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Technical Article

Ionopsis utricularioides (Sw.) Lindl.: a native Brazilian orchid with innovative potential for winter floriculture and sustainable landscaping

Ionopsis utricularioides (Sw.) Lindl.: uma orquídea nativa brasileira com potencial inovador para floricultura de inverno e paisagismo sustentável

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Abstract
Native ornamental flora has great sustainable commercial potential but is still little explored compared to exotic species. This study aimed to describe the vegetative and floral morphological characteristics of *Ionopsis utricularioides* (Sw.) Lindl., with the objective of evaluating its ornamental potential. To achieve the proposed objective, eight individuals showing floral buds were used. The evaluated characteristics were: plant length (mm), plant diameter (mm), number of pseudobulbs per plant, pseudobulb diameter (mm), leaf length (mm), number of inflorescences per plant, inflorescence length (mm), inflorescence diameter (mm), number of flowers per floral scape, floral scape length (mm), number of open flowers per inflorescence per day, inflorescence and flower durability (days), and coloration. Floral measurements were obtained on the horizontal and vertical axes and coloration was visually assessed. For morphological analysis, the most representative plant was photographed, and at the end of the experimental period, means and standard deviations were calculated for all characteristics. *I. utricularioides* plants average 60.8 mm in length and 67.0 mm in diameter. Regarding flowering characteristics, the species averaged one inflorescence per plant, a floral scape of 200.3 mm, and 3.6 flowers open per day, with an average inflorescence durability of 26 days and flower durability of 10 days, notably featuring winter flowering. It is concluded that *I. utricularioides* has remarkable ornamental potential for use in floriculture and landscaping, offering a sustainable and valuable alternative for the market, especially with its winter blooming.
Keywords: Native plant, Orchidaceae, ornamental potential, germplasm conservation.

Resumo
A flora ornamental nativa possui grande potencial comercial sustentável, mas ainda é pouco explorada em comparação às espécies exóticas. O estudo foi realizado com o intuito de descrever as características morfológicas vegetativas e florais de *Ionopsis utricularioides* (Sw.) Lindl, visando avaliar seu potencial ornamental. Para atingir o objetivo proposto, foram utilizados oito indivíduos que apresentavam botões florais. As características avaliadas foram: comprimento da planta (mm), diâmetro da planta (mm) número de pseudobulbos por planta, diâmetro do pseudobulbo (mm), comprimento da folha (mm), número de inflorescência por planta, comprimento da inflorescência (mm), diâmetro da inflorescência (mm), número de flores por haste floral, comprimento da haste floral (mm), número de flores abertas por inflorescência por dia, durabilidade da inflorescência e flores (dias), e coloração. As medições florais foram obtidas nos eixos horizontal e vertical e a coloração avaliada visualmente. Para a análise morfológica, a planta mais representativa foi fotografada, e ao final do período experimental foram calculadas médias e desvios padrão para todas as características. A espécie *I. utricularioides* apresentou, em média, plantas com 60,8 mm de comprimento e 67,0 mm de diâmetro. Para caracteres de floração, a espécie apresentou em média 1,00 inflorescência por planta, haste floral de 200,3 mm e 3,6 flores abertas por dia, com durabilidade média da inflorescência de 26 dias e das flores de 10 dias, destacando-se pela floração também no inverno. Conclui-se que *I. utricularioides* possui notável potencial ornamental para utilização na floricultura e no paisagismo, oferecendo uma alternativa sustentável e de valor para o mercado, especialmente com seu florescimento de inverno.
Palavras-chave: Orchidaceae, planta nativa, potencial ornamental, conservação do germoplasma.

Introduction

Brazil is considered the center of origin for a diversity of orchid species. However, increasing anthropogenic pressure on biodiversity has intensified the need for awareness regarding the importance and value of these plants, especially native species (Vitt et al., 2023). Native ornamental flora constitutes a valuable resource for sustainable commercial exploitation (Sorgato et al., 2021).

Furthermore, the production of seedlings and the introduction of native orchids into the market have the potential to minimize illegal and irrational extraction from nature, contributing to the reduction of biodiversity loss (Nongdam et al., 2023; Vendrame et al., 2023; Ribeiro et al., 2024). However, despite their great potential, the presence of native flora in commercial nurseries and floriculture businesses in Brazil remains limited, and knowledge about the supply and demand for these species is scarce (Junqueira and Peetz, 2018; Zucchi et al., 2019; Castro et al., 2022).

The valorization of native orchid species as ornamental plants can represent a significant strategy for Brazil to produce and commercialize new cultivars and seedlings, thereby achieving greater independence in ornamental plant production (Castro et al., 2022). This approach not only benefits small producers by contributing to the conservation of local flora but also highlights the unique characteristics of different regions (Junqueira and Peetz, 2018; Sorgato et al., 2021; Castro et al., 2022). Moreover, the study of native plant diversity and the climatic conditions in which they develop facilitates species identification and enables planning for the reintegration of native species into degraded areas (Castro et al., 2022; Ribeiro et al., 2024).

I. utricularioides, is a mini-orchid native to the Brazilian flora, occurring in the Cerrado, Amazon, and Atlantic Forest. It has an epiphytic habit, small size, and slow development, and is capable of developing multiple inflorescences with a large number of flowers despite its reduced stature. The inflorescence is paniculate and can often be much larger than the plant itself (Cardoso, 2017; Flora and Funga of Brazil, 2025) (Fig. 1).

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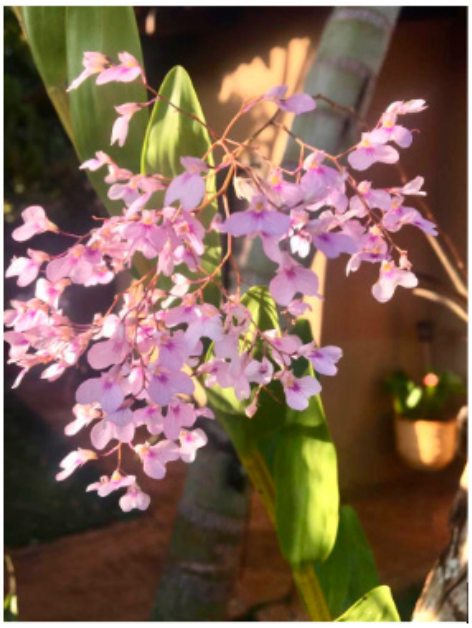

Fig. 1. *I. utricularioides* plants and their floral and morphological aspects.

Found in the North, Northeast, Central-West, Southeast, and South regions of the country, this species, despite its wide distribution, is listed in the Brazilian flora's Red List as Least Concern. However, despite the broad distribution of this species, fruit production depends not only on available resources but also on the frequency with which it is pollinated (CNCFlora, 2012; Flora and Funga of Brazil, 2025).

In this context, research is fundamental to identify native species that can boost the development of floriculture in the country, encouraging the exploration of new markets and contributing to the conservation and preservation of diverse species (Castro et al., 2022; Ribeiro et al., 2024). Thus, it is essential to integrate these plants into genetic breeding programs as part of a sustainable commercial exploitation strategy. This involves the use of these species in the development of new cultivars, such as the hybrid *Ionocidium Cerrado* '101', resulting from the cross between *I. utricularioides* and *Oncidium* 'Sweet Sugar', with potential for use in floriculture as a new cultivar (Cardoso, 2017).

Therefore, the use of native species can ensure the continuous provision of essential ecosystem services, in addition to promoting the maintenance and preservation of *in vivo* germplasm banks in urban green areas (Tartaglia and Aronson, 2024). It is crucial to explore native species with ornamental potential, considering the growing demand for plants in the flower and ornamental plant market. This study fills a knowledge gap by providing the first morphological and ornamental characterization of *I. utricularioides*, a native Brazilian orchid with a remarkable differential: its ability to flower during the winter months. This characteristic not only distinguishes it from many ornamental species available in the market but also offers a new perspective for the diversification of national floriculture and the exploration of seasonally strategic market niches. Given this, the objective of this study was to evaluate the ornamental potential of *I. utricularioides* aiming to promote its conservation and sustainable use in Brazilian floriculture, through the detailed characterization of its morphological and ornamental attributes.

Materials and Methods

This study was conducted on four-year-old *I. utricularioides* plants, obtained from asymbiotic seed germination. The plants were maintained in a screened shade house covered by the superposition of two 50% shade cloths, resulting in a photosynthetically active radiation (PAR) of 235.1 µmol m^{-2} s^{-1}. The cultivation substrate used was coconut chips and sphagnum moss in a 2:1 ratio. The study was carried out at the Orchidarium of the Faculty of Agricultural Sciences (FCA/UFGD) (22°11'53.2" S and 54°56'02.3" W) during the periods of September to October 2022 (flowering period 1) and July to August 2023 (flowering period 2).

To evaluate the ornamental potential of the species, eight *I. utricularioides* individuals with floral buds were selected, six in flowering period 1 and two in flowering period 2. The quantitative analysis involved these eight plants and their respective inflorescences, corresponding to 99 evaluated flowers. The vegetative morphological characteristics evaluated included plant length (PL) (mm), measured from the substrate surface to the apex of the longest leaf; plant diameter (PD) (mm), measured across the widest part of the plant from one leaf tip to the opposite leaf tip; number of pseudobulbs (NP) per plant, and leaf length (LL) (mm), measured from the point of leaf insertion to the apex of the leaf blade. The floral morphological characteristics were obtained: the number of inflorescences (NI) per plant, inflorescence length (IL) (mm), measured from the insertion of the first pedicel to the apex of the inflorescence; inflorescence diameter (ID) (mm), measured across the widest part of the inflorescence; number of flowers per floral scape (NFS), floral scape length (FSL) (mm), measured from the point of emergence of the floral scape at the base of the plant to the apex of the inflorescence; number of open flowers per inflorescence per day (NOF), inflorescence durability (IDur) (days), and flower durability (FDur) (days).

The color of the flowers was visually assessed and categorized into three distinct tones: 1 - white, 2 - light lilac, and 3 - dark lilac. Plant length was measured from the base of the leaf/pseudobulb to the apex of the leaf blade. The durability and monitoring of flowers were recorded from anthesis to senescence, while they remained on the plant. Floral scape length was determined in fully developed and completely flowered inflorescences. All measurements were performed using a digital caliper, on both horizontal and vertical axes. The first flowering period occurred from September to October 2022, and the second was from July to early August 2023.

During the flowering period, the most representative individual was selected for visual assessment of its morphological characteristics through photographs. A floral diagnosis sheet was prepared based on photos of fresh flowers, aiming to preserve maximum morphological details. At the end of the experimental period, means and standard deviations for each evaluated characteristic were calculated. The interpretation of the results was carried out based on the descriptive analysis of these parameters, aiming to identify and quantify the ornamental potential attributes of the species in the context of ornamental horticulture.

Results and discussion

Regarding morphological aspects, *I. utricularioides* plants, on average across the two flowering periods, exhibited a length of 60.88 ± 14.33 mm and a diameter of 67.00 ± 0.68 mm. Each plant had an average of 2.17 ± 1.65 pseudobulbs, with an average pseudobulb diameter of 3.00 ± 1.17 mm, and an average of 4.83 ± 0.12 leaves per plant, with an average leaf length of 54.75 ± 6.86 mm (Table 1).

Table 1. Morphological characteristics of *I. utricularioides*.

Characteristics	(Mean Value ± Standard Deviation)
Plant length (mm)	60.88 ± 14.33
Plant diameter (mm)	67.00 ± 0.68
Number of pseudobulbs per plant	2.17 ± 1.65
Pseudobulb diameter (mm)	3.00 ± 1.17
Number of leaves	4.83 ± 0.12
Leaf length (mm)	54.75 ± 6.86

The results observed in this study corroborate the descriptions made by Ostetto (2015) and Romahn (2021), who highlight the delicate nature of *I. utricularioides*, evidenced by its slender branches and reduced size, as well as its linear and coriaceous leaves, approximately 10 cm long (Fig. 2).

Regarding flowering, each plant produced an inflorescence with an average length of 38.89 ± 0.47 mm and a diameter of 36.17 ± 4.24 mm. The species presented, on average, 15.09 ± 7.66 flowers per floral scape and a rate of 3.58 ± 3.18 open flowers per inflorescence per day. The average inflorescence durability was 26.17 ± 18.62 days, while that of the flowers was 10.09 ± 1.53 days (Table 2) (Fig. 3).

Fig. 2. General morphological aspects of *I. utricularioides*. 1 - root; 2 - leaf; 3 - floral scape and 4 - flower.

Table 2. Mean values of flowering characteristics of *I. utricularioides*.

Characteristics	(Mean Value ± Standard Deviation)
Number of inflorescences/plant	1.00 ± 0.00
Inflorescence length (mm)	38.89 ± 0.47
Inflorescence diameter (mm)	36.17 ± 4.24
Number of flowers per floral scape	15.09 ± 7.66
Floral scape length (mm)	200.29 ± 34.95
Number of open flowers per inflorescence/day	3.58 ± 3.18
Inflorescence durability (days)	26.17 ± 18.62
Flower durability (days)	10.09 ± 1.53

Fig. 3. Floral structures of *I. utricularioides*. (A) Frontal view, showing 1 - lateral petals; 2 - labellum (median petal); 3 - column; 4 - anther; and 5 - labellum callus. (B) Dorsal view, showing 6 - dorsal sepal; 7 - lateral sepals; 8 - ovary; and 9 - pedicel.

The inflorescence of *I. utricularioides* is paniculate and significantly larger than the plant itself. The flowers of this species can reach up to 1.5 cm with small petals and sepals and a large labellum. The plants have floral scapes up to 30 cm long during spring (Aguiar and Pansarin, 2019; Aguiar et al., 2021).

The flowering phenology of this species demonstrates plasticity, with records in different periods of the year. Carrodeguas-Gonzáles et al. (2021) observed flowering in August, while Krahl et al. (2021) reported it from May to October. In this work, however, flowering was also recorded during winter. This observation corroborates previous reports, such as that by Koch and Silva (2012), who described the flowering of specimens of the same species in winter, when cultivated in the state of Mato Grosso. These data reinforce the species' capacity for phenological plasticity in the face of different environmental conditions and highlight its ornamental value by providing flowering in a period of lower abundance of flowering species, which is of great interest for garden ornamentation (Ribeiro et al., 2024).

Previous studies report that the flowers of *I. utricularioides* have a cordate shape and present color variations ranging from lilac to white and pinkish tones (Aguiar et al., 2020; Aguiar et al., 2021). In the present study, flower coloration was visually assessed and classified into three categories: 6 inflorescences with white coloration, 2 with light lilac coloration, and none with dark lilac coloration.

The reduced size of these plants, associated with the large number of flowers per panicle, can influence both the reduced size of the fruits and seed production (Henríquez-Gangas et al., 2023). This aspect may be related to the reproductive biology of some orchid species that adopt deceptive pollination systems, with about one-third of all orchid species considered deceptive (Aguiar et al., 2020; Capó et al., 2023; Scaccabarozzi et al., 2023). Such a mechanism is characterized by the absence of reward for pollinators in exchange for pollination services, although it mimics the flower color, inflorescence shape, perfume, and even the nectar guides of reward-offering plants (Aguiar et al., 2021; Capó et al., 2023).

Furthermore, as reported in the literature, the absence of nectar in flowers may be related to energy saving in these plants (Aguiar and Pansarin, 2019; Aguiar et al., 2021), as well as the effect of floral polymorphism on pollinator behavior, which may be obscured or not perceptible in this context (Aguiar et al., 2021; Capó et al., 2023). Typically, species that use deceptive strategies for pollination, such as *I. utricularioides*, tend to produce fewer fruits compared to those that offer rewards to their pollinators, including some bee species like *Apis mellifera* and bees from the tribe Meliponini. Despite being considered a strategy to encourage cross-pollination, these plants face pollen limitations, which can limit available resources for the plant, such as water and nutrients, resulting in the abortion of excess fruits. Even with more efficient pollen distribution, this can be a natural plant mechanism aimed at directing limited resources to a smaller number of fruits with a greater chance of developing, constituting a plant survival strategy under limited resource availability (Aguiar et al., 2021; Capó et al., 2023).

The high ornamental potential of *I. utricularioides* is evident, driven by the significant quantity of flowers per panicle and the durability of its inflorescences, which extends for 26.17 days. Although the individual durability of the flowers was 10.09 days, the continuous flowering of the panicle ensures a prolonged aesthetic period, a highly valued attribute for potted plant production. This prolonged flowering period, including winter, gives the species a strategic market niche and offers an attractive alternative for the scarcity of ornamental floral options during this season. The data from this study, such as the average plant size (60.88 ± 14.33 mm in length and 67.00 ± 0.68 mm in diameter), the length and diameter of the inflorescence (38.89 ± 0.47 mm and 36.17 ± 4.24 mm, respectively), and the average number of flowers per floral scape (15.09 ± 7.66) align with the key attributes valued in ornamental plant commercialization, as advocated by Hunhoff et al. (2016), including inflorescence size, plant habit, number, coloration, and durability of flowers, as well as applicability in pots. Such characteristics reinforce the ornamental potential of *I. utricularioides* and its promising variability for the market.

It is important to note that the sample size was limited by the number of flowering individuals of *I. utricularioides* available in cultivation at the orchidarium during the study period. Therefore, the results presented here represent the cultivated material available for evaluation under the experimental conditions, and the distribution of individuals across the two flowering periods should be considered when interpreting the descriptive statistics reported in Tables 1 and 2.

The data from this study, including inflorescence size, plant size, flower number, coloration, and longevity as well as the species' potential for use in potted plant production, demonstrate its ornamental value and market potential (Carrodeguas-González et al., 2021). In this study, the durability of *I. utricularioides* flowers was approximately 10 days, plant size was about 61 mm, and the inflorescence length and diameter were 38 and 36 mm, respectively.

In general, any plant species can have ornamental potential, provided it is placed in an appropriate environment and serves a specific purpose (Favacho et al., 2013). Thus, *I. utricularioides* highlights the ornamental potential of native orchids due to its striking characteristics such as inflorescence size, coloration, beauty, flower durability, and adaptability to adverse climates. These features contribute to its ornamental value and support its use in landscaping projects. Furthermore, the distinct floral characteristics of the species, including its cordate shape and rich palette of colors ranging from lilac to pink and white, along with continuous color polymorphism, significantly enhance its ornamental appeal.

It is worth noting that the use of native species for ornamental purposes is recognized as an economically viable strategy. This practice not only aids in the conservation of local flora but also requires little maintenance and offers a wide diversity of habitats for wildlife, contributing to the strengthening of regional identities (Antunes et al., 2020). From this perspective, research in this area continues to advance, keeping open the possibility of new discoveries about properties in orchids that have varied applications in different fields (Mezzalira and Kuhn, 2019).

Therefore, the species *I. utricularioides* highlights the ornamental potential of native orchids, standing out for its beauty, habit, large number of flowers per panicle, coloration, and flower durability, as well as its adaptability. Moreover, plants of this species can be used in crosses with other commercial species (Cardoso, 2014), producing new plants.

Several studies with native and endemic species for landscaping use have shown positive results, highlighting new perspectives for national floriculture (Sorgato et al., 2022; Castro et al., 2022; Ribeiro et al., 2024). However, there are few initiatives for the conservation and domestication of species for sustainable use (Castro et al., 2022). Thus, it is fundamental to conduct research that can evaluate both the characterization and the ornamental potential of native species in order to ensure the sustainable production of these plants.

Beyond its aesthetic and commercial value, the promotion of *I. utricularioides* represents a strategic point for the conservation of Brazilian biodiversity, enabling the commercial production of a native species, reducing pressure on wild populations and illegal extraction and promoting interest in maintaining local ecosystems. This approach not only strengthens regional identity but also contributes to the development of a bioeconomy aligned with sustainability principles, offering new opportunities for small producers and encouraging research and genetic improvement of other underutilized native species.

Conclusions

In summary, the native orchid *I. utricularioides* reveals itself as a species of remarkable ornamental potential. Its morphological and floral attributes, including attractive architecture, and high inflorescence durability, coupled with its ability to flower in winter, position it as a promising alternative. This study demonstrates that *I. utricularioides* not only enriches the diversity of ornamental plants but also offers a sustainable and economically viable pathway for floriculture and landscaping in Brazil, aligned with native flora conservation efforts.

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Author Contribution

JCMR: Conceptualization, Data Curation, Investigation, Software, Writing – Original Draft. **ISAST:** Data Curation, Formal Analysis, Investigation, Project Administration, Writing – Original Draft. **JSS:** Conceptualization, Formal Analysis, Investigation, Methodology, Visualization, Writing – Review & Editing. **LMR:** Data Curation, Investigation, Validation, Visualization, Writing – Review & Editing. **JCS:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Supervision, Writing – Review & Editing.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability Statement

Data will be made available upon request to the authors.

Declaration of generative AI and AI-assisted technologies in the writing process

The authors declare that the use of AI and AI-assisted technologies was not applied in the writing process.

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