



Protective traits of aboveground buds in *Duguetia furfuracea* (A.St.-Hil.) Saff. (Annonaceae) from the *Cerrado stricto sensu*

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Abstract

The *Cerrado*, the most biodiverse neotropical savanna, is characterized by recurrent fires, light intensity, seasonal drought, and nutrient-poor soils, conditions that exert strong selective pressures on vegetation. In this context, the endemic species occurring in this region exhibit diverse strategies to cope with these varied natural disturbances. Resprouting acts as the key trait for natural regeneration and is heavily influenced by a bud bank. The number and degree of protection of these meristematic structures determine the effectiveness of post-disturbance resprouting. Understanding the different protective mechanisms related to these structures enriches our knowledge of how native species adapt to the current challenges faced in fire-prone ecosystems. Here, we provide a detailed anatomical description of the apical and nodal buds of *D. furfuracea*, a species occurring in grassland formations of the Brazilian *Cerrado*. For this, the apical bud and the three subsequent nodal regions were collected and analyzed under light microscopy, histochemical analysis, fluorescence microscopy and scanning electron microscopy (SEM). Our analyses reveal that aerial buds are consistently enclosed by thick, inverted leaf primordia, densely covered by lepidote and stellate trichomes with thick cell walls. The morphology and wall thickening of these trichomes are consistent with a putative role as a mechanical and optical barrier, as proposed for similar trichomes in other angiosperms. In addition, numerous idioblasts containing phenolic compounds, alkaloids, and lipophilic substances, together with the presence of prismatic crystals, contribute to chemical and structural defense. Accessory buds were observed at all nodes, expanding the bud bank and reinforcing resprouting potential. The combination of mechanical, chemical, and structural traits indicates that *D. furfuracea* invests in a complex protective strategy for its aboveground buds, corroborating recent evidence of the functional importance of aerial buds in fire-prone ecosystems and extending this perspective to Annonaceae species. Our findings highlight the ecological relevance of aerial bud defenses and expand current frameworks for understanding plant persistence strategies in the *Cerrado*.

Keywords Accessory buds · *Duguetia furfuracea* (Campinas, SP) · Resprouting · Trichomes

1 Introduction

The *Cerrado* is considered the most biodiverse neotropical savanna, characterized by a predominantly herbaceous and subshrub layer, transient seed banks, high belowground biomass, and a persistent bud bank, with open and discontinuous tree canopies (Parr et al. 2014; Veldman et al. 2015; Daibes et al. 2019). Additionally, its seasonal climate—marked by defined dry periods, high temperatures, intense solar radiation, frequent fires, herbivory, and deep, nutrient-poor

soils—imposes strong selective pressures on the vegetation (Simon et al. 2009; Simon and Pennington 2012). In this context, structural and functional adaptations aimed at protection play a crucial role in the survival and ecological success of endemic species.

Among these adaptations, resprouting acts as a natural regeneration trait, which may occur from subterranean and/or aerial sources, depending on the presence of a bud bank (Klimesová and Klimeš 2007; Clarke et al. 2013; Ott et al. 2019). The degree of protection of these meristematic structures reflects crucial aspects of the resilience of species inhabiting fire-prone ecosystems (Charles-Dominique et al. 2015). The allocation of buds within thickened belowground organs (such as xylopodia, lignotubers, and rhizomes) is well documented across different plant families (Bombo et al.

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2014; da Silva et al. 2021; Ferraro et al. 2021b, a; Faleiro et al. 2022). While research on aboveground bud protection has primarily focused on the role of bark in woody species (Charles-Dominique et al. 2017; De Antonio et al. 2020; Chiminazzo et al. 2021, 2023), interest in protective traits of non-woody life forms, such as shrubs and forbs that do not develop thick bark, has grown substantially over the past five years.

Among these studies, the fundamental role of pilose leaf primordia as primary protective structures has been emphasized (de Campos et al. 2021), along with the contribution of secretory structures such as colleters, extrafloral nectaries, stipules, cavities, laticifers, and idioblasts (Machado et al. 2008; Coutinho and Meira 2015; Silva et al. 2020; Paiva et al. 2021; da Silva et al. 2023). It has also been reported that the occurrence of these structures varies among species depending on growth conditions (Faleiro et al. 2025), and that their distribution may follow a temporal pattern. In species such as *Chamaecrista desvauxii* (Collad.) Killip var. *desvauxii* and *Chamaecrista nictitans* (L.) Moench, primary defense is initially provided by colleters at the first node; as the organ expands and the colleters senesce, protection is subsequently assumed by extrafloral nectaries (Faleiro and Mayer 2026). The presence of chemical compounds, particularly phenolic compounds, stored in various structures has also been reported as an important defense mechanism against both herbivory and photo-oxidation (Kulbat 2016; Faleiro et al. 2022).

These studies are critically important, as they reveal the diverse strategies and mechanisms that endemic species employ in response to natural disturbances in these ecosystems. This is especially relevant in a context of expanding agriculture and growing human populations, which are driving the rapid conversion of native areas to agricultural use (Sano et al. 2010). Currently, over 60% of the Brazilian *Cerrado* (MapBiomas 2024) is already degraded—a particularly concerning scenario given the complexity and long timeframes required for restoring savanic ecosystems (Pilon et al. 2018; Cava et al. 2018). Research that elucidates functional plasticity and adaptive responses of species to environmental conditions thus provides an essential scientific foundation for future ecological restoration plans (Pilon et al. 2021; Campos et al. 2025), in addition to deepening our understanding of resprouting mechanisms and the behavior of endemic species under anthropogenic pressure.

In this context, the present study provides a detailed anatomical description of the apical buds and nodal regions of *Duguetia furfuracea* (A.St.-Hil.) Saff. (Annonaceae), a species endemic to the *Cerrado* grassland formations. We aimed to elucidate the structural investments underlying its complex and effective defensive strategy, which enables persistence under high light intensity, seasonal drought, and recurrent fire. By doing so, this work expands the current

understanding of bud protection mechanisms to include previously unstudied botanical families within fire-prone ecosystems.

Annonaceae is one of the largest families within Magnoliales, with species distributed across a wide range of Neotropical ecosystems, including forests, grasslands, and savanna formations (Chatrou et al. 2012). Among its representative genera, *Duguetia* comprises approximately 95 species, most of which are native to the Neotropics (Maas et al. 2003; Lobão and Bazante 2026). In addition to their recognized pharmacological importance (Carollo et al. 2005), several *Duguetia* species exhibit a strong capacity for post-disturbance resprouting, making them ecologically relevant components of *Cerrado* vegetation (Pilon et al. 2021). *Duguetia furfuracea* is particularly suitable for investigating bud protective strategies because it is a non-arboreal resprouting species that persists in fire-prone environments, where the protection of meristematic tissues is essential for survival and regeneration (Durigan et al. 2018).

2 Materials and methods

Species sampling and study area In our study, we collected three individuals of *D. furfuracea* from a preserved *Cerrado stricto sensu* fragment (Fig. 1b) located in the municipality of Campinas, São Paulo (Fig. 1a). Collections were performed in September 2023, during the transition from the dry to the wet season, when individuals were in the vegetative and flowering phenological stage. This species (Fig. 1c) was selected due to its high abundance in the area and its relevance in previous studies highlighting its occurrence across different *Cerrado* areas.

Aboveground bud anatomy study For the study of aboveground buds, aerial shoots containing the apical bud and the three subsequent nodal regions were collected, following the protocol described by Faleiro et al. (2025).

Branches collected from each plant were fixed in neutral formalin solution (Lillie 1948) for 48 h. After fixation, the material was dehydrated through an ethanol series and stored in 70% ethanol. A subset of samples was further dehydrated in 100% ethanol and embedded in plastic resin (Leica®), following the manufacturer's instructions. Resin blocks were sectioned in both transverse and longitudinal planes using a manual rotary microtome (Leica RM 2045) equipped with C-type blades, producing section 5–7 µm thick. Sections were stained with 0.05% toluidine blue O in phosphate-citrate buffer (pH 4.5) according to Sakai (1973), and mounted in synthetic resin (Entellan®, Merck).

Histochemical analyses For histochemical analyses, both fresh samples and samples previously fixed in Lillie's

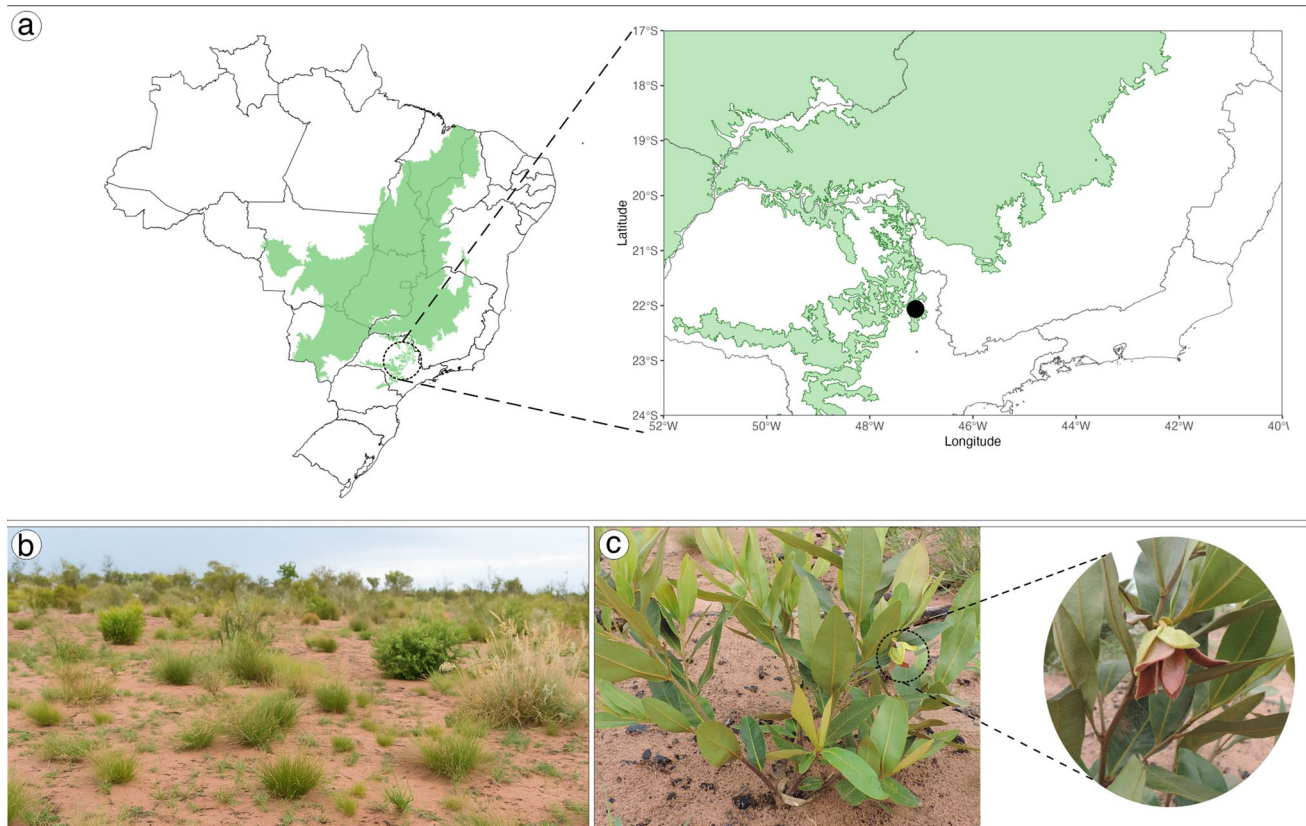


Fig. 1 Collection site of *Duguetia furfuracea*. **a** Map of Brazil indicating collection localities in São Paulo State. **b** Landscape view of the *Cerrado stricto sensu* fragment. **c** Study species with a detail of the flower

solution were subjected to the following staining protocols: Sudan IV (Jensen 1962) and Sudan Black B (Pearse 1953) for total lipids; Ruthenium Red for acidic mucilage (Gregory and Baas 1989); ferric chloride for phenolic compounds (Johansen 1940); and Lugol's iodine solution for starch grains (Johansen 1940). Control sections were prepared following standard procedures to validate the histochemical reactions. All analyses were performed in triplicate.

The leaf trichome autofluorescence images were acquired using confocal microscopy (Upright LSM780-NLO) at the INFABIC/Unicamp laboratory, under excitation at 340 nm and emission detection at 460 nm.

Scanning electron microscopy (SEM) Terminal bud samples were processed for scanning electron microscopy (SEM). Samples were dehydrated using the CO₂ critical-point drying method (Horridge and Tamm 1969), mounted on aluminum stubs, and sputter-coated with a 30–40 nm gold layer using a Balzers SCD 050 coater. SEM imaging was performed at the UNICAMP Electron Microscopy Laboratory (LME) using a JSM 5800LV microscope operated at 30 kV. Scale bars were digitally embedded during image acquisition.

3 Results

The terminal bud, as well as the axillary buds in all individuals analyzed, was entirely enclosed by thick leaf primordia (Fig. 2a, b). The number of primordia ranged from four to six in the terminal bud (Fig. 2c) and from two to four in the axillary buds (Fig. 2h, j). These primordia were arranged in an inverted orientation, with the abaxial surface facing outward and the adaxial surface oriented toward the meristematic region (Fig. 2f).

The epidermis of the leaf primordia covering the apical meristem exhibited a high density of trichomes. On the abaxial surface, lepidote trichomes with a scale-like appearance (Fig. 2a, m) densely covered the entire epidermis, including both leaf and stem regions (Fig. 2e, h). These trichomes are pedunculate, multicellular, non-secretory, and originate from a single protodermal cell (Fig. 2n–t). Through a combination of periclinal and anticlinal divisions, this initial cell gives rise to a central peduncle, while adjacent cells elongate to form the upper, scale-like portion. In cross-sectional view, both the

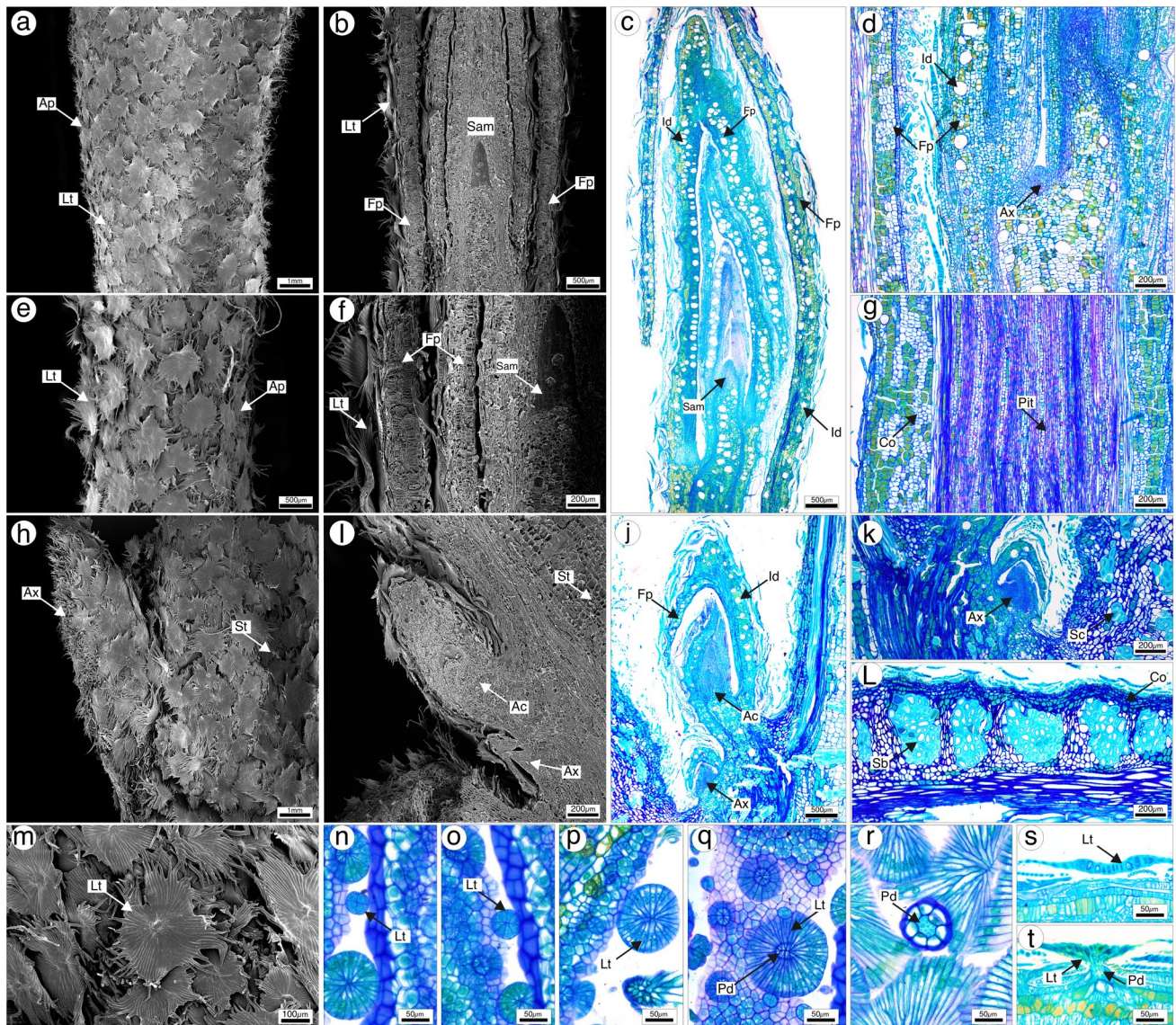


Fig. 2 Electron micrographs (a, b, e, f, h, i, m) and photomicrographs (c, d, g, j, k, L, n, o, p, q, r, s, t) of the shoot apical meristem and nodal regions of *Duguetia furfuracea* occurring in a *Cerrado* fragment. a, b, e, f Apical bud observed under scanning electron microscopy, highlighting lepidote trichomes, the apical meristem region, and the thickness of leaf primordia. c, d, g Longitudinal section of the shoot apical meristem and nodal regions under light microscopy. h, i, j, k Axillary and accessory buds. L Longitudinal section showing the presence of sclereid bands in the cortical stem region. m Lepidote trichome beneath the apical bud and in the stem region. n, o, p, q, r, s, t Ontogeny of the lepidote trichome, showing the formation of central cells and the scale-shaped disc, as well as the thickened wall after complete differentiation. *Abbreviations:* Ap, apical bud; Ax, axillary bud; Ac, accessory bud; Co, cortex; Fp, leaf primordium; Pd, peduncle; Id, idioblast; Lt, lepidote trichome; Sc, sclereids; Sb, sclereid bands; St, stem; Sam, shoot apical meristem

peduncle and the distal region exhibit thickened cell walls, which are typically lignified at maturity, as revealed under polarized light (Fig. 3b, c). Lignification initiates in the central cells of the peduncle and gradually extends toward the peripheral scale-forming cells.

Additionally, numerous secretory idioblasts were observed throughout the leaf blade mesophyll of the primordia (Fig. 2c, d). These idioblasts produced substances that tested positive for both lipidic compounds (Fig. 5i,

j). In addition to the axillary buds located in the nodal regions, accessory buds were consistently observed at all nodes analyzed (Fig. 2i, j). These buds exhibited the same protective features as the terminal bud (Fig. 2k). Within the stem, the pith was clearly identifiable, and idioblasts were present in the cortical region (Fig. 2g). Beginning at the first node, clusters of sclereids were interspersed with parenchyma cells (Fig. 2L). Under polarized light, prismatic crystals were frequently detected in the leaf

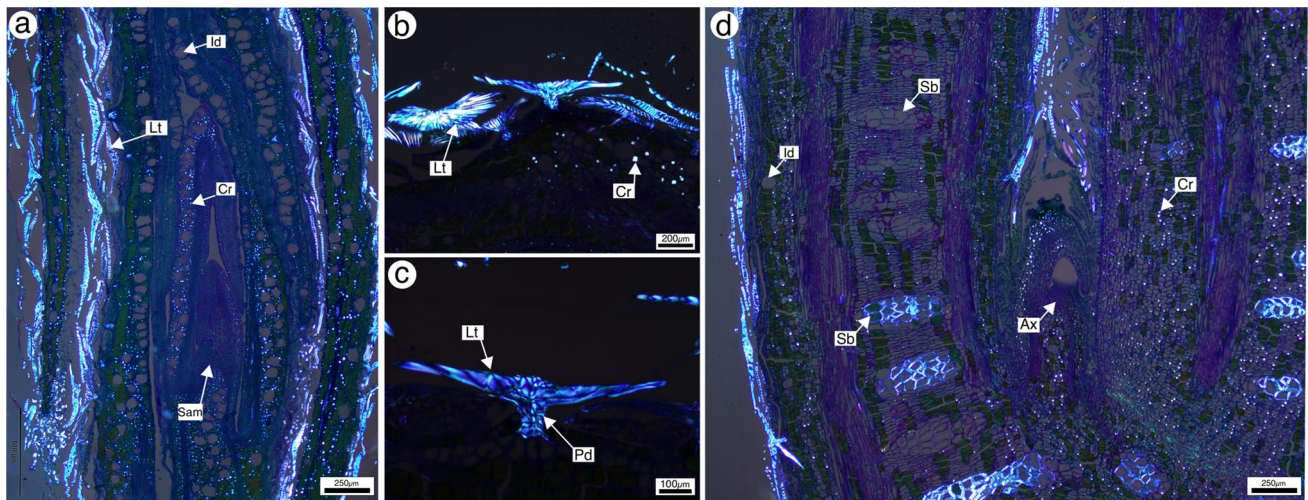


Fig. 3 Longitudinal sections of the shoot apical meristem and nodal regions of *Duguetia furfuracea* under polarized light. **a** Apical bud region showing the thick walls of lepidote trichomes located beneath the surface of the leaf primordia, with detailed views in **(b)** and **(c)**. **d** Detail of the nodal region illustrating the differentiation process of sclereid bands from the first node. In **a** and **d**, numerous prismatic crystals can be seen distributed throughout the bud, stem, and leaf primordia. Ax, axillary buds; Cr, crystals; Id, idioblast; Lt, lepidote trichome; Pd, peduncle; Sam, shoot apical meristem. Sb, sclereids bands

primordia of the terminal bud (Fig. 3a), as well as in axillary and accessory buds (Fig. 3d). This optical filter also facilitated the identification of sclereid band differentiation, which initiates shortly after the first stem node (Fig. 3d).

As leaf primordia undergo differentiation, numerous stellate trichomes develop and densely cover the adaxial epidermis (Fig. 4a–c). Their density progressively decreases from the third and fourth stem nodes onward, coinciding with full leaf expansion. On the abaxial surface (Fig. 4d–f), lepidote trichomes persist with similar morphology to those observed in the terminal bud region. Under confocal microscopy with autofluorescence filters (Fig. 4b, c, e, f) both trichome types exhibit a different coloration in relation to epidermal cells, allowing clear visualization of differences in size and spatial arrangement between trichomes on the adaxial and abaxial surfaces.

The fully expanded leaf displays a prominent central vein (Fig. 5a), with fundamental parenchyma near or adjacent on both epidermal surfaces, a collateral vascular bundle, and a central pith (Fig. 5b–d). The leaves are hypostomatic, and the adaxial epidermal cells are larger and covered by a thicker cuticle (Fig. 5f). Upon full differentiation, the mesophyll is isobilateral, consisting of palisade parenchyma on both surfaces and lacunose parenchyma centrally located (Fig. 5h). Idioblasts are also present in the expanded leaf (Fig. 5e), although at a lower density than in the leaf primordia.

Similar to lepidote trichomes, stellate trichomes (Fig. 5k) originate from a single protodermal cell (Fig. 5l), are multicellular, non-secretory, and possess a short peduncle (Fig. 5m). The main difference lies in the organization of the elongated cells above the peduncle: in lepidote trichomes, these cells are fused from the center to the apex, whereas in stellate trichomes, they remain connected only at the central

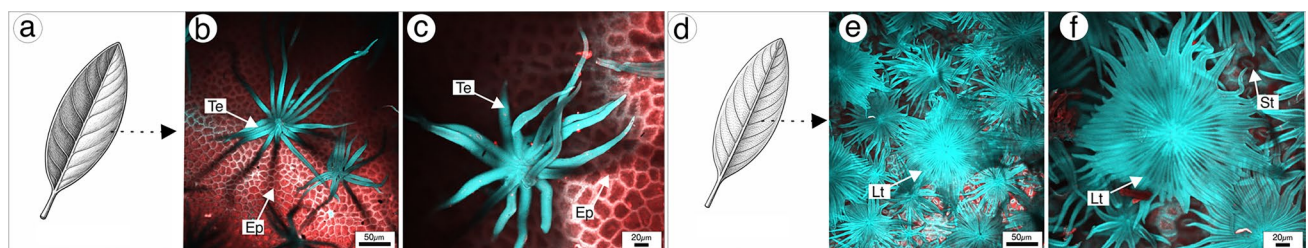


Fig. 4 Schematic illustrations and confocal micrographs of stellate and lepidote trichomes on fully expanded leaves of *Duguetia furfuracea*. Panels 4a and 4d are schematic illustrations showing the adaxial and abaxial leaf surfaces, respectively. Panels 4b–c and 4e–f correspond to confocal micrographs of the respective leaf surfaces. Ep, epidermis; Lt, lepidote trichome; St, stomata; Te, stellate trichome. Illustrations of *Duguetia* leaves by Debora Lima

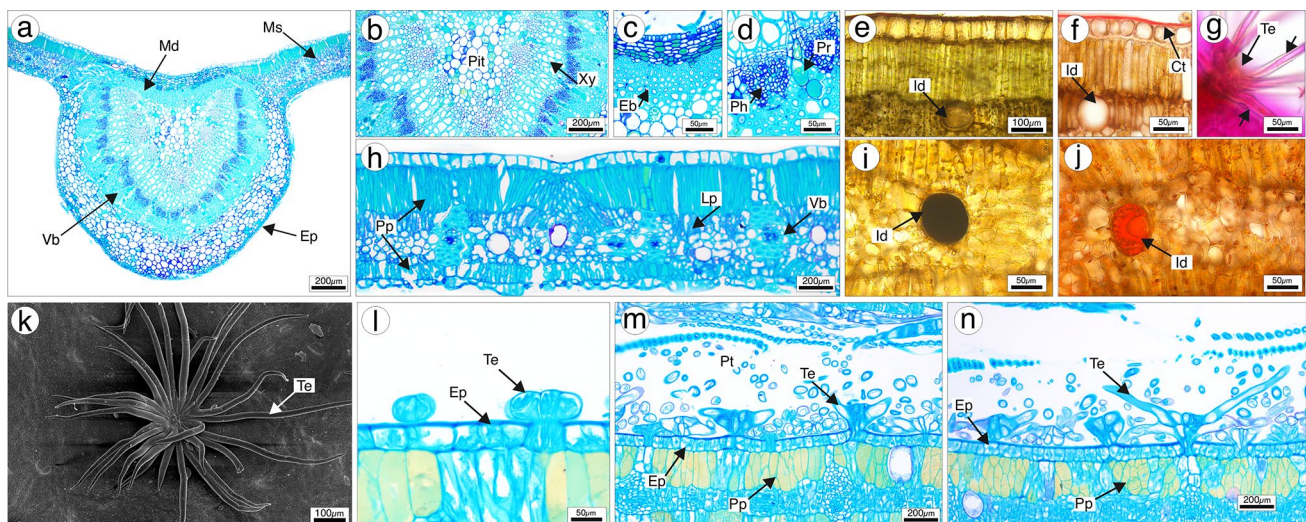


Fig. 5 Electron and photomicrographs of expanded leaves of *Duguetia furfuracea* from a *Cerrado* fragment. Anatomy of the expanded leaf, highlighting the central vein (a–d) and the leaf mesophyll region (e–j). Thickened wall of a stellate trichome after staining with Ruthenium Red (g). Secretory idioblast after reaction with Sudan Black B (i) and Sudan IV (j). l–n Developmental sequence of a stellate trichome and a fully differentiated stellate trichome (k). *Abbreviations:* Ct, cuticle; Ep, epidermis; Eb, sclerenchymatic sheath; Id, idioblast; Lp, lacunose parenchyma; Ms, leaf mesophyll; Pp, palisade parenchyma; Ph, phloem; Pr, radial parenchyma; Pit, pith. Md, central vein. St, stomatal; Te, stellate trichome; Vb, vascular bundle; Xy, xylem

region and are free at the apical ends (Fig. 5n). Although both trichomes types exhibit thick cell walls (Fig. 5g), unlike lepidote trichomes, stellate trichomes do not undergo lignification.

4 Discussion

The traits observed in aboveground buds reveal a set of finely coordinated anatomical features associated with bud protection and early leaf development. Both terminal and axillary buds were consistently enveloped by thick leaf primordia. The epidermis of these primordia was densely covered by lepidote trichomes, whose thick walls and scale-like architecture may further reinforce this protective function. As development progressed, stellate trichomes emerged on the adaxial surface, forming a dense indumentum that gradually decreased with leaf expansion. Additionally, the presence of idioblasts and prismatic crystals throughout developing and mature organs, along with the initiation of sclereid differentiation from the first node, indicates that structural and chemical defenses are established early and maintained throughout organ maturation.

The degree of bud protection—whether below or aboveground—is considered a key factor influencing resprouting capacity and, consequently, the growth of plant species in fire-prone ecosystems such as the *Cerrado* (Clarke et al. 2013; Charles-Dominique et al. 2015). While buds embedded in thick belowground structures are well documented (Pausas et al. 2018), recent studies have highlighted the

functional role of aerial buds in this natural regeneration strategy (Chiminazzo et al. 2023). However, current classifications of bud protection are largely limited to the presence of thick bark (Loram-Lourenço et al. 2020), and more recently, trichome coverage (Chiminazzo et al. 2021). This narrow framework complicates the classification of other life forms beyond trees, particularly shrubs and herbs (da Silva et al. 2023), which represent the majority of the biodiversity in *Cerrado* areas.

In all buds analyzed, thick leaf primordia were present, covering the meristematic regions. Such structures are widely reported in endemic *Cerrado* species (Silva et al. 2020; de Campos et al. 2021; da Silva et al. 2023; Faleiro et al. 2025) and are considered the primary protective barrier separating meristematic tissues from the external environment, particularly shielding them from high light intensity and herbivory (Schoonderwoerd and Friedman 2021). In leaf primordia adjacent to the terminal bud, an inverted orientation was observed, with the abaxial surface facing outward. This arrangement likely represents an efficient strategy to reduce absorbed light energy, especially in open ecosystems (Eller and Willi 1977).

A dense indumentum was observed covering both epidermal surfaces. In differentiating leaf primordia, the abaxial surface was densely covered by numerous lepidote trichomes. As the primordia expanded, stellate trichomes differentiated on the adaxial surface. These trichomes are characteristic of the genus *Duguetia* (Bazante and Alves 2017), both types possessing a short stalk and a central disk—fused and scale-like in lepidote trichomes and fused

only at the center with free apices in the stellate form. Both originate from a single protodermal cell, similar to the scale-like trichomes described in Euphorbiaceae (Vitarelli et al. 2015), with the distinction that these may have a secretory function in some families, such as Bromeliaceae (Ballego-Campos et al. 2020). In our study, lepidote trichomes formed a dense indumentum over the shoot apical meristem. Similarly, in species of Rutaceae, scale-shaped trichomes have been reported to densely cover apical buds, exhibiting secretory activity (Machado et al. 2023). In our observations, no active secretion process was detected in either trichome type, apart from the accumulation of phenolic compounds, a feature also reported for similar trichomes in Euphorbiaceae species (Naidoo et al. 2023). Additionally, the authors related that trichome types have been associated with functions related to water regulation, as they may increase the effective surface area and contribute to the formation of a boundary layer, potentially reducing water loss.

Trichomes are fundamental structures associated with both mechanical and chemical protection (Karabourniotis et al. 2020), occurring widely among angiosperms (Khan et al. 2025). Their morphology and function vary according to environmental and genetic factors, playing a key role in the survival and success of plants in tropical environments (Hauser 2014). They are highly plastic structures, strongly influenced by the growth conditions to which plants are exposed (Faleiro et al. 2025). Specifically, scale-shaped or stellate trichomes reflect sunlight, reducing UV radiation absorption and protecting sensitive tissues from damage caused by intense light and heat (Bickford 2016; Karabourniotis et al. 2020). Additionally, they act as both physical and chemical barriers, hindering insect access and accumulating various compounds that enhance defense (Hauser 2014; Karabourniotis et al. 2020).

The conformation of trichomes on leaf primordia over the apical meristem may represent a potential defense mechanism against herbivory, as suggested by studies in other plant species. Although herbivory was not directly evaluated in *D. furfuracea*, this feature may be particularly relevant in *Cerrado stricto sensu* environments, where herbivore pressure is often considered an important selective factor. Herbivory rates averaging 7% have been reported on leaves of plants in *Cerrado stricto sensu* environments, with at least 60% of sampled species showing damage to leaf structures (Marquis et al. 2001). Anti-herbivory systems are fundamental for plants; although costly, they are crucial during vegetative periods, especially in young leaves and meristematic regions (Delgado et al. 2017, 2022), as observed in the studied species.

Alongside the trichomes present on the epidermis, numerous idioblasts were observed in both leaf primordia and fully expanded leaves. Secretory idioblasts are specialized cells, isolated from the surrounding tissue, that accumulate and/

or secrete substances (Evert 2013). They occur in various plant organs and play essential roles in adaptation, defense, and overall physiology (Fortuna-Perez et al. 2021; de Deus Bento et al. 2024). In our study, the chemical nature of the substances stored in idioblasts was primarily associated with defense against herbivory. Phenolic compounds, oils, and alkaloids have been reported to function as chemical barriers (Kulbat 2016; Widuri et al. 2024). Indeed, the presence of phenolic compounds can prevent these structures from being damaged by various predators (Delgado et al. 2017).

In addition to axillary buds, we observed the presence of an accessory bud at all nodal regions analyzed, exhibiting the same protective mechanisms described for the apical bud. The occurrence of accessory buds has been reported as a trait present in various plant families inhabiting the Brazilian *Cerrado* (de Campos et al. 2021; da Silva et al. 2023; Faleiro et al. 2025). These structures increase the bud bank; a key trait associated with resprouting capacity (Klimesová and Klimeš 2007). Moreover, aerial resprouting tends to occur more rapidly than subterranean resprouting (Burrows 2013; Burrows and Chisnall 2016). Therefore, the presence of accessory buds provides an efficient response to endogenous disturbances that are frequent in *Cerrado* environments.

Prismatic crystals were observed beneath the apical bud, as well as in axillary and accessory buds, within the mesophyll of both leaf primordia and expanded leaves, and in the stem region. Similar to idioblasts, their primary function has been associated with defense against herbivory (Hudgins et al. 2003), as reported in several studies. However, recent research suggests that these crystals also play a key role in calcium remobilization to regions of intense cell division, such as meristematic areas (Paiva 2019). Indeed, these crystalline structures may be related to detoxification processes in soils with high aluminum presence (Somavilla et al. 2024). It has also been reported that the occurrence of sclereid clusters interspersed with prismatic crystals serves as a significant physical barrier to herbivory (Faleiro et al. 2022). Although the occurrence of prismatic crystals in *D. furfuracea* is consistent with functions previously reported in the literature, these roles were not directly evaluated in the present study and should therefore be considered as hypotheses inferred from previous studies.

It is noteworthy that colleters were not observed in the buds analyzed. These secretory structures have been reported in various botanical families occurring in the *Cerrado* (da Silva et al. 2012; Coutinho et al. 2015; Tresmondi et al. 2017; Silva et al. 2019; Paiva et al. 2021), yet they were absent in the individuals examined. Similarly, extrafloral nectaries were not detected (Machado et al. 2008). These findings indicate that protective mechanisms may vary according to the plant family and species under study. While some species possess diverse protective structures, others

display distinct temporal patterns in the differentiation of such structures.

In the expanded leaf, the presence of an isobilateral mesophyll, thick cuticle, and elongated cells on the adaxial surface, along with stomata restricted to the abaxial surface, represents adaptations to environments with high light intensity and low precipitation (Bieras and Sajo 2009; Domínguez et al. 2017; Barbosa et al. 2022). The occurrence of palisade parenchyma beneath both epidermal layers acts as an efficient modulator of light intensity, preventing oxidative processes induced by UV radiation (Procko et al. 2022).

Our findings demonstrate that the aboveground buds of *D. furfuracea* exhibit a marked structural investment, corroborating recent evidence that aboveground buds can also play an important role in persistence and regeneration in fire-prone ecosystems. The combination of these traits observed in the apical and nodal buds suggests a substantial investment in structures potentially associated with protection against herbivory and high solar incidence. This evidence broadens current frameworks for classifying bud protection, which have largely focused on bark thickness or trichome coverage, and highlights the ecological significance of aboveground bud investment in both woody and non-woody life forms of the grassland environments.

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Author contributions RF: Conceptualization; anatomical analyses; writing—original draft; writing—review & editing. JLSM: Conceptualization, Writing—original draft, Writing—review & editing.

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Declarations

Conflict of interests The authors declare that they have no competing interests.

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