Specific leaf area and leaf nitrogen content of *Cecropia* and *Eschweilera*

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Julia Rossi Mora

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Introduction

The genus *Cecropia* belongs to the family Urticaceae and consists of species of pioneer trees (Berg, Rosselli, & Davidson, 2005). The genus *Eschweilera* belongs to the family Lecythidaceae.

Plant functional traits are attributes that potentially affect establishment, survival and fitness of plant individuals (Reich et al., 2003). Two examples are specific leaf area (SLA) and leaf nitrogen content.

Specific leaf area (SLA, i.e., leaf area per leaf dry mass) is an inverse index of leaf density or thickness (Reich & Walters, 1994). A correlation between specific leaf area (SLA) and mass of nitrogen (N~mass) has been previously identified in 23 Amazonian tree species, one of them being *Cecropia ficifolia*. In all species analysed, across increasing leaf age and light gradients, SLA decreased and so did N~mass, but proportionally slower, in a way that N~area increased (Reich & Walters, 1994).

In the study of Raaimakers et al. (1995), nine tropical rainforest tree species were defined as pioneer or climax, based on regeneration strategy: *Cecropia obtusa* was classified as a pioneer species and *Eschweilera sagotiana* as a climax species. The results showed that, for tropical rainforest trees, pioneer species have higher leaf phosphorus and nitrogen content in comparison to climax species (Raaimakers, Boot, Dijkstra, & Pot, 1995).

I formulated two hypothesis in the present study. The first hypothesis is that the specific leaf area of *Cecropia* is greater than that of *Eschweilera*. The second hypothesis is that the leaf nitrogen content per leaf dry mass of *Cecropia* is higher than that of *Eschweilera*.

Methods

For the current study, I used the package BIEN (Maitner, 2022), the Botanical Information and Ecology Network, in RStudio (R Core Team, 2022). Firstly, all occurence records available in BIEN of *Cecropia* and *Eschweilera* were ploted in a map. I gathered the data of specific leaf area (SLA, i.e., leaf area per leaf dry mass) of *Cecropia* and *Eschweilera* and created a boxplot to better visualize them. The same was done for leaf nitrogen content per leaf dry mass of both genera. I performed two Welch Two Sample t-tests, one for each trait of both genera, in order to test if both have equal means.

Results and Discussion

According to the database of BIEN, *Cecropia* and *Eschweilera* are distributed in the Neotropics, but observations of *Cecropia* are more widely distributed than *Eschweilera* (for instance, there are no observations of *Eschweilera* in Argentina, Paraguay and south of Brazil in the database of BIEN) (Figure 1).

Figure 1: Occurence map of *Cecropia* and *Eschweilera*.

For both genera, I loaded all available measures of the specific leaf area (SLA) - i.e., leaf area per leaf dry mass. Figure 2 shows these observations in boxplots.

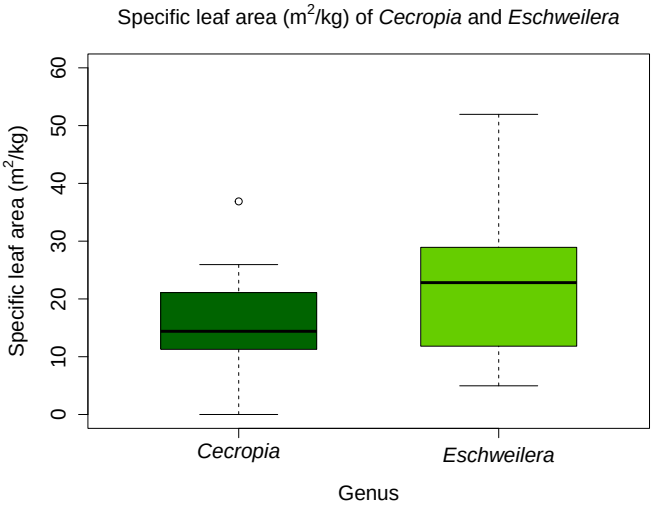

Figure 2: Specific leaf area (SLA) of *Cecropia* and *Eschweilera*.

The Welch Two Sample t-test of the specific leaf area (SLA) of *Cecropia* and *Eschweilera* resulted in: t = -5.2641, df = 78.642, p-value = 1.191e-06. The 95% confidence interval is -8.889639 to -4.011222. Since the p-value is much smaller than 0.05, it is possible to conclude that there is a statistically significant difference between the means of SLA of the two genera.

The median of SLA of *Cecropia* is 14.40105 m^2/kg, the mean is 15.51825 m^2/kg and the standard deviation is 7.191866 m^2/kg. The median of SLA of *Eschweilera* is 22.8217 m^2/kg, the mean is 21.96868

m^2/kg and the standard deviation is 9.690317 m^2/kg. Thence, the median and the mean of SLA of *Cecropia* are smaller than those of *Eschweilera*.

Therefore, the first hypothesis, that says that the specific leaf area of *Cecropia* is greater than that of *Eschweilera*, was refuted.

I also loaded all available measures of leaf nitrogen content per leaf dry mass of *Cecropia* and *Eschweilera*. These observations are shown in the boxplots of Figure 3.

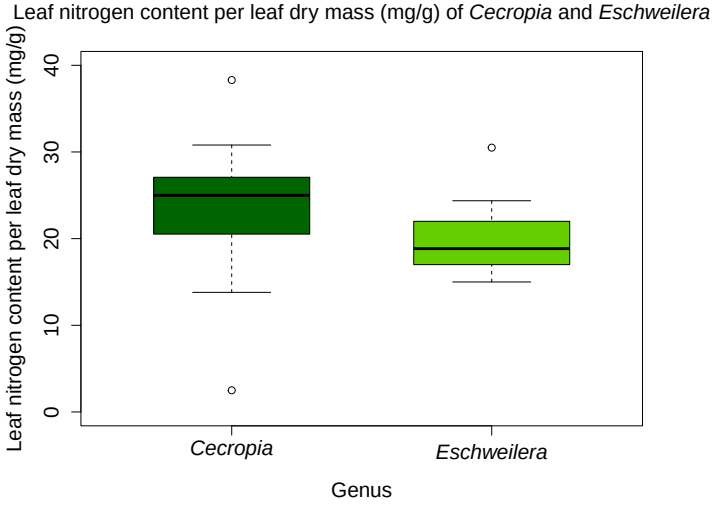

Figure 3: Leaf nitrogen content per leaf dry mass of *Cecropia* and *Eschweilera*.

The Welch Two Sample t-test of leaf nitrogen content per leaf dry mass of *Cecropia* and *Eschweilera* resulted in: t = 2.4205, df = 33.201, p-value = 0.02113. The 95% confidence interval is 0.6461239 to 7.4481962. The p-value is smaller than 0.05, so there is also a statistically significant difference between the means of leaf nitrogen content per leaf dry mass of both genera.

The median of leaf nitrogen content per leaf dry mass of *Cecropia* is 25 mg/g, the mean is 23.72648 mg/g and the standard deviation is 7.09657 mg/g. The median of leaf nitrogen content per leaf dry mass of *Eschweilera* is 18.85 mg/g, the mean is 19.67932 mg/g and the standard deviation is 3.65172 mg/g.

The results obtained corroborate the hypothesis that the leaf nitrogen content per leaf dry mass of *Cecropia* is higher than that of *Eschweilera*. It is possible that the particular morphology of *Cecropia* leaves had an impact in the results of this trait.

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