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ANALYSIS OF THE HORIZONTAL STRUCTURE OF THE YOUNG REGENERANT BANK IN A DEGRADED RIVERSIDE ECOSYSTEM IN THE SEMIARID OF PARAIBA

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Resumo

Análise da estrutura horizontal do banco de jovens regenerantes em ecossistema ribeirinho degradado no semiárido paraibano. Objetivou-se avaliar a estrutura do estrato jovem regenerante em uma área ribeirinha degradada de caatinga no município de Serra Branca-PB semiárido paraibano. Foram realizados dois inventários, sendo um no período seco (setembro/2019) e outro no período chuvoso (março/2020). Na área ciliar foram alocadas 50 parcelas contíguas de 10 X 20 m, e no centro de cada parcela foram plotadas subparcelas de 1 X 1 m totalizando 50 m^2 para avaliação do estrato regenerante. Foram calculados os parâmetros de densidade, frequência, dominância e valor de importância. A heterogeneidade da comunidade florística foi determinada pelo índice de diversidade de Shannon (H') e o índice de equabilidade de Pielou (J'). Nos dois inventários foram registradas 39 espécies distribuídas em 31 gêneros e 14 famílias. No período seco as espécies com maior valor de importância foram respectivamente *Alternanthera tenella* Colla, *Sida galheirensis* Ulbr. e Fabaceae 1. Relacionado ao período chuvoso as espécies com maior valor de importância foram *Urochloa decumbens* (Stapf), R.D.Webster, *Blainvillea acmella* (L.), Philipson e *Boerhavia diffusa* L. Os valores de diversidade e equabilidade foram 1,22 nats.ind.$^{-1}$ e 0,49 (período seco) e 2,59 nats.ind.$^{-1}$ e 0,71 (período chuvoso) respectivamente. Os resultados obtidos nos dois inventários foram similares a outros trabalhos nessas mesmas condições de caatinga degradada. O estudo demostrou ainda que essa área se encontra em estágio inicial de sucessão ecológica, apresentando uma predominância de espécies exóticas em ambos os inventários (seco e chuvoso).
Palavras-Chave: Vegetação ribeirinha. Regeneração natural. Rio intermitente.

Abstract

The objective was to evaluate the structure of the young regenerating stratum in a degraded riverside area of caatinga in the Serra Branca-PB, the semiarid region of Paraíba. Two inventories were performed, one in the dry season (September/2019) and the other in the rainy season (March/2020). In the riparian area, 50 contiguous plots of 10 X 20 m were allocated. In the center of each plot, subplots of 1 X 1 m were plotted, totaling 50 m^2, for the evaluation of the regenerating stratum. The density, frequency, dominance, and importance value parameters were calculated. The heterogeneity of the floristic community was determined by the Shannon diversity index (H') and Pielou's evenness index (J'). In both inventories, 39 species distributed in 31 genera and 14 families were recorded. In the dry period, the species with the highest importance value were respectively *Alternanthera tenella* Colla, *Sida galheirensis* Ulbr. and Fabaceae 1. Related to the rainy season, the species with the highest importance value were *Urochloa decumbens* (Stapf), R.D.Webster, *Blainvillea acmella* (L.), Philipson, and *Boerhavia diffusa* L. The diversity and evenness values were 1.22 nats.ind.$^{-1}$ and 0.49 (dry season) and 2.59 nats.ind.$^{-1}$ and 0.71 (rainy season), respectively. The results obtained in the two inventories were similar to other studies in these same conditions of degraded caatinga. The study also demonstrated that this area is in an initial stage of ecological succession, with a predominance of exotic species in both inventories (dry and rainy).
Keywords: Riverside vegetation. Natural regeneration. Intermittent river.

INTRODUCTION

The high rate of environmental degradation in the Brazilian semiarid tropical region, where the Caatinga Biome predominates, is directly related to inappropriate human practices and the worsening of regional soil and climate conditions (FERNANDES *et al*., 2022). However, studies aimed at establishing the succession are essential for recovery in these areas of degraded caatinga, especially in those areas that surround water bodies.

Díaz-Pascacio *et al*. (2018) in their studies observed that the richness of forest species in riverside strips is inversely related to the degree of urbanization of adjacent areas, realizing that land uses with greater forest cover guarantees a less degraded condition and greater diversity of species. According to Fonseca et al. (2017), studies involving natural regeneration can contribute to a good indication of successional processes, whose analysis can indicate the state and potential resilience of areas under restoration.

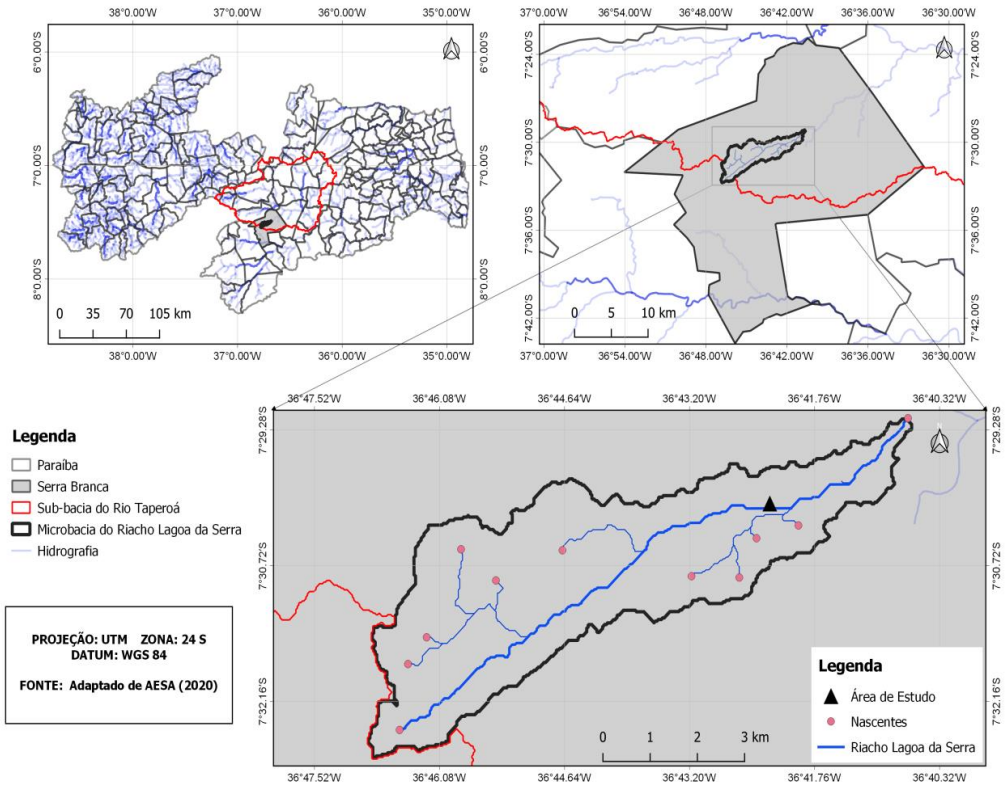
Lacerda and Barbosa (2018) reported that studies aimed at the structure of plant communities in riparian areas of the Caatinga in the Brazilian semiarid region are essential to support conservation and restoration

procedures for these natural systems important for maintaining the balance of associated water resources.

Given the above, this study aimed to evaluate the structure of the young regenerating component in a strip of degraded riparian caatinga forest in the semiarid region of Paraíba.

MATERIAL AND METHODS

The area selected for the study is located in the hydrographic basin of the Paraíba river, which has an approximate area of 20,071.83 km², comprising the sub-basin of the Taperoá river and regions of the upper, middle, and lower course of the Paraíba river (AESA, 2018). The experiment was implemented in the stretch of riparian forest in the Lagoa da Serra stream between the coordinates (7°30'04.32" S and 36°42'13.12" W; 511 m of altitude) (Figure 1).



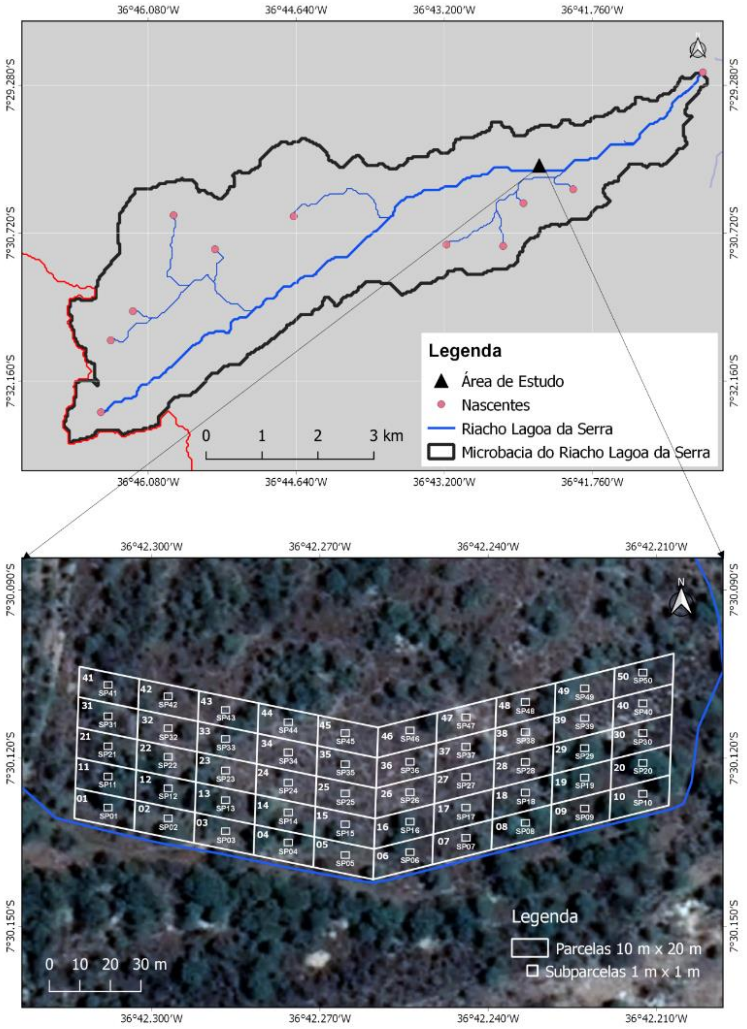
Source: Adapted from AESA (2020)

Figure 1. Location of the riparian area in the Lagoa da Serra stream in the microbasin of the Lagoa da Serra stream in the municipality of Serra Branca in the area covered by the sub-basin of the Taperoá river in the Cariri region of Paraíba.

Figura 1. Localização da área ciliar no riacho Lagoa da Serra na microbacia do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia do rio Taperoá no Cariri paraibano.

Data collection and analysis

In the stretch of riparian forest selected for the study, 50 contiguous plots of 10 X 20 m were plotted, totaling an area of 1 ha. To evaluate the phytosociological parameters of the young regenerants, a subplot measuring 1 X 1 m was arranged in the center of each plot, making a total of 50 m2 (Figure 2). Inventories were performed on September 30, 2019 (dry season) and March 30, 2020 (rainy season).



Source: Adapted from AESA (2020) - Google Earth (2020)

Figure 2. Location of subplots for analysis of young regenerants in the degraded riparian area of the Lagoa da Serra stream in the municipality of Serra Branca in the area covered by the sub-basin of the Taperoá river in the Cariri region of Paraíba.

Figura 2. Localização das subparcelas para análise dos jovens regenerantes na área ciliar degradada do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia do rio Taperoá no Cariri paraibano.

All individuals sampled in these subplots were identified with numbered platelets. Particularly about the tree and shrub component, only those with a height of less than 1.0 m and DGL (Diameter at ground level) < 0.03 m were sampled. The values of total height were measured with a graduated ruler and the diameter with a caliper, recording all the information observed in the field (Figure 05).

The identification process of the specimens occurred through consultations with specialists and comparative morphology using specialized bibliography. The APG III system (2009) was used to organize species by family, including habit information. Popular names are in line with local knowledge. For the structural analysis of the vegetation, the data collected in the field were organized in a Microsoft Excel version 2010 spreadsheet. The phytosociological parameters were calculated using the MATA NATIVA 2 program (CIENTEC, 2006). Thus, relative parameters of density, frequency, and dominance were characterized, and through these data, the value of importance and coverage were calculated (MUELLER-DOMBOIS; ELLENBERG, 1974). As for the parameters for floristic heterogeneity, the Shannon diversity index - Weaver (H') and Pielou's evenness index (J') were used using the following formulas:

$$\mathbf{RDi = (Ni/Nt) \times 100}$$

where: RDi = Relative Density of the species i, Ni = number of individuals sampled from the species i, Nt = total

number of individuals sampled from all species.

$$RFi = (AFi/SAFn) \times 100$$

where: RFi = Relative Frequency of the species i, AFi = Absolute Frequency of species i, SAFn = sum of absolute frequencies of all species.

$$RDo = (BAi/BAt) \times 100$$

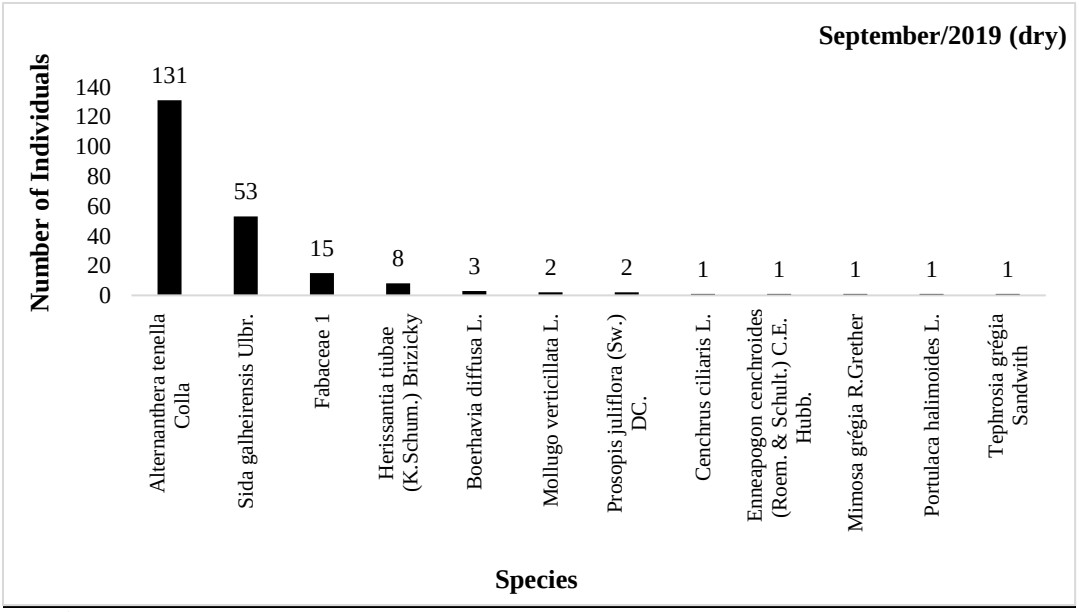
where: RDo = Relative Dominance of the species i (m2), BAi = Basal Area of species i, BAt = Sum of basal areas (m2) of all sampled species.

$$IV = RDi + RFi + RDo$$

where: IV = Importance Value of the species i, RDi = Relative Density of the species i, RFi = Relative Frequency of the species i, RDo = Relative Dominance of the species i.

RESULTS

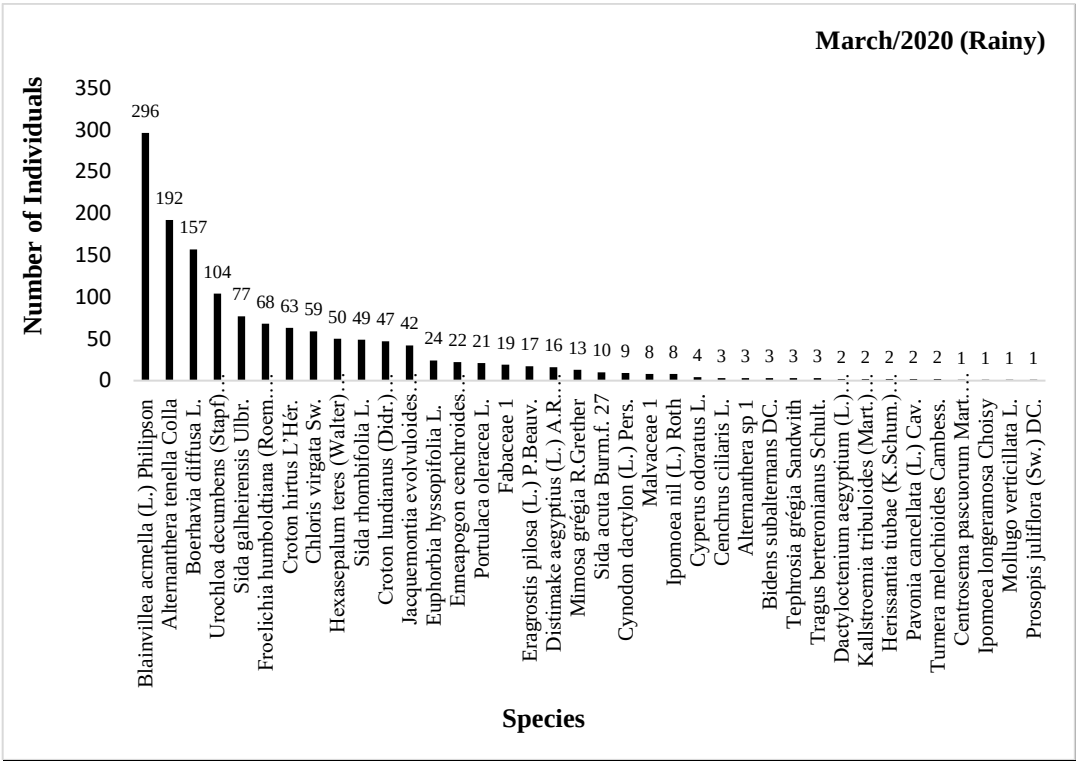
A density of 1,623 individuals was recorded in this study, of which 219 were inventoried in the dry period (September/2019) and 1,404 individuals in the rainy period (March/2020). The species with the highest number of individuals sampled in the dry period (September/2019) were: *Alternanthera tenella* Colla, *Sida galheirensis* Ulbr, Fabaceae 1, and *Herissantia tiubae* (K.Schum.) Brizicky with 131, 53, 15, and 8, respectively. These four species represented 94.52% of all individuals sampled in this period. Another eight species had from one to three individuals each, corresponding to 5.48% (Figure 3). n the survey of the rainy season (March/2020), it was observed that the species with the highest incidence in the study area were: *Blainvillea acmella* (L.) Philipson, *Alternanthera tenella* Colla, *Boerhavia difusa* L., and *Urochloa decumbens (*Stapf) R.D.Webster, with 296, 192, 157, and 104 individuals, respectively, corresponding to more than half of the total species in this period (53.35%). The remaining 34 species had from 1 to 77 individuals, corresponding to 46.65% (Figure 4).



Source: Data from the research

Figure 3. Number of individuals per species sampled in the dry season (March/2020 – monthly precipitation – 249.8mm). In the survey of young regenerants in the degraded riparian forest of the Lagoa da Serra stream in the municipality of Serra Branca in the catchment area of the Taperoá river hydrographic sub-basin in the Cariri region of Paraíba.

Figura 3. Número de indivíduos por espécies amostrados no período seco (setembro/2019 – precipitação mensal – 0,0 mm). No levantamento dos jovens regenerantes na mata ciliar degradada do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia hidrográfica do rio Taperoá no Cariri paraibano.



Source: Data from the research

Figure 4 - Number of individuals per species sampled in the rainy season (March/2020 – monthly precipitation – 249.8mm). In the survey of young regenerants in the degraded riparian forest of the Lagoa da Serra stream in the municipality of Serra Branca in the catchment area of the Taperoá river hydrographic sub-basin in the Cariri region of Paraíba.

Figura 4. Número de indivíduos por espécies amostrados no período chuvoso (março/2020 – precipitação mensal – 249,8mm). No levantamento dos jovens regenerantes na mata ciliar degradada do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia hidrográfica do rio Taperoá no Cariri paraibano.

It was observed that *Prosopis juliflora* was the only species of the young regenerating woody component of this study, presenting two individuals in the dry period and one in the rainy period. The species *A. tenella* obtained the highest values for relative density (RD), 59.82%, relative frequency (RF), 32.79%, relative dominance (RDo), 40.19%, and the highest importance value of the sampled population (IV), 44.27%. In the rainy season, this species reached the second highest value for relative density (RD) among the 38 species, with 13.67%.

Another species that also stood out in the parameters sampled in the dry period was *S. galheirensis*, which obtained the second highest values for relative density (RD) of 24.20% and relative frequency (FR) of 27.87%. Regarding the relative dominance values (RDo) and importance value (IV), the species *S. galheirensis* presented 46.95% and 33.00%, respectively. However, in the rainy season, it obtained the fifth-highest relative density (RD) value of 5.14% (Table 1).

The species Fabacea 1 came next with the third highest value for relative density, relative frequency, relative dominance, and importance value with the following values: 6.85%, 16.39%, 9.64%, and 10.96%, respectively. As for the relative density value in the rainy season, it was observed that the species had the sixteenth highest value, with 1.35%. As for the relative dominance values (RDo) and importance value (IV), species *U. decumbens* appeared only in the rainy season. However, it presented the highest values in the studied area, with 28.95% and 14.25%, respectively. The species B. acmella, B. diffusa, S. galheirensis, and U. decumbens, together, obtained more than half of the relative dominance (RD) in the rainy season with (52.14%).

Table 1. Phytosociological parameters of the regenerant stratum in alphabetical order in the dry period (September/2019 – monthly precipitation – 0.0 mm) and rainy period (March 2020 – monthly precipitation – 249.8 mm) in the degraded riparian forest of the Lagoa da Serra stream in the municipality of Serra Branca in the coverage area of the Taperoá river sub-basin in the Cariri region of Paraíba. RD: Relative Density, RF: Relative Frequency, RDo: Relative Dominance, IV: Importance Value.

Tabela 1. Parâmetros fitossociológicos do estrato regenerante em ordem alfabética no período seco (setembro/2019 – precipitação mensal – 0,0 mm) e no período chuvoso (março de 2020 - precipitação mensal – 249,8 mm) na mata ciliar degradada do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia hidrográfica do rio Taperoá no Cariri paraibano. RD: Densidade Relativa, RF: Frequência Relativa, RDo: Dominância Relativa, IV: Valor de Importância.

SPECIES	September/2019 (dry period)				March/2020 (rainy period)			
	RD(%)	RF(%)	RDo(%)	VI (%)	RD (%)	RF(%)	RDo(%)	VI(%)
Alternanthera tenella Colla	59.816	32.788	40.192	44.265	13.676	5.277	5.787	8.248
Alternanthera sp 1	--	--	--	--	0.214	0.833	0.044	0.364
Bidens subalternans DC.	--	--	--	--	0.214	0.833	0.017	0.355
Blainvillea acmella (L.)Philipson	--	--	--	--	21.084	9.166	11.527	13.927
Boerhavia diffusa L.	1.370	3.280	0.239	1.630	11.183	11.943	7.568	10.231
Cenchrus ciliaris L.	0.457	1.639	0.987	1.028	0.214	0.833	2.158	1.068
Centrosema pascuorum Mart. Ex Benth.	--	--	--	--	0.071	0.278	0.002	0.117
Chloris virgata Sw.	--	--	--	--	4.202	5.000	7.389	5.530
Croton hirtus L'Hér.	--	--	--	--	4.487	6.389	1.211	4.029
Croton lundianus (Didr.) Müll.Arg.	--	--	--	--	3.348	3.056	0.977	2.460
Cynodon dactylon (L.) Pers.	--	--	--	--	0.641	1.667	0.969	1.092
Cyperus odoratus L.	--	--	--	--	0.285	0.833	0.335	0.484
Dactyloctenium aegyptium (L.) Willd.	--	--	--	--	0.142	0.556	0.248	0.315
Distimake aegyptius (L.) A.R. Simões & Staples	--	--	--	--	1.140	3.056	0.572	1.589
Enneapogon cenchroides (Roem. & Schult.) C.E. Hubb	0.457	1.639	0.202	0.766	1.567	2.500	4.899	2.989
Eragrostis pilosa (L.) P.Beauv.	--	--	--	--	1.211	2.222	1.031	1.488
Euphorbia hyssopifolia L.	--	--	--	--	1.709	2.778	0.879	1.789
Froelichia humboldtiana (Roem. & Schult.) Seub.	--	--	--	--	4.843	0.833	14.687	6.788
Fabaceae 1	6.849	16.393	9.642	10.961	1.353	4.444	0.433	2.077
Herissantia tiubae (K.Schum.) Brizicky	3.653	8.197	1.403	4.418	0.142	0.556	0.014	0.237
Hexasepalum teres (Walter) J.H.Kirkbr.	--	--	--	--	3.561	5.00	2.317	3.626
Ipomoea longeramosa Choisy	--	--	--	--	0.071	0.278	0.171	0.173
Ipomoea nil (L.) Roth	--	--	--	--	0.57	0.833	0.145	0.516
Jacquemontia evolvuloides (Moric.) Meisn.	--	--	--	--	2.991	3.611	1.052	2.551
Kallstroemia tribuloides (Mart.) Steud.	--	--	--	--	0.142	0.556	0.011	0.236
Malvaceae 1	--	--	--	--	0.570	1.111	0.720	0.800
Mimosa gregia R.Grether	0.457	1.639	0.016	0.704	0.926	2.500	0.112	1.179
Mollugo verticillata L.	0.913	1.639	0.056	0.869	0.071	0.278	0.002	0.117
Pavonia cancellata (L.) Cav.	--	--	--	--	0.142	0.556	0.022	0.24
Portulaca halimoides L.	0.457	1.639	0.072	0.723	--	--	--	--
Portulaca oleracea L.	--	--	--	--	1.496	2.778	0.172	1.482
Prosopis juliflora (Sw.) DC.	0.913	1.639	0.088	0.880	0.071	0.278	0.003	0.117
Sida acuta Burm.f.	--	--	--	--	0.712	1.389	0.580	0.894
Sida galheirensis Ulbr	24.201	27.869	46.948	33.006	5.484	5.833	4.093	5.137
Sida rhombifolia L.	--	--	--	--	3.49	4.167	0.725	2.794
Tephrosia gregia Sandwith	0.457	1.639	0.155	0.750	0.214	0.556	0.034	0.268
Tragus berteronianus Schult.	--	--	--	--	0.214	0.278	0.130	0.207
Turnera melochioides Cambess.	--	--	--	--	0.142	0.556	0.013	0.237
Urochloa decumbens (Stapf) R.D.Webster.	--	--	--	--	7.407	6.389	28.951	14.249

Source: Data of the research (2020).

It is observed in (Table 2) that the Shannon-Weaver (H') diversity indexes reached 1.22 nats.ind.-1 in the first survey carried out in the dry period and 2.59 nats.ind.-1 in the second inventory comprising the rainy season. In this same table, Pielou's evenness indexes (J') in the dry period inventory obtained a value of 0.49 and 0.71 in the rainy period.

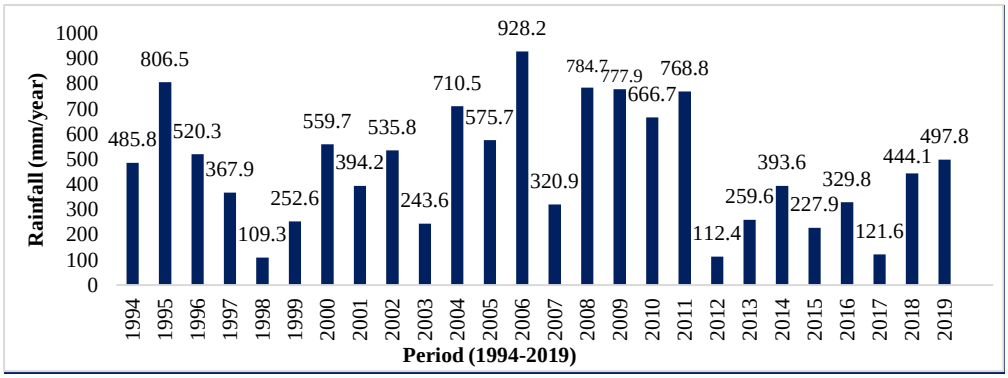
Table 2. Diversity of the regenerant stratum in the dry period (September/2019 – monthly precipitation – 0.0 mm) and rainy period (March 2020 – monthly precipitation – 249.8 mm) in the degraded riparian forest of the Lagoa da Serra stream in the municipality of Serra Branca in the coverage area of the Taperoá river sub-basin in the Cariri region of Paraíba. NI: number of individuals, S: number of species, (H'): Shannon diversity index, (J'): Pielou's evenness index.

Tabela 2. Diversidade do estrato regenerante no período seco (setembro/2019 – precipitação mensal – 0,0 mm) e no período chuvoso (março de 2020 - precipitação mensal – 249,8 mm) na mata ciliar degradada do riacho Lagoa da Serra no município de Serra Branca em área de abrangência da sub-bacia hidrográfica do rio Taperoá no Cariri paraibano. NI: número de indivíduos, S: Número de espécies, (H'): índice de diversidade de Shannon, (J'): índice de equabilidade de Pielou.

Period	NI	S	H'	J'
Dry (September/2019)	219	12	1,22	0,49
Rainy (March/2020)	404	38	2,59	0,71

Source: Data of the research (2020).

Rainfall data from the region where the study was conducted, based on information from the official rainfall station in the municipality of Serra Branca located at coordinates S 7º28'55.60" and W 36º39'35,62" (Figure 5).

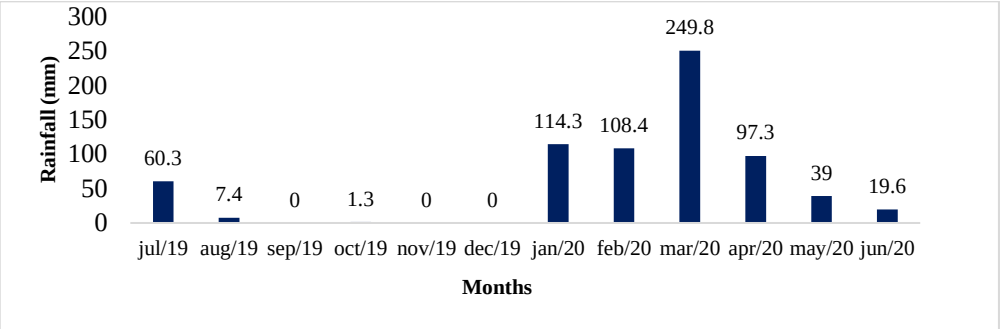


Source: Adapted from SUDENE (1990); AESA (2020)

Figure 5. Rainfall data from the Serra Branca rainfall station (geographical coordinates - Latitude: 7°28'55.60"; Longitude: 36°39'35.62").

Figura 5. Dados de precipitação na estação pluviométrica de Serra Branca (coordenadas geográficas - Latitude: 7°28'55.60"; Longitude: 36°39'35.62").

Figure 6 shows the rainfall data recorded during the 1-year study period in the riverside area of the Lagoa da Serra stream from July/2019 to June/2020.



Source: Adapted from SUDENE (1990); AESA (2020)

Figure 6. Rainfall data recorded during the study period (July/2019 to June/2020) by the rainfall station located near the Taperoá river sub-basin in the Municipality of Serra Branca-PB, Western Cariri in Paraíba.

Figura 6. Dados pluviométricos registrados no período do estudo (julho/2019 a junho/2020) pelo posto pluviométrico localizado nas proximidades da sub- bacia do rio Taperoá no Município de Serra Branca-PB, Cariri Ocidental paraibano.

DISCUSSION

The low incidence of woody individuals, especially of the *P. juliflora* species, may be related to the fact that the adult plants close to the studied area suffered years ago clear-cutting for the sale of firewood, which delayed the growth of sprouts and consequently made the production and dispersion of seeds unfeasible. Observing the results obtained in the inventories of the dry and rainy periods, the species *A. tenella* was the one that stood out the most among the research parameters; such data may be related to the fact that these individuals in the environment present a very high rate of seed production and dispersion as a survival strategy in semiarid environments as highlighted by (ALVES *et al*., 2017).

In their study, Costa and Herrera (2016) observed that *S. galheirensis* and four other species of the Malvaceae family (*Herissantia crispa* (L.) Brizicky, *H. tiubae*, *Sida cordifolia* L. and *Melochia tomentosa* L.) as being well adapted to colonize degraded areas in the caatinga. The data observed for Fabaceae 1, as it is a species belonging to one of the most varied families in the phytogeographic domain of the Caatinga, has a richness and diversity often related to efficiency in association with nitrogen-fixing bacteria and morphological, physiological, and agroecological adaptations to inhabit both temperate and tropical climates (LPWG, 2017).

The results obtained for the species *U. decumbens*, in particular, can be explained by the form of growth of the individuals of the taxon since, in the Poaceae family, the species are present in clumps or rhizomatous and stoloniferous individuals, which have larger coverage area and scattering. In this sense, the species of the Poaceae family may have benefited from the presence of open areas arising from the anthropization of the fragment with a predominance of exotic species, which are ideal environments for their development (CAMPOS; JARDIM, 2020).

Analyzing the values obtained for the exotics *B. acmella, B. difusa* L, *S. galheirensis*, and *U. decumbens* demonstrate that they are species that adapt quickly in open degraded areas, especially in periods of higher rainfall, allowing in a short period an explosion in their densities and the values of coverage and importance in these areas, a fact observed by Santos et al. (2013), where they report that it is at the beginning of the rains in the caatinga that seed germination and maximum recruitment of new individuals increase.

In the dry period, however, there is a sharp drop in the recruitment of new individuals compared to the rainy period within natural regeneration. For Mutti *et al*. (2019), the variations of the dry period can be correlated to the effects of seasonality, where the high values of air temperature, radiation, and the water deficit in this region, can put a plant population of the caatinga in a situation of stress.

The data obtained in the survey for diversity were higher in other studies in Paraíba in areas of degraded caatinga, where higher rates were found in the region of Cariri with 1.43 nats. ind.$^{-1}$ (ANDRADE et al., 2005), and in the hinterland, 1.92 nats.ind.$^{-1}$ (SABINO; CUNHA; SANTANA, 2016). Pielou's evenness index (J') ranges from 0 to 1, where 0 is the minimum, and 1 is the maximum evenness between samples. Thus, the values obtained in the two surveys (J' = 0.49 and 0.71) suggest that the diversity found in the first case (dry) is in low uniformity in the proportions of the number of individuals/number of species within the plant community. Particularly the second (rainy) survey can be considered with high uniformity. Such values were close to those found by Dias et al. (2018), who obtained (J') = 0.62 in an anthropized area in Petrolina-PE.

Analyzing the graph (Figure 5) of the rainfall series recorded over 26 years, it was observed that in just 11 years, above-average rainfall was detected for this region. It was also found that the average annual rainfall for Serra Branca between 1994 and 2019 was only 487.24 mm. This may be closely related to the slowness of natural regeneration in this studied area associated with the other uses and occupations of the soil in that interval.

According to Aquino et al. (2021), the fact that severe drought phenomena occur regularly in this semiarid region aggravates the impacts on the dynamics of regeneration on the forest cover in caatinga fragments, making this process slower.

Still observing the data referring to the two periods that occurred in the inventories of information (dry/rainy) present in Figure 6, we observe two very different periods, with the beginning of the dry period starting in August and ending in December, and the other in the rainy season from January to July of this year. Other studies corroborate these data; Andrade et al. (2020) report that the rainy season in this semiarid region is concentrated in the first four months, rarely exceeding the month of May, with the other months concentrating on average only 15% of the total annual precipitation. These data can be seen in Figure 6, where the dry period runs from August to December, and the rainy period is well highlighted from January 2020.

Relating the information from the rainfall data with the variability occurring in the floristic surveys regarding the number of species and individuals, Andrade-Lima (1981) stated that the caatingas located in places where precipitation is more accentuated have a greater number of species. Farias et al. (2016) agree that depending on all these attributes, water availability is the main factor affecting plant communities in areas subject to strong seasonality.

Some studies have shown that the lower the annual rainfall in an area, the greater the proportion of species in the herbaceous component concerning the woody component (COSTA *et al*., 2016). For Ferreira et al. (2014),

the perpetuation of herbaceous species is guaranteed by the seeds that accumulate in the soil managing to germinate and complete their cycle, even with the reduction in the water content in the soil. Different from arboreal and shrubby species, although with seed germination, the humidity in the soil is often not enough to establish the seedlings, leading them to death.

CONCLUSIONS

- In the dry season, there was a lower species richness and number of individuals compared to the rainy season.
- In the dry period inventory, the species with the highest importance value (IV) were, respectively, *A. tenella*, *S. galheirensis*, and Fabaceae 1.
- Related to the rainy season, the species with the highest importance value (IV) were *U. decumbens*, *B. Acmella*, and *B. diffusa*. A low value in the diversity (H') and evenness (J') indices was registered in the dry period compared to the rainy period.
- The structural and floristic parameters for young regeneration demonstrate that the riverside area is in an initial stage of ecological succession.

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