



Two new critically endangered species of *Vellozia* (Velloziaceae) from the *Campos Rupestres* of *Espinhaço* Range, Brazil

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ABSTRACT

Two new narrowly distributed species of *Vellozia* (Velloziaceae) are described, illustrated, and a preliminary status of conservation was assessed, *Vellozia flavida* Mello-Silva ex Magri and *V. formosa* Mello-Silva ex Magri. Both species occur in the municipality of Monte Azul, Minas Gerais State, Brazil, in the *Campos Rupestres* vegetation. *Vellozia flavida* is closely related to *V. luteola* and both are easily recognized by having yellow perianth, an uncommon character in the genus. *Vellozia flavida* however is distinguished by the high number of stamens (22) and the presence of capitate hypanthial emergences, whereas *V. luteola* has 15 stamens and subulate hypanthial emergences. *Vellozia formosa* is morphologically related to *V. nanuzae*, showing similar habits, however, it is distinguished by the leaf blades covered with long emergences on both surfaces vs. glabrous in *V. nanuzae*. Due to the narrow distribution of *V. flavida* and *V. formosa* and threats to their habitat such as mining and livestock industries, they were considered as critically endangered (CR) according to IUCN criteria.

Key words: Diversity, endemic species, Pandanales, rocky outcrops, taxonomy

INTRODUCTION

Velloziaceae has around 250 species and five genera (Mello-Silva *et al.* 2011) with a pantropical distribution, generally growing on highlands: *Acanthochlamys* P.C.Kao (1980:1), monospecific and distributed in China and Yemen; *Xerophyta* Juss. (1789: 50) with around 30 species distributed in the African continent and Madagascar; *Barbaceniopsis* L.B.Sm. (1962: 270) with four species restricted to the Andes, *Barbacenia* Vand. (1788: 21) with ca. 100 species, centered in Brazil and *Vellozia* Vand. (1788: 32), the most diverse genus in the family, with around 130 species, also centered in Brazil (Smith 1962, Smith & Ayensu 1976, Mello-Silva *et al.* 2011). The latter two genera mainly occur in the *Campos Rupestres* vegetation, being among the most abundant and characteristic plant groups of this vegetation, where populations of these genera are very common (Conceição *et al.* 2016, Mello-Silva *et al.* 2011, Velloziaceae in the Flora and Funga of Brazil, 2024).

The *Campos Rupestres* is an outstanding environment due to its high levels of diversity and endemism of species (Giulietti *et al.* 1997, Colli-Silva *et al.* 2019). They are predominantly herbaceous-shrubby vegetation on quartzite, arenite, or ironstone formations, usually above 900 meters above sea level (Conceição *et al.* 2016). The *Campos Rupestres* are predominantly distributed along the *Espinhaço* Range, a mountainous region extending from the Southern Minas Gerais State to Chapada Diamantina, in the Northern portion of the Bahia State, Brazil (Silveira *et al.* 2016). Despite the high diversity of Velloziaceae documented in *Campos Rupestres*, the recent discoveries of new species for the family (e.g., Cabral *et al.* 2022, 2023, present study), alongside the prevalence of micro-endemism and the challenging access to areas in the *Espinhaço* Range (Mello-Silva & Menezes 1999) suggest that this diversity may still be underestimated.

The Northern portion of the *Espinhaço* Range in Minas Gerais State has called the attention of botanists due to the remarkable diversity of plant species (Pirani *et al.* 2003). Besides that, some regions were neglected concerning collection efforts, among them the Municipality of Monte Azul, where several new plant species were discovered in different groups of flowering plants, such as Verbenaceae (Cardoso *et al.* 2022), Melastomataceae (Silva *et al.* 2023), and Oleaceae (Zavatin *et al.* 2023). As part of ongoing studies of *Vellozia*, we describe here two new species from the Northern portion of the *Espinhaço* Range from Minas Gerais State, Municipality of Monte Azul, located near the border between Minas Gerais and Bahia states. One of these species, *Vellozia flavida* Mello-Silva ex Magri, has yellow flowers, a rare feature in *Vellozia*, which has usually purple to white flowers (Mello-Silva & Menezes 1988). The other species, *Vellozia formosa* Mello-Silva ex Magri, has long hairs along both surfaces of the leaf lamina, a rare attribute within *Vellozia*. Here, we describe, illustrate, and provide preliminary conservation status for these two new species that have a narrow distribution in the Brazilian *Campos Rupestres* vegetation.

MATERIAL AND METHODS

Specimens of the two new species were collected during a field trip to the Municipality of Monte Azul, Minas Gerais State, Brazil in March 2023, complementing the existing collections of these species. Morphological descriptions and measurements were based on specimens collected in the field and herbarium collections (i.e., SPF and RB, acronyms according to Thiers, continuously updated), and type collections used for comparison were checked using JSTOR Global Plants (plants.jstor.org). All cited specimens for both new taxa analyzed in person are marked with an exclamation mark (!). Phenology and distribution data were gathered from specimen labels and observations in the field. Morphological terminology followed Mello-Silva *et al.* (2005), Mello-Silva & Menezes (2014), and Gonçalves & Lorenzi (2011).

Distribution maps were prepared using the software QGIS v. 3.22 (QGIS.org, 2024) with shapefiles downloaded from Natural Earth (naturalearthdata.com), using the coordinates provided on the label of herbarium sheets and collected on the field. Preliminary conservation status assessment followed the IUCN guidelines and criteria (IUCN, 2019). GeoCAT (www.geocat.iucnredlist.org, Bachman *et al.* 2011) was used to calculate the Extent of Occurrence (EOO) and Area of Occurrence (AOO), the latter using the default 2 km² grid.

TAXONOMY

Vellozia flavida Mello-Silva ex Magri, *sp. nov.* (Figs. 1, 2 and 3).

Type—BRAZIL. Minas Gerais: Serra de Montevidéu, Morro das Marombas, 15°08'30.7" S, 42°47'29.5" W, 1121 m elev., 01 March 2023, fr., R.A. Magri, R.B. Almeida & J.C. Batista 47 (holotype SPF00255500!, isotypes to be sent to: K!, RB!, US!).

Diagnosis: *Vellozia flavida* is similar to *Vellozia luteola* Mello-Silva & N.L.Menezes (1988: 202) and *V. sulphurea* Pohl (1828: 120), the latter is known only from the type collection. All have yellow or yellowish perianth and this floral character differs them from all other *Vellozia* species (Fig. 2C), which have usually purple or white flowers. Among them, they can be distinguished from each other by the emergences on the hypanthium, i.e., subulate in *V. luteola* vs. capitate in *V. flavida* (Fig. 1D), and by the number of stamens, 15 stamens in *V. luteola* vs. 22 on *V. flavida*. Both can be distinguished from *V. sulphurea* by the presence of glabrous and marcescent leaf blades (Fig. 2A) vs. setose on the abaxial surface and deciduous leaf blades on *V. sulphurea*.

Description. Herbs caespitose or solitary, up to 15 cm tall, stems few branched. Leaves tristichous; lamina 4.5–6.2 × 0.5–0.75 cm, linear-triangular, arcuate, apex caudate, margins serrate, glabrous, the lamina marcescent and reflexed. Flowers solitary; pedicel evident, 1.2–2.6 cm long, trigonous, subdensely covered by glandular emergences; Hypanthium 0.3–0.5 × 0.3–0.5 cm, globose, densely covered by glandular emergences; Tepals 1.4–2 × 0.45–0.58 cm, yellowish, adaxial surface glabrous, abaxial surface subdensely covered with emergences, subsessile, stipitate on the outer tepals, restricted to the proximal portion on the inner tepals; Stamens 22, filaments ca. 1.6 mm long, anthers ca. 1.1 mm long, appendages absent; Style ca. 1.2 cm long; Stigma ca. 3.5 mm diameter. Fruits loculicidal capsule, 0.45–1 × 0.35–0.8 cm, dehiscent by longitudinal slits. Seeds 0.9–1.3 mm long, brown.



FIGURE 1. *Vellozia flavida* Mello-Silva ex Magri. **A** and **B**: General aspect of the plant. **C**: apical portion of the leaf blade. **D**: detail of the hypanthial emergences. Illustration based on specimen *R.B. Almeida 841* (SPF).



FIGURE 2. *Vellozia flavida* Mello-Silva ex Magri. **A:** Habit. **B:** Detail of the fruit. **C:** Detail of the flower and immature fruit. Credit of photos **A:** R.A. Magri; **B** and **C:** R.B. Almeida.

Habitat: Clefts on quartzitic rocky outcrops. Between 1120 and 1200 meters above sea level (a.s.l.) (Fig. 2A).

Distribution: *Vellozia flavida* is restricted to the locality of *Morro das Marombas*, in the municipality of Monte Azul, on the Northern portion of the *Espinhaço* Range, Minas Gerais State, Brazil (Fig. 3).

Etymology: The specific epithet refers to the yellowish color of the perianth, a rare character in the genus *Vellozia*.

Paratypes: BRAZIL. Minas Gerais: Serra de Montevidéu, Morro das Marombas, 15°08'13" S, 42°47'29" W, 1150 m elev., 22 October 2018 (fr.), *G. Martinelli et al.* 20434 (RB!, SPF!); Serra de Montevidéu, Morro das Marombas, 15°08'32" S, 42°47'28" W, 1121 m elev., 07 August 2021 (fr.), *R.A. Magri et al.* 11 (SPF!); Serra de Montevidéu, Morro das Marombas, sobre rocha em área de mineração de quartzito, 15°08'18" S, 42°47'10" W, 1165 m elev., 04 October 2022 (fl., fr.), *R.B. Almeida et al.* 841 (SPF!); Serra de Montevidéu, Morro das Marombas, 1165 m elev., 01 March 2023 (fr.), *R.A. Magri et al.* 50 (SPF!).

Phenology: The plants were collected with flowers in October and with fruits in August, October, and March.

Conservation Status: The species has an EOO of 0.177 km² and an AOO of 8 km², occurring on a small population in a not protected area that is also coveted by the Quartzite Mining industry. In this way, this species is characterized as Critically Endangered (CR) according to IUCN criteria B2ab (i, ii, iii, iv).

Vellozia formosa Mello-Silva ex Magri, *sp. nov.* (Figs. 3, 4 and 5).

Type:—BRAZIL. Minas Gerais: Monte Azul, 16 km da estrada Monte Azul-Mato Verde (BR 122), entrada ao sul da cidade. Paredão rochoso formando amplo anfiteatro. Afloramentos rochosos no terço basal da montanha na trilha do cano d'água, 15°14'02.7" S, 42°49'08.0" W, 1515 m elev., 28 December 2017 (fl.), *R. Mello-Silva, A. Cabral, F.K. Kiataki & D.Y.M. Nakamura* 4370 (holotype SPF00255779!, isotypes to be sent to: CEN!, GH!, HUEFS!, K!, NY!, RB!, US!).

Diagnosis. *Vellozia formosa* is similar in habit to *V. nanuzae* L.B.Sm & Ayensu (1976: 115) but differs by the leaf lamina hirsute on both surfaces with attenuate apex (Fig. 4C) and hypanthium densely covered by subulate emergences (Fig. 4D) vs. leaf lamina completely glabrous with acute apex and hypanthium densely covered by capitate emergences in *V. nanuzae*.

Description. Herbs caespitose, 10–30 cm tall, stems few branched. Leaves tristichous; lamina 3.2–6.5 cm × 2–5 mm, linear-triangular, arcuate, attenuate apex, margins ciliate, conduplicate when dry, hirsute in both surfaces, tomentose near leaf sheath, deciduous, the distal portion of leaf sheath curled after abscission of the lamina. Flowers solitary, subsessile, pedicel hidden by the leaves, 3.76–11.42 mm, glabrous; Hypanthium 6.10–10.15 × 2.3–4.2 mm, oblong-ellipsoid, densely covered by subulate emergences; Tepals 2.6–3.8 × 0.74–1.1 cm, oblong-elliptical, purple, glabrous; Stamens 18, connate in three phalanges, filaments ca. 10 mm long, connate around the middle portion, anthers 7.5–13 mm, appendages absent; Style 2.2–3.2 cm long; Stigma 3.0–4.8 mm diameter. Fruits loculicidal capsule, 1.1–2 × 0.7–1.1 cm, dehiscent by longitudinal slits. Seeds ca. 1.4 mm long, black.

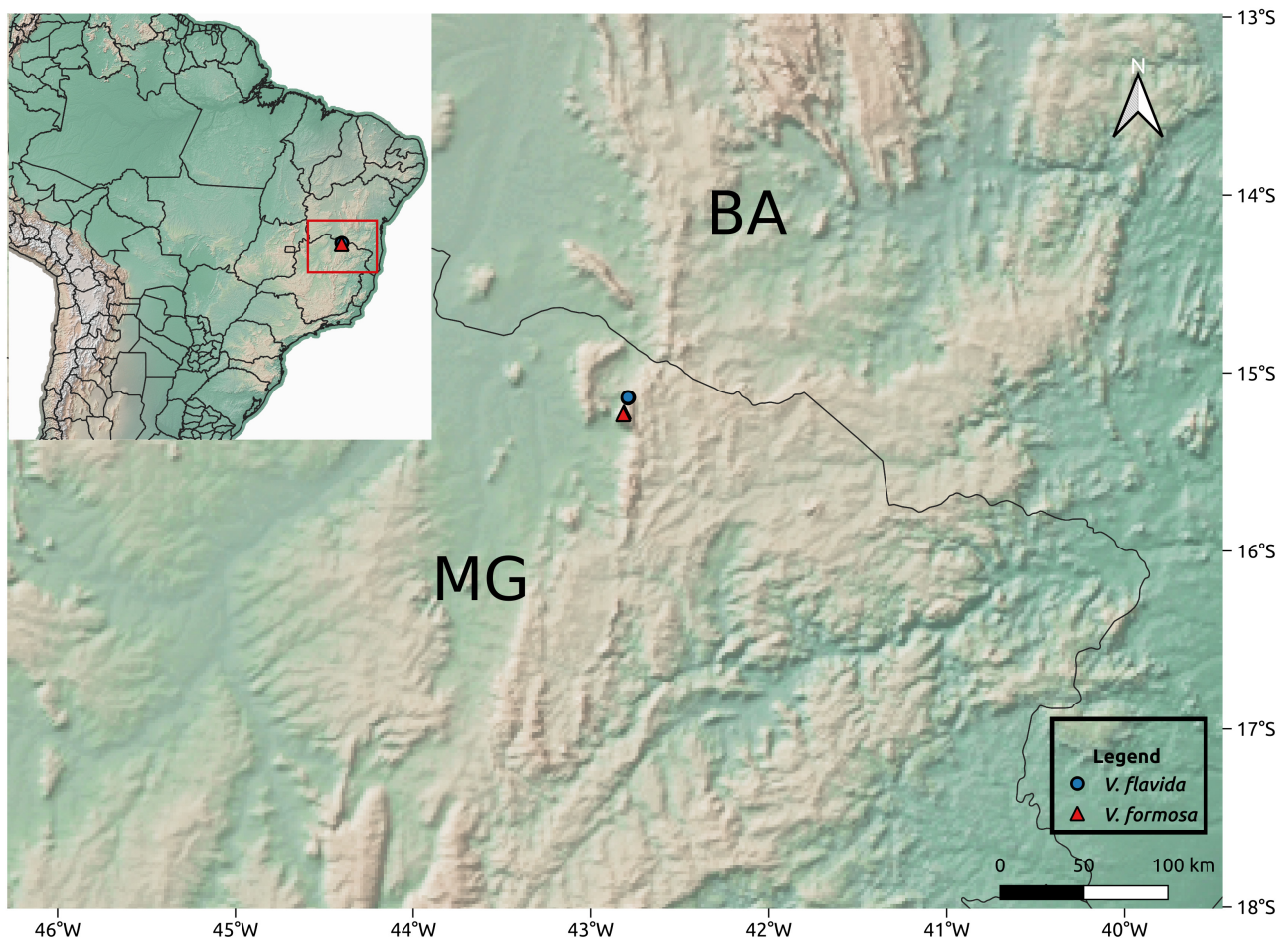


FIGURE 3. Distribution of *Vellozia flavida* and *V. formosa*, restricted to the municipality of Monte Azul, Espinhaço Range, near the border of Minas Gerais (MG) and Bahia (BA) states.

Habitat: On sandy fields and sandy soil among quartzite outcrops from approximately 1300 to 1600 meters a.s.l (Fig. 5C).

Distribution: *Vellozia formosa* is restricted to the locality of *Serra da Formosa*, in the municipality of Monte Azul, on the Northern portion of the *Espinhaço Range*, Minas Gerais State, Brazil (Fig. 3).

Etymology: The specific epithet was previously chosen by Dr. Renato Mello-Silva and refers to the location where this species occurs, *Serra da Formosa*, in Northern Minas Gerais State.

Paratypes: BRAZIL. Minas Gerais: Monte Azul, Pico da Formosa, 15°13'55" S, 42°48'55" W, 1416 m elev., 26 February 2016 (fl.), *D.M.G. Oliveira et al.* 20 (SPF!, RB!); Serra da Formosa, grande população no entorno do Pico da Formosa, 15°13'13" S, 42°48'48" W, 1324 m elev., 02 March 2023 (fl., fr.), *R.A. Magri et al.* 60 (SPF!); Serra da Formosa, subida para o Pico da Formosa, 15°13'56" S, 42°49'04" W, 1520 m elev., 03 March 2023 (fr.), *R.A. Magri et al.* 67 (SPF!).



FIGURE 4. *Vellozia formosa* Mello-Silva ex Magri. **A** and **B**: General aspect of the plant. **C**: apical portion of leaf blade showing the indument. **D**: detail of the hypanthial emergences. Illustration based on specimen *R. Mello-Silva 4370* (SPF).

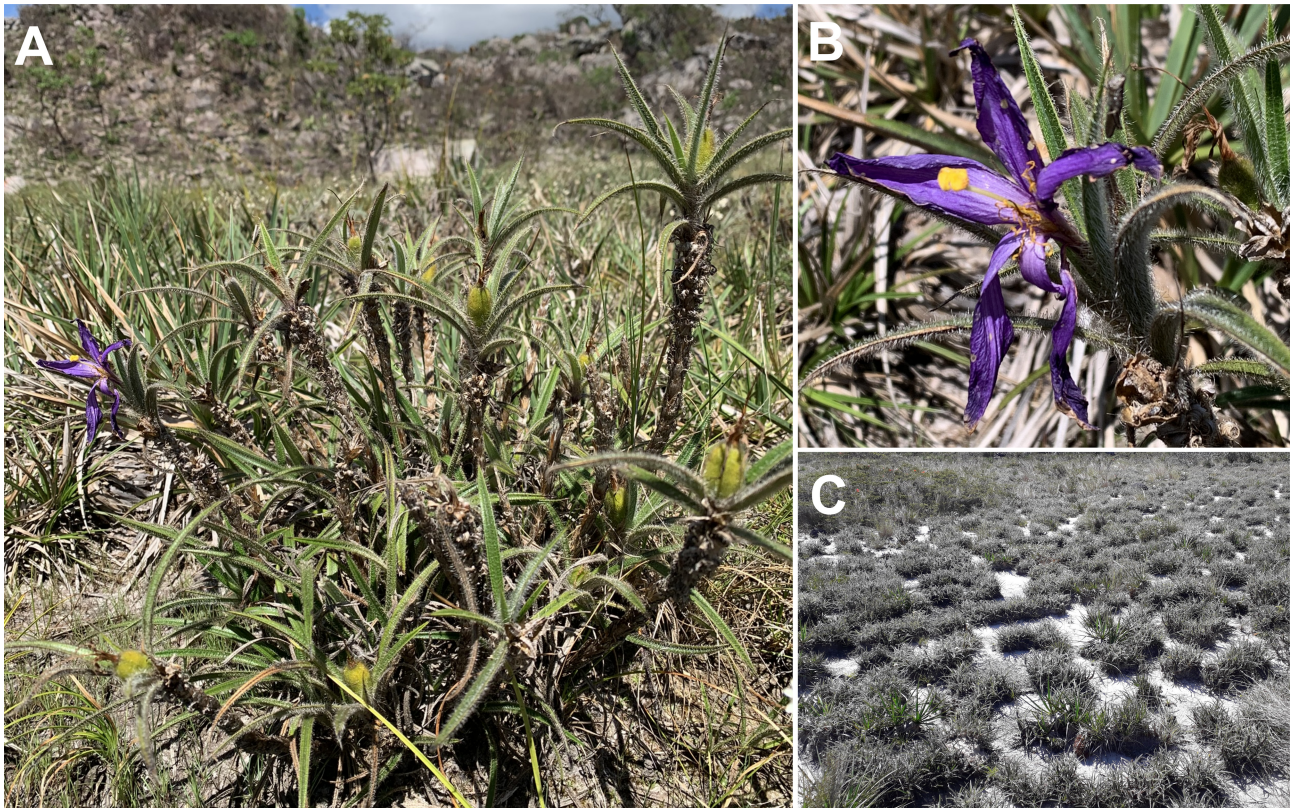


FIGURE 5. *Vellozia formosa* Mello-Silva ex Magri. **A:** Habit. **B:** Detail of the flower of the unique individual found with flowers (March, 2023). **C:** General view of a population occurring on sandy soil. Credit of photos **A** and **B:** R.B. Almeida. **C:** R.A. Magri.

Phenology: This species was collected with flowers in December, February, and March and with fruits in March.

Conservation Status: *Vellozia formosa* has an EOO of 0.227 km² and an AOO of 8 km². Although the species occurs in a large population in *Serra da Formosa*, its habitat faces the danger of Livestock industry and Eolic Energy industry and is not inserted in a protected area. This characterizes the species as Critically Endangered (CR) according to the criteria B2ab (i, ii, iii).

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