Flowering is gregarious, and the small flowers are ephemeral, white to pink or rarely yellow, often with yellowish to green crests and warts on the labellum, which is variously three-lobed. The column is slender, arcuate, with incumbent anther and the pollinarium consist of two deeply divided, mealy pollinia devoid of a viscidium, apparently being stuck to a pollinator by means of a viscarium (a rim of glue-producing tissue on the underside of the rostellum that requires the intervention of the pollinator to contact the pollinia; Dressler, 1993; G. A. Salazar, pers. obs.).

Little is known on the natural pollination of *Triphora*, and the only species for which there is information on this regard is the North American *T. trianthophoros* (Sw.) Ridl., pollinated by bees of families Apidae (*Bombus* sp.; Williams 1994) and Halictidae (*Augochlora pura* (Say, 1837); Dodds, 2022). Eight *Triphora* species have been recorded in Colombia: *T. foldatsii* Carnevali, *T. galeanoae* Szlach, Baranow & Mytnik, *T. gentianoides* (Sw.) Nutt. ex Ames & Schltr., *T. giraldoi* Szlach. & Kolan., *T. miserrima* (Cogn.) Acuña, *T. pygmea* Szlach. & Kolan, *T. vichadaensis* Szlach., Baranow & Mytnik, and *T. surinamensis* (Lindl.) Britton (Szlachetko et al., 2014; Morales-Morales et al., 2024; IPNI, 2025).

The inconspicuous nature of *Triphora* species, coupled with their already mentioned ephemeral flowers and fluctuating dormancy cycles, often leads them to be overlooked by field botanists, resulting in poor representation

in herbaria. Moreover, the flowers are thin and delicate, resulting in a loss or distortion of critical details after pressing and drying, which is problematic since many specimens lack floral dissections or are not linked to photographs or drawings that illustrate diagnostic characters (Ferreira et al., 2010; Szlachetko et al., 2014; Morales-Morales et al., 2024). Consequently, the genus remains poorly documented, with taxonomically ambiguous specimens and limited information on habitat, distribution patterns, and precise species distinctions (Carnevali, 2010; Morales-Morales et al., 2024).

*Triphora hassleriana* (Cogn. ex Chodat & Hassl.) Schltr. exemplifies these challenges, as it is one of the least documented species of the genus. Its known distribution has been restricted to Argentina, Brazil, Ecuador, Mexico, Paraguay and United States of America (USA) (Schlechter, 1920, 1925; Hoehne, 1940; Flora Argentina, 2024). Historical treatments relied on limited or poorly preserved material, often lacking detailed floral descriptions or illustrations, which has led to inaccurate identifications and confusion with morphologically similar taxa such as *T. amazonica* Schltr. Moreover, some unverified reports from other Neotropical regions appear to result from misidentifications. As a result, both the morphology and the geographic range of *T. hassleriana* have remained uncertain. The discovery of a living population in Colombia provides an opportunity to clarify these aspects and to contribute reliable, updated information on its taxonomy and distribution.

Here, we report the first record of *Triphora hassleriana* (for Colombia, based on a collection made recently in the city of Palmira, in the department of Valle del Cauca). We provide a detailed comparison of *T. hassleriana* with *T. amazonica*, due to their geographic proximity and morphological similarity. This approach strengthens their taxonomic delimitation and provides key insights into the distribution of the genus in the region.

## Material and Methods

The population of *Triphora hassleriana* was discovered on 28 September 2023 during fieldwork conducted within the research project “Ecología poblacional de orquídeas terrestres en Palmira” (Código Hermes: 55503). The study was carried out in a cocoa plantation located in Palmira, Valle del



Cauca, where ecological monitoring was being performed on populations of *Cyclopogon lindleyanus* (Link, Klotzsch & Otto) Schltr. and *Eulophia maculata* (Lindl.) Rchb.f. within a 25 m<sup>2</sup> plot. During one of these monitoring sessions, the first specimens of *T. hassleriana* were observed unexpectedly, forming a dense population of approximately 12 individuals, many of which were in bloom. At the time of discovery, their taxonomic identity was uncertain, prompting subsequent morphological documentation, including photography and dissections of flowers, leaves, and tubers. In 2024, the species was recorded again in the same forest, although in lower abundance. Additional scattered individuals were also located throughout the cacao understory, which covers approximately 15 hectares. In 2025, the population exhibited a marked decline in abundance. At the original site of discovery, only a few individuals were observed between February and June, after which no aerial parts were visible, indicating a possible transition to a subterranean stage. This pattern has complicated ongoing monitoring and highlights the species' seasonal dormancy, a typical characteristic of geophytic orchids. One specimen was pressed and deposited in the José Cuatrecasas Arumí Herbarium of the Universidad Nacional de Colombia, Palmira, Valle del Cauca (VALLE; acronyms follow Thiers, 2024) and compared with specimens from herbaria located in Colombia (COL, CUVC, HUA, HPUJ, JAUM, JBB, SURCO, TOLI, TULV, UDBC) and abroad (AMES, AMO, G, MEXU, MO, NY, U and US). The sparse literature available on *Triphora* was consulted. A Composite Dissection Plate was prepared using Photoshop® v. CS6 (Adobe Inc., San José, California, USA). Fresh flowers were dissected and photographed in Palmira, Colombia, using a Canon EOS Rebel T7 camera with an EF-S 18-55 mm f/3.5-5.6 IS II lens (Canon Inc., Tokyo, Japan) in the laboratory of the herbarium VALLE. A figure comparing the outlines of the dissected perianth parts of all species of Colombian *Triphora* recorded was prepared freehand using the pointillism technique on opaline paper based on previously published illustrations: *T. foldatsii* (Carnevali, 1984), *T. galeanae*, *T. giraldoi*, *T. pygmea*, *T. vichadaensis*, *T. miserima* (Szlachetko and Kolanowska, 2020), *T. gentianoides* (Dunsterville and Garay, 1959-1976), and *T. surinamensis* (Edquén et al., 2024).

## Results

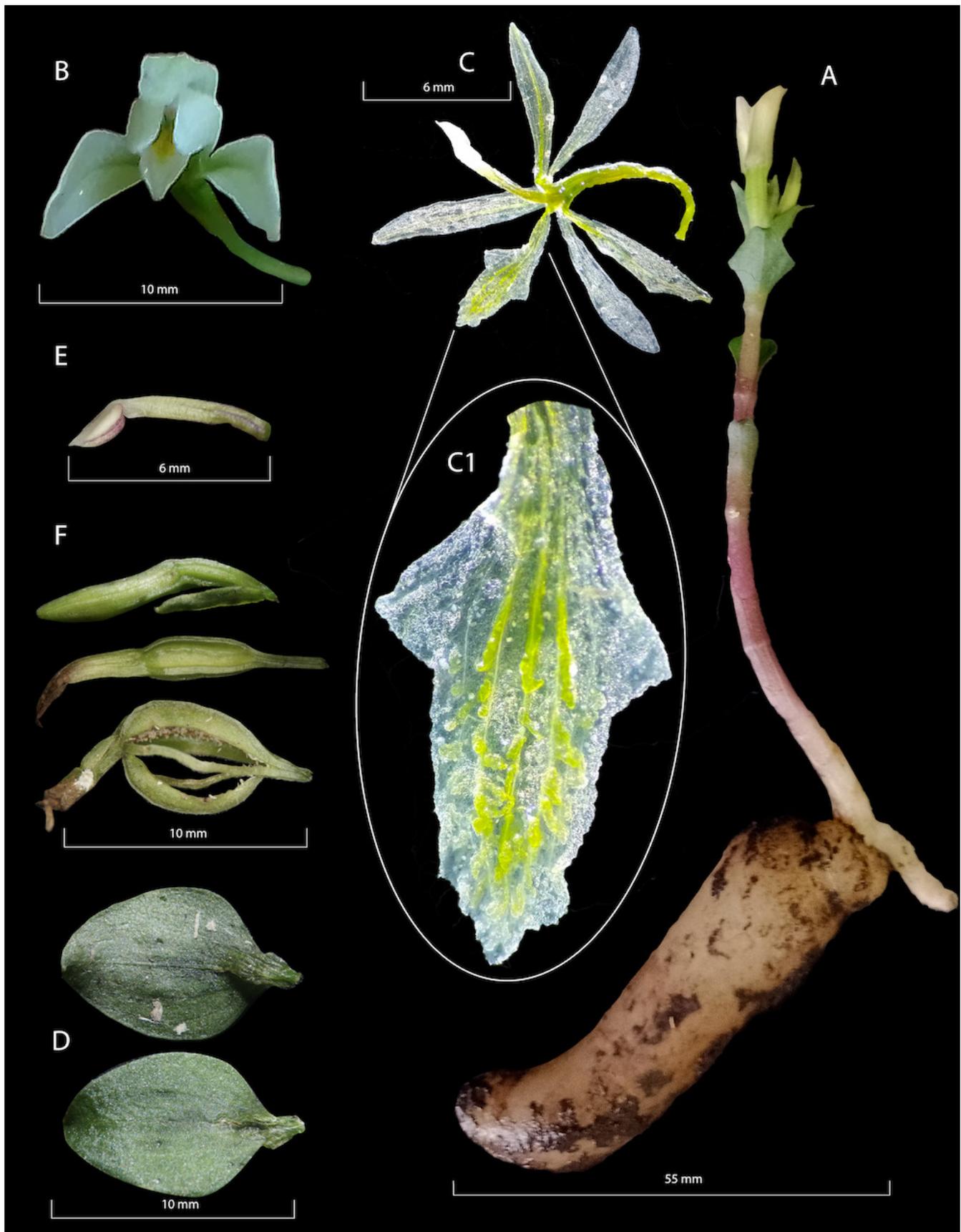
### Taxonomy

***Triphora hassleriana*** (Cogn. ex Chodat & Hassl.) Schltr., Beih. Bot. Centralbl., Abt. 2. 42(2): 76. 1925. Figs. 1, 2.

≡ *Pogonia hassleriana* Cogn. ex Chodat & Hassl., Bull. Soc. Roy. Bot. Belgique 43: 283. 1907. (1907). TYPE: PARAGUAY. In colle Santo Tomas prope Paraguari, floret decembri, *Hassler 6809* (holotype: BR0000013540418!; analysis of a flower of the holotype in K!).

Terrestrial herb up to 72 mm tall, measured from the base of the tuber to the apex of the inflorescence; tuber 55 mm long, oblong, fleshy, brownish, glabrous; stem about 17 × 1-3 mm, cylindrical, fleshy, glabrous, erect, with the white basal portion immersed in the leaf litter and the emergent portion greenish to reddish; leaves 2-4, blades 10-12 × 7.5-9 mm, sub-elliptical, spreading, base semi-amplexicaul, apex acute, margin entire, adaxial surface light green and abaxial surface greyish-green; inflorescence 15-20 mm long, terminal, racemose; floral bracts 3-4 × 2-3 mm, ovate, amplexicaul, acute, margin entire, light green; flowers 1-6, successive, 1-3 open at a time, ephemeral (18-24 h), resupinate, white; dorsal sepal 6.6 × 0.8 mm, lanceolate, apex acute, margin entire, whitish-green; lateral sepals 6.4 × 1.0 mm, lanceolate, slightly oblique and falcate, apex acute, margin entire, whitish-green; petals 6.8 × 0.8 mm, narrowly lanceolate, falcate, concave, apex acute, margin entire, whitish-green; lip 4.9 × 2.7 mm, trilobate, with lateral lobes triangular, short, and projecting forward, and mid-lobe ovate to elliptic, apex obtuse, margins entire, disc with three longitudinal ridges, irregularly papillose, greenish; column 4.4 × 0.9 mm, slender, slightly arcuate, apex curved, pale green, with terminal anther; ovary 3.0-4.5 × 1.1-1.4 mm, obconical, 3-ribbed, pale green with faint purplish suffusion at the base, with pedicel reaching up to 10 mm long; anther terminal, two-celled, white; pollinia 2, soft and mealy; rostellum short, rounded; stigmatic cavity concave, white; capsule 5.0-5.5 × 3.6-4.5 mm, fusiform, dehiscent by six longitudinal sutures.





**Figure 1:** *Triphora hassleriana* (Cogn. ex Chodat & Hassl.) Schltr. (Colombia, Rodríguez 03 (VALLE)). A. habit; B. flower, oblique view; C. dissected perianth; C1. enlargement of the distal half of the labellum; D. leaves in adaxial (left) and abaxial view (right); E. column from side; F. sequence of a flower bud (above), a flower in post-anthesis (middle) and a ripe fruit (below). Photos: Diego Rodríguez.

Distribution: widespread in the mainland Neotropics, in northern Argentina, Brazil, Ecuador, Mexico and Paraguay (Medley, 1996), and now also Colombia. For this country, this species is known from a single population recently discovered in a plantation of *Theobroma cacao* L. next to the campus of the Universidad Nacional de Colombia - Sede Palmira. The area is part of the Río Cauca basin, on a valley between the eastern slope of the Cordillera Occidental and the western slope of the Cordillera Central of the Colombian Andes.

Habitat: the population of this orchid, discovered in Colombia, is restricted to the alluvial plain of the Cauca River, situated between the Central and Western mountain ranges. The life zone here is classified as Tropical Dry Forest (Bs-T; Holdridge and Jiménez, 1977), characterized by a warm, relatively humid climate. The soils are composed of transported sediments of fluvial, lacustrine, and aeolian origin, primarily derived from the Ruiz-Tolima volcanic complex, and consist of diabases, phyllites, chlorites, granites, andesites, and gabbros (Rodríguez et al., 2007).

Although the local vegetation retains some remnants of its original structure, the area corresponds to Tropical Dry Forest (Bs-T; Holdridge and Jiménez, 1977). This forest fragment has undergone extensive transformation into cocoa plantations. The understory of these plantations, however, hosts *Triphora hassleriana* alongside other orchid species such as *Eulophia maculata* and *Cyclopogon lindleyanus*.

Phenology: the Colombian plants were found flowering in September and December and fruiting in January.

Additional specimens examined: ARGENTINA. Misiones, localidad General Manuel Belgrano, Reserva Vida Silvestre Urugua-í, -26°N, -53.98°W, A. Johnson s.n. (HERB96628). COLOMBIA. Valle del Cauca, Palmira, Universidad Nacional, bosque húmedo del cacaotal, 3°30'33.44"N, 76°8'30.97"W, 998 m, 23.I.2025, D. Rodríguez 03 (VALLE17125). ECUADOR. Zamora-Chinchiipe, 1630 m, 15.II.1993, S. Dalström 1916 (MO677992); El Recreo, 50 m, H. von Eggers 15750 (MO645667). MEXICO. Chiapas, San Andres Tuxtla, vereda Vigía-VI, estación de Biología Tropical 'Los Tuxtlas', 18.583°N, -95.082°W, 360 m, 31.VII.2011, M. Cruz

Olmedo and A. Campos s.n. (MEXU1331254). USA. Florida, wet woods west of S, Prong of Alafia river, Hillsborough Co., 03.I.1969, G. Luer s.n. (NY00009442); locality obscured, 20.VII.2024, M. Neelands and A. Barkdoll s.n. (FLAS287140).

Preliminary conservation status: The scarcity of records for *T. hassleriana* seems to indicate that it is a rare species. However, the known locations in Argentina, Brazil, Colombia, Ecuador, Mexico, Paraguay and USA are widely distant from each other and show an interruption in the species distribution, which implies a great lack of collection in intermediate countries such as Bolivia, Peru, Uruguay, and Venezuela in South America and Central American countries. The category "Data Deficient" (DD; IUCN Standards and Petitions Committee 2024) is suggested until there are studies that objectively evaluate the risk status of this species. The ecosystem variability of South American countries harbors potentially suitable habitats for this species, which have largely not been botanically explored. Furthermore, *T. hassleriana* plants, like other terrestrial orchids, are often overlooked due to their small size and their location immersed in the understory. Therefore, it is likely that the scarcity of records represents a lack of collection in the extensive, topographically complex, and relatively inaccessible Amazonian slope of the Eastern Cordillera of the Andes.

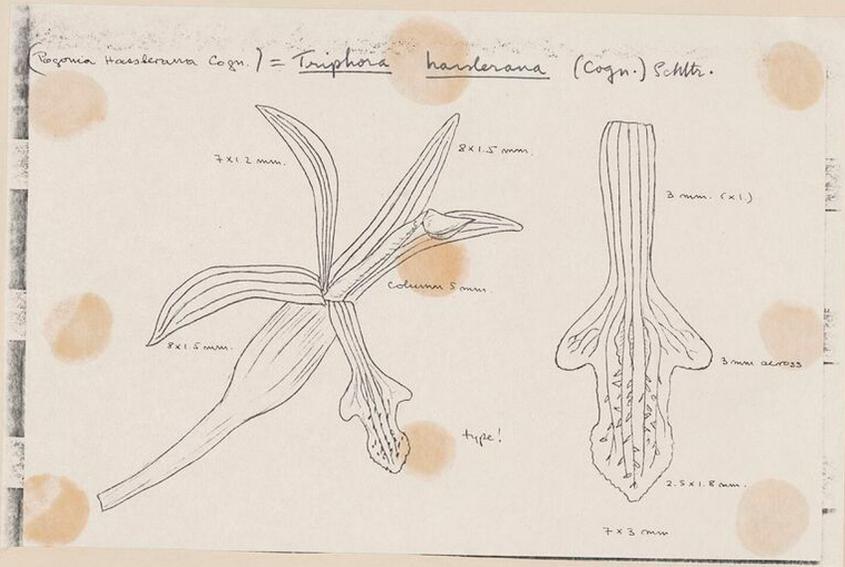
## Discussion

Species of the genus *Triphora* are very poorly represented in Colombian herbaria, so currently it is not possible to determine with confidence their local geographical distribution. The presence of species such as *T. miserrima* (Cogn.) Acuña and *T. gentianoides* (Sw.) Ames & Schltr. in Colombia is suggested by online photographs (Ortiz-Valdivieso and Uribe-Vélez, 2007; Szlachetko and Kolanowska, 2020). We were unable to corroborate the determination of the collection Idrobo 1925 as *T. gentianoides*, cited by Szlachetko and Kolanowska (2020) from a partially damaged specimen, as it was not located in COL or any of the other Colombian herbaria examined. Likewise, we could not locate the holotypes of *T. giraldoi*, *T. galeanae*, and *T. vichadaensis*, described in a synopsis of the Colombian *Triphora* (Szlachetko et al. 2014), although the protologues indicated that they are deposited in COL.



HERB. HORT. KEW.

ROYAL BOTANIC GARDENS KEW  
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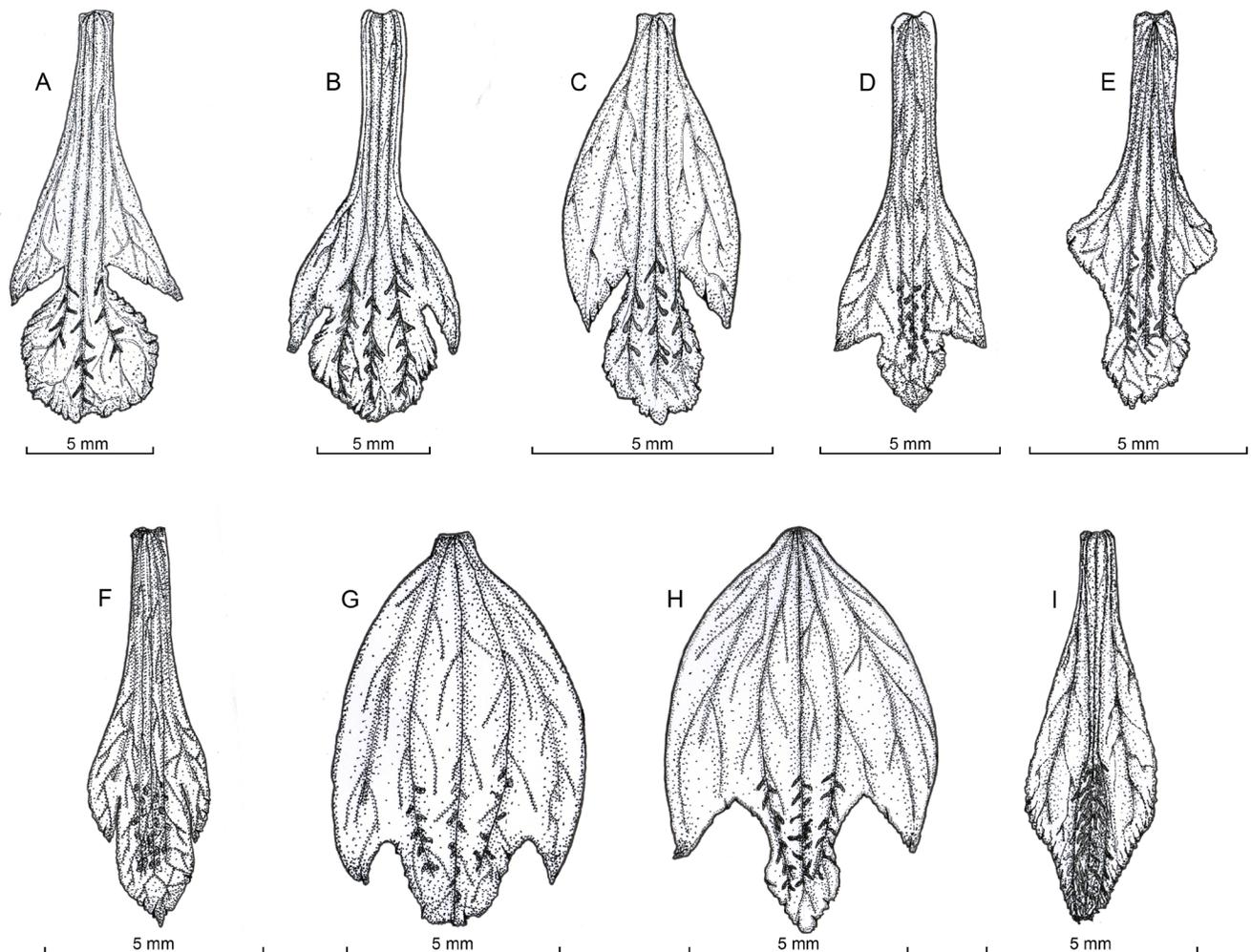


**Figure 2:** Analysis of a flower from the type of *Pogonia hassleriana* Cogn. ex Chodat & Hassl. Drawn by L. A. Garay (reproduced by courtesy of the Royal Botanic Gardens, Kew).



Our Colombian record of *T. hassleriana* matches closely the analysis of a flower of the type (BR0000013540418) made by the former Harvard orchidologist L. A. Garay, a copy of which is on a sheet at K (Fig. 2). The comparative overview of lip morphology (Fig. 3) provides the essential framework for interpreting the distinctiveness of *Triphora hassleriana* within the Colombian context. As panel E shows, the lip of *T. hassleriana* differs markedly from the other eight Colom-

bian species illustrated. Its mid-lobe is ovate to elliptic with smooth, entire margins, and the lateral lobes are short, triangular, and only slightly projected forward. These features contrast with the more prominently undulate or erose margins seen in species such as *T. foldatsii* (A), *T. galeanae* (B), and *T. gentianoides* (C). Furthermore, the three disc ridges in *T. hassleriana* (E) are irregularly papillose and not as prominently denticulate as those of *T. pygmaea* (F),



**Figure 3:** Morphological comparison of the flower lip of the species of *Triphora* Nutt. recorded in Colombia. A. *T. foldatsii* Carnevali (modified from G. Carnevali and A. Hernández 1186 (MYF), originally published in Carnevali 1984); B. *T. galeanae* Szlach., Baranow and Mytnik (modified from G. Galeano and R. Bernal 190 (MEDEL), originally published in Szlachetko et al. 2014); C. *T. gentianoides* (Sw.) Nutt. ex Ames & Schltr. (modified from P. Swartz 482 (S), originally published in Fawcett and Rendle, 1910); D. *T. giraldoi* Szlach. & Kolan. (modified from G. Giraldo 66C (MEDEL), originally published in Szlachetko and Kolanowska 2020); E. *T. hassleriana* (Cogn. ex Chodat & Hassl.) Schltr. (from Rodríguez 03 (VALLE)); F. *T. pygmaea* Szlach. & Kolan. (modified from J.M. Idrobo 2569 (COL), originally published in Szlachetko and Kolanowska 2020); G. *T. miserrima* (Cogn.) Acuña (modified from Baker 4943 (NY), originally published in Cogniaux, 1898); H. *T. surinamensis* (Lindl.) Britton (modified from Edquén 7421 (AMAZ), originally published in Edquén et al. 2024); I. *T. vichadaensis* Szlach., Baranow & Mytnik (modified from I. Cabrera 2339 (COL), originally published in Szlachetko et al. 2014). Illustration by D. Lozano-Cifuentes.

*T. surinamensis* (H), or *T. vichadaensis* (L). By integrating all Colombian representatives into a single comparative plate, **Figure 3** reinforces the diagnostic reliability of lip characters and unambiguously distinguishes the Colombian material of *T. hassleriana* from sympatric and regionally similar taxa. The geographic distribution and leaf and lip morphology provide the most reliable diagnostic characters permitting the distinction between *T. hassleriana* and the similar *T. amazonica* (**Fig. 4**). In *T. hassleriana*, the leaves are sub-elliptic, longer than wide, whereas in *T. amazonica* the leaves are reniform to subcordiform. In *T. hassleriana* the midlobe of the labellum is entire, oblong to elliptic, with entire margins, while the lateral lobes are short and slightly projected forward (**Schlechter, 1920**). In contrast, *T. amazonica* exhibits a broadly ovate to suborbicular midlobe with finely erose and undulate margins, and triangular, falcate lateral lobes. Moreover, the three longitudinal ridges on the disc of *T. amazonica* are denticulate and more conspicuous, whereas in *T. hassleriana* they are irregularly papillose (**Figs. 3, 4; Schlechter, 1925; Veyret, 1987**). These features highlight the taxonomic significance of both leaf and lip structure for delimiting closely related species within the genus. The illustration and description of *T. hassleriana* reproduced in **Szlachetko and Kolanowska (2020)** from the work “Orchids of Ecuador” (**Dodson and Dodson, 1980**) are imprecise and fail to mention some distinctive features of the species, such as the three keels with prominent warts. Moreover, they indicate that the flowers are yellow, which conflicts with the protologue and our field observations, which reveal that the flowers are white. Since the illustration and description by **Szlachetko and Kolanowska (2020)** were not based on examination of actual specimens, they should be regarded with caution. This discovery not only expands the known distribution of this species but also highlights the need for further botanical exploration and detailed documentation to better understand the diversity and conservation status of the genus *Triphora* in Colombia.

## Author contributions

Conceptualization: DR, DLC; Data curation: GAS, and JTO; Investigation: DR, DLC, GAS and JTO; Writing - original draft: DLC and DR; Writing - review and editing: DR, DLC, GAS and JTO.

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## Literature cited

- Carnevali, G. 1984. Una nueva *Triphora* (Orchidaceae) para la ciencia. *Ernstia* 22: 10-14.
- Carnevali G. 2010. *Triphora gentianoides* o el misterio del jardín. Desde el Herbario CICY 3: 41-43. [https://www.cicy.mx/Documentos/CICY/Desde\\_Herbario/2010/2010-07-01-Carnevali-Triphora-gentianoides.pdf](https://www.cicy.mx/Documentos/CICY/Desde_Herbario/2010/2010-07-01-Carnevali-Triphora-gentianoides.pdf) (Consulted August, 2025).
- Chase, M. W., K. M. Cameron, J. V. Freudenstein, A. M. Pridgeon, G. Salazar, C. Van den Berg and A. Schuiteman. 2015. An updated classification of Orchidaceae. *Botanical Journal of the Linnean Society* 177(2): 151-174. DOI: <https://doi.org/10.1111/boj.12234>
- Cogniaux, F. 1898. VII-Orchidaceae. In: Urban, I. (ed.). *Symbolae Antillanae, seu, Fundamenta florum Indiae Occidentalis*. Paris, Francia. DOI: <https://doi.org/10.5962/bhl.title.144>
- Dressler, R. L. 1979. The subfamilies of the Orchidaceae. *Selbyana* 5(2): 197-206.
- Dressler, R. L. 1993. *Phylogeny and classification of the orchid family*. Dioscorides Press. Portland, USA. 330 pp.
- Dodson, C. H. and P. M. Dodson. 1980. *Orchids of Ecuador*. *Icones Plantarum Tropicarum* 4: i-ii, t. 301-400.
- Dodds, J. S. 2022. *Triphora trianthophoros* (Three-Birds-Orchid) Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, State Forest Fire Service & Forestry, Office of Natural Lands Management, New Jersey Natural Heritage Program. New Jersey, USA. 16 pp.



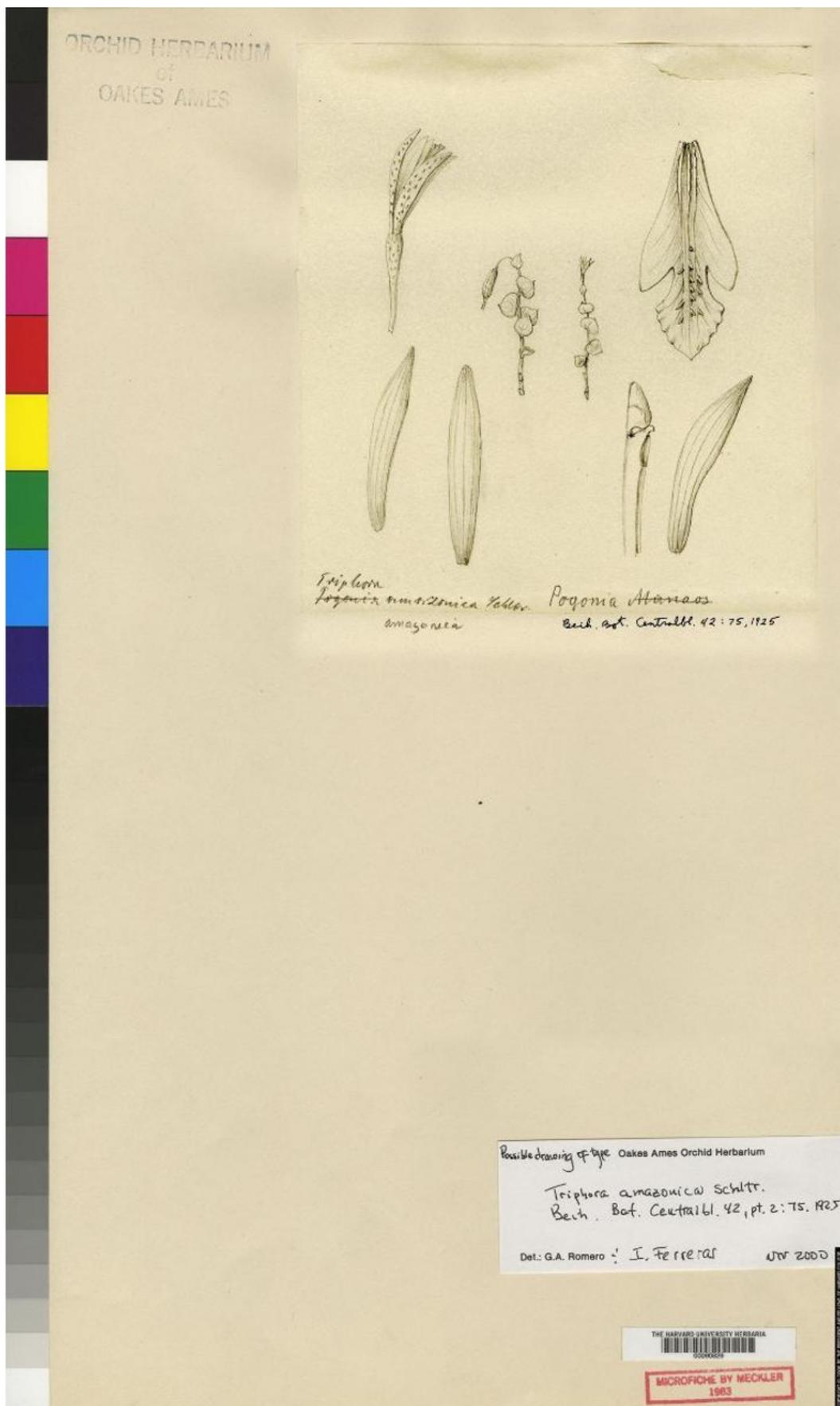


Figure 4: Analysis of a flower from the type of *Triphora amazonica* Schltr. Illustration by R. Mansfeld (Herbarium AMES).

- Dunsterville, G. C. K. and L. A. Garay. 1959-1976. Venezuelan Orchids Illustrated, Volume III. Andre Deutsch. London, UK. 236 pp.
- Edquén, J. D., E. Yrigoín, G. A. Salazar, E. Hágsater, E. Santiago and L. I. Cabrera, R. Jiménez-Machorro, D. Trujillo, K. Edquen, J. P. Arista, J. Duarte and M. Oliva. 2024. Los géneros de orquídeas del Bosque de Protección Alto Mayo. Guía ilustrada. Servicio Nacional de Áreas Naturales Protegidas por el Estado (SERNANP)/ Conservation International-Perú. Lima, Perú. 123 pp.
- Fawcett, W. and A. B. Rendle. 1910. Flora of Jamaica, containing descriptions of the flowering plants known from the island, Volume 1. Printed by order of the Trustees of the British Museum. London, UK. <https://www.biodiversitylibrary.org/item/23232> (Consulted August, 2025).
- Ferreira, A. W. C., D. H. Baptista and E. R. Pansarin. 2010. *Triphora uniflora* A. C. Ferreira, Baptista and Pansarin (Orchidaceae: *Triphoreae*): uma nova espécie e primeiro registro do gênero *Triphora* Nutt. para o estado de São Paulo, Brasil. Acta Botanica Brasilica 24: 288-291. DOI: <https://doi.org/10.1590/S0102-33062010000100031>
- Figueroa, D. S., A. Zabalgoitia, P. Velázquez-Ríos, M. A. Muñiz-Castro, R. Jiménez-Machorro, R. Guerrero-Hernández and O. Huerta-Galván. 2023. A new species of *Triphora* (Orchidaceae: Triphoreae, Triphorinae) from Mexico. Phytotaxa 599(2): 89-99. DOI: <https://doi.org/10.11646/phytotaxa.599.2.1>
- Flora Argentina. 2024. *Triphora hassleriana*. Instituto de Botánica Darwinion. <http://www.darwin.edu.ar/Proyectos/FloraArgentina/DetalleEspecie.asp?espcod=24012> (Consulted August, 2025).
- Hoehne, F. C. 1940. Orchidaceae. In: Hoehne, F. C. (ed.). Flora Brasílica 12 (1). Secretaria da Agricultura, Indústria e Comércio de São Paulo. São Paulo, Brazil. Pp. 52-254
- Holdridge, L. and S. H. Jiménez. 1977. Ecología basada en zonas de vida. Instituto Interamericano de Ciencias Agrícolas. San José, Costa Rica. <https://hdl.handle.net/11324/7936> (Consulted August, 2025).
- IPNI. 2025. International Plant Names Index. The Royal Botanic Gardens, Kew, Harvard University Herbaria and Libraries and Australian National Herbarium. <http://www.ipni.org> (Consulted August, 2025).
- IUCN Standards and Petitions Committee. 2024. Guidelines for Using the IUCN Red List Categories and Criteria. Version 16. Prepared by the Standards and Petitions Committee. <https://www.iucnredlist.org/documents/RedListGuidelines.pdf> (Consulted August, 2025).
- Johnson, A. E. 2001. Las Orquídeas del Parque Nacional Iguazú. Fundación de Vida Silvestre Argentina, Literatura de Latin América (L.O.L.A.), Los Talleres Gráficos LUX S.A. Buenos Aires, Argentina. 282 pp.
- Medley, M. E. 1996. Notes on collections of *Triphora* (orchidaceae) from the american tropics. Selbyana 17(1): 83-87. <http://www.jstor.org/stable/41759929> (Consulted August, 2025).
- Morales-Morales, P. A., E. Posada-Silva, A. Vélez-Marín and Á. Idárraga-Piedrahita. 2024. Confirmación de *Triphora surinamensis* (Orchidaceae) para la flora de Colombia y evaluación de su estado de conservación. Caldasia 46(3): 694-697. DOI: <https://doi.org/10.15446/caldasias.v46n3.105953>
- Ortiz-Valdivieso, P. and C. Uribe-Vélez. 2007. Gallery of Colombian orchids, CD-ROM. Da Vinci Ediciones. Bogotá, Colombia.
- Pridgeon, A. M., P. J. Cribb, M. W. Chase and F. N. Rasmussen. 2003. Genera Orchidacearum, Vol. 3: Orchidoideae part 2, Vanilloideae. Oxford University Press. London, UK. 378 pp.
- Rodríguez, J. V., G. Barney, P. J. Botero, C. A. Rodríguez, S. Blanco, G. Cabal and A. Clavijo. 2007. Territorio ancestral, rituales funerarios y chamanismo en Palmira prehispánica, Valle del Cauca. Universidad Nacional de Colombia. Bogotá, Colombia. 180 pp. <https://repositorio.unal.edu.co/handle/unal/3128> (Consulted August, 2025).
- Rothacker, E. P. 2005. Tribe *Triphoreae*. In: Pridgeon, A. M, P. J. Cribb, M. W. Chase and F. N. Rasmussen (eds.). Genera Orchidacearum, Vol. 4: Epidendroideae part 1. Oxford University Press. Oxford, UK. pp. 607-618.
- Schlechter, R. 1920. Orchidaceae novae paraguarienses I. Repertorium Specierum Novarum Regni Vegetabilis 16: 129-136.
- Schlechter, R. 1925. Orchidaceae novae et criticae. Beihefte zum Botanischen Centralblatt 42(2): 65-115.
- Soto-Calvo, M. A., P. Esperon and R. P. Saulea. 2021. A new species of *Triphora* Nuttall is described from Isla de La Juventud, Cuba. New World Orchidaceae—Nomenclatural Notes 96: 1-10.



- Szlachetko, D. L. and M. Kolanowska. 2020. Materials to the Orchid flora of Colombia. Volume 3: Spiranthoideae - Cranichideae, Vanilloideae. Koeltz Botanical Books. Oberreifenberg, Germany. 493 pp.
- Szlachetko, D. L., P. Baranow and J. Mytnik-Ejsmont. 2014. The genus *Triphora* (Triphoreae, Orchidaceae) in Colombia. Biodiversity Research and Conservation 34: 1-5. DOI: <https://doi.org/10.2478/biorc-2014-0006>
- Thiers, B. 2024. Index Herbariorum: a global directory of public herbaria and associated staff. New York Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/> (Consulted August, 2025).
- Veyret, Y. 1987. Orchidées de Guyane Française: Orchidaceae. Muséum National d'Histoire Naturelle. Paris, France. 42 pp.
- Vieira, T. L., C. F. Hall and F. de Barros. 2017. First record of *Triphora* Nutt. (Orchidaceae) for Northeastern Brazil. Hoehnea 44(2): 246-250. DOI: <https://doi.org/10.1590/2236-8906-108/2016>
- Williams S. A. 1994. Observations on reproduction in *Triphora trianthophora* (Orchidaceae). Rhodora 96: 30-43. <https://www.jstor.org/stable/23313002?seq=1> (Consulted August, 2025).

