Echinoagave nievesiorum (Agavaceae, Asparagales): A new species from the Sierra Madre Occidental, Jalisco, Mexico

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Abstract

Echinoagave nievesiorum (Agavaceae, Asparagales), a new species endemic to the Sierra Wixárika (Huichola), part of the Sierra Madre Occidental, Jalisco, Mexico, is described. This species shares morphological characteristics with Echinoagave rzedowskiana but it differs from the latter by having narrower and striate leaves; leaf sheaths shorter, triangular and wider at the base; narrower ovary width; shorter tube length; tepal lobes at anthesis converging and tightening the filaments; larger filament length to flower length ratio; fruiting spikes thicker and denser with the peduncle covered by the capsules and the bracts usually deciduous; capsules broadly ellipsoid with dorsally blackish valves. A distribution map with biogeographic provinces is provided to place the species in an ecological and evolutionary context.

Key words: Allopatric speciation, endemic species, Group Striatae, subgen. Littaea

Resumen

Se describe Echinoagave nievesiorum (Agavaceae, Asparagales), una especie nueva endémica de la Sierra Wixárika (Huichola), Jalisco, México. Esta especie comparte características morfológicas con Echinoagave rzedowskiana pero se diferencia de esta última en tener hojas evidentemente estriadas, más estrechas en la parte más ancha y en la mitad de las hojas; vainas de las hojas más cortas, triangulares y más anchas en la base; ancho de ovario más estrecho; longitud del tubo más corta; lóbulos del tépalo en la antesis convergiendo y apretando los filamentos; mayor relación entre la longitud del filamento y la longitud de la flor; espigas en fructificación más gruesas y densas con el pedúnculo cubierto por las cápsulas y las brácteas generalmente caducas; cápsulas ampliamente elipsoides con las valvas dorsalmente negruzcas. Se proporciona un mapa de distribución con provincias biogeográficas para ubicar la especie en un contexto ecológico y evolutivo.

Palabras-clave: Endémica, especiación alopátrica, Grupo Striatae, Sierra Huichola, subgen. Littaea
Introduction

The circumscription of the family Agavaceae Dumortier (1829: 57) and that of the genus *Agave* Linnaeus (1753: 323), have changed historically with the emergence of new lines of evidence (Bentham & Hooker 1883, Engler & Prantl 1888, McKelvey & Sax 1933, Hutchinson 1934, Takhtajan 1980, Cronquist 1981, Dahlgren & Clifford 1982, Dahlgren et al. 1985, Chase et al. 1993, Duval et al. 1993, Eguiarte et al. 2000, APG II 2003, APG III 2009, APG IV 2016). However, recent treatments on the classification of Angiosperms adopt the concept of Agavaceae as an independent family (Judd et al. 2016, Thiede & Eggli 2020, Thiede 2020) since a broad sense of Asparagaceae is not useful for gaining a better understanding of relationships between different clades due to its low support (Kim et al. 2010, Givnish et al. 2018). Likewise, *Agave* sensu lato being polyphyletic (Jiménez-Barrón et al. 2020) prompted Thiede et al. (2019) to merge *Manfreda* Salisbury (1866: 78), *Polianthes* Linnaeus (1753: 316) and *Prochnyanthes* Watson (1887: 457) into the same *Agave* concept, maintaining monophyly. However, instead of having a huge genus *Agave* an alternative is to recognize new genera, for highly supported lineages with substantial evolutionary and/or morphological change (Thiede & Eggli 2020). Following this alternative three new genera of Agavaceae (Asparagales) were recently erected based on genetics, morphology, and estimated divergence times: *Echinoagave* A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 4), *Paleoagave* A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 5) and *Paraagave* A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 5).

*Echinoagave*, formerly known as *Agave* Linnaeus (1753: 323), subgenus *Littaea* (Tagliabue 1816: 106) Baker (1888: 164), sect. *Juncineae* Salm-Dyck (1861: 182), or Group *Striatae* Baker (1877: 171), includes species such as *E. dasylirioides* (Jacobi & C.D. Bouché in Jacobi 1865: 344) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), putatively considered to hold a basal position in the genus, by bearing “primitive” (plesiomorphic) morphology (leaves serrulate and scarcely succulent, inflorescences relatively simple, ovary incompletely inferior, tepals all equal, lobes nearly of equal length) (Gentry 1982). Molecular data support Gentry’s hypothesis since *Echinoagave* is a sister group to the great majority of species of *Agave* s.l. (Bogler & Simpson 1996, Bogler et al. 2006, Gil-Vega et al. 2007, Hernández-Vera 2007, Hernández-Vera et al. 2007, Archibald et al. 2015 and Jiménez-Barrón et al. 2020).

In Mexico, there are twelve species of *Echinoagave*: *E. albopilosa* (I.Cabral, Villarreal & A.E.Estrada in Cabral-Cordero et al. 2007: 52) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), from Nuevo León; *E. cryptica* (G.D.Starr & T.J.Davis in Starr et al. 2021: 275) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), from NE Mexico; *E. cremnophila* (G.D.Starr, Etter & Kristen in Starr et al. 2018: 40) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), from Oaxaca; *E. dasylirioides*, from the states of Mexico and Morelos; *E. gracielae* (Galván & Zamudio 2013: 2) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), from Queretaro and San Luis Potosi; *E. kavandivi* (Garcia-Mendoza & Chávez-Rendón 2013: 1071) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 6), from Oaxaca; *E. lexii* (Garcia-Mor., Garcia-Jim. & Iamonico in Garcia-Morales et al. 2019: 1) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Tamaulipas; *E. petrophila* (García-Mendoza & Martínez 1998: 627) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Guerrero and Oaxaca; *E. rzedowskiana* (P.Carrillo, Vega & R.Delgad. in Carrillo-Reyes et al. 2003: 240) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Central Jalisco; *E. striata* (Zuccarini 1833: 678) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Central-Northeast Mexico; *E. stricta* (Salm-Dyck 1859: 94) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Puebla; and *E. tenufolia* (Zamudio & Sánchez 1995: 48) A.Vázquez, Rosales & García-Mor. in Vázquez-Garcia et al. (2024: 7), from Querétaro (Gentry 1982, Vázquez-García et al. 2007a, 2007b, Thiede 2020).

In Jalisco, the first record of an *Echinoagave* species was made in 1990, from La Toma [=Los Alisos], Bolaños, southern end of the Sierra Madre Occidental, by Agustín Flores-Macias, however, this species was initially confused with *E. dasylirioides* (Vigueras 1993), subsequently, with *E. striata* subsp. *falcata* (Engelmann 1875: 304) Gentry (1982: 245) (Cházar-Basáñez et al. 2004a, 2004b, 2004c), and later with *E. rzedowskiana* (Carrillo et al. 2003, Cházar-Basáñez et al. 2004a, Vázquez-Garcia et al. 2004a, 2004b, 2007a, 2007b, Hernández-Vera 2007, Thiede 2020).

Here we propose that the populations from the Sierra Wixarika, in Bolaños, formerly treated under *Echinoagave rzedowskiana* are significantly distinct from the latter and deserve to be described as a new species named *Echinoagave nievesiorum*. 

A NEW SPECIES OF ECHINOAGAVE FROM MEXICO

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Methods

Recently, during the spring of 2021, a living specimen of this species, previously collected in 2013, bloomed on the rooftop of the home of one of the authors, Ana Nuño, at Huentitán El Alto, Guadalajara, Jalisco, and it was possible to understand in detail its flower morphology and phenology. One of the authors, García-Morales, looked closely at the specimens of several populations of the *E. rzedowskiana* complex and found differences among them in the leaves, spine, and serrulate margins. In the autumn of 2022, a couple of visits to Sierra de Bolaños, allowed us to obtain fruiting material from the vertical cliffs. Voucher specimens collected from these field surveys were made following Bridson & Forman (1989) and were deposited at IBUG herbarium.

A literature review was carried out. We reviewed and determined the specimens of *Agave* and *Echinoagave* deposited in the herbaria IBUG [herbarium acronym following Thiers (2023)]. Additionally, we revised the types and digitalized images from the corresponding herbaria and the iNaturalist website (https://www.inaturalist.org/). A map of the geographic distribution was made with the ArcMap software, v. 10.3 (ESRI 2016). To estimate the IUCN Red List category of *Echinoagave nievesiorum* we followed the guidelines and criteria B1 of the International Union for Conservation of Nature (IUCN 2022), and the Geospatial Conservation Assessment Tool (GeoCAT) from the Royal Botanic Gardens, Kew (Bachman et al. 2011) to calculate the Extent of Occurrence (EOO) and the Area of Occupancy (AOO), with the standard 2 × 2 km grid area.

Description of the new species

**Echinoagave nievesiorum** A. Vázquez, A.T. Nuño, Cházaro, Padilla-Lepe & García-Mor. *sp. nov.* (Figs. 1–4).

**Type:**—MEXICO. Jalisco: Municipio de Bolaños, Cercanías de Las Azucenas, Sierra Huichola, Cerro La Gallina, 21°52’18.20”N, 103°50’23.93”W, elev. 2286 m, con *Brahea sarukhanii* y *Dasylirion acrotrichum* (floreció en cultivo en Huentitán El Alto, Guadalajara, 8 años después de haber sido recolectado), April 2021 (fl., bd.), J. Antonio Vázquez-García 10286 w/Ana Teresa Nuño-Rubio & Jesús Padilla-Lepe (holotype: IBUG!).

**Diagnosis:**—*Echinoagave nievesiorum* shares with *E. rzedowskiana* a similar rosette size and cespitose habit, rigid leaves, length of flowers, ovaries, tepal lobes, and size of capsules; however, it differs from the latter by having mature leaves bluish-white to whitish (vs. pale-green to green), narrower at the widest part (12.0–12.5 mm vs. 13.0–14.0 mm), and narrower at the middle of the leaves (6.0–6.5 mm vs. 7.0–10.0 mm); leaf sheaths shorter (9.0–11.0 mm vs. 28.0–34.0 mm), triangular and wider at the base (vs. rectangular and wider above the base); inflorescences usually straight and erect, sometimes vertically-curved or geniculate, rarely drooping (vs. usually horizontally-curved, often dropping and sinuous) narrower ovary width (4.5–5.1 mm vs. 5.7–7.5 mm); shorter tube length (5.5–6.4 mm vs. 7.0–10.0 mm); leaf sheaths shorter (9.0–11.0 mm vs. 28.0–34.0 mm), triangular and wider at the base (vs. rectangular and wider above the base); inflorescences usually straight and erect, sometimes vertically-curved or geniculate, rarely drooping (vs. usually horizontally-curved, often dropping and sinuous) narrower ovary width (4.5–5.1 mm vs. 5.7–7.5 mm); shorter tube length (5.5–6.4 mm vs. 7.0–10.0 mm); tepal lobes at anthesis converging and thickening the filaments (vs. diverging and not thickening the filaments); larger filament length to flower length ratio (2.0–2.3 vs. 1.8–1.9); fruiting spike narrowly pyramidal thicker (3.5–4.5 cm vs. 2.4–2.5 cm) and denser with the peduncle covered by the capsules and the bracts usually deciduous (vs. cylindroid, slim and lax, with the peduncle conspicuous and the bracts usually persistent); mature capsules broadly ellipsoid with dorsally blackish and opaque valves (vs. broadly ovoid, slightly depressed, with dorsally light brown and shiny valves) (Table 1).

**Description:**—Perennial, cespitose rosette 35.0–55.0 cm in diameter, 20.0–40.0 cm tall, hemispherical, compact, bluish-white to whitish. Leaves 29.5–32.0 × 1.2–1.25 × 0.2–0.4 cm, sheath length 9.0–11.0 mm, linear-triangular, straight or falcate, rigid, acuminate at the apex, grooved on both surfaces, bluish-white to whitish when mature, green when young; margin non-hyaline, crenate-dentate, 19 teeth per cm; spines 2.5–2.8 × 1.6–2.2 mm; terminal spine blackish at apex, base brown. Inflorescence 130.0–155.0 × 4.3–4.7 cm, usually straight and erect, sometimes vertically-curved or geniculate, rarely sinuous or dropping; fertile portion 17.5–38.0 cm, spike narrowly pyramidal dense, oblongoid to obovoid, truncate at the base and acute at the apex; peduncle bracts 6.5–9.0 × 0.4–0.5 cm, linear, broadest at the sheath base, narrowing towards the apex, needle-like, greyish-white, brown base; flower bracts 2.0–2.3 × 1.0–1.5 cm, longer than flowers, triangular, caudate at apex, greyish-white. Flowers 65–70 pairs per spike, 21.7–23.5 × 14.0–16.0 mm, funnel-shaped, red to pink; pedicels 2 mm long on fruit. Ovary 7.0–7.8 × 4.5–5.1 mm, cylindrical to fusiform, glabrous. Corolla tube 5.5–6.4 × 10.0–12.0 mm; tepals 4.5–5.5 mm long, adaxially concave, the outer ones wider than the inner ones. Filaments 4.3–4.6 cm long, brown at anthesis then turning purple. Anthers 9.0–12.0 mm long, centric, arched, oblong, and rounded at both ends, brownish to yellow or pinkish-purple. Style 4.5–6.0 cm long, filiform, sinuate to straight. Fruiting spike 18–21 × 3.5–4.5 cm, narrowly pyramidal, covering ¼ of the length of the peduncle, capsules densely appressed hiding the peduncle, bracts usually deciduous. Capsules 0.8–1.1 × 0.8–1.0 cm, broadly opaque valves (vs. narrowly ovoid, slightly depressed, with dorsally light brown and shiny valves) (Table 1).
ellipsoid, apically dehiscent, valves dorsally blackish and opaque; perianth deciduous. Seeds 3.24–3.53 × 1.68–2.15 mm, laminate, lunate (“D” shape), one of the angles right, the other a cleft, the cleft 0.10–0.25 mm deep, black (Fig. 7).
FIGURE 2. Differences in leaves, spines, margins (upper row), flowers (mid row), and fruits (bottom row) among *Echinoagave* sp. from Concordia, Sinaloa (A); *E. rzedowskiana* from San Cristóbal de La Barranca, Jalisco (B); and *E. nievesiorum* from Bolaños, Jalisco (C). Photographs: Leaves, spines, margins, flowers (A), and fruits (A–B) by L.J. García-Morales; flowers (B) by S. Rosales; flowers (C) by A.T. Nuño-R.; and fruits (C) by J.A. Vázquez-G.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>E. nievesiorum</em></th>
<th><em>E. petrophila</em></th>
<th><em>E. rzedowskiana</em></th>
<th><em>E. dasylirioides</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosette diameter (cm)</td>
<td>35.0–55.0</td>
<td>50.0–80.0</td>
<td>25.0–45.0 (–65.0)</td>
<td>(60.0–)100.0–200.0</td>
</tr>
<tr>
<td>Rosette habit</td>
<td>Cespitose</td>
<td>Cespitose</td>
<td>Cespitose</td>
<td>Solitary</td>
</tr>
<tr>
<td>Leaves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (cm)</td>
<td>29.5–32.0</td>
<td>40.0–70.0</td>
<td>(11.0)20.0–35.0 (–50.0)</td>
<td>(40.0–)60.0–100.0</td>
</tr>
<tr>
<td>Width at the widest part (mm)</td>
<td>12.0–12.5</td>
<td>4.0–9.0</td>
<td>7.0–10.0</td>
<td>20.0–38.0</td>
</tr>
<tr>
<td>Shape</td>
<td>Straight to falcate</td>
<td>Straight</td>
<td>Straight to falcate</td>
<td>Straight</td>
</tr>
<tr>
<td>Margins</td>
<td>Sparsely serrulate</td>
<td>Denticulate</td>
<td>Densely serrulate</td>
<td>Inconspicuously and sparsely serrulate</td>
</tr>
<tr>
<td>Sheath length (mm)</td>
<td>9.0–11.0</td>
<td>?</td>
<td>28.0–34.0</td>
<td>26.8–30.0</td>
</tr>
<tr>
<td>Sheath Shape</td>
<td>Triangular, widest at the base</td>
<td>?</td>
<td>Rectangular, narrower at the base</td>
<td>Trapezoid, widest at the base</td>
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<tr>
<td>Flower length (mm)</td>
<td>21.7–23.5</td>
<td>20–25</td>
<td>22.0–24</td>
<td>25.0–39.0</td>
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<td>Ovary length (mm)</td>
<td>7.0–7.8</td>
<td>7.0–10.0</td>
<td>7.0–9.0</td>
<td>9.0–13.0</td>
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<tr>
<td>Width (mm)</td>
<td>4.5–5.1</td>
<td>3.0–4.0</td>
<td>5.7–7.5</td>
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<tr>
<td>Tube length (mm)</td>
<td>5.5–6.4</td>
<td>7.0–10.0</td>
<td>8.0–15.0</td>
<td></td>
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<tr>
<td>Tepal lobes length (mm)</td>
<td>4.5–5.5</td>
<td>4.0–8.0</td>
<td>9.0–13.0</td>
<td></td>
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<tr>
<td>Tepal shape</td>
<td>Converging and tightening the filaments</td>
<td>Diverging and not tightening the filaments</td>
<td>Diverging and not tightening the filaments</td>
<td>Diverging and not tightening the filaments</td>
</tr>
<tr>
<td>Filaments insertion</td>
<td>Half of the tube</td>
<td>Apex of tube</td>
<td>Half of the tube</td>
<td>Half of the tube</td>
</tr>
<tr>
<td>Filament length to flower length ratio (mm)</td>
<td>2.00–2.30</td>
<td>1.36–1.43</td>
<td>1.80–1.90</td>
<td>1.08–1.10</td>
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<tr>
<td>Infrauctescence (fruiting spike)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Thickness (cm)</td>
<td>3.5–4.5</td>
<td>3.7–3.9</td>
<td>2.4–2.5</td>
<td>4.0–6.0</td>
</tr>
<tr>
<td>Density</td>
<td>Dense, peduncle covered</td>
<td>Lax, peduncle visible</td>
<td>Lax with, peduncle visible</td>
<td>Dense, peduncle covered</td>
</tr>
<tr>
<td>Bracts</td>
<td>Usually deciduous</td>
<td>Persistent</td>
<td>Persistent</td>
<td>Persistent</td>
</tr>
<tr>
<td>Capsule size (mm)</td>
<td>8.0–11.0 × 8.0–10.0</td>
<td>9.0–10.0 × 8.0–9.0</td>
<td>7.0–13.0 × 6.0–9.0</td>
<td>10.0–20.0 × 6.0–9.0</td>
</tr>
<tr>
<td>Shape</td>
<td>Broadly ellipsoid</td>
<td>Globose</td>
<td>Broadly ovoid</td>
<td>Ellipsoid to oblongoid</td>
</tr>
<tr>
<td>Color of valves</td>
<td>Dorsally blackish</td>
<td>Dorsally brown-blackish</td>
<td>Dorsally brownish green</td>
<td>Dorsally blackish</td>
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<tr>
<td>Habitat</td>
<td>Pine-oak forests</td>
<td>Tropical dry forest</td>
<td>Pine-oak forests</td>
<td>Pine-oak forest</td>
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<td>Elevation (m a.s.l.)</td>
<td>2000–2600</td>
<td>850–1300</td>
<td>1501–1700</td>
<td>1900–2500</td>
</tr>
<tr>
<td>Distribution</td>
<td>N of Jalisco</td>
<td>E Guerrero, S Puebla, W &amp; N Oaxaca</td>
<td>Central Jalisco</td>
<td>San Luis Potosi and Morelos</td>
</tr>
</tbody>
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### TABLE 2. The elevational disjunct distribution *E. nievesiorum* and morphologically close species

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<td>1201–1300</td>
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<td>1301–1400</td>
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<td>1801–1900</td>
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<td>1901–2000</td>
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**Etymology:**—The specific epithet honors the family members of Prof. Gregorio Nieves Hernández, who have contributed notably for over a decade to the knowledge of vascular flora and ethnobotany of the Sierra Wixarika.

**Conservation status:**—The known geographic distribution of *Echinoagave nievesiorum* covers an extent of occurrence (EOO) of 54.96 km². According to the IUCN Red List Criteria (IUCN 2022), *E. nievesiorum* could be categorized as Critically Endangered CR B1+B2ab(ii,iii) due to its EOO <100 km², and area of occupancy (AOO) of 16 km². Consequently, the species may have a wider distribution in neighboring municipalities and states to determine if this species may have a wider distribution.

**Additional specimens examined:**—**MEXICO. Jalisco:** Municipio de Bolaños, La Toma, Cerro La Gallina, km 20[22] hacia Puente de Camotlán, 16 June 1990 (young fr.), *A. Flores M.*, G. Martínez P. & N.P. Ramos G. 1890 (IBUG, IEB, MEXU); La Toma, 30[22] km NW of Bolaños, 1 July 1991 (young fr.), *A. Flores M.* & J.M. Flores M. 2734 (IEB, MEXU, WIS). Cerros cercanos a La Tomá, km 17 del camino a Tuxpan de Bolaños, 21°53'N, 103°50'W, elev. 2100–2170 m, 12 March 2001 (fr.), *P. Carrillo-Imes* & M. Barba 1519 (IBUG, IEB); Los Alisos (arriba de depósito de agua, “La Toma”), Cerro La Gallina, km 22 al NW de Bolaños, rumbo a Cruce Banderitas (Tuxpan de Bolaños-Bajo el Tule), 15 November 2003 (sterile), *J. A. Vázquez-García*, 7614 w/G. López D. & M. Mantilla B. (IBUG), same locality, elev. 2100 m, 8 April 2004 (sterile), *J. A. Vázquez-García*, 7790 w/M. Cházar & R. Perez M. (IBUG); Cerro El Gallo, km 29 al NW de Bolaños, elev. 2600 m, rumbo a cruce baderitas, 9 April 2004 (fl. buds and old infructescence); *J. A. Vázquez-García*, M. Cházar & R. Perez M. 7813 (IBUG); Frente a El Nalgazo, 23 km al NW de Bolaños, rumbo a Cruce Banderitas, elev. 2180 m, 21 October 2022 (sterile), *Vázquez-García*, Gónzalez-Villegas & Romero González 10205 (IBUG); Same locality, 29 Octubre 2022 (fr.), *J. A. Vázquez-García*, J. Padilla-Lepe, A. Prinz, J.L. Lomeli-Hernández, A. Chavarín & S. Cristóbal-Gabriel 10216a (IBUG); El Nalgazo, elev. 2200 m, 29 October 2022 (fr.), *S. Cristóbal-Gabriel*, A. Prinz & J.L. Lomeli-Hernández 10216b (IBUG).

**Discussion**

*Echinoagave nievesiorum* is sufficiently morphologically distinct from *E. rzedowskiana* to warrant its recognition as a distinct species. Additionally, they inhabit different biogeographic provinces and are ecologically disjunct along the elevational gradient (Table 2). Populations from Durango may correspond to *E. nievesiorum*, but further morphological study of populations from Durango is needed. *Echinoagave nievesiorum* differs from *E. petrophila* in having shorter leaves 29.5–32.0 vs. 40.0–70.0 cm, leaf margins sparsely serrulate vs. denticulate margins; longer tube length (5.5–6.4 vs. 3.0–4.0 mm); shorter tepal lobes (4.5–5.5 vs. 9.0–11.0 mm) and these converging and tightening the filaments vs. diverging and not tightening the filaments, filament insertion at the middle of the tube vs. at the apex; inflorescence dense and covering the peduncle vs. lax with the peduncle visible; bracts usually deciduous vs. persistent; and capsules broadly ellipsoid vs. globose. *Echinoagave nievesiorum* differs from *E. dasyliriodes* in having shorter rosettes (35.0–55.0 vs. 60.0–200.0 cm), caespitose vs. solitary; shorter leaves 29.5–32.0 vs. 40.0–100.0 cm); leaves narrower at the middle (6.0–6.5 vs. 20.0–38.0 mm); leaf sheath shorter (9.0–11.0 vs. 26.8–30.0 mm) and triangular vs. trapezoid;
flowers shorter (21.7–23.5 vs. 25.0–39.0 mm); ovary shorter (7.0–7.8 vs. 9.0–13.0 mm); tubes shorter (5.5–6.4 vs. 8.0–15.0 mm); tepal lobes shorter (4.5–5.5 vs. 9.0–13.0 mm), these converging and tightening the filaments vs. diverging and not tightening the filaments; and bracts usually deciduous vs. persistent.

**Echinoagave nievesiorum** adds up to a total of 13 species in genus *Echinoagave*, and together with *E. rzedowskiana*, are the only two species of the genus for Jalisco, the two endemic to the state.

The relatively close morphological and geographical proximity between *E. rzedowskiana* and *E. nievesiorum* suggest that the two belong to the basal and monophyletic Ordatitae clade (Hernández-Vera 2007, Hernández-Vera et al. 2007, Gil-Vega et al. 2007), recently erected as Echinoagave (Vázquez-García et al. 2024). *Echinoagave rzedowskiana*, is an endemic to the Trans-Mexican Volcanic Belt province in Jalisco, meanwhile *E. nievesiorum* is endemic to the Sierra Madre Occidental province; both species may have derived from a common ancestor distributed along the Sierra Madre Occidental from which migration into the relatively recent Trans-Mexican Volcanic Belt led to exposure to new environmental selective pressures allowing speciation.

It should be noted that floristically these two *Echinoagave* species hardly share cohabiting species in common, among the 37 species listed in the habitat of *E. nievesiorum* only one species, *Comarostaphylis glaucescens* (Carrillo-Reyes et al. 2003), occurred in the habitat of both species, representing 2.7% similarity among these distant plant communities. This is partly due to the geographical distance, ecological differences, and the different biogeographic provinces where they inhabit (Morrone et al. 2017). Particularly, *E. nievesiorum* is found in a colder climate on cliffs and on top of high mountains in the southern Sierra Madre Occidental biogeographic province, while *E. rzedowskiana* is in a subtropical warmer climate, on cliffs of highly eroded mid-elevation plateaus, within the Trans-Mexican Volcanic Belt province in Jalisco.

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