Savanna seedlings will not invest more in root growth under a future climate scenario

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1 Introduction

Seedlings are susceptible to environmental stresses and represent a bottleneck in the plant's life history[1].

Climate change is exposing seedlings to significant different conditions in a short period of time, making phenotipical responses more important to seedling recruitment success.

2 Aim

The Cerrado (Brazilian savanna) is the most biodiverse savanna, and is now threatened by agriculture expansion and climate change[2].

In this research, we aimed to evaluate responses of Cerrado's tree seedlings to a simulated future climate scenario.

3 Method

We used 4 tree species from the Cerrado: *Hymenaea stignocarpa*, *Kielmeyera coriacea*, *Qualea grandiflora*, and *Tabebuia aurea*. Seeds were germinated at 28° C and moved to pots filled with Red Latossoil and sand (3:1). After 30 days, seedlings were planted in tubes (10 cm diameter and 100 cm height) in 2 fitotrons set for different climate conditions, where they grew for 130 days before measurements.

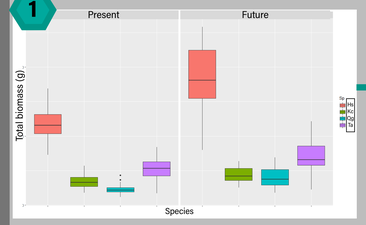
Fitotron 1 - **Present scenario**:
Based on the last 50 years data
Max/min temperature - 28 °C/17 °C
Air [CO_2]: 420 ppm

Fitotron 2 - **Future scenario**:
Based on SSP 3-7,0 (CMIP6) for the year of 2100
Max/min temperature - 30,5 °C/19,5 °C
Air [CO_2]: 860 ppm

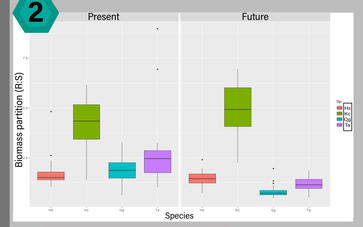
Both scenarios:
Photoperiod: 12h dark / 12h light
Watering: 140 ml each 2 days

Statistical analisis were made in R using Generalized Linear Models.

4 Results and discussion

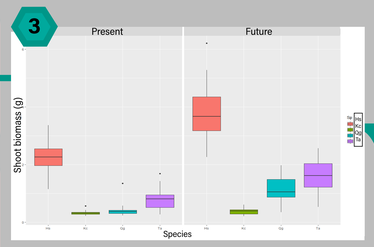


Total biomass increased in plants submitted to the simulated future climate scenario in all species studied.

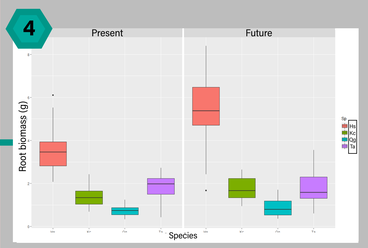


Hymenaea stignocarpa (Hs) and *Kielmeyera coriacea* (Kc) maintained their biomass partition similar when under both simulated scenarios.

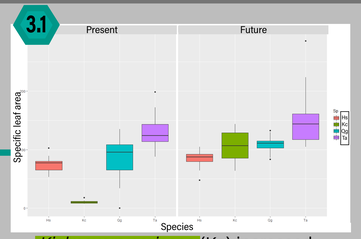
Biomass partition (R:S) has been reduced for *Qualea grandiflora* (Qg) and *Tabebuia aurea* (Ta), indicating a higher investment on shoot biomass under the simulated future climate scenario.



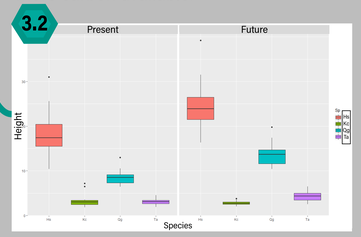
All species presented a significant increase in shoot biomass under the simulated future scenario.



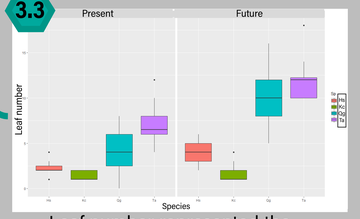
Hymenaea stignocarpa (Hs) and *Kielmeyera coriacea* (Kc) presented a significant increase in root biomass under the simulated future scenario, while *Qualea grandiflora* (Qg) and *Tabebuia aurea* (Ta) had no difference on root biomass investment when compared the two simulated scenarios.



Kielmeyera coriacea (Kc) increased specific leaf area (SLA) under the simulated future scenario. It can indicate that Kc invests more in leaf area rather than increase leaf number when there is more carbon available.



Seedling height has increased under the future scenario for the two species that didn't produce a xilopodium: *Hymenaea stignocarpa* (Hs) and *Qualea grandiflora* (Qg). This result can indicate that when carbon is not assigned to reserves, it will be used in stem growth.



Leaf number represented the principal destination of increased shoot biomass under the simulated future scenario. It was significant higher for *Hymenaea stignocarpa* (Hs), *Qualea grandiflora* (Qg) and *Tabebuia aurea* (Ta). Leaf number remained the same for *Kielmeyera coriacea* (Kc).

5 Conclusions

Seedling biomass increases under the future scenario, when there is no water limitation.

Savanna tree seedlings don't allocate more carbon in the root fraction under a future climate scenario. Some species mantain the same ratio observed under present scenario, other species present greater carbon investment in the shoot fraction, resulting in lower biomass partition (R:S).

The increment in shoot biomass can be observed on plant height and leaf number.

6 References

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2. Diniz-Filho JAF, de Oliveira Ferraz Barbosa AC, Chaves LJ, da Silva e Souza K, Dbrovolski R, Rattis L, et al. Overcomming the worst of two worlds: integrating climate change and habitat loss into spacial conservation planning of genetic diversity in the Brazilian Cerrado. Biodivers Conserv 2020; 29:1555 - 70

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