

Notes and Comments

First records of *Aspasia variegata* Lindl. (Orchidaceae) for Alagoas state and Atlantic Forest domain, Brazil

J. I. S. Silva^a , D. Endres Júnior^b , I. S. Melo Neto^a  and J. L. Schmitt^{a*} 

^aUniversidade Federal de Alagoas – UFAL, Curso de Licenciatura em Ciências Biológicas, Laboratório de Botânica e Conservação, Penedo, AL, Brasil

^bUniversidade Feevale, Programa de Pós-graduação em Qualidade Ambiental, Laboratório Biotecnologia Vegetal, Novo Hamburgo, RS, Brasil

Aspasia Lindl. is a genus of Orchidaceae represented by seven species distributed from Panama to southern Belize in Central America, and Colombia, Venezuela, Paraguay, Ecuador and Brazil (Chase, 2009). Three species occur in Brazil: *Aspasia lunata* Lindl, *A. silvana* F.Barros and *A. variegata* Lindl (Santos and Smidt, 2024). According to Williams (1974), this genus is easily recognized among the others belonging to the Tribe Oncidieae, since the lip has its lateral margins fused to the median region of the column, being perpendicular to it.

Aspasia variegata is an epiphytic herbaceous plant native to Brazil (Santos and Smidt, 2024) with light green, striated, ovate or oblong and laterally flattened pseudobulbs bearing one to two leaves each. Its stems can be unifloral or multifloral, with up to three flowers, with greenish or yellowish sepals and petals, striated or spotted with purple. The lip has a yellowish base and the rest is white, spotted and stained purple with the basal portion fused to the column; two corns at the base; lateral lobes smaller than the median; median lobe oblong, bent downwards, apex usually emarginate. The column is 1.4–1.6 cm long and brown in colour (Williams, 1974; Queiroz et al., 2015; Santos and Smidt, 2024).

As well as being found in Brazil, *A. variegata* also occurs in other countries, such as Bolivia, Colombia, French Guiana, Suriname, Trinidad and Venezuela (Williams, 1974). The species has a wide distribution in Brazil, occurring in the North, Northeast, Central-western and Southeast regions, with records in the Federal District and the states of Amazonas, Amapá, Pará, Roraima, Tocantins, Maranhão, Goiás, Mato Grosso and Minas Gerais (Santos and Smidt, 2024). Typical of dry and flooded forests (Silva et al., 1999; Petini-Benelli, 2014), *A. variegata* occurs mainly in habitats characteristic of the Brazilian savanna, the Cerrado, and that their populations are in decline due to their high ornamental value and the collection of specimens in the wild, which is aggravated by the destruction of their habitats (Paiva-Neto et al., 2013). Although the species is not classified in terms of its conservation status at national level (Menini-Neto et al., 2013), threats such as mineral extraction, fires, logging, deforestation, forest fragmentation and urban sprawl can cause major impacts on ecotypes of *A. variegata*, making it locally threatened (Queiroz et al.,

2015). Thus, understanding its environmental preferences and where its populations occur can help to design effective *in situ* conservation strategies, integrating them with the *ex situ* conservation actions already available in the literature (Paiva-Neto et al., 2013; Arenas-de-Souza and Karsburg, 2017).

Despite its wide distribution in Brazilian regions, states and habitats, there are no records of *A. variegata* for the state of Alagoas or for the Atlantic Forest phytogeographic domain (Santos and Smidt, 2024). Recently, however, individuals of this species were found in two fragments of Atlantic Forest in the municipality of São Sebastião (Alagoas), based on studies carried out by the Botany Laboratory research group at the Universidade Federal de Alagoas (UFAL). Thus, considering the ornamental importance of *A. variegata* (Paiva-Neto et al., 2013), the widespread exploitation of wild genotypes of Orchidaceae (Kämpf, 2000) and the populations of the species found under new environmental conditions, the aims of this study are (1) to record the occurrence of *A. variegata* for the state of Alagoas and for the Atlantic Forest, expanding knowledge about the distribution of the species and (2) to analyse the distribution and environmental preferences of the species in Brazil based on primary and secondary data, with a view to proposing conservation strategies.

Individuals from two populations of *A. variegata* were found growing under an arboreal/shrub fragment of Semideciduous Seasonal Forest in the Atlantic Forest phytogeographic domain located in the municipality of São Sebastião, Alagoas (9°57'18"S and 36°32'41"S; 190 m high). The plants were monitored and recorded using photographs during the reproductive period, when identification could be confirmed (Figure 1). In order to record the species in this region, shoots of *A. variegata* containing leaves, pseudobulbs, rhizomes, roots and fruit were collected and exsiccates were prepared. The exsiccates were deposited in the ARA herbarium at the Universidade Federal de Alagoas and in the MAC Herbarium - Herbário do Instituto do Meio Ambiente do Estado de Alagoas under the numbers ARA000090 and MAC70259, which can be checked on SpeciesLink (2024).

In order to analyse the distribution of *A. variegata* and its environmental preferences, data from SpeciesLink

*e-mail: jairo.schmitt@penedo.ufal.br

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Figure 1. Flowers of *Aspasia variegata*.

(2024) and the REFLORA Virtual Herbarium (Reflora, 2023) were consulted in August 2023 in search for records of the species. In addition to the current accepted name, the homotypic synonym *Odontoglossum variegatum* (Lindl.) Rchb.f. was included in the search. From the resulting data, repeated records were excluded, in which the same collector deposited samples in more than one herbarium in the same year, in the same locality, municipality and state. Records without geographical coordinates were kept, as long as they had locality, municipality, and state data, allowing the occurrence point to be found on Google Earth Pro, and the assigning coordinate pairs. The occurrence records of *A. variegata* were plotted on a map of Brazil using ArcGIS 10.3 software (Endres-Júnior et al., 2022; Santos et al., 2022).

The data described in the herbarium records (including those of the present study) were used to classify each of them according to the categories (1) habit: (1a) epiphyte; (1b) height in the phorophyte (yes/no); (2) rarity (yes/no); (3) habitat: (3a) Amazon; (3b) Cerrado; (3c) Atlantic Forest; (3d) Humid Area (=wet forest, near river, area under the ahe (hydroelectric plant) influence, river, river bank); and (3e) Other (Ecotone, old capoeira vegetation, dry soil, forest, Ombrophilous Dense Forest, Semideciduous Seasonal Forest, Deciduous Seasonal Forest and Savanna). The percentages of records in terms of habit and rarity (P1) were calculated using the formula: $P1 = (NP \times 100)/NC$, where NP is the number of positive records for a given mention (epiphyte, height in the phorophyte and rarity) and NC is the total number of records that mention at least some characteristic about the species. To calculate the percentage of records for the habitat (P2), the formula $P2 = (NSC \times 100)/NC$ was applied, where NSC is the number of records in a given subcategory (e.g. Amazon) and NC is the total number of records in the corresponding category (habitat), in an adaptation of the methods applied by Santos et al. (2022).

No data was obtained for the name *O. variegatum*. Herbarium data indicates the occurrence of *A. variegata*, in addition to Brazil, in Bolivia, Guyana, French Guiana,

Colombia, Suriname and Venezuela. There were 125 records for Brazil. Of these, 94 contained geographical coordinates or had coordinate pairs assigned to them and were then inserted into the map (Figure 2), which also included the new records for the state of Alagoas. The state with the highest number of records was Mato Grosso (38 occurrence points), followed by Roraima (17) and Pará (14). We highlight that our findings confirmed the previous absence of collections for the state of Alagoas. Of the 94 records that contained geographical coordinates and were used to build the species' distribution map, 86 contained observations related to the habit, rarity or habitat characteristics of *A. variegata*. This data was used to analyse the species' environmental preferences and is shown in Table 1 and Table 2.

Aspasia variegata is an epiphytic species and, in this study, these orchids were found in the highest part of their phorophytes, attached to the phorophyte at estimated height of 9.0 m in an area of dry land far from water courses. The plants were growing in a shaded area and the populations were made up of small clumps formed by adult (presence of flowers and fruit) and young individuals (pseudobulbs, rhizomes and leaves characteristics of the species). The epiphytic habit was the most cited characteristic in the herbarium records (Table 1), in which *A. variegata* occurrence was between 1.0 and 2.5 m above the ground (average of 1.6 m). Paiva-Neto et al. (2013) describe that *A. variegata* is a typical species from the Brazilian Savanna, the cerrado phytogeographical domain, and that it can be found growing on trees in riparian forests. This information corroborates with the present study since an important percentage of habitat descriptions from the herbarium data points to the importance of *A. variegata* for the Cerrado and humid areas. Furthermore, this is the only species of this genus that occurs in this phytogeographic domain: *A. lunata* and *A. silvana* only recorded for the Atlantic Forest (Santos and Smidt, 2024).

Despite being described as a species characteristic of the Cerrado, occurring in dry and flooded forests (Silva et al., 1999; Petini-Benelli, 2014), most records with habitat data analysed in this study cite *A. variegata* for the Amazon (53.3%, see Table 2) and many of these records point to other characteristics, such as ecotones and different vegetation types (43.3%, see Table 2). These data agree with the findings of Silva et al. (1999), who found the species in various types of habitat in the state of Maranhão. In addition, the populations found in the current study indicate that the species also occurs in Atlantic Forest areas, which increases knowledge about its geographical distribution and ecological preferences of *A. variegata*. Fragments of Atlantic Forest domain are rich in species of Orchidaceae, and the preservation of these areas must be considered for orchid conservation (Barbosa et al., 2015), such as *A. variegata*. The wide geographical distribution of this species and heterogeneity of habitats result in multiple ecotypes, which should be observed when developing *ex situ* conservation strategies aimed at translocating individuals with native genotypes that can adapt to local conditions (Hufford and Mazer, 2003).

The habitats in which *A. variegata* was found in this study are characteristic of unprotected secondary forest,

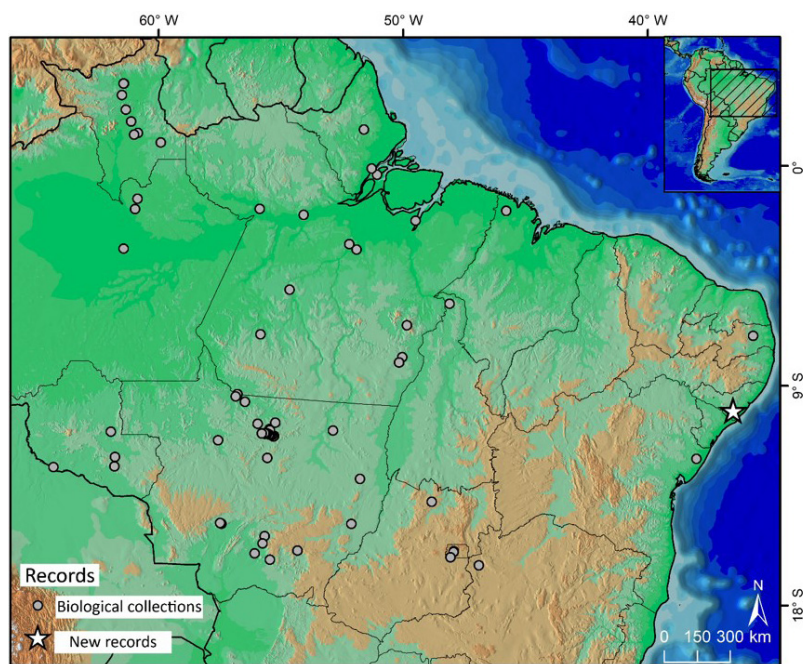


Figure 2. Distribution of *Aspasia variegata* in Brazilian states, according to herbarium records and new record for Alagoas.

Table 1. Characterization of the occurrence of *Aspasia variegata* according to habit (epiphyte), habitat, height in the phorophyte, and rarity.

Category (observations)	Number of records ¹	% ²	Total number of records with observations
Epiphyte	53	61.6	86
Habitat	30	34.9	86
Height in the phorophyte	7	8.1	86
Rarity	2	2.3	86

Legend: Number of records¹ = absolute number of records with the respective category;
%² = percentage of records with the respective category over the number of records with observations in a given category.

Table 2. Characterization of the occurrence of *Aspasia variegata* according to habitat type (Amazon, Cerrado, Atlantic Forest, Humid area, and Other).

Habitat type	Number of records ¹	% ²	Total number of records with habitat observations
Amazon	16	53.3	30
Cerrado	9	30.0	30
Atlantic Forest	2	6.7	30
Humid area	13	43.3	30
Other	13	43.3	30

Legend: Number of records¹ = absolute number of records with the habitat type;
%² = percentage of records with the respective habitat type over the number of records with habitat observations.

where illegal collection of wood and other resources occurs, as well as use for extensive livestock farming and agriculture. Queiroz et al. (2015) describe that in the Federal District (Cerrado) the species was found growing in mesophytic forest, or dry forest, on limestone outcrops,

especially exposed to anthropogenic actions and outside protected areas, making the species locally endangered. In addition, epiphytic species are even more sensitive to anthropogenic disturbances, such as the suppression of the arboreal stratum, due to their dependence on trees

for support (Krömer et al., 2014). *Aspasia variegata* is not officially on the lists of threatened species at national level, such as the Livro Vermelho da Flora do Brasil (Red Book of Brazilian Flora) (Martinelli and Moraes, 2013) and Ordinance No. 148 of 7 June, 2022, of the Ministry of Environment, which updates the National List of Endangered Species of Brazil (Brasil, 2022), and is considered not very rare (see Table 1). Nevertheless, different populations are suffering from anthropogenic pressures in each region, and ecotypes can be assessed separately in order to design conservation strategies aimed at conserving the species' genetic diversity.

We recommend that special attention be paid to this ecotype of *A. variegata*, which is native to Alagoas and adapted to Atlantic Forest conditions so that its natural populations can be subjected to *in situ* conservation strategies. Seeds of these populations should be collected and propagated by *in vitro* techniques, to *ex situ* conservation and the translocation of individuals to protected areas. In addition, new studies should be carried out to survey the epiphytic flora and orchids of the state of Alagoas, making it possible to record new populations of this and other species with ornamental and conservation relevance.

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