ISOTOPIC COMPOSITION OF SOILS AND PLANTS IN A GALLERY FOREST OF CERRADO BIOME: EFFECT OF TOPOGRAPHIC GRADIENT

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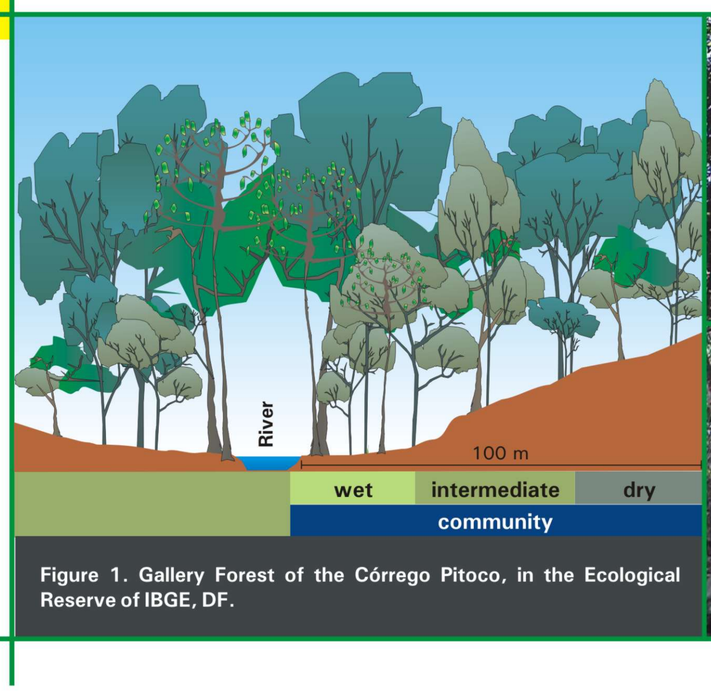
Introduction

Gallery forests represent 5% of the Cerrado biome (savannas of Central Brazil) but contain 1/3 of its biodiversity. They protect water quality, control soil erosion and are important corridors for the fauna. In Central Brazil, gallery forests are characterized by a high heterogeneity particularly due to topographic variations that determine important variations of the edaphic conditions. In the present study we determine the isotopic composition of carbon and nitrogen in soils and leaves of 15 woody species for the Gallery Forest ecosystems according to variations in the topographic.

Materials and methods

The experiment was conducted between March of 2001 and February of 2002 in a plot of 100 x 100 m in the Gallery Forest of the Córrego Pitoco (Figure 1), located in the Ecological Reserve of IBGE, DF. (15°56'41''S and 47°56'07''W). Three sampling lines were established, parallel to the stream and 45 m apart to each other. The lines represent wet community (near the stream), intermediate community and dry community (adjacent to a typical Cerrado area).



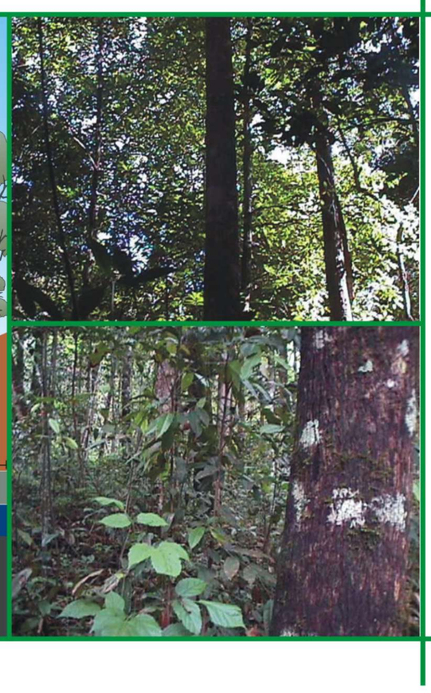


Figure 1. Gallery Forest of the Córrego Pitoco, in the Ecological Reserve of IBGE, DF.

Conclusions

The isotopic composition of carbon and nitrogen in soils and leaves is an important tool to identify differences in biogeochemical cycling processes in Gallery Forest ecosystems along the topographical gradient.

The higher values of isotopic composition of C ($\delta^{13}C$) in soils of the dry community in relation to wet community, can be related to the contribution of organic matter with higher values of $\delta^{13}C$. The higher values of ^{13}C in green leaves of the dry community's species in relation to species of the wet community seem to be associated to the reduction in the availability of water in the soil.

Woody species of the wet community presented isotopic composition of N ($\delta^{15}N$) and N concentration higher in relation to the dry community's species, indicating that where the soils possess larger N concentration, the plants leaves are more enriched in ^{15}N. To opposite, where N is less available in the soil and plants, increases the importance of other mechanisms to obtaining and conservation of N.

Results and discussion

The foliar $\delta^{13}C$ values increased from the wet to the dry community species. Probably because in the drier sites the water stress leads to a decrease in the ratio ci/ca and consequently to a decrease in the foliar $\delta^{13}C$ values (Figure 2). The higher $\delta^{13}C$ values of the soil organic matter in the dry community can be related to the input of a litter with higher $\delta^{13}C$ values or a higher contribution of C4 grasses in the past (Figure 3). The woody species of wet community presented larger values of $\delta^{15}N$ and of N in comparison to the dry community species indicating that denitrification is probably higher in the wet communities leaving behind a ^{15}N enriched organic matter (Figures 4 and 5).

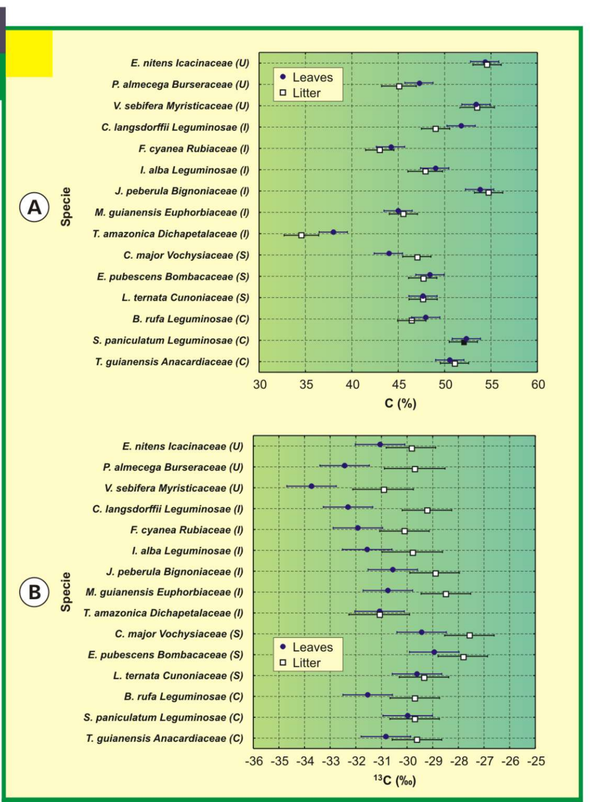


Figure 2. Carbon (%) and ^{13}C isotopic composition (‰) in leaves of 15 woody species in wet (U), intermediate (I) and dry (S) communities and common to three communities (C) (n = 3, the bars denote 0.95 confidence intervals).

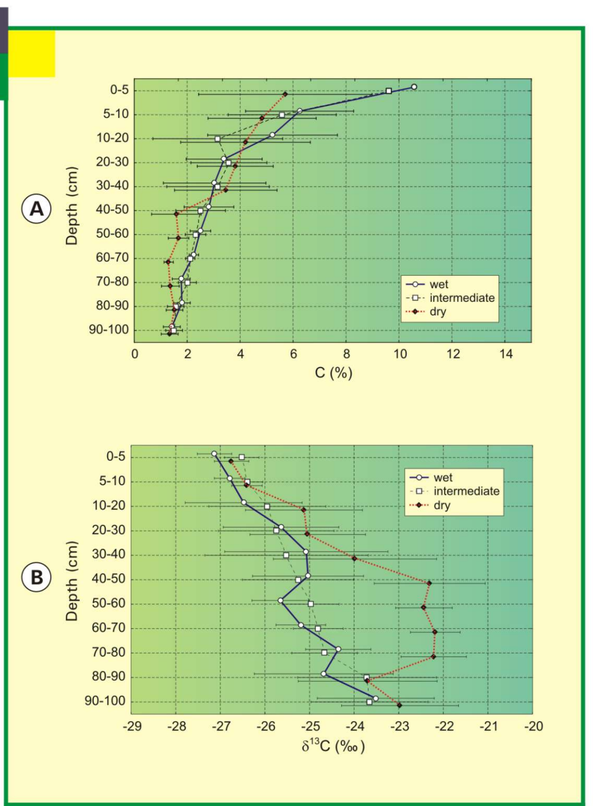


Figure 3. Carbon (%) and ^{13}C isotopic composition (‰) in function of soils depth in wet, intermediate and dry communities (n = 3, the bars indicate 0.95 confidence intervals).

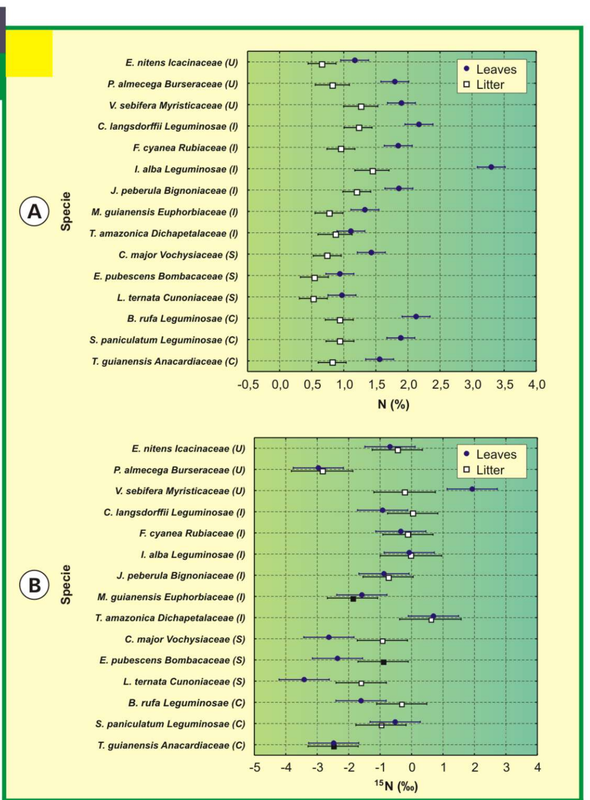


Figure 4. Nitrogen (%)and ^{15}N isotopic composition (‰) in leaves of 15 woody species in wet (U), intermediate (I) and dry (S) communities and common to three communities (C) (n = 3, the bars denote 0.95 confidence intervals).

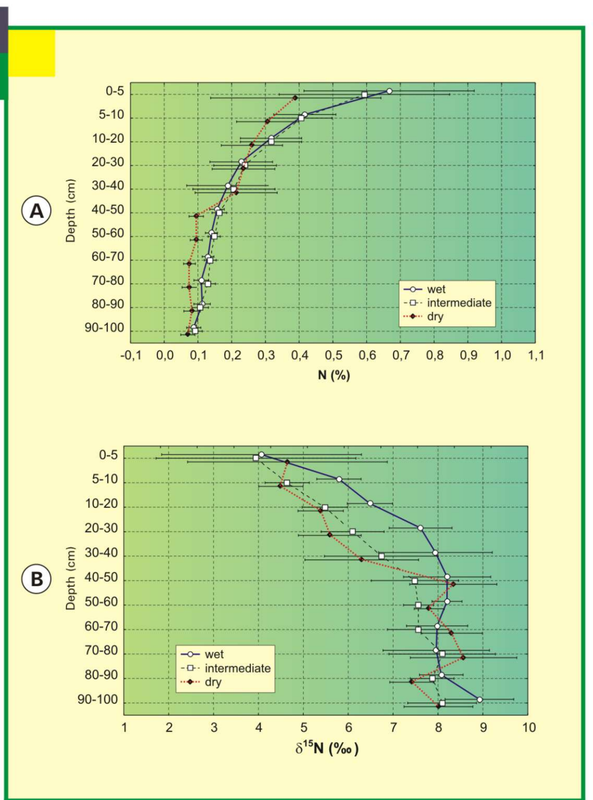


Figure 5. Nitrogen (%)and ^{15}N isotopic composition (‰) in function of soils depth in wet, intermediate and dry communities (n = 3, the bars denote 0.95 confidence intervals).

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