Growth and Photosynthesis Responses of Chihuahuan Desert Succulent Seedlings

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Abstract

The mechanisms that allow establishment of succulent seedlings under stressful arid conditions are poorly understood. In this study we measured photosynthetic and growth responses of seedlings of seven species under nurse plants and under direct sunlight for 105 days. Photosynthetic variables (ΦPSII, ETR) were different between species and light conditions. There were no differences for RGR. Our results show some survival mechanisms for succulent seedlings under stressful environmental conditions.

Objective

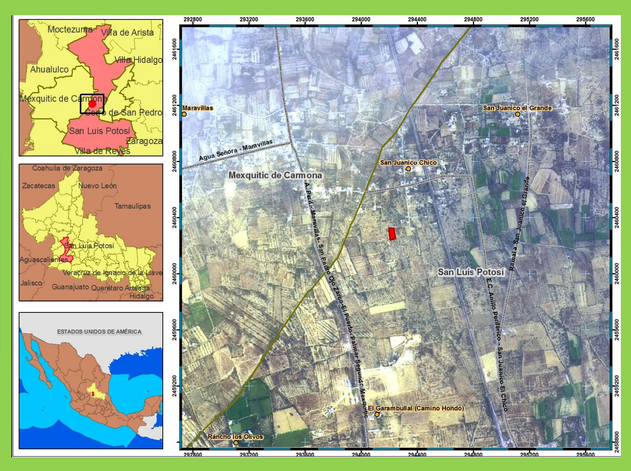
To determine ecophysiological response mechanisms (Quantum yield of photosystem II photochemistry, electron transport rate and relative growth rate) of desert succulent seedlings under shrubs and direct sunlight.

Hypotheses

Under nurse plants, succulent seedlings have a more efficient photosynthesis that when exposed to direct sunlight.
Under nurse plants, succulent seedlings grow more than when exposed to direct sunlight.

Study site

San Juanico Chico.
San Luis Potosí. S.L.P.
Mexico



Studied species

Stenocactus coptonogonus

Myrtillocactus geometrizans

Echinocactus platyacanthus

Ferocactus histrix

Agave lecheguilla

Agave salmiana

Yucca filifera

Experimental design

Factors:

1.- Species (seven levels)
2.- Light Condition (two levels)

Response variables:

1.- Quantum yield of photosystem II photochemistry (ΦPSII)
2.- Electron Transport Rate (ETR)
3.- Relative Growth Rate (RGR)

Experimental design

Germinated seedlings

Plots sun / shade

41 seedlings / plot /species

ΦPSII & ETR

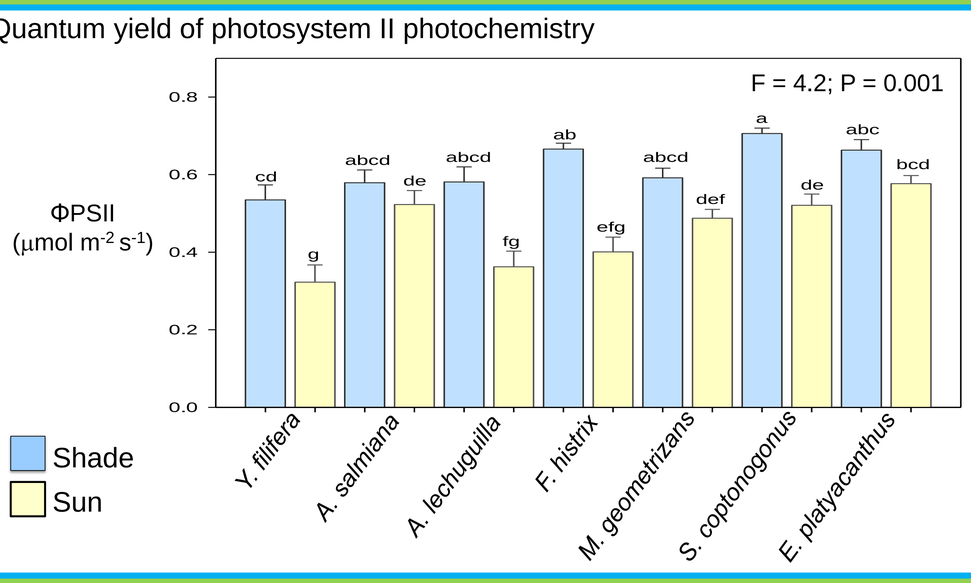
MINI PAM

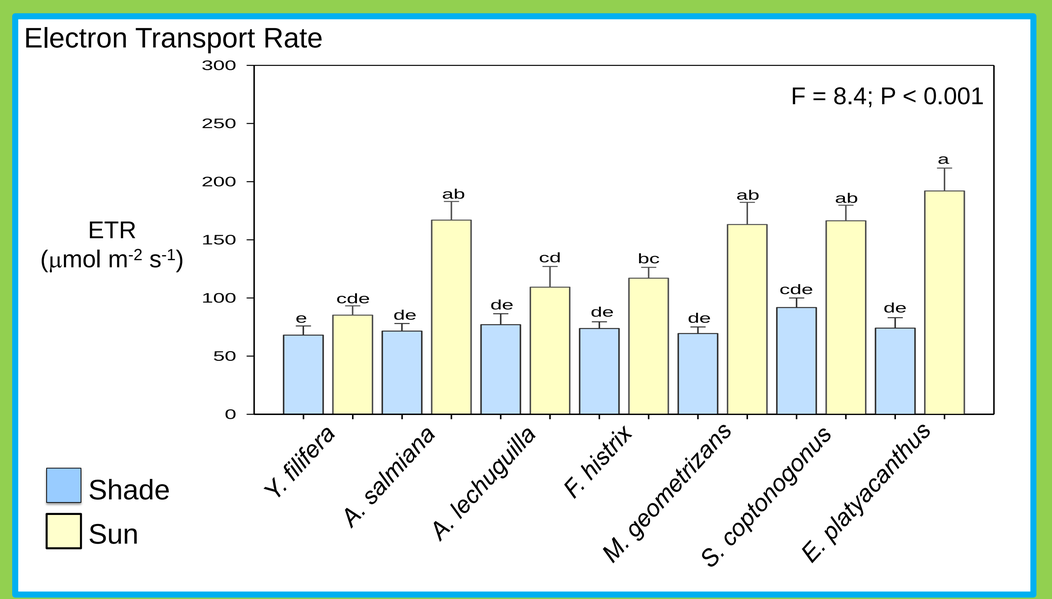
RGR

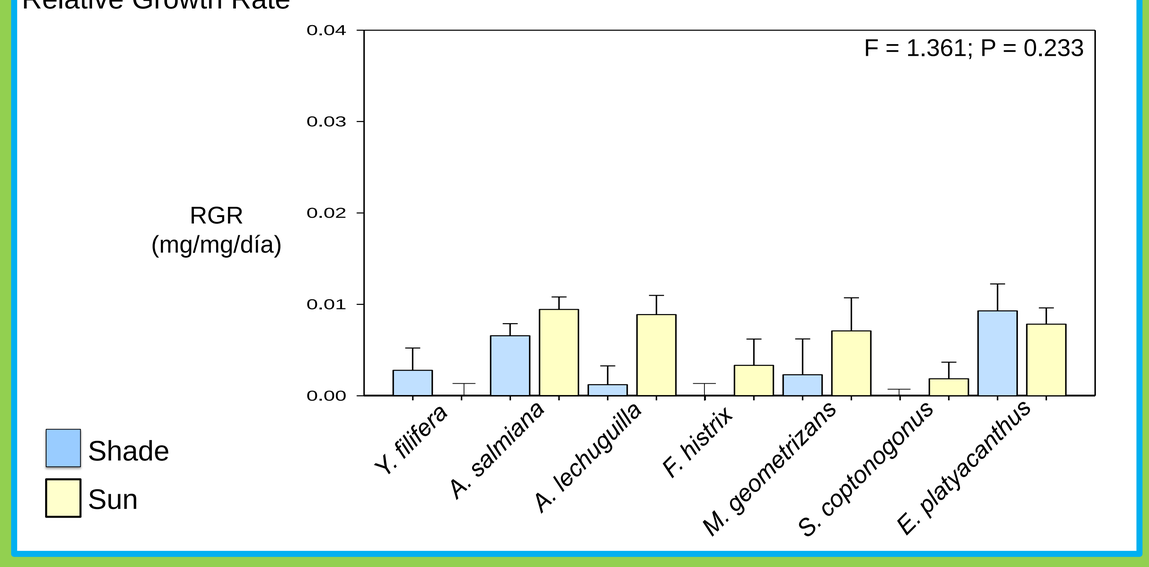
Biomass (B); Time (T)

$$RGR = \frac{(\ln B_{final} - \ln B_{initial})}{(T_{final} - T_{initial})}$$

Results







Conclusions

Seedlings had greater photosynthetic efficiency and lower ETR under shade, their RGR was similar, implying greater resource allocation to photosynthesis than growth. Further studies on the mechanisms that seedlings have to survive in different microenvironments, may help identify suitable locations for plantation programmes.