

Synchronism of Production and Degradation of Litter in Fragment of Dry Tropical Forest in Paraiba, Brazil

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Abstract

The litter is an important way of returning the organic matter to the soil, through the cycling of the nutrients, aiding in the development of the vegetation present in the ecosystems. The study aimed to estimate the spatio-temporal variation of deposition, accumulation and decomposition of the litter present in the preserved caatinga vegetation, located in the RPPN Fazenda Tamanduá in Santa Terezinha-PB, Brazil and the interference of climatic variables in the dynamics of these events. The research was conducted at RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil. The deposition of litter on 20 collectors of 1.0 m × 1.0 m was collected monthly in two periods: period I (August/2015 to July/2016) and period II (August/2016 to July/2017), the collected material was separated into leaves, branches + barks, reproductive and miscellaneous fractions. To estimate the rate of decomposition the litter accumulated on the forest floor was quantified using a 0.5 m × 0.5 m metal frame. The deposition of the total litter in periods I and II was 2,356.83 kg ha⁻¹ and 1,163.67 kg ha⁻¹, respectively. The leaf fraction was the one that contributed the most during the two collection periods. The analysis of the data allowed to conclude that the total litter deposition in the two periods is in line with the average production for the Caatinga. The increase in precipitation provided higher deposition of litter after the rainy season. Due to several factors, the decomposition of litter in the caatinga is slower than in other biomes.

Keywords: litter contribution, nutrient cycling, climatic variables

1. Introduction

The return of organic matter to the soil and the cycling of nutrients in Tropical Rainforests are especially due to the deposition of the biomass of the aerial part, being the leaves fraction the main base for the development of the chain of decomposers and the main reservoir of nutrients for the soil.

The greatest fall of the leaves, in ecosystems, is regulated by the smaller supply of water for the vegetation. When the rainfall index is lower, vegetation once exposed to prolonged dry periods, because it needs a resource that becomes scarce, ends up allowing leaf abscission, thus representing a strategy to minimize the lower availability of water, since with fewer leaves the need for water for vegetation ends up being smaller (Barbosa & Faria, 2006). In seasonally Tropical Rainforests such as the Caatinga, this mechanism is accentuated by the deciduous species, which is an inherent characteristic of most species in the semiarid region of northeastern Brazil.

Studies on the dynamics of nutrient cycling have been widely carried out in several forest formations, the litter is an important nutrient source for the maintenance of tree production (Rosa et al., 2015).

According to Cunha Neto et al. (2013), the trees play an important role on the systems where they are inserted. Throughout the growth and development, the arboreal vegetation adds organic matter to the soil via deposition of litter and renewal of the root system, exerting influence on the physical attributes of the soil such as the density, porosity, aeration, water infiltration and retention capacity, as well as the formation and stabilization of aggregates. The tree component also influences the cycling of nutrients and consequently the ground fertility, besides promoting a microclimate that favors the development of several organisms.

The nutrient input pattern via litter in the environment may be related to the distribution of the litter supply, because the higher the monthly contribution, the greater the chances of a greater nutrient input via litter to the soil (Giácomo et al., 2012).

The nutrient cycling efficiency, portrayed by leaf litter decomposition in a more accelerated way, may imply a rapid release of nutrients to the soil and subsequent absorption by the vegetation. This fact is of paramount importance in areas of low fertility soils (Cunha Neto et al., 2013).

Therefore, the present study aimed to estimate the spatio-temporal variation of deposition, accumulation and decomposition of the litter present in the preserved caatinga vegetation, located in the RPPN Fazenda Tamanduá in Santa Terezinha-PB, Brazil and the interference of climatic variables in the dynamics of these events.

2. Method

2.1 Description of the Area

The study was conducted at the Natural Patrimony Private Reserve (RPPN), belonging to Fazenda Tamanduá, located in the municipality of Santa Terezinha-Paraíba, Brazil, between the geographical coordinates of 7°00'00" S and 37°23'00" W, 18 km from the town of Patos (Figure 1).

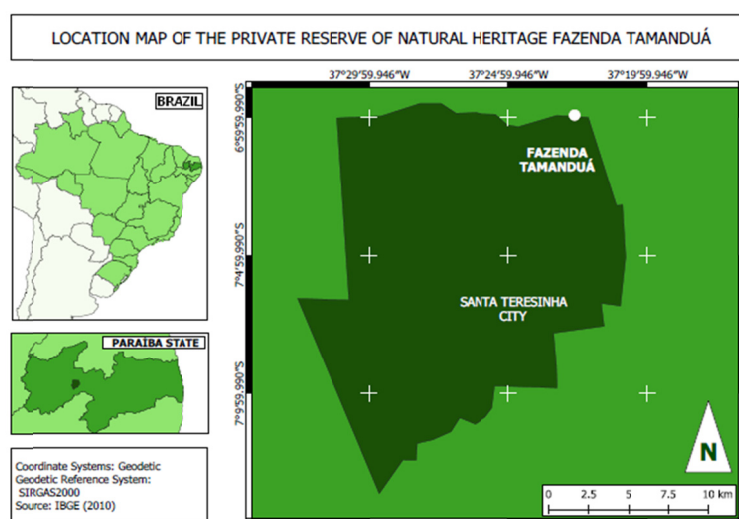


Figure 1. Map of Brazil, Paraíba and location of the municipality of Santa Terezinha where the RPPN Fazenda Tamanduá

The municipality is inserted in the Sertão Paraibano mesoregion, with an average altitude of 300 meters. The climate of the region, according to the classification of Köppen (Ávares et al., 2014) is of the type BSh, semi-arid, marked by a dry season and a rainy season. The average annual rainfall is around 600 mm. The dry season usually starts in May and lasts until January (Brazil, 1978).

The RPPN has an area of 325 hectares that has not been explored for more than 40 years, being vegetation of the area characterized by Araújo (2000), as a closed shrub-tree caatinga. The predominant soils in the municipality are Neossolos Litólicos (Embrapa, 2013), with outcrops of rocks and topography with strong undulations, presenting serrotes.

2.2 Climatic Variables and Water Content in the Soil

The data on climatic variables (temperature, relative humidity, insolation and wind speed) were obtained from the INMET website (<http://www.inmet.gov.br>). However, the precipitation data were obtained from the meteorological minestation installed at Fazenda Tamanduá. The data obtained were tabulated in Excel spreadsheets for later correlation with the other variables.

The soil water content was estimated monthly in each transect, and three soil samples were collected at depths of 0-20.0 cm. The soil samples were conditioned in aluminum cans of known weight and taken to the Laboratory of Mineral Nutrition of Plants/UAEF/UFCG, at Campus de Patos-PB, where they were weighed and placed in a

greenhouse at 105 °C for 24 hours. Posteriorly, they were placed in desiccator until cooling and then weighed. Soil water content was determined according to Tedesco et al. (1995).

2.3 Litter Supply

In the evaluation of litter deposition, the methodology described by Souto (2006) was used, where 20 collectors were used, with dimensions of 1.0 m × 1.0 m, made of iron bars and mesh nylon screen with 1.0 mm × 1.0 mm at 10.0 cm above the soil surface, which will condition the forming material of the litter without allowing the accumulation of water, thus avoiding the beginning of the process of decomposition of the material in the period between the collections, as well as to prevent the entrance of material from the surface of the soil into the collector and the exit of this by the action of the wind.

The collectors were randomly installed in seven transects in the year 2003, being distributed from the 50 m meters of the road, to avoid the border effect and, equidistant about 30 m. The material intercepted by the collectors in each research area was collected monthly during the period from August/2015 to July/2017, being packed in plastic bags properly identified and sent to the Laboratory of Mineral Nutrition of Plants/UAEF/UFCG to be separated in fractions: leaves, twigs + barks, reproductive structures (flowers + fruits + seeds) and miscellaneous (material < 2.0 mm in diameter, difficult to identify, and faeces). After the separation, the fractions were packed in paper bags and numbered according to the number of the collectors, being carried to the greenhouse at 65 °C until reaching a constant mass. The weight of each fraction was determined separately, on a precision balance.

After obtaining the data, the monthly average of each fraction and the total litter (sum of the fractions) were calculated over the year, to detect the possible differences between the months (seasonality of production).

2.4 Estimates of Accumulated Litter Stock on the Forest Floor

The litter accumulated at the soil surface was estimated in monthly collections, from August/2015 to July/2017, using a metal frame with dimensions of 0.5 m × 0.5 m, cast randomly, this procedure being repeated three times in each transect.

The collections included the dry period and the rainy season, thus detecting possible seasonal variations in these compartments (Figure 2). All litter contained in the frame was collected, packed in properly identified plastic bags and sent to the Laboratory of Mineral Nutrition of Plants/UAEF/UFCG to be cleaned, removing stones or soil adhered to the material and, later, packed in properly labeled paper bags, placed in an greenhouse at 65 °C for drying until constant weight, and finally weighed in a precision balance.

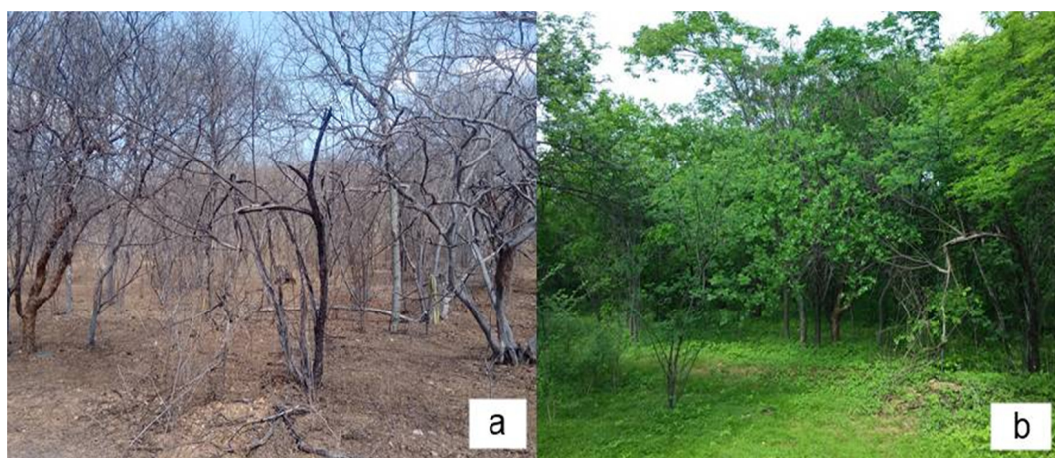


Figure 2. Vegetation during the dry period (a) and rainy season (b) at the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil

2.5 Estimation of Decomposition and Mean Time Renewal of Litter

The rate of decomposition of the litter was estimated using the equation proposed by Olson (1963), and used in similar studies (Vital, 2002; Santana, 2005; Souto, 2006). The K value or rate of instantaneous decomposition is the reason of litter mass produced/accumulated litter mass (Anderson & Ingram, 1989).

From the K value, the average renewal time estimated by $1/K$ and the time required for decomposition of 50% ($t_{0.5}$) and 95% ($t_{0.05}$) of the litter, estimated by the equation of Shanks and Olson (1961).

2.6 Statistical Analysis

Aiming to reduce the coefficient of variation between the weights of the fractions deposited in the 20 collectors installed, at the end of the experiment, the values were added to each four collectors, after which the average was calculated, resulting in five monthly repetitions. The experimental design used to analyze litter deposition was in causalized blocks, with treatments in a 24×2 factorial arrangement (months \times periods), with five replications.

3. Results

3.1 Climate Variables

The climatic data were measured during the experimental period, allowing to identify the possible influences of the climatic variables in the litter deposition process, being available in Table 1.

Table 1. Climate variables recorded and monthly litter production at RPPN Fazenda Tamanduá, Santa Terezinha-PB, Brazil, during period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

<i>Period I</i>					
Variables (Months/Year)	Rainfall (mm)	Temperature (°C)	Wind speed (m s ⁻¹)	Relative humidity (%)	Insolation (h)
Aug/15	0.0	27.12	5.29	49.77	310.6
Sep/15	0.0	28.21	5.41	49.83	303.5
Oct/15	0.0	28.61	4.63	45.18	317.0
Nov/15	0.0	29.42	4.63	43.51	333.6
Dec/15	6.20	28.93	4.59	49.28	286.1
Jan/16	193.3	27.37	4.40	64.94	197.0
Feb/16	73.6	27.79	4.23	61.23	246.8
Mar/16	127.6	28.70	4.30	61.09	267.3
Apr/16	55.1	27.83	4.34	66.92	264.3
May/16	49.1	29.07	4.26	58.17	252.3
Jun/16	8.2	25.00	4.07	56.87	219.9
Jul/16	0.0	29.02	4.37	48.03	292.5
Total	513.1				
<i>Period II</i>					
Variables (Months/Year)	Rainfall (mm)	Temperature (°C)	Wind speed (m s ⁻¹)	Relative humidity (%)	Insolation (h)
Aug/16	0.0	27.72	4.36	48.38	316.1
Sep/16	0.0	28.59	4.45	49.59	315.5
Oct/16	0.0	29.27	4.40	45.15	306.8
Nov/16	0.0	29.62	4.37	43.81	312.5
Dec/16	0.0	29.69	4.35	46.93	255.6
Jan/17	5.6	29.66	4.33	48.43	271.5
Feb/17	195.5	28.47	4.32	59.38	243.6
Mar/17	205.6	27.78	4.29	66.87	249.0
Apr/17	130.0	27.68	4.33	65.98	262.5
May/17	15.0	28.38	4.13	59.03	232.6
Jun/17	11.6	25.83	4.19	63.25	197.8
Jul/17	20.0	26.26	4.29	57.24	175.9
Total	583.3				

The total rainfall during the two study periods was 1,096.4 mm, period II contributed 583.3 mm, with the highlight being the month of March/2017, which recorded the highest rainfall. In period I, total precipitation was 513.1 mm, with the largest contribution in January/2016 with 193.3 mm (Table 1). It is possible to notice that the distribution of rainfall during the experimental period was irregular and that the rainy season was concentrated in the months of January to June of both years; from this period a drastic decrease in rainfall rates occurred.

In relation to temperature (Table 1), in period I the month that registered the highest temperature was November/2015 and lower in June/2016, with 29.42 °C and 25.00 °C, respectively. In period II, the month of December/2016 registered a higher temperature with 29.69 °C, and a lower temperature registered in June/2017, with 25.83 °C.

The highest recorded values of wind speed (Table 1), during the two experimental periods were in the months of August to December, in the remaining months it is possible to observe that the speed of the winds remains practically constant. In the period when the velocity of the winds was higher corresponding to the same one in that the plants have a smaller amount of leaves, providing greater fall of the branches and barks.

The relative humidity of the air (Table 1), in the period I and period II, the months of October and November presented the lowest values. For the same months, the highest heat stroke values were recorded. These results show that these two variables are directly linked.

The water content in soil showed no statistical difference between the average in both experimental periods (Table 2). In period I, the highest recorded soil water content was in the month of March/2016 and the lowest in the month of November/2015, with 13.40% and 0.67%, respectively. In period II, the month of February/2017 registered higher value with 12.68% and the month of November/2016 the lowest value with 0.62%.

Table 2. Average soil water content in the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil during period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

Period I		Period II	
Month	Soil water content (%)	Month	Soil water content (%)
Aug/15	0.69 d	Aug/16	0.76 d
Sep/15	0.96 d	Sep/16	0.66 d
Oct/15	0.80 d	Oct/16	0.65 d
Nov/15	0.67 d	Nov/16	0.62 d
Dec/15	0.71 d	Dec/16	0.92 d
Jan/16	11.35 b	Jan/17	0.82 d
Feb/16	8.59 c	Feb/17	12.68 a
Mar/16	13.40 a	Mar/17	8.70 b
Apr/16	2.49 d	Apr/17	4.51 c
May/16	1.19 d	May/17	4.45 c
Jun/16	1.03 d	Jun/17	1.56 d
Jul/16	0.84 d	Jul/17	0.87 d
CV (%)	30.97	CV (%)	29.42
DMS	1.996	DMS	1.69

It is possible to observe that the water content in the soil increased from January/2016 (Period I) and February/2017 (Period II), due to the higher rainfall indexes that occurred in the region. In period I, the first rains were recorded in December/2015 with 6.2 mm and higher volume in January/2016 with 193.3 mm. In period II, it began to occur in the first rains in January/2017 and recorded a greater amount of rain in March/2017, with 5.6 mm and 205.6 mm, respectively.

3.2 Deposition of Litter

The total litter production deposited in period I was 2.356.89 kg ha⁻¹ (Figure 3a). Corresponding to 2.36 Mg ha⁻¹ year⁻¹, with the leaf fraction contributing with 1.678.06 kg ha⁻¹ (71.20%) of the total litter deposited in the collection boxes, the other fractions contributed 583.21 kg ha⁻¹ (24.74%) for twigs + barks. 84.73 kg ha⁻¹ (3.60%) for reproductive material and 10.83 kg ha⁻¹ (0.46%) for miscellaneous.

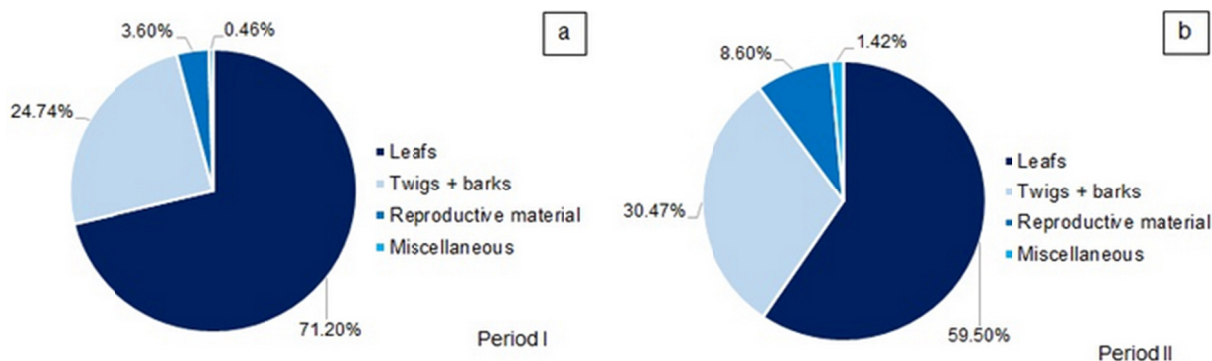


Figure 3. Total yield and percentage of contribution of the fractions in the litter formation, at the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil (Period I: August/2015 to July/2016 (a) and Period II: August/2016 to July/2017 (b))

In period II, the total litter production was 1.162.66 kg ha⁻¹, or 1.16 Mg ha⁻¹ year⁻¹ (Figure 3b). It was observed a reduction of 50.62% in litter deposition in this period, which can be attributed to the reduction in rainfall indices, with a reflection on the soil water regime, directly affecting the plant metabolism and, consequently, the renewal of the foliage. Following the same pattern, the leaf fraction was the most abundant, contributing 691.42 kg ha⁻¹ (59.50%) of the total litter deposited in the boxes. The fraction twigs + barks contributed 354.63 kg ha⁻¹ (30.47%), reproductive material 100.05 kg ha⁻¹ (8.60%) and miscellaneous with 16.57 kg ha⁻¹ (1.42%).

When analyzing the monthly contribution of the fractions that compose the litter during the two periods and the rainfall, the leaf fraction was the one with the highest total yield, with 1,678.06 kg ha⁻¹ in period I and 692.42 kg ha⁻¹ in period II (Figure 4). There was a difference between the months, with the highest average in June/2016 (619.59 kg ha⁻¹) and the lowest in December/2015 (1.15 kg ha⁻¹). In period II, the highest recorded average was in May/2017 and the lowest in November/2016, with 308.40 kg ha⁻¹ and 1.89 kg ha⁻¹, respectively.

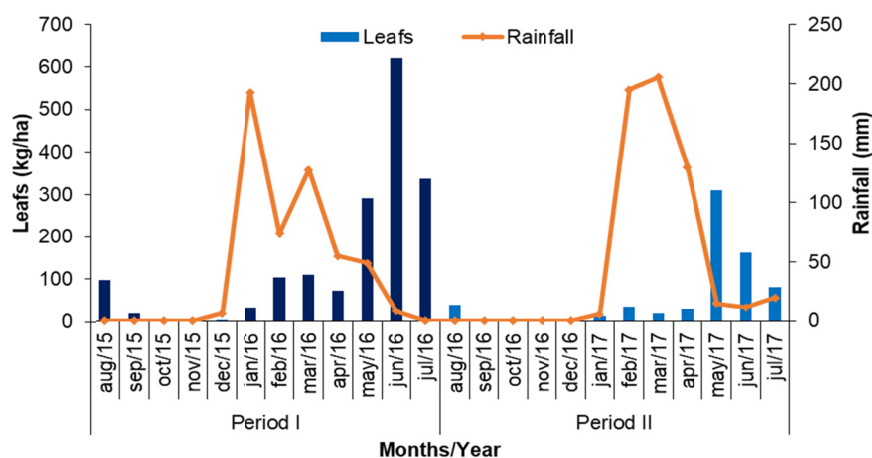


Figure 4. Monthly variation of leaves fraction (kg ha⁻¹) and precipitation (mm) in the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil, in period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

The yield of the leaves fraction was uninterrupted during the two study periods; however, a great seasonality was observed, which can be attributed to the drought in the region. With the first rains, the canopy of the majority of the species occurred and, at this time, the vegetation concentrates its energies to produce flowers and fruits that are responsible for perpetuating the species.

The fraction twigs+barks contributed 683.21 kg ha⁻¹ to produce litter for the period I and 354.62 kg ha⁻¹ for the period II, and the discrepancy between the average in the two periods (Figure 5).

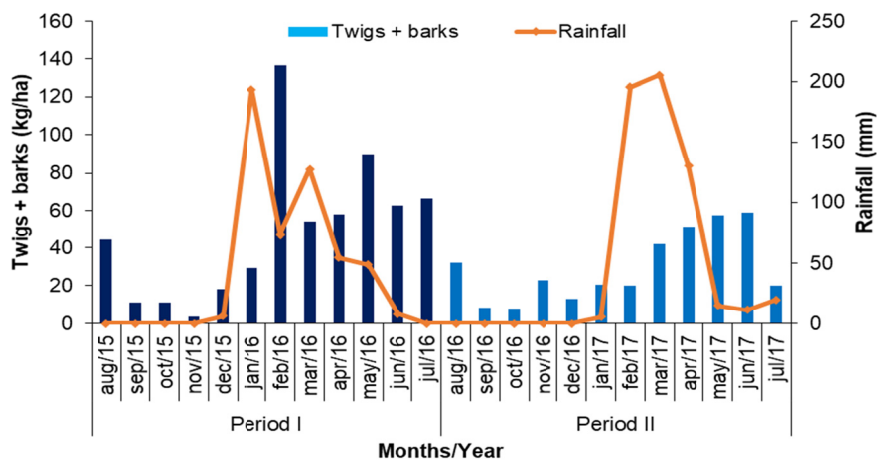


Figure 5. Monthly variation of the fraction of twigs + bark (kg ha^{-1}) and precipitation (mm) in the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil, in period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

It was observed in period I (Figure 5) that, in February/2016, the highest deposition of this fraction occurred with $136.75 \text{ kg ha}^{-1}$ and November/2015 registering the lowest deposition with 3.91 kg ha^{-1} . For the period II, the highest deposition occurred in June/2017 (58.55 kg ha^{-1}) and the lowest in October/2016, with 8.04 kg ha^{-1} .

The fall of the twigs + bark fraction occurred in both periods (dry and rainy), being closely linked to the strong winds and weight of raindrops, as well as the higher solar incidence on them during the dry season leaving them more susceptible to fall as the winds increase.

The production of the reproductive material showed no difference between the averages in the two evaluation periods. In the period I, 84.73 kg ha^{-1} was deposited in the collection boxes, with the highest contribution in the months of May/2016 and October/2015 with lower deposition, obtaining 33.84 kg ha^{-1} and 0.07 kg ha^{-1} , respectively. In the period II, the deposition in the collection boxes was of $100.06 \text{ kg ha}^{-1}$, with the month of May/2017 registered the highest average with 38.86 kg ha^{-1} and lower average in September/2016, with 0.03 kg ha^{-1} (Figure 6).

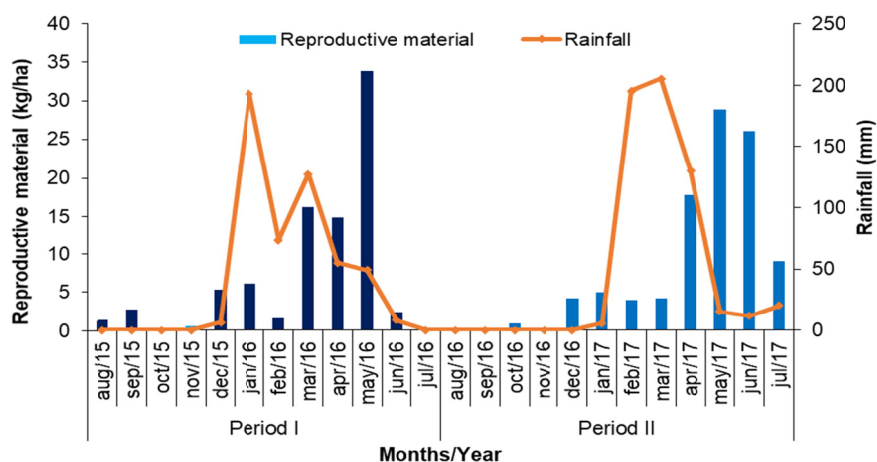


Figure 6. Monthly variation of the reproductive material fraction (kg ha^{-1}) and precipitation (mm) in the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil, in period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

Miscellanea is the fraction that least contributes to the formation of the litter (Figure 7), where during the period I the total production was 10.83 kg ha^{-1} , with highlight the month of January/2016 with 2.68 kg ha^{-1} , the highest recorded average. In period II, the total production was 16.57 kg ha^{-1} , with the highest average of April/2017 (2.41 kg ha^{-1}). It should be noted that during the two periods no difference was found between the means.

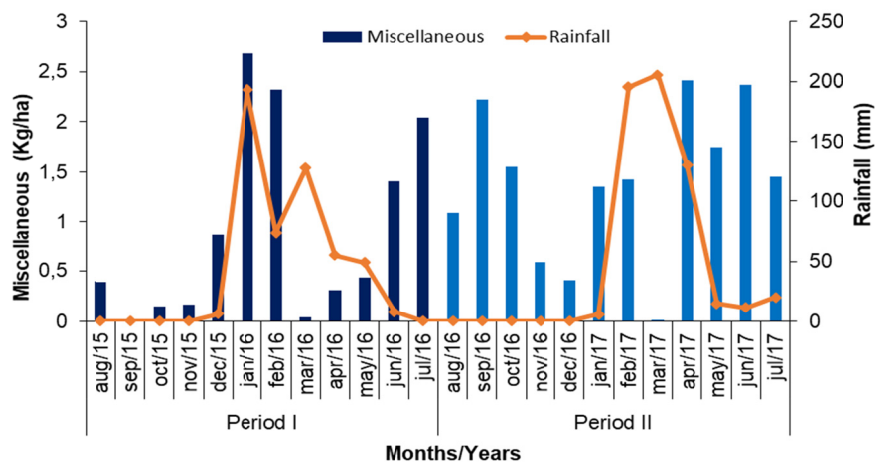


Figure 7. Monthly variation of the miscellaneous fraction (kg ha^{-1}) and precipitation (mm) in the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil in period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

3.3 Accumulation and Decomposition of Litter on the Forest Floor

According to figure 8, the accumulated litter on the forest floor was $33.145.24 \text{ kg ha}^{-1}$ for period I and $21.990.48 \text{ kg ha}^{-1}$ for period II. The accumulated litter average was $2.762.10 \text{ kg ha}^{-1}$ and $1.832.54 \text{ kg ha}^{-1}$ for periods I and II, respectively.

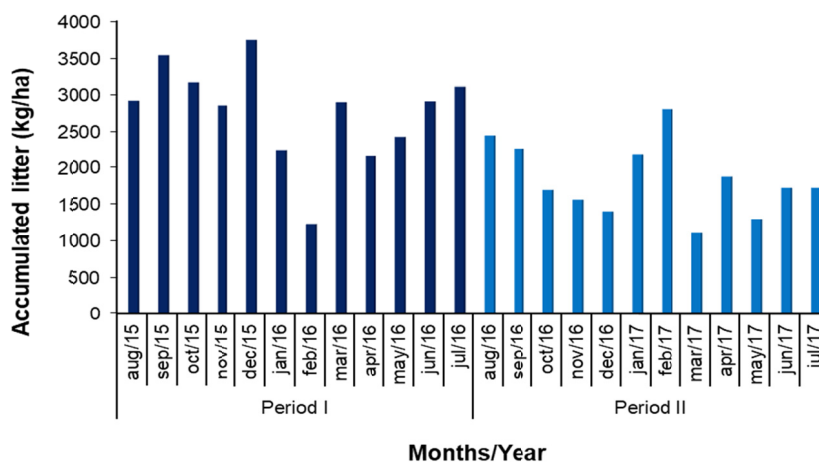


Figure 8. Time evolution of soil litter accumulation (kg ha^{-1}) at the RPPN Fazenda Tamanduá, in Santa Terezinha-PB, Brazil in period I (August/2015 to July/2016) and period II (August/2016 to July/2017)

It is also observed in Figure 8, that during the period I was recorded the largest accumulation of litter in the month of December/2015 with $3.742.86 \text{ kg ha}^{-1}$ and the lowest in February/2016 with $1.219.05 \text{ kg ha}^{-1}$. For the period II, the highest value was registered in February/2017 and the lowest in March/2017, with $2.800.00 \text{ kg ha}^{-1}$ and $1.104.76 \text{ kg ha}^{-1}$, respectively.

The largest accumulation of litter observed in the months of December/2015 (Period I) and February/2017 (Period II) may be related to a decrease in the activity of decomposing organisms, because of adverse edaphoclimatic conditions, limiting the action of these organisms in the degradation of the organic material. With increasing precipitation, decomposing organisms increase their activity, degrading organic material more easily, occurring to the decrease of the accumulation of litter and, increasing the return of the nutrients to the soil.

From accumulation of the litter during the two study periods, it was possible to estimate the decomposition coefficient (Table 3). The value of K obtained for period I was 0.85 and 0.64 for period II.

Table 3. Decomposition coefficient (k), average renewal time (1/k) and time required for the decomposition of 50% and 95% of accumulated litter during period I (August/2015 to July/2016) and period II (August/2016 to July/2017) at RPPN Fazenda Tamanduá, Santa Terezinha-PB, Brazil

<i>Period I</i>			
Coefficient of decomposition (k)	1/K (years)	t_{0.5} (years)	t_{0.05} (years)
0.85	1.17	0.81	3.52
<i>Period II</i>			
coefficient of decomposition (k)	1/K (years)	t_{0.5} (years)	t_{0.05} (years)
0.64	1.57	1.09	4.72

According to the data obtained in Table 3, it can be observed that for period I the average time for renewal of the litter is approximately 427 days, so that 50% of this material is decomposed it takes an average of 295 days and, to decompose 95% of the accumulated litter on the soil surface it takes 1.285 days. In period II, the average time for renewal of the litter is around 573 days, however, it takes approximately 398 days to decompose 50% and to decompose 95% of the accumulated litter, it takes 1,723 days.

4. Discussion

In the Brazilian semiarid region, the characteristics presented by the climate reflect directly on the way in which the vegetation behaves locally as well as on the seasonality of litter produced monthly (Brasil et al., 2017). The low rainfall in tropical forests directly influences leaf fall (Wagner et al., 2016), in addition, the species present in these formations present greater reproductive effort than in humid forests (Lohbeck et al., 2015).

The rainfall in these regions presents great variability, so it is important to monitor the atmospheric conditions and the soil water content, thus evaluating the litter decomposition process present in these local (Souto et al., 2013).

Different studies carried out in areas of caatinga confirm the dynamics that occur in relation to the production of litter. The values of total deposition were similar to those obtained by Brasil et al. (2017), in Iguatu, in thinned caatinga area, which totaled 2.676.3 kg ha⁻¹ and 1.216.2 kg ha⁻¹ in the years of 2012 and 2013, respectively. Souza et al. (2016), in Santa Terezinha, at RPPN Fazenda Tamanduá, during three periods, P2 with 1.433.19 kg ha⁻¹ and P3 with 2.368.94 kg ha⁻¹, were the ones that most resembled.

A study by Toscan et al. (2017), in the RPPN Fazenda Santa Maria, in Santa Terezinha de Itaipu-PR, observed that annual litter production was 11.886 kg ha⁻¹, however, it should be noted that this high result is generally reported for seasonal semideciduous forests, not occurring in dry tropical forests such as the Caatinga.

According to Henriques (2016), studying the seasonality of the leaves fraction allows greater knowledge about how the vegetation behaves in relation to climatic variations, the distribution and stock of the nutrients present in the litter disposed on the forest floor, providing a better understanding of the strategies that the vegetation uses in the process of ecosystem maintenance.

Nascimento et al. (2013), emphasize that the production of the leaves fraction is directly linked to the reduction of precipitation along with the reduction of the photoperiod, contributing to the water stress that leads to higher deposition of this material in the most critical periods of the year.

Holanda et al. (2017), studying the Sítio Riachão in Pombal-PB, found that the month of April/2010 presented higher deposition of the fraction of twigs + bark, being able to be associated with high rainfall indexes that caused strong winds, allowing the dry branches in the treetops to be soaked. Thus, increasing their weight and making them more vulnerable to the action of the winds.

However, Maciel et al. (2012) in Serra Talhada-PE, obtained results superior to 50% for fraction of twigs + bark, due to the absence of rainfall and the non-sprouting of vegetation, resulting in the loss of lignified structures.

The production of reproductive material in the dry period may be related to the high rainfall that occurred previously, thus contributing to the maintenance of soil moisture for a longer period and supplying the water needs of the plants (Souza et al., 2016).

There are indications that the contribution of the reproductive material fraction throughout the year is directly related to the maturation stage of the fruits and, consequently, their dispersion, common characteristics for species present in the Caatinga (Ferreira, 2011).

The diversity of species present in fragments of preserved Caatinga allows greater phenological variability, providing that these ecosystems are in equilibrium even if a low water availability occurs in these regions (Araújo et al., 2018).

In the miscellaneous fraction, it is possible to observe variability in its composition and deposition, presenting a smaller participation in the constitution of the litter, however, it presents considerable importance as it is easy to decompose and releases nutrients to the soil faster (Alves, 2014). In the dry period, much of this fraction is composed of bird excreta, feathers and insect carcasses. Deposition generally increases in the middle of the rainy season and extends to the dry season (Moura et al., 2016).

In any biome or study site differences can be found in relation to the litter decomposition time, this fact is related to the amount and quality of litter disposed on the forest floor, because there are variations from one period to another, especially those that refer to climatic variations (Ferreira, 2011).

5. Conclusions

The total deposition of litter during the two study periods is in line with the average yield for the Caatinga biome;

The increase in precipitation provided higher deposition of litter after the rainy season;

In both periods in the dry season there was greater litter production due to the intensification of the deciduous species of most caatinga species;

The decomposition of the sawmill is slow, which may be influenced by climatic factors or characteristics presented in the materials, such as: higher lignin content, providing a longer time on the surface of the soil. It brings benefits such as greater soil protection from erosive processes and less water evaporation.

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