TREE REGENERATION AND DYNAMICS OF *MEROSTACHYS MULTIRAMEA* HACK. IN A REMNANT IN THE NORTHERN RIO GRANDE DO SUL, BRAZIL

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INTRODUCTION

Natural gaps, from the fall of one or more of the canopy trees are a mechanism for maintaining the diversity of species in tropical forests, as many tree species depends on environmental conditions found in order to establish at least one of its cycles of life.

The size of the gaps reflects on the dynamics of species and plant succession, especially in relation to new seedlings recruitment, because small gaps do not generally provide microclimatic conditions for the establishment of pioneer species, which means that late successional species usually fill the gap with the growth of lateral branches. Furthermore, if the gap is large, it is first colonized by pioneer species (Silva Jardim *et al.*, 007). These microclimatic conditions: light, temperature and relative humidity of the air and the soil is enabling a wide variety of micro - habitats within the forest and explain the different formations in an understorey.

According to Campbell & Norman (1989) the different formations of the canopy may also cause indirect consequences, such as variations in the processes of photosynthesis, transpiration and elongation of the plant cells, infection by pathogens, multiplication of insects and competition in the community of plants. Another important factor in understanding gap dynamics is the presence of opportunistic plants such as *Merostachys multiramea* Hack., a bamboo species which shows high density in the study area and can influence the local regeneration processes.

OBJECTIVES

This study aimed to compare the species richness in regeneration, the influence of bamboo and relations to environmental variables as lightness and canopy gaps, to better understand the role of discontinuity in the canopy of maintaining diversity.

MATERIAL AND METHODS

The study of canopy gaps of a forest remnant was conducted in Horto Florestal Municipal of Erechim, northern Rio Grande do Sul state. The place is located 768 m above sea level, between the coordinates 27º42' and 27º43' S latitude and 52º18' and 52º18' W longitude, showing an area of 717,970 m^2.

The region is characterized by presenting subtropical climate and classified as Cfa by Köppen, with four well defined seasons (Rampazzo, 2003). The rains are regular, reaching rainfall of 1618 $mm.yr^{-1}$. The place of study is a transition between Rain Mixed Forest and Seasonal Semideciduous Forest.

For data collection were allocated 25 sampling units of 100 m^2 each (10 x 10 m), arranged at random over the remainder, amounting to 0.25 ha of area sampled. For the installation of the sampling units were used measuring tapes (horizontal distance) and compass (alignment the contour of the sampling units).

In the center of each sampling unit a hemispheric photograph was taken with the aid of a specific lens (Fish Eye Lens - 185 ^{0}). The photographs were obtained at a height of 1.5 m above the ground on a cloudy day - to avoid the incidence of direct sunlight and considering the true north.

In each sampling unit were sampled all individuals from 0.30 m until a (01) meter in height and were divided into three height classes (class 1: $0.30 \geq 0.50$ m, class 2: 0, $50 \geq 0.80$ and class 3: $0.8 \geq 1.00$ m). The height of these seedlings was estimated using a metric tape. Individuals who were on the line of sampling units were included in when half or more of the individual was present within the sampling unit.

The plants were identified at the species level, using specialized literature and queries in herbaria. For species not identified in the field, the botanical material was collected and then compared with the exsiccates from Herbário Padre Balduino Rambo (HPBR) of the Universidade Regional Integrada do Alto Uruguai e das Missões - Campus de Erechim.

The data of lightness of each sampling were obtained using a luximeter (MLM - 1332 Digital Lux Meter) at a height of approximately 1.30 meters above the ground and quickly to prevent changes from the time of collection.

Four measurements were taken, obtaining then the average value per sampling unit. Similarly, temperature and relative humidity were obtained through a digital termohigrometer (Model THWD - 1) at a height of approximately 1.30 meters above the ground; four measures were taken by sampling unit, obtaining then the value medium.

For each sampling unit, the structural variables were obtained from adult tree component "density of individuals"and "basal area", which were later incorporated in the matrix of environmental variables to be considered as possible sources of variation on structure of the regenerative component.

The presence of bamboo (*Merostachys multiramea* Hack.) was evaluated by counting the number of individuals, number of live stems, number of dead stems and height of individuals in each sampling unit.

For the analysis of photographs was used the program GAP Light Analyzer (Frazer *et al.*, 1999) by which they obtained the percentage of canopy discontinuity of the sampling units.

To evaluate the relationship between discontinuity of canopy, light, temperature and other abiotic variables, and the diversity of regeneration and the relationship with the dynamics of *Merostachys multiramea*, was used a regression analysis and analysis made by the Spearman correlation. After the selection of significant variables (independent) by multiple regression analysis, the canopy discontinuity and lightness were identified as most predictive variables related to dependent variables.

RESULTS AND DISCUSSION

In this study were sampled a total of 1,447 individuals in regeneration, belonging to 26 families and 57 species at a density of 5,788 total estimated ind.ha $^{-1}$. The Shannon index of diversity (H') and Pielou index of equability (J') were 2.62 (nats.ind) and 0.65, respectively.

Families who had the highest species richness were Myrtaceae and Fabaceae, followed by Euphorbiaceae. These three families had 54% of individuals sampled, while the other 23 families divided the 46% of others.

The distribution of the number of individuals by height class, indicated that the majority of individuals sampled (47% of total) was concentrated on first class, with values between 0.3 and 0.5 m. Followed by class 2 (0.5 $\geq$ 0.8 m) with 37% of the total and the remaining 16%, was considered in class 3 which corresponded to individuals from 0.8 to 1.0 m in height.

Of total species sampled, about 75% have zoochory dispersal strategy, 18% anemochorous and only 7% autochoric.Characterizing the species in accordance with the application in the light necessary for germination and initial establishment, approximately 63% of species fall within the category of light dependent, representing more than half (53%) of total subjects, 30% of species are tolerant of shade, representing 45% of individuals, while only 7% of species are pioneers, representing 1% of individuals. Approximately 53% of species are part of the forest canopy, 33% of species are part of the sub - forest and only 14% are emerging.

From the data obtained in the search were done analysis of correlation and linear regression. In the analysis of correlation of discontinuity of the canopy with environmental variables, except for basal area variable, all variables showed correlation, being the most significant humidity/temperature (P <0.01, r_s = - 0.74) and discontinuity of canopy/lightness (P <0.01, r_s = 0.77) which indicates negative and positive correlations, respectively. Thus it appears that the greater is the temperature, the lower is the humidity and the greater is the discontinuity of the canopy, higher is the light input inside the forest.

In the correlation of diversity/canopy discontinuity/presence of bamboo, significant values were found for the diversity variables/canopy discontinuity (P <0.01, r_s = 0.68) and diversity/number of live stems (P <0, 01, r_s = 0.59), with both positive correlations, ie the greater the discontinuity of the canopy, the greater the diversity and the greater the number of live stems. In this case, the aspects of height and number of individuals did not show any correlation.

For the analysis of correlation between diversity and environmental variables, only the variable basal area showed no correlation, and the most significant values were found to diversity/lightness (P <0.01, r_s = 0.65) and diversity/temperature (P <0.01, r_s = 0.62), in which there are also positive correlations. Thus, one can say that the greater the lightness input, higher is the temperature and greater is the diversity.

The analysis of the data also showed that the greater the discontinuity of the canopy, the greater the number of live stems and the larger the number of dead stems, since the correlation of canopy discontinuity and number of stems, the most important values were for number of stems alive/number of dead stems (P <0.01, r_s = 0.76) and discontinuity of canopy/number of dead stems (P <0.01, r_s = 0.77), both being positive correlations. The variable number of individuals didn't present any kind of correlation.

In linear regression analysis, we found extreme importance values (R^2 = 0.46) which state that allows a variable can cause the other, ie, the variation of diversity can be considered a reflection of the discontinuity of the canopy.

CONCLUSION

So, it can be concluded that the gradient of lightness makes the distribution of tree species in regeneration is directly related to the gradient. In areas with more shade, it can find more interior forest individuals. However, in areas with higher canopy discontinuity there is a bigger recruitment of

seedlings above the other areas, presenting a greater diversity of species, mostly of pioneer species. The presence of stalks of bamboo (*Merostachys multiramea* Hack.) is also higher where the discontinuity of the canopy is more pronounced. Thus, the discontinuity of the canopy is essential to the development of seedlings.

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