SURVIVAL AND GROWTH RESPONSES OF SEEDINGS TO WATER AND LIGHT AVAILABILITY IN FOUR SPECIES OF COASTAL SANDY PLAIN (RESTINGA) VEGETATION IN SOUTHEAST OF BRAZIL

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INTRODUÇÃO

Coastal habitats are highly heterogeneous ecosystems characterized by strong and diverse environmental stresses (high light and air-soil temperatures, low/irregular rainfall and common droughts) and by the occurrence of patchy structures in the vegetation, which results in a two-phase mosaic with shrubby/woody patches surrounded by a bare soil matrix (5). Changes in micro-climate properties of the patches, like an increase in key resources (i.e. water and shade), may be responsible for the enhancement of plant performance under canopies in comparison to open areas (1). In dry ecosystems, combined drought and shade effects may have important implications for the structure and dynamics of plant communities (4), and support, at least, two contrasting theoretical models: the facilitation and the trade-off hypotheses. The first one assumes that drought has a weaker impact in plants growing under shade when the negative effects of light limitation are compensated by its benefits for plant water status (2). If this offset does not occur, drought might have a stronger impact under shade than under sunny conditions (1). The latter explains that drought will be increasingly harmful under shadier conditions, since there is a simultaneous demand for root: shoot allocation (6).

OBJETIVOS

We examine the performance of four restinga shrub species: *Erythroxylum ovalifolium* Peyr. (Eo), *Maytenus obtusifolia* Mart. (Mo), *Garcinia brasiliensis* Mart. (Gb) and *Neomitranthes obscura* (DC.) N. Silveira (No), along an experimental light and water gradient, to evaluate the impact of combined shade and drought on seedling performance and on facilitative interactions.

MATERIAL E MÉTODOS

We have performed a factorial experiment with (a) three levels of relative photosynthetic active photon-flux density (PPFD%-R:FR), and (b) two watering regimes, well watered versus water stressed. The light levels were chosen to represent the natural gradient observed along the three microsites found in the open restinga formations: in the center (2%-0.6), on the edge (10%-0.7), and outside (80%-1.0) the patch (bare soil). Two levels of water were used to simulate the water availability observed in open areas and under the patches. Forty seedlings per light intensity were randomly distributed in the mentioned two treatments: well watered (20 seedlings) and water-stressed plants (20 seedlings). For survival analysis, seedlings were monitored weekly. The Kaplan Meier product

limit method was used to estimate the survival function, and the Cox's F-Test to search for significant differences in survival curves among light x water for each species. At zero, 60 and 120 days of the experiment we harvested samples of ten seedlings per treatment to evaluated relative growth ratios (3) in biomass (RGRb), stem collar diameter (RGRd) and height of the main stem (RGRh). Differences in RGR among treatments were tested for significance using the 95% confidence interval. All the statistical analysis was performed using STATISTICA version 8.0.

RESULTADOS

We found interspecific differences in seedling survival and growth along the light gradient and water supply. All species exhibited higher survival rates (probability of survival > 80%) in deep and moderate shade than in high light. For most of the species high light condition promoted 100% mortality after 60 days, except for No (probability of survival > 50%). In general, the impact of drought on survival was null at 2% sunlight, higher at 10%, and intermediate at 80%. At 10% light, the differences between well and water stressed were significant for all species (except for Mo); at 2% light were significant only for Mo, and at 80% light only for Eo. For most species maximum RGRb, RGRd and RGRh were achieved at the intermediate light intensity, except for RGRd in No (greater at 80% light). The species ranking for overall RGRb was: Eo>Mo>No>Gb; for RGRd: Eo>Mo>Gb>No and for RGRh: Mo>Eo>Gb>No. These rankings change substantially according to the light intensity. Under high light, No and Gb exhibited growth rates higher than Mo and Eo. Under 10 and 2% light the inverse is true. In low light the growth rates were null for Gb and negative for No, indicating lower tolerance to shade. The growth responses to drought were different among light intensities and species. In general, the impact of drought was larger on the biomass and height than in diameter. For Mo and Eo drought decreased growth rates. This effect was greater at 10% light than in 2% light. High light suppressed growth so strongly that no effect of drought could be detected for these two species. In Gb drought had a positive impact on growth rates, so RGR were consistently higher under water stressed than in well water conditions. This positive effect of drought increased along an increasing light gradient. Drought had a negative impact for No under shade, but a positive effect at high light.

DISCUSSÃO

For Eo and Mo growth responses conform to facilitation hypothesis. For these species drought had a negative impact on growth and this effect reduces along a decreasing light gradient. High light and/or water stress inhibit seedling survival and growth of both species, limiting their distribution under the shade of patches. In contrast, No exhibited shade intolerance with negative growth rate at 2% light. Drought had a negative effect on growth rate under shade, but a positive effect at high light. Probably water availability drives their distribution in the restinga. In dry conditions, No grows better at high light of open areas, whereas in wet conditions this species is benefited by shade. For Gb, drought had a positive impact on growth rates, and this effect raised along an increasing light gradient. This species grows better under high light conditions and low water supply found in open areas, constituting a possible nurse plant in the restinga environment.

CONCLUSÃO

In agreement with facilitation hypothesis the survival rates were enhanced under shade, either on well or on water stressed conditions. However, growth rates showed interspecific differences in response to combined light and water availability. These differences may explain the spatial patterns of species distribution in restinga vegetation.

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Agradecimento

(Financial support was provided by CAPES).