



EDGE EFFECT ON THE COVER OF HERBACEOUS LAYER AT THE "ARIE DO CERRADÃO", IN THE "APA GAMA E CABEÇA DE VEADO", FEDERAL DISTRICT, BRAZIL.

J.S.Silva¹

J.M.Felfili²; M.R.A.Mendes¹

¹ University of Brasília, Institute of Biological Sciences, Department of Botany - Campus Darcy Ribeiro, 70910 - 970, Brasília -FD, Brazil. Mailbox 04457 - julissilva@unb.br ² University of Brasília, Faculty of Technology, Department of Forest Engineering - Campus Darcy Ribeiro, 70919 - 970, Brasília -FD, Brazil. Mailbox 04357

INTRODUCTION

Fragmentation of a habitat is the process that causes loss or reduction of an area into smaller and isolated pieces, increasing the quantity and the size of the edges. These, in turn, due to the pressure that suffer from wind, solar radiation and man - made, tend to favor the invasion and establishment of alien species to the detriment of those of the native biome, which receives the name of the edge effect (Primack & Rodrigues, 2001).

Although the edges of tropical forests are potentially important for the preservation of these environments and its incidence is increasing with deforestation (Williams - Linera, 1990), the data about vegetation structure of these edges are still scarce. Little is known about the dynamics of the Cerrado vegetation in the border environment as a result of fragmentation.

Studies in gallery forests of the Federal District (Felfili, 1997; Felfili & Silva Junior, 1992) showed that disturbances occurred in the area promoted the invasion of herbaceous species. Among the main responses of the Cerrado vegetation to the process of fragmentation are the increase in species richness (especially due to the increase of the number of exotic species), density of woody individuals, mortality, recruitment of plants adapted to disturbances and the decrease of seedlings survival due to the accumulation of litter (Aquino & Miranda, 2008).

OBJECTIVES

In view of the loss that the Cerrado is suffering with the fragmentation of forest and savanna areas, this study aims to evaluate the edge effect on the flora of the *cerradão* at "ARIE of Cerradão" by comparing the herbaceous layer on its interior and edge, since the *cerradão* is one of the most threatened forested physiognomy of the Cerrado due to conversion to agriculture.

MATERIAL AND METHODS

The "ARIE do Cerradão" with 54,12 ha is located under the coordinates 15°51'S - 47°49'W, inserted in the "APA Gama e Cabeça de Veado" in the Federal District. The vegetation is *cerrado denso* and dystrophic *cerradão*. The latter occupies an area of 16 ha (400 m x 400 m) on clayey Red Oxisol, with base saturation of 6% and water pH of 4,9.

To assess edge effects on the herbaceous cover, a strip of 400 m x 1m was assessed and inside environment, the most internal of *cerradão*, to 175 m away from their limits (50 m x 50 m). In both environments, 40 plots of 1 m x 1 m were randomly selected and the coverage of herbaceous layer in relation to the area of the plots was evaluated as well as the coverage of each species separately, following the Braun - Blanquet scale (Kent & Coker, 1994). The absolute frequency and relative dominance were also calculated as described in Müeller - Dombois & Ellenberg (2002). All species that occurred within the plots were classified as native or exotic/invasive, according to Mendonça *et al.*, (2008). The adult and/or fertile individuals were collected and vouchers were incorporated in the Herbarium of the University of Brasília (UB). The identification followed the system of botanical nomenclature proposed in Angiosperm Phylogeny Group II (APG II, 2003).

The Kolmogorov - Smirnov non - parametric test ($\alpha = 0,05$) was used to compare the percentages of coverage of the herbaceous layer at the edge and in the interior. The hypothesis admitted, as null (H0) was that the coverage of the herbaceous layer in the edge and within the fragment are equal and the alternative hypothesis (HA) admitted that the percentage of coverage at the edge is higher than in the interior of the *cerradão*.

RESULTS AND DISCUSSION

The Kolmogorov - Smirnov test was significant (D= 0.475;

P= 0.000133), showing that the distributions are different between the environments sampled. Inside the fragment, were ten native herbs and no exotic species were found while at the edge of the fragment there were 13 native herbs and seven exotic species.

In plots of the interior the species that predominated in frequency and dominance were *Echinolaena inflexa* (Poir.) Chase and *Rhynchospora exaltata* Kunth, both natives and commons to *cerradão*. *E. inflexa* was among the most important herbaceous species in all undisturbed *cerradões* studied by Felfili *et al.*, . (1994) and appeared in 67.5% of the plots of the interior, dominating 51.5% of the sampled area in this *cerradão*. *R. exaltata* is common in areas of *cerradão* (Mendonça *et al.*, ., 2008), been present in 80% of the plots of the interior and 25% at the edge. The values of relative dominance were 38.65% at the interior and 6.92% at the edge of the area, indicating that is a species with a preference to protected environments. At the edge of the *cerradão*, *R. exaltata* was represented by a large number of young individuals but few adults indicating a capacity to regenerate but not to establish in disturbed environments.

At the edge, the species with higher frequency was *E. Inflexa*, followed by the invasive and exotic species *Melinis minutiflora* P. Beauv. and *Urochloa brizantha* (Hochst. ex A. Rich.) Webster which were present in 37.5% of the plots each one, with cover of 29.6% and 23.1%, respectively.

The invader *M. minutiflora* occurred at the edge portion of *cerradão* closer to *cerrado denso*, where the vegetation appears to be lower and the light focuses more directly. *M. minutiflora* is not efficient in exploring large areas of soil due to the small size of their roots. But an increase in the mineralization of nutrients, caused by a fire, and of organic matter may lead to an improvement in the availability of nutrients in the soil surface, and in these sites, the invasive species are able to replace the natives (Martins *et al.*, ., 2004).

The high number of exotic species in the plots at the edge corroborates with the affirmation that the fragmentation of a site facilitates the process of invasion of these species, difficulting, or even preventing, the development of species of natural occurrence. Felfili *et al.*, . (1994) verified that the areas of *cerradão* were presented by greater numbers of invasive species in the Chapada Pratinha, demonstrating the vulnerability of phytophysiology. At the interior of the fragment studied, where the environment is shaded by the canopy of trees, the cover of herbaceous layer hardly exceeds 50%, however, half of the plots allocated at the edge showed more than 50% coverage of the herbaceous layer.

Only in the zone of the edge formed by the construction of the reservoir of the CAESB (Environmental Sanitation Company of Federal District), in 1978, the herbaceous layer is still null or low and the trees form a canopy that is responsible for total shading and consequent lack of conditions for the establishment of herbaceous species, as occurs within the fragment.

It is believed, however, that with the time, the composition and structure of this portion of the edge will changed due to the constant interference of natural factors, such as intense light and strong winds, and anthropogenic factors, such as trampling, burning, pruning and disposal of trash.

CONCLUSION

The *cerradão* suffer effect of edge, which can be diagnosed by high cover of herbaceous layer in the edge and by presence of invasives and exotics species like *Melinis minutiflora* P. Beauv. e *Urochloa brizantha* (Hochst. ex A. Rich.) Webster.

Only in the areas protected from the weather the vegetation tends to remain closer to the original, maintaining typical species of the phytophysiology that form canopy and prevent the establishment of invasive species.

To FNMA - project "Restabelecimento da Integridade Ecológica e Ecogestão nas Bacias do Paranoá e São Francisco, DF- which provided facilities for work field, to CRAD - UnB by providing the technical Manoel M. Alves, whose contribution in the survey data was crucial, and to Herbarium of University of Brasilia (UB).

REFERENCES

- APG II. 2003.** An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* 141: 399 - 436.
- Aquino, F. G., & Miranda, G. H. B. 2008.** Conseqüências ambientais da fragmentação de habitats no Cerrado. In: S. M. Sano, S. P. Almeida, & J. F. Ribeiro (Eds.). *Cerrado: Ecologia e Flora*, p. 383 - 398. v.2. Embrapa Cerrados/Embrapa Informação Tecnológica. Brasília, DF.
- Felfili, J. M. 1997.** Comparison of Dynamics of two gallery forests in Central Brazil. In: J. Imaña - Encinas, & C. Kleinn (Orgs.). *Proceedings: International Symposium on Assessment and Monitoring of Forests in Tropical Dry Regions with Special Reference to Gallery Forests*, p. 115 - 124. Universidade de Brasília. Brasília, DF.
- Felfili, J. M., & Silva Junior, M. C. 1992.** Composition, phytosociology and comparison of the cerrado and gallery forests at Fazenda Água Limpa, Federal District, Brazil. In: P. A. Furley, J. Proctor, & J. A. Ratter (Eds.). *Nature and dynamics of Forest - Savanna Boundaries*, p. 393 - 415. Chapman & Hall London.
- Felfili, J. M., Haridasan, M., Mendonça, R. C., Filgueiras, T. S., Silva Junior, M. C., & Rezende, A. V. 1994.** Projeto Biogeografia do Bioma Cerrado: Vegetação e solos. *Caderno de Geociências* 12: 75 - 166.
- Kent, M., & Coker, P. 1994.** *Vegetation description and analysis: A practical approach*. Chichester, UK. John Wiley.
- Martins, C. R., Leite, L. L., & Haridasan, M. 2004.** Capim - gordura (*Melinis minutiflora* P.Beauv.), uma gramínea exótica que compromete a recuperação de áreas degradadas em Unidades de Conservação. *Revista Árvore* 28(5): 739 - 747.
- Mendonça, R. C., Felfili, J. M., Walter, B. M. T., Silva Junior, M. C., Rezende, A. B., Filgueiras, T. S., Nogueira, P. E., & Fagg, C. W. 2008.** Flora vascular do bioma Cerrado: checklist com 12.356 espécies. In: S. M. Sano, S. P. Almeida, & J. F. Ribeiro (Eds.). *Cerrado: Ecologia e Flora*, p. 421 - 1279. v.2. Embrapa Cerrados/Embrapa Informação Tecnológica. Brasília, DF.

Müeller - Dombois, D., & Ellenberg, H. 2002. *Aims and methods of vegetation ecology*. 2^a ed. The Blackburn Press. New Jersey.

Primack, R. B., & Rodrigues, E. 2001. *Biologia da*

Conservação. Ed. Planta. Londrina, PR.

Williams - Linera, G. 1990. Vegetation structure and environmental conditions of forest edges in Panamá. *Journal of Ecology* 78(2): 356 - 373.