




New record of *Vitex orinocensis* Kunth (Lamiaceae) for the state of Ceará, Brazil: insights on its conservation

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Abstract. We report the first record of *Vitex orinocensis* Kunth (Lamiaceae) from Ceará state, northeastern Brazil. This species was collected in an upland Semideciduous Seasonal Forest. This occurrence adds new information about the flora of Ceará and expands the geographic range of this species in Brazil, which is important for its conservation. We provide taxonomic information, distribution map, implications for its conservation status, photographs, and a identification key for the *Vitex* Tour. ex L. species from Ceará.

Keywords. Conservation status, geographic distribution, new occurrences, taxonomy

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Introduction

The Brazilian Atlantic Forest domain is one of the 25 global priorities for biodiversity conservation and harbors about 20,000 species of vascular plants, of which 8,000 are endemic (Tabarelli and Santos 2004). Tabarelli and Santos (2004) claimed that the biodiversity of this phytogeographic domain is distributed in five centers of endemism and that one of these centers comprises upland forests, which are “islands” of Semideciduous Seasonal Forest located in the states of Ceará and Piauí, in the Caatinga domain. The origin of these islands is associated with the occurrence of plateaus and layers between elevations of 500 and 1,000 m, which provide orographic rains that guarantee climatic conditions that favor the survival of several groups of plants typical of the Atlantic Forest in the semiarid region (Tabarelli and Santos 2004; Cardoso 2011).

Vitex Tour. ex L. (Lamiaceae) stands out with 250 species distributed throughout tropical and subtropical regions (Bramley et al. 2009). In Brazil, there are 34 species (23 spp. endemic) distributed in all geopolitical

regions and in the Amazon, Caatinga, Cerrado, Atlantic Forest, and Pantanal domains (Flora do Brasil 2020). Among these, the Atlantic Forest and Cerrado stand out in having the second greatest species diversity for this genus (13 spp. each) (Flora do Brasil 2020). *Vitex* is characterized by arboreal or shrub habits, rarely prostrate; leaves are compound-palmate to trifoliolate (or unifoliolate in some cases); inflorescence is terminal or axillary, the calyx is campanulate or cupuliform, the corolla is (4-)5-lobed, infundibuliform; anthers are black to purple; and the fruit drupe globose, with 1–4 seeds (Bramley et al. 2009).

During a floristic survey in areas of Semideciduous Seasonal Forest in the Serra de Itacoatiara, Ceará state, *V. orinocensis* Kunth was identified and recorded for the first time from the state. It had been recorded in the Northeast Region of Brazil from the states of Bahia, Maranhão, Paraíba, and Pernambuco, covering areas of both Amazon and Atlantic Forests (Monteiro et al. 2018; Flora do Brasil 2020).

Considering the importance of recording the real distribution of species in order to assess the ecological

and morphological range, distribution pattern, and to evaluate conservation status, we report the first record of *V. orinocensis* from Ceará. Herein, we present a morphological description, identification key to *Vitex* species in Ceará, photographs, comments on the geographic distribution, and information for a future assessment of its conservation status.

Methods

Serra de Itacoatiara is located in Maciço da Uruburetama (03°34'34"S, 039°36'00"W; 700–1,000 m a.s.l.), northern Ceará, Brazil (Fig. 1). Serra de Itacoatiara is located in the municipality of Itapipoca and is comprised of Semideciduous Seasonal Forest in an upland forest. It has a Tropical Hot Semi-arid climate and rainfall of 1,130.4 mm per year, and an average temperature of 26°C (Bezerra et al. 1989). The floristic survey was carried out between 2013 and 2016, during which some species of *Vitex* were collected and processed according to the usual taxonomic techniques (Mori et al. 1989) and deposited in the Herbarium Prof. Francisco José de Abreu Matos, Universidade Estadual Vale do Acaraú, Sobral (HUVA), and Herbarium Prisco Bezerra, Universidade Federal do Ceará, Fortaleza (EAC) (acronyms according to Thiers 2019). The identification was determined through morphological comparison with exsiccates that were previously identified by experts and available on the speciesLink database (<http://www.splink.org.br/>); the identification was confirmed by the study of type

collections available online (<https://plants.jstor.org/>). The morphological description was based on the samples collected and uses the terminology adopted by Harris and Harris (2001). Data referring to the flowering and fruiting period was obtained from field observations. The distribution map was prepared with QGIS v. 1.4 (QGIS 2016) using records with original geographical coordinates and those that were taxonomically verified by an expert. These records were obtained from the speciesLink. The main diagnostic characters have been illustrated.

Results

Identification key to species of *Vitex* in Ceará state

1. Leaves 1- to 3-foliolate 2
- 1'. Leaves more than 3-foliolate 4
2. Leaves unifoliolate; peduncle <10 mm long
..... *V. gardneriana* Schauer
- 2'. Leaves 3-foliolate; peduncle >10 mm long 3
3. Branches divaricate; inflorescence congested; calyx with obtuse lobes..... *V. orinocensis* Kunth
- 3'. Branches non-divaricate; inflorescence lax; calyx with acute to acuminate lobes *V. triflora* Vahl
4. Inflorescence cymose *V. agnus-castus* L.
- 4'. Inflorescence racemose 5
5. Calyx <6.0 mm long; corolla externally pubescent ..6
- 5'. Calyx >6.0 mm long; corolla externally hirsute or tomentose 7

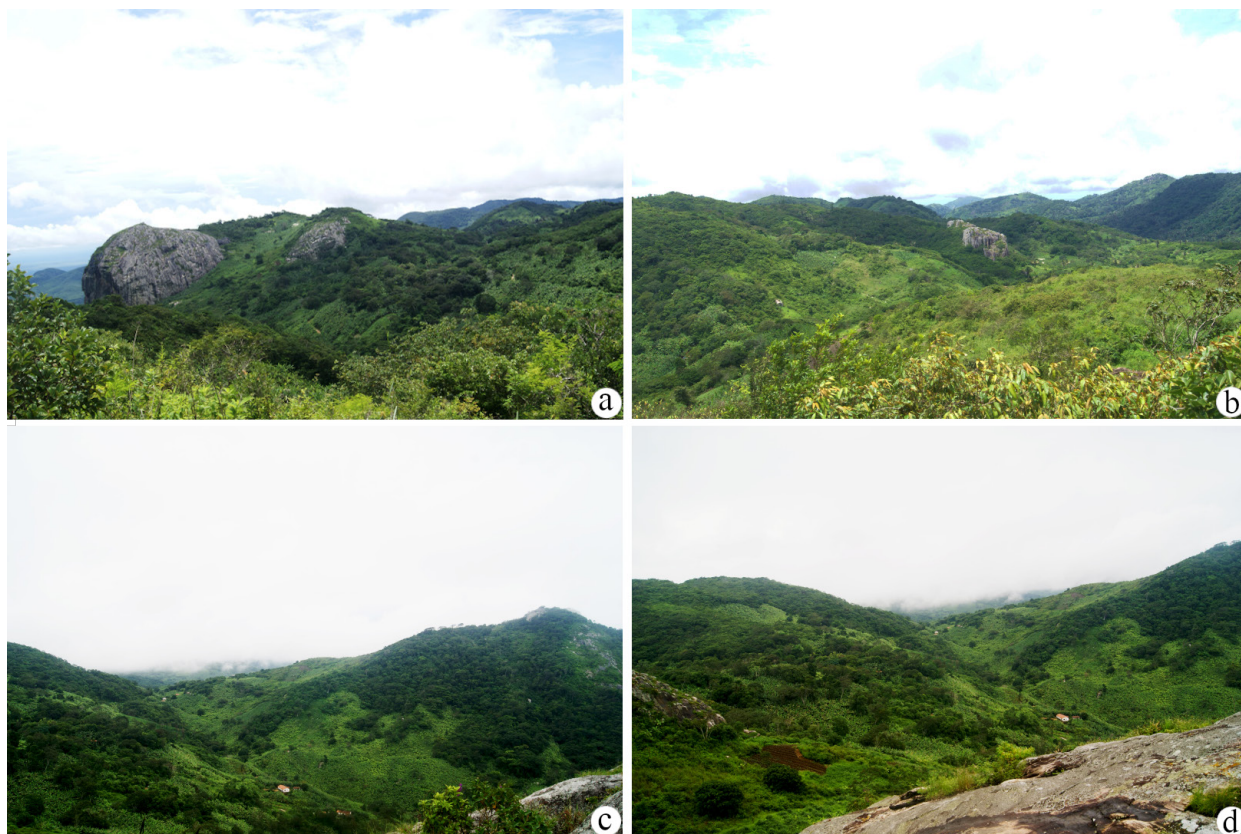


Figure 1. Serra de Itacoatiara, Maciço de Uruburetama, Ceará. Location of new record of *Vitex orinocensis*.

6. Central leaflet short-pillose above; corolla >10 mm long *V. polygama* Cham
 6'. Central leaflet glabrous above; corolla <10 mm long *V. schaueriana* Moldenke
 7. Central leaflet cartaceous or coriaceous; calyx sub-truncate *V. capitata* Vahl
 7'. Central leaflet submembranaceous or membranaceous; calyx short-dentate 8
 8. Central leaflet hisute above; petiole <5 mm long *V. flavens* Kunth
 8'. Central leaflet villous above; petiole >5 mm long *V. panshiniana* Moldenke

***Vitex orinocensis* Kunth.**

Figures 2, 3

New record. BRAZIL • Ceará, Itapipoca, Maciço de Uruburetama, Serra de Itacoatiara; 03°34'34"S, 039°36'00"W; 03 March 2016; F.D. Santos 417 leg.; HUVA 18975.

Identification. In the state of Ceará, *V. orinocensis* is

morphologically similar to *V. triflora* Vahl., as they share trifoliolate leaves and peduncles more than 10 mm long. *Vitex orinocensis* differs from *V. triflora* in having divaricate branches (vs. non-divaricate in *V. triflora*), inflorescence congested (vs. lax), and calyx with obtuse lobes (vs. acute to acuminate). *Vitex orinocensis* can also be confused with *V. schaueriana* Moldenke; the calyx in both species has obtuse lobes, but *V. orinocensis* differs from *V. schaueriana* in having trifoliolate leaves (vs. pentafoiolate in *V. schaueriana*).

Habitat and distribution. *Vitex orinocensis* is widely distributed throughout South America (Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela) (Macbride 1960). In Brazil, this species is known in the North (Acre, Amapá, Amazonas and Pará), Northeast (Bahia, Maranhão and Paraíba), Central-West (Mato Grosso), and Southeast (Espírito Santo) regions, with disjunct distribution between the Amazon and Atlantic forests (Monteiro et al. 2018; Flora do Brasil 2020). Herein, its distribution is expanded to Ceará state, where it was found in upland Semideciduous Seasonal Forest (Mata Seca), on a rocky outcrop

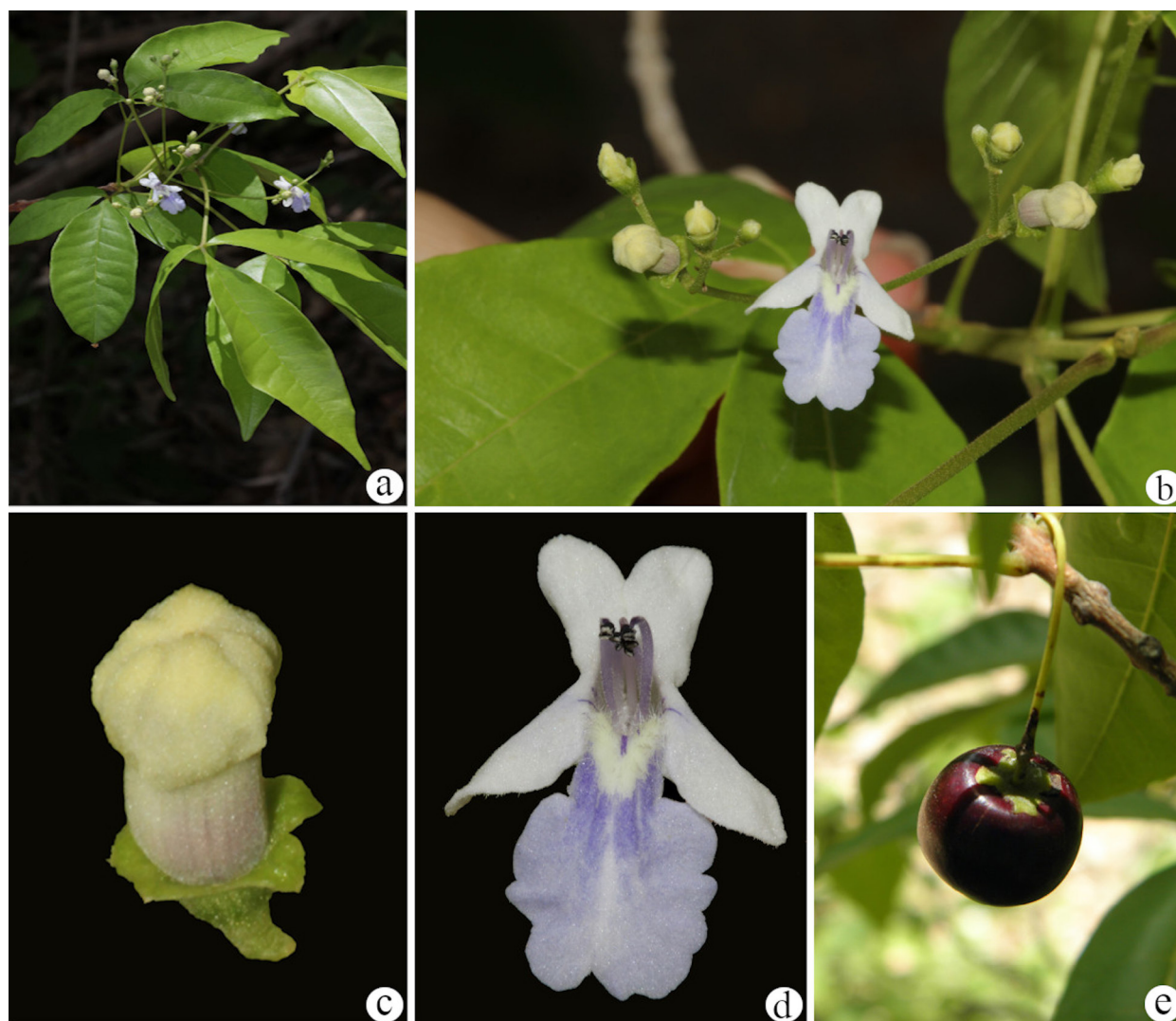


Figure 2. *Vitex orinocensis*. **A.** Habit. **B.** Branche, showing divaricated inflorescence. **C.** Details of the bud. **D.** Details of the flower. **E.** Details of the fruit.

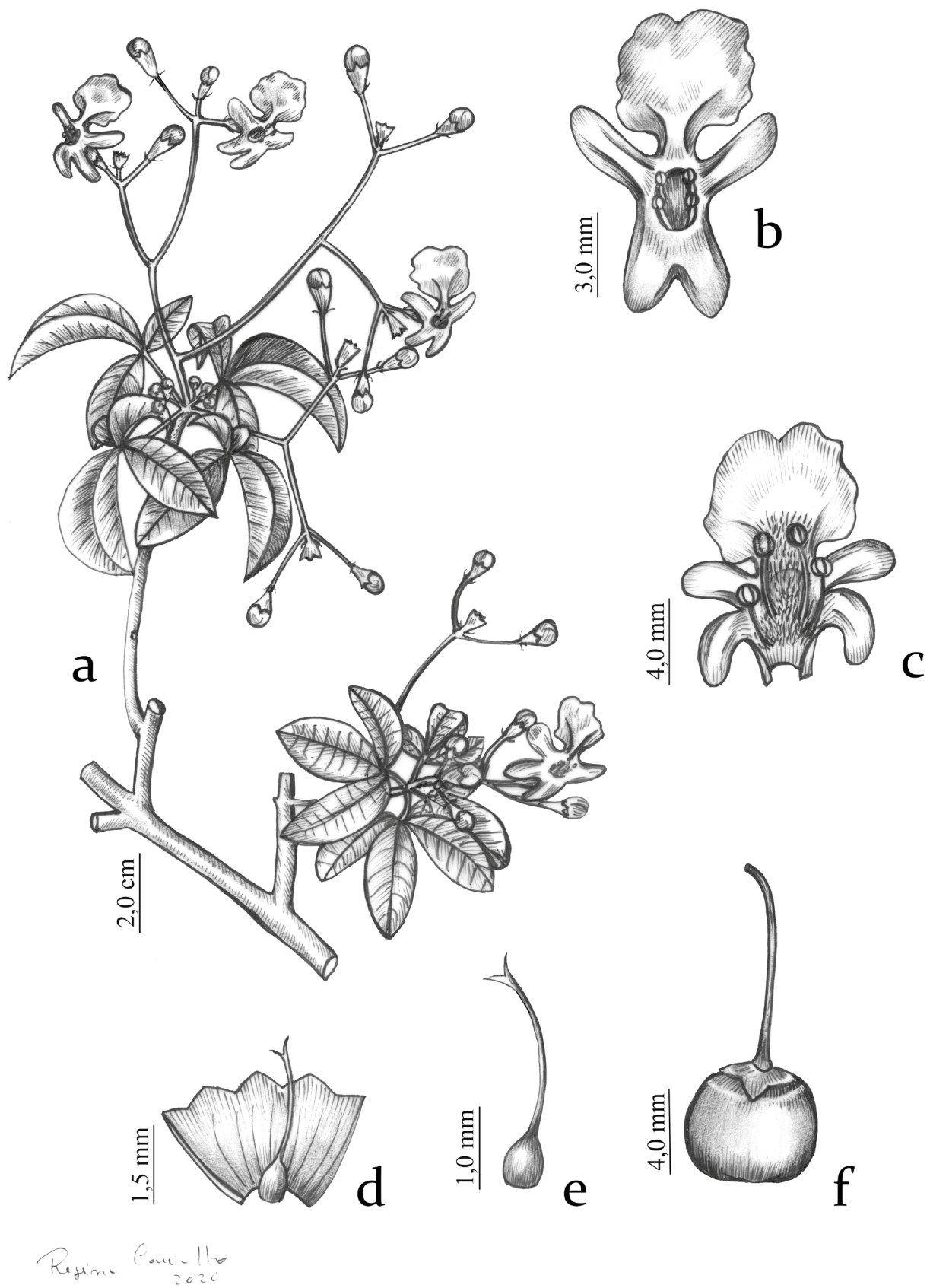


Figure 3. *Vitex orinocensis*. **A.** Habit. **B.** Details of the flower. **C.** Dissected flower, frontal view. **D.** Dissected calyx, frontal view showing the pistil. **E.** Details of the pistil. **F.** Details of the fruit.

(Fig. 4). This species was seen flowering and fruiting in March.

Conservation status. *Vitex orinocensis* is an unevaluated species (NE) (Flora do Brasil 2020), and in Ceará state it is not known to occur in any protected area. In its area of occurrence, the threats to the small population of *V. orinocensis* are mainly associated with habitat loss due to agricultural activities, such as banana monocultures; this emphasizes the importance of creating new conservation units in Atlantic Forest areas of the state. Our new record expands the occurrence of *V. orinocensis* to the north of the Northeast Region, and is important for future assessment of the conservation status of this species.

Discussion

According to Flora do Brasil (2020) and considering the vegetation classification of Ceará state (Moro et al. 2015), seven species of *Vitex* are widely distributed in different vegetation types in the state. The rocky-outcrop habitat where we report *Vitex orinocensis* was also mentioned by Monteiro et al. (2018) for Paraíba state, confirming that this species grows on rocky outcrop in the Atlantic Forest. Considering its disjunct distribution between the Amazon and Atlantic Forests, the

occurrence of *V. orinocensis* in upland forest may be support the hypothesis that these ecosystems constitute refuges for Atlantic Forest species, whose ancestors were continuously distributed between these two domains during the Pleistocene glacial periods (Tabarelli and Santos 2004; Batalha-Filho and Miyaki 2014).

As for conservation, it is important to mention that our new record of *V. orinocensis* expands not only the area of occurrence of this species but also its geographic range. This information will be important for future assessments of the conservation status of this species following the B1 criterion of the International Union for Conservation of Nature Red List. New records that are taxonomically verified are essential for assessing the conservation status of species (Marinho and Beech 2020). Our new record reinforces the need to expand floristic studies in Ceará state in order to increase knowledge of the distribution of *V. orinocensis* and reduce gaps in its geographic distribution. This record also shows the importance of creating of new conservation units in the upland forests of the state.

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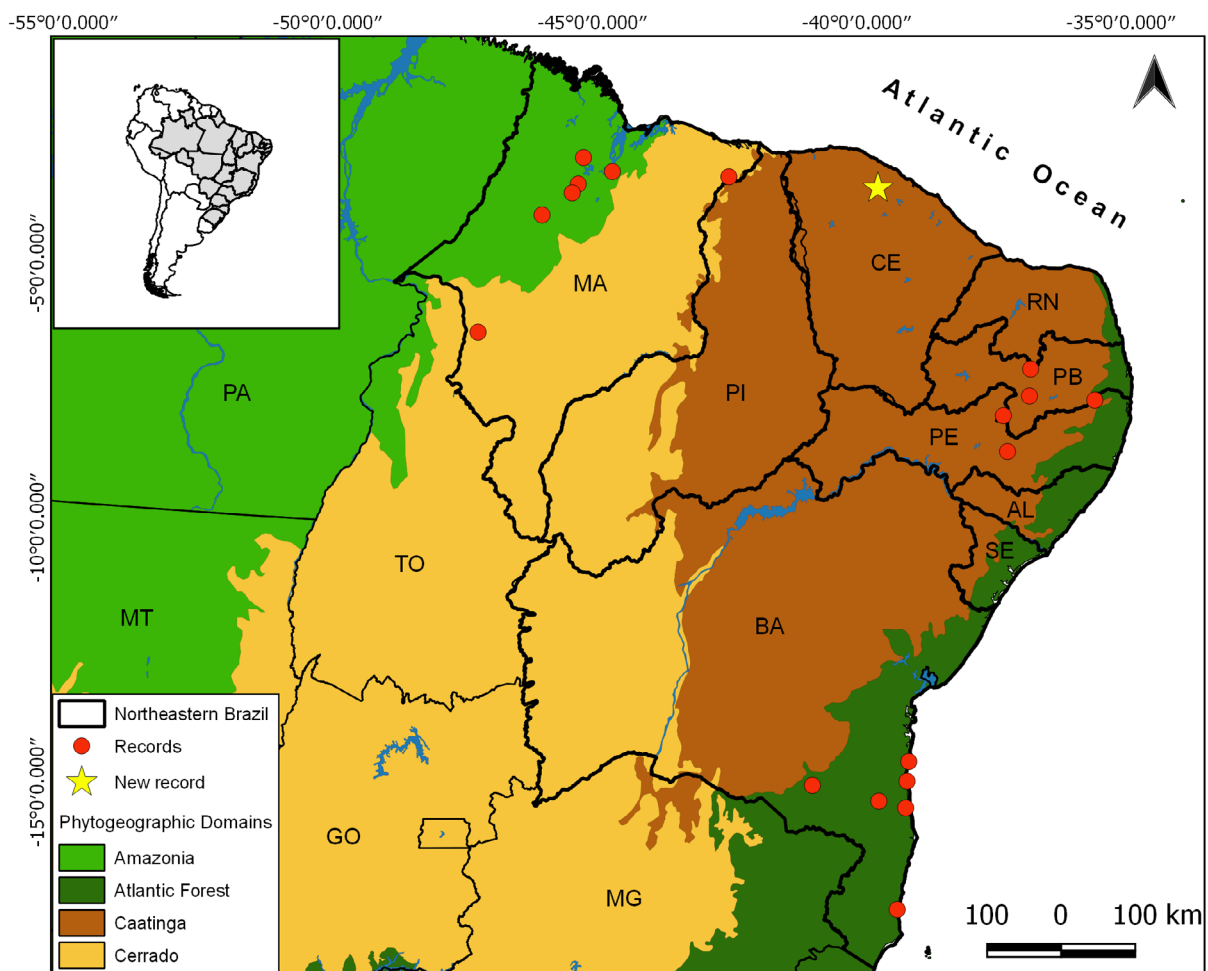


Figure 4. Geographic distribution of *Vitex orinocensis* in northeastern Brazil.

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Authors' Contributions

Conceptualization: FDSS. Investigation: FDSS. Resources: FDSS. Visualization: FDSS, FCPC. Writing – original draft: FDSS, FCPC. Writing – review and editing: FDSS, FCPC.

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