

ECOLOGICAL TENDENCIES IN WOOD ANATOMY OF CERRADO SPECIES

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Cerrado *sensu lato* (*s.l.*) is considered the richest savanna in biodiversity in the world (Oliveira & Marquis [14]), besides of been one of the 25 global hotspots (Mittermeier *et al.* [13]). It is mostly restricted to Brazil and merges into a great diversity of biomes, such as Amazon rain forest, Pantanal, Atlantic forest and Caatinga, which enriches its flora, about 7000 plant species, of this total 44 % are endemic (Coutinho, Castro [5, 4]). This Biome has different physiognomies varying of clean field, dirty field, cerrado *sensu stricto* (*s.s.*) and cerradão (Coutinho [6]). Along the rivers there are the riparian zones, forest galleries, among other formations, which are considered as part of cerrado *s.l.* (Eiten [7]).

This paper describes the differences in wood anatomy of 97 arboreal and shrubby species in three different physiognomies of cerrado *s.l.* relating the wood anatomy features to these environments, as well as to verify the strategies used by them to survive in the different physiognomies.

The study was carried out in a private cerrado *s.l.* reserve (cerrado *s.s.*, cerradão, and riparian zone) (Table) covering an area of about 180 ha, located in the Palmeira da Serra Ranch in the municipality of Pratânia, in the mid-western region of the state of São Paulo, Brazil (Scheme).

Table. Studied areas of cerrado *s.l.*

Area	Cerrado <i>s.s.</i>	Cerradão	Riparian zone (RZ)
Geographic Coordinates	22° 82' 01,8" S e 48° 74' 02,6" W	22° 82' 97,0" S e 48° 75' 05,5" W	22° 80' 99,0" S e 48° 74' 06,4" W
Altitude (m)	715	716	715
Vegetation Characterization	Shrubs and trees more scattered, low and of xeromorphic appearance, bark are usually thick, coriaceous leaves and with a low vegetation consisting of grasses that cover the ground	Smaller amount of shrubs, the trees are taller than in cerrado, 8 to 15 meters, also with xeromorphic aspect, and is seen as a transition area between forest and cerrado <i>s.s.</i>	Occur along small rivers in cerrado region, in this case with water depth that remains even in the dry season, is characterised by tall trees on average 20 to 30 m, with a small amount of shrubs

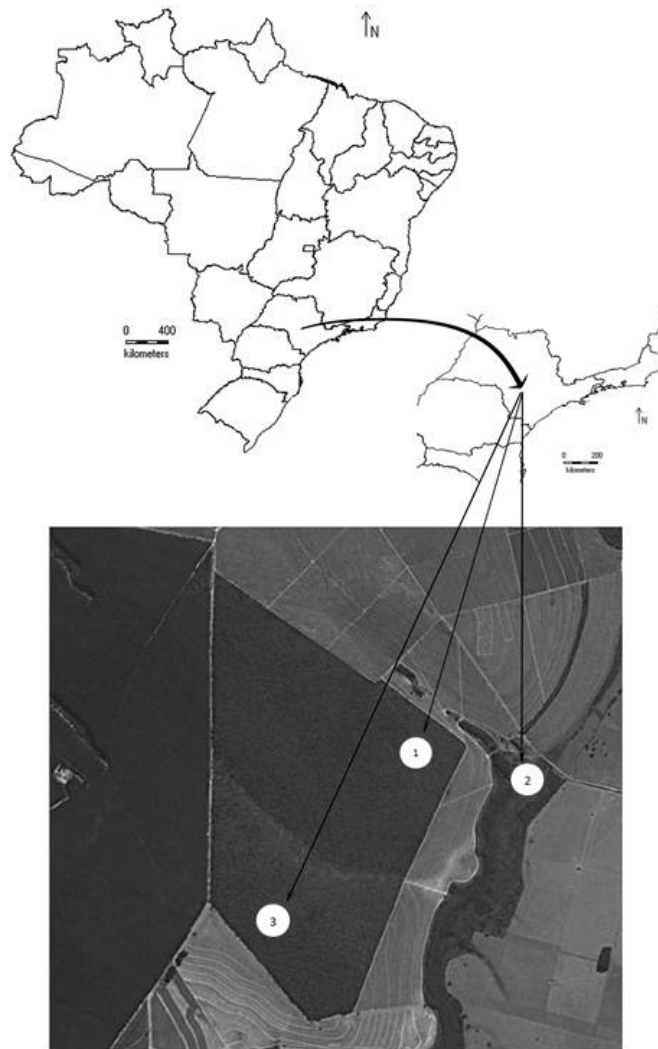
The studied area has a dry period of about four months with precipitation below 60 mm, average annual rainfall is approximately 1306 mm and the average temperature is 19,9°C (climate parameters were obtained by the same software as described in Hijmans *et al.* [9]). The different physiognomies do not show climatic changes probably due to the areas proximity.

Samples of 97 species (adult individuals) occurring in cerrado *s.s.* (Ce), cerradão (Cd) and in riparian zone (RZ) were collected. The analyses were conducted in the most developed branches of the plants due to restriction against the use of destructive methods environmental reserve areas. Discs of ca. 3 cm in thickness from the basal portion of were obtained from each specimen. Family classification followed APGIII 2009 [1].

Sections of transverse, longitudinal – radial and tangential of 15 to 20 \square m thickness, were double stained with aqueous 1 % safranin and aqueous 1 % astra blue (Bukatsch [2]) (1:9). Histological slides were embedded permanently in synthetic resin (Entellan[®]). The cells were macerated according to Franklin's [8] method (1945, modified by Kraus & Arduim [11]) and stained with aqueous 1 % safranin dye (Sass [15]). Semi-permanent slides were mounted in glycerin diluted in water (1:1).

We followed IAWA list Committee [10] for the anatomical features. Vulnerability (V = vessel element diameter/vessel frequency) and mesomorphy (M = V x vessel element length) index were calculated following Carlquist [3].

The statistical analyses were performed with the Statistica software version 8.0. The tests ANOVA, Levene and Brown-Forsythe, and HSD of Tukey (Zar [16]) were used. The principal components analysis was used to order species, qualitative and quantitative wood anatomy features and climate features, showing the factors with more variance (Ludwig & Reynolds [12]).



Anatomical tendencies were observed to cerrado *s.l.* species, based on microscopic characteristics of the secondary xylem. For cerrado *s.l.* species we observed anatomic features that may contribute to both safety and efficiency in water flow, such as: high incidence of multiple vessels and high vessel frequency per mm², small intervessel pits alternate, vested pits, simple perforation plates. The vulnerability and mesomorphy index were 1,6 and 600, respectively for Cerrado *s.l.* species. In statistical analyses only the parameters fibre wall thickness, intervessel pits and vessel ray pitting diameter were significant between physiognomies. In principal component analyses cerradão species remain separated, while the species of the other physiognomies were close each other probably due to the areas proximity. However, the species have anatomical features that show particular strategies for survival in each physiognomy, the cerrado *s.s.* ones had higher frequency of vessels with small diameter, with medium length, smaller diameter of intervessel and ray vessel pits; on the other hand riparian zone species were the opposite, had lower frequency of vessels with wider diameter and higher length, and multiple perforation plates had higher percentage when compared with other physiognomies; cerradão species, except for vessel length which was smaller comparing with other physiognomies, had intermediate values between cerrado *s.s.* and riparian zone, this reflects in cerrado *s.l.* formation, cerradão is seen as a transition area between cerrado and Forest.

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THE FEATURES OF CONDUCTIVE TISSUE STRUCTURES IN PINE AND BIRCH STEMS AT ANTHROPOGENIC LANDSCAPES

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Abstract. The structural changes of conductive and storage tissues of pine and birch stems under the influence of complex of anthropogenic loadings were studied. Both in pine and birch stems the decrease of xylem annual increments was found. In pine stems it is accompanied by decreasing of tracheid radial dimensions. In pine phloem the reducing of annual increments was less expressed, and so the ratio of xylem cells to phloem ones diminished. These changes increased with the intensification of anthropogenic impact. In birch stem xylem the number of vessels per unit of cross section area showed the tendency to increase under the influence of dust pollution. The frequency of xylem rays appeared to be not directly connected with level of technogenic loads. The influence of dust pollution on the tissues outside the cambium was not shown in this study. All these changes reflected nonspecific reactions of growth processes in unfavorable environmental conditions.

ОСОБЕННОСТИ СТРУКТУРЫ ПРОВОДЯЩИХ ТКАНЕЙ СТВОЛОВ СОСНЫ И БЕРЕЗЫ В АНТРОПОГЕННЫХ ЛАНДШАФТАХ

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По степени техногенного загрязнения атмосферы Красноярск входит в число наиболее загрязненных городов Российской Федерации. Воздушная среда города загрязняется выбросами ТЭЦ, алюминиевого, цементного, целлюлозно-бумажного заводов и целого ряда других предприятий. К