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Storage and physical fractionation of organic carbon in different phytophysiognomies in the cerrado in the West of Bahia, Brazil

The Western Bahia region is one of the country's agricultural frontiers with the capacity to expand without harming the environment. The aim of this work was to evaluate the total carbon stock and the physical fractions of the organic matter of the soils under different phytophysiognomies of the Cerrado of the West of Bahia. The soils of the studied vegetation types were classified, according to Embrapa (2018) as dystrophic Red-Yellow Latosol (LVAd), (Oxisols), Orthic Quartzarenic Neosol (RQo), (Quartzipsamments) and Haplic Gleysol (GX), (Entisols). In each of the areas, trenches were randomly opened at four points at depths of 0.0-0.10 and 0.10-0.20 m. The total organic carbon (TOC) content was quantified by humic oxidation of organic matter (OM) with potassium dichromate in sulfuric acid. The values ranged in the superficial layer (0.00 to 0.10 m) for the TOC from 4.42 ± 0.22, in the cerrado clean field (CCL) to 48.25 ± 0.14 g kg-1. In the footpath (VRD), for particulate carbon (OCp) the variation was from 0.54 ± 0.36 in the cerrado stricto sensu (CSS) to 20.78 ± 0.80 g kg-1 in the VRD and for carbon associated with mineral fraction (OCam) it varied from 3.07 ± 0.27 in the CCL to 24.34 ± 0.50 g kg-1 in the VRD. The soils under different phytophysiognomies in the cerrado have different levels of TOC, (OCp), OCam and differ, depending on the granulometry and density of trees.

Keywords: Soil management; Organic matter; Cerrado soils; Matopiba.

Armazenamento e fracionamento físico de carbono orgânico em diferentes fitofisionomias no cerrado do Oeste da Bahia, Brasil

A região Oeste da Bahia é uma das fronteiras agrícolas do país, com capacidade de expansão sem agressão ao meio ambiente. Esse trabalho teve o objetivo de avaliar o estoque de carbono total e as frações físicas da matéria orgânica dos solos sob diferentes fitofisionomias do Cerrado do Oeste da Bahia. Os solos das fitofisionomias estudadas foram classificados, de acordo com a Embrapa (2018), como sendo Latossolo Vermelho-Amarelo distrófico (LVAd), (Oxisols), Neossolo Quartzarênico órtico (RQo), (Quartzipsamments) e Gleissolo Háplico (GX), (Entisols). Em cada uma das áreas foram abertas ao acaso trincheiras em quatro pontos, nas profundidades de 0.0-0.10 e 0.10-0.20 m. Os conteúdos de carbono orgânico total (TOC) foi quantificado mediante oxidação húmica da matéria orgânica (OM) com dicromato de potássio em ácido sulfúrico. Os valores variaram, na camada superficial (0.00 a 0.10 m), para o TOC de 4.42 ± 0.22 no cerrado campo limpo (CCL) a 48.25 ± 0.14 g kg-1 na vereda (VRD); para carbono particulado (OCp) a variação foi de 0.54±0.36 no cerrado strict sensu (CSS) a 20.78±0.80 g kg-1 na VRD e para carbono associado a fração mineral (OCam) variou de 3.07±0.27 no CCL a 24.34±0.50 g kg-1 na VRD. Os solos sob as diferentes fitofisionomias nos cerrados apresentam diferentes teores de TOC, (OCp) e OCam e, diferentes em função da granulometria e da densidade de arvores.

Palavras-chave: Manejo do solo; Matéria orgânica; Solos do cerrado; Matopiba.

Topic: **Ciências do Solo**

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INTRODUCTION

The MATOPIBA region that covers the states of Maranhão, Tocantins, Piauí and Bahia is currently considered a major national agricultural frontier in the Brazilian Cerrado region. This characteristic imposes pressure on the suppression of natural vegetation to expand cultivated areas, especially with grains, fibers and pastures the implementation of new technologies in the production units has enabled rapid growth in production, mainly of grains, in the western region of Bahia. However, activities to expand areas are still necessary. In the 2018/2019 agricultural year, the cultivated area in the region grew by 1.3 and 5% in soybeans (Gyicine max L, Merr) and cotton (Gossypium hirsutum L), respectively (AIBA, 2019) and this can alter the environmental balance, mainly the carbon stock in soils under natural vegetation.

Eswaran et al. (1993) and Fan et al. (2017) stated that worldwide the amount of C in the soil can reach 3,150 Pg of C that is the double of the amount stored in the atmosphere (750 Pg of C) and four times the amount in aerial plant biomass (650 Pg of C). In Brazil is estimated that carbon storage in the soil at a depth of up to 0.30 m reaches a value of 36.60 Pg of C (FIDALGO et al., 2012).

Pereira (2017) detected the negative influence of the removal of natural vegetation cover on the physical attributes of the soil such as soil density, porosity, and resistance to penetration. In relation to the organic carbon, Deng et al. (2016) observed an increase in the rate of decomposition with the removal of natural vegetation after 10 years. The reduction in total organic carbon in the change in land use under natural vegetation for agricultural areas was 40% in Argentina (ROJAS et al., 2016), 87 and 50% in 2 areas in Ethiopia (ASSEFA et al., 2017) and 100% in Ghana (LOGAH et al., 2020).

Thus, the knowledge of the amounts of total organic carbon and its physical fractions in the soils under the different cerrado physiognomies can help the farmer to plan a management that best adapts to the edaphoclimatic conditions of the savannas of Western Bahia. In this sense, Bruun et al. (2010) studying soils with different mineralogies, found significant differences regarding to basal soil respiration. In Organosol of the State of Rio de Janeiro, the suppression of forests for the implantation of agriculture after two decades of cultivation reduced the stocks of carbon and nitrogen, mainly in the histic and Gley horizon. The loss of C was related to the reduction of labile organic carbon, which is more sensitive to environmental changes even in the deepest layers (SANTOS et al., 2020).

Thus, the aim of this study was to evaluate the total carbon stock and physical fractions of organic matter in soils under different phytophysiognomies in the cerrado of Western Bahia, Brazil.

MATERIALS AND METHODS

Study area

The work was carried out in native forest areas of the cerrado of the West of Bahia, in different phytophysiognomies whose location with the geographic coordinates are shown in Table 1.

Table 1: Geographic coordinates of the sampling points in the five physiognomies. West of Bahia, Brazil.

Phytophysiognomies	Coordinates and altitude
Cerradão (CRD)	12º 04' 46" south latitude, 46º 08' 1.9" west longitude and 797 m of altitude
Cerrado *stricto sensu* (CSS)	12 º 27' 43.4'' south latitude, 45 º 27' 49.2 west longitude and 680 m of altitude
Dirty field (CCS)	12° 23' 8.61" south latitude, 45° 22' 29.13'' west longitude and 722 m of altitude.
Clean field (CCL)	12° 24' 7.54'' south latitude, 45° 21' 21.1'' west longitude and 718 m of altitude
Footpath (VRD)	12° 28' 22.2 south latitude, 44° 55' 3.8'' west longitude and 654 m of altitude

According to the Koppen classification, the predominant climate of the region is of the Aw type, that is, sub-humid tropical with summer rains with rainfall between 500 and 1,500 mm and dry period in winter (BAHIA, 2008). The soils of the studied vegetation types were classified, according to Embrapa (2018) as dystrophic Red-Yellow Latosol (LVAd), (Oxisols), Orthic Quartzarenic Neosol (RQo), (Quartzipsamments) and Haplic Gleysol (GX), (Entisols) whose physical-chemical properties are shown in Table 2.

Table 2: Physico-chemical properties of the studied soils.

Physyognomy	Soil Layer	SB	CTCe	CTCp	V	Granulometry (g kg^{-1})		
	m	............cmol dm^{-3}.............			%	Sand	Silt	Clay
CRD (LVAd)	0.00-0.10	4.46	0.33	6.53	5.05	750.6	55.0	194.4
	0.10-0.20	4.54	0.25	6.75	3.73	735.5	77.4	187.1
CSS (RQo)	0.00-0.10	4.85	0.44	6.14	7.16	890.7	29.3	79.9
	0.10-0.20	5.02	0.28	5.28	5.33	829.1	96.0	84.8
CCS (RQo),	0.00-0.10	4.34	0.22	4.02	5.56	831.1	38.6	130.4
	0.10-0.20	4.77	0.22	3.52	6.34	840.0	30.6	129.4
CCL (RQo),	0.00-0.10	4.75	0.31	3.10	9.52	853.0	23.5	123.5
	0.10-0.20	4.72	0.30	2.67	7.25	858.8	18.4	122.7
VRD (GX)	0.00-0.10	4.07	0.53	13.93	3.80	585.6	221.6	192.8
	0,10-0,20	4.55	0.32	10.22	3.13	567.0	18.5	314.6

CRD = cerradão, CSS = cerrado *stricto sensu,* CCS = cerrado dirty field, CCL = cerrado clean field and VRD =footpath, SB = sum of bases, CTCe = ability to exchange cations effectively, V = base saturation.

Soil sampling and analysis

In each of the areas, trenches were randomly opened at 4 points at depths of 0.0-0.10 and 0.10-0.20 m. Sample collections were made in duplicates in each layer to determine the total organic carbon (TOC) and soil density (Ds). These samples were stored in properly identified plastic bags and taken to the Soil Physics and Chemistry Laboratory, both from the State University of Bahia - Campus IX for the analysis.

The TOC contents were quantified by humic oxidation of organic matter (OM) with potassium dichromate in sulfuric acid according to the methodology of Embrapa (2017). The granulometric physical fractionation was determined following the method of Cambardella et al. (1992). This method consists of weighing 20 g of air-dried fine earth (TFSA) and adding 60 mL of sodium hexametaphosphate solution (5 g L-1). The samples were homogenized for 16 hours on a horizontal shaker and after these procedures were sieved in 53µm meshes. The material retained in this sieve was particulate organic carbon (OCp), associated with the sand fraction and the material that passed through the sieve is called organic carbon associated with silt plus clay (OCam). All the retained material was transferred to a Petri plate and taken to oven at 50 ° C for 24 hours. OCam content was determined according to equation 1.

$$\mathrm{OCam} = \mathrm{TOC} - \mathrm{OCp} \qquad \text{Eq. 1}$$

Where: Ocam = mineral organic carbon
TOC = total organic carbon
OCp = particulate organic carbon
The carbon stock, stock index and lability index

The TOC stock was obtained by correcting the soil mass, using the soil of the cerrado *stricto sensu* phytophysiognomy (CSS) as Ellert et al. (2001). The equivalent mass was calculated considering the relative mass of the soil in the different phytophysiognomies according to equation 2.

$$\mathrm{Msoil} = \mathrm{BDxTxA} \qquad \text{Eq. 2}$$

Where: Msoil = soil mass (Mg ha^{-1}),
BD = soil density (Mg m^{-3}),
T = thickness of the soil layer (m), and,
A = area, 10,000 m^2.

The determination of soil mass per layer was obtained according to equation 3.

$$\frac{Tad}{sub} = (\mathrm{Mref} - \mathrm{Marea})\mathrm{x}\frac{\mathrm{Fha}}{\mathrm{BD}} \qquad \text{Eq. 3}$$

Where: Trad/sub = layer to add (+) or to subtract (-), (m),
Mref = soil mass equivalent to the reference area (CSS) (Mg ha^{-1}),
Marea = soil mass equivalent of the area (Mg ha^{-1}),
Fha - conversion factor of ha a m^2, 0.0001 ha m^{-2}, e,
BD - soil density, (Mg m^{-3}).

The carbon stock was obtained by equation 4:

$$\mathrm{TOC\ stock} = \mathrm{TOCxBDx}\left(\mathrm{T} \pm \frac{\mathrm{Tad}}{\mathrm{sub}}\right)\mathrm{xAxFkg} \qquad \text{Eq. 4}$$

Where: TOC stock = carbon stock per layer (Mg ha^{-1}), TOC = total organic carbon ($g.kg^{-1}$),BD = soil density (Mg ha^{-1}),T = thickness of the soil layer (m),Tad/sub = thickness of the soil layer to add or to subtract (m),
A = considered area 10,000 m2, and
Fkg = conversion factor from kg to Mg (0.001)

Carbon stock index (CSI) was determined by the ratio of equation 5

$$\mathrm{CSI} = \frac{\mathrm{TOC\ stock\ i}}{\mathrm{TOC\ stockref}} \qquad \text{Eq. 5}$$

Where: TOC stock i = total carbon stock of treatment i, i = CRD, CCS, CCL e VRD
TOC stock ref = total carbon stock of reference

Lability index (LI) was determined by equation 6.

$$\mathrm{LI} = \frac{\mathrm{OCp\ stock}}{\mathrm{OCam\ stock}} \qquad \text{Eq. 6}$$

Onde: OCp stock = stock of particulate carbon, and,
OCam stock = carbon stock associated with silt and clay.

Statistical analysis

The data were subjected to analysis of variance and subsequently the means were submitted to the Tukey test with $p \leq 0.05$ using the AgroEstat software.

RESULTS

Total organic carbon, particulate fractions and associated with soil mineral

Table 3 shows the contents of TOC, OCp and OCam in the soil under the five most frequent phytophysiognomies in Western Bahia. It is observed that these values varied in the superficial layer (0.00 to 0.10 m) for the TOC from 4.42 ± 0.22 (CCL) to 48.25 ± 0.14 g kg-1 (VRD), for OCp from 0.54 ± 0.36 (CSS) to 20.78 ± 0.80 g kg-1 (VRD) and for OCam from 3.07 ± 0.27 (CCL) to 24.34 ± 0.50 g kg-1 (VRD). There are still significant differences ($p < 0.05$) between the TOC values of the soils for CRD and VRD and those for the other phytophysiognomies (0.00 to 0.10 m). In the 0.10 to 0.20 m layer, the soil under the VRD vegetation showed to be of greater value for TOC ($p < 0.05$) with significant differences from all other phytophysiognomies. The second highest total carbon content was the soil with CRD vegetation.

Table 3: Total organic carbon (TOC), particulate organic carbon (OCp), organic carbon associated with mineral fraction (OCam) in soils under different phytophysiognomies (FITO) at the depths of 0.00-0.10 and 0.10-0.20 m.

FITO	TOC		OCp		OCam	
	0.00-0.10 m	0.10-0.20 m	0.00-0.10 m	0.10-0.20 m	0.00-0.10 m	0.10-0.20m
	.... g kg^{-1}..					
CRD	17.11±0.11Ba	13.78±0.10Bb	1.76±0.36Ba	2.67±0.27Aa	15.68±0.04ABa	11.62±0.07Aa
CSS	9.63±0.17Ca	4.63±0.03Cb	0.54±0.36Ba	1.09±0.34Aba	9.29±0.12Ba	3.89±0.09Bb
CCS	4.74±0.29Da	2.76±0.18Db	1.65±0.72Ba	0.98±1.26Bb	3.64±0.47Ca	2.52±0.21BCa
CCL	4.42±0.22Da	3.12±0.24CDb	2.14±0.67Ba	1.56±0.22Aba	3.07±0.27Ca	2.10±0.31Ca
VRD	48.25±0.14Aa	19.90±0.41Ab	20.78±0.80Aa	2.64±0.73Ab	24.34±0.50Aa	17.48±0.24Aa

CRD = cerradão, CSS = cerrado *stricto sensu,* CCS = cerrado dirty field, CCL =cerrado clean field and, VRD = footpath. Different capital letters indicate difference in the column and different lower letters indicate difference in the line.

The labile fraction, defined as OCp, in soils under the phytophysiognomies of CRD, CSS, CCS and CCL were not statistically different, however, all were different from the soil under VRD at a depth of 0.00 to 0.10 m. For the 0.10 to 0.20 m layer, the soil under the CCS showed the lowest OCp value, while the soils under the other phytophysiognomies were not different ($p < 0.05$). Regarding OCam, the soils under CCS and CCL were the lowest values in the superficial layer, while in the layer 0.10 to 0.20 m the lowest value was only that of the soil under CCL (Table 3).

OCp/TOC and OCam/TOC ratios

The values of the particulate organic carbon and total organic carbon (OCp /TOC) and organic carbon associated with mineral fraction of the soil and total organic carbon (OCam /TOC) ratios are shown in Figure 1. It was found that this variable showed no difference between the soils on the CRD, CSS and CCS phytophysiognomies. However, these were different from CCL and VRD by the Tukey test ($p < 0.05$) in the 0.00-0.10 m layer (Figure 1 a). As for the 0.10-0.20 m layer, the soils under the phytophysiognomies of CRD, CSS, CCS and VRD were not different, only the CCL was different from the CCS and VRD ($p < 0.05$). This fraction of carbon responds quickly to changes in land use and management (Pillon et al., 2002), to land use and management systems under different vegetation types and, therefore, must be also different.

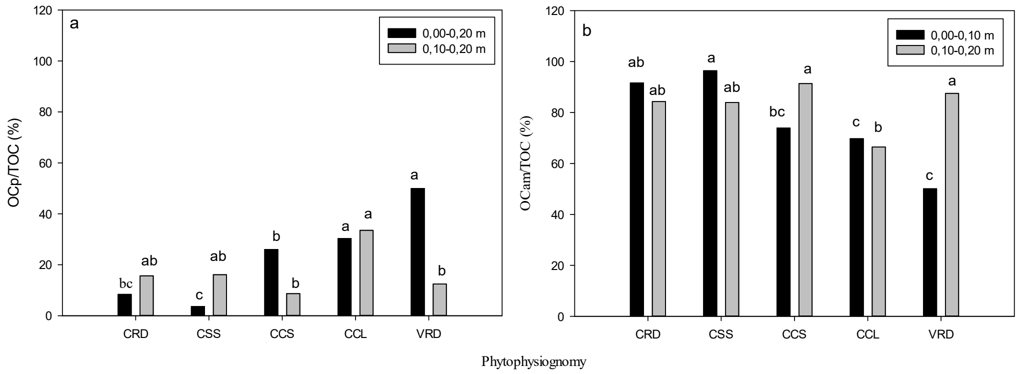

Figure 1: Ratio in percentage of OCp /TOC and OCam/TOC in soils under different phytophysiognomies from 0.00-0.10 and 0.10-0.20 m in the Cerrado.

Figure 1b for the 0.00-0.10 m layer shows that the soils that house the CRD and CSS phytophysiognomies did not differ. Whereas the CSS differed from the others for the OCam/TOC ratio. In the 0.10 to 0.20 m layer, no significant differences were detected in the soils under the phytophysiognomies of CRD, CSS, CCS and VRD, while CCL was different from CCS and VRD ($p < 0.05$. Figure 2b also shows that the OCam/ OC values varied between 50.06 and 96.38% in the 0.00-0.10 m layer and from 66.47 and 91.35% in the depth of 0.10-0.20 m. This shows a high amplitude between the maximum and minimum values, indicating a great variability between the soils under the different phytophysiognomies of the Cerrado.

Carbon stock

The stocks of total carbon (TOC stock), particulate carbon (OCp stock) and carbon associated with minerals (OCam stock) differ in soils under the different phytophysiognomies types (Table 4). The total carbon stock (TOC stock) in the soils under CRD and VRD showed the highest values and differed significantly by the Tukey test ($p < 0.05$) from the others in the 0.00-0.10 m and 0.10-0.20 m layers. The third highest value was the soil under CSS, while the CCS and CCL phytophysiognomies showed the lowest values and were not statistically different.

Table 4: Stock of total carbon (TOC stock), of particulate organic carbon (OCp stock) and carbon in the mineral fraction (OCam stock) in soils under different phytophysiognomies (FITO).

FITO	TOC stock		OCp stock		OCam stock	
	0.00-0.10 m	0.10-0.20 m	0.00-0.10 m	0.10-0.20 m	0.00-0.10 m	0.10-0.20 m
	………………… Mg ha^{-1} …………………					
CRD	27.04±0.13Ba	20.39±0.23Bb	1.76±0.36Ba	2.67±0.27Aa	19.28±0.001Aa	14.42±0.003Aa
CSS	11.85±0.37Ca	5.74±0.07Cb	0.54±0.36Ba	1.10±0.34ABa	14.68±0.003Aa	5.76±0.003Bb
CCS	7.49±0.71Da	4.09±0.43Cb	1.65±0.73Ba	0.98±1.21Bb	5.42±0.01Ba	3.81±0.006Ba
CCL	6.99±0.55Da	4.62±0.57Cb	2.15±0.66Ba	1.56±0.22ABa	4.84±0.008Ba	3.19±0.008Ba
VRD	76.23±0.34Aa	29.46±0.48Ab	20.80±0.79Aa	2.64±0.73Ab	21.18±0.02Aa	19.06±0.008Aa

CRD = cerradão, CSS = cerrado *stricto sensu*, CCS = cerrado dirty field, CCL = cerrado clean field and, VRD = footpath. Different capital letters indicate difference in the column and different lower letters indicate difference in the line.

In the stock of particulate carbon (OCp stock), the soils under the phytophysiognomies of CRD, CSS, CCS and CCL did not differ significantly ($p < 0.05$) but all were different from the soil under the VRD (20.80 Mg ha-1) in surface layer (0.00-0.10 m). For the depth of 0.10-0.20 m, the OCp stock values were lower than the surface layer only in soils under CCS and VRD.

Regarding the carbon stock associated with minerals (OCam stock), in the 0.00-0.10 m layer the soils under CRD and VRD did not show significant differences ($p < 0.05$), while in soils under the CCS and CCL phytophysiognomies they were not different, but they were statistically smaller than the others. At a depth of 0.10-0.20 m, the soil of the CRD and VRD were the ones that obtained the highest values and were statistically superior to the CSS, CCS and CCL that did not differ (Table 4).

The results of the carbon stock index (CSI) for these soils show that the values of the soils under the CRD and VRD phytophysiognomies were higher than the CCS and CCL and higher than the reference (CSS) in all layers, while the others were below the CSS (Figure 2a).

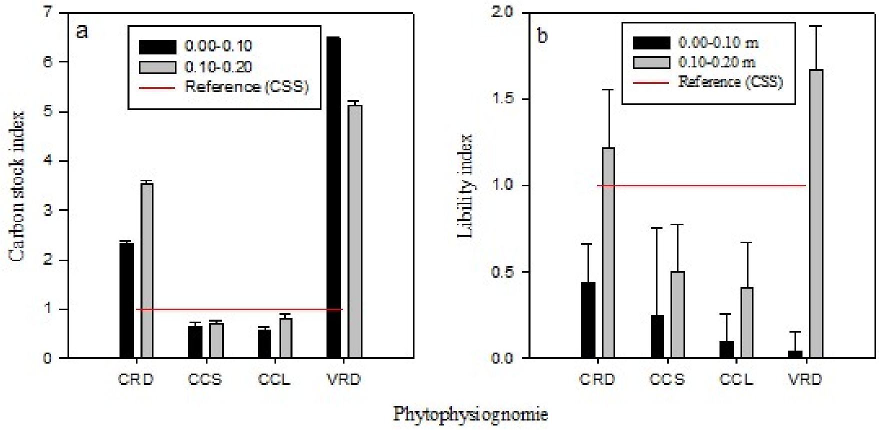

Figure 2: Carbon stock index (a) and lability index (b) in soils under different Cerrado phytophysiognomies in Western Bahia.

All values of the lability index (LI) in the 0.00-0.10 m layer were below the ground under the CSS physiognomy (reference) and only the CRD and VRD in the 0.10-0.20 m layer were higher than the soil under the phytophysiognomy of reference (Figure 2b).

DISCUSSION

Total organic carbon, particulate fractions and associated with soil mineral

In general, the more sandy soils and with less vegetal mass (CSS, CCS and CCL) presented low TOC contents. In a similar study, in the Amazon region, Vale et al. (2016) also found that soils under phytophysiognomies with low plant biomass showed low values of total organic carbon. Therefore, in soils with these characteristics, the adoption of use and management that allows the intensity of the ordering processes to be higher than that of the dissipative processes should be a fundamental practice in this region (BAYER et al., 2019).

The low levels of OCp and OCam in soils under CSS, CCS and CCL may have occurred due to the low amount of plant residues in these phytophysiognomies (FACCIN et al., 2016). On the other hand, higher values of these variables for the soil under CRD and VRD are associated with a greater amount of plant residues and clay contents (Table 2) (BAYER et al., 2004; NANZER et al., 2019).

The concentration of particulate carbon (OCp) as a function of litter, TOC and organic carbon associated with mineral fraction (OCam) as a function of clay and TOC for soils under the five Cerrado phytophysiognomies types are shown in Figure 1a and b. Although the equation OCp = f (litter) has a moderate linear correlation coefficient according to the classification by Callegari-Jacques (2003) (R = 0.5839), this function indicates a direct relationship between the variables (dependent and independent), showing a trend in this range of data that OCp grows with the increase of litter, according to a polynomial model of first degree (Figure 3a). OCp = f (TOC), on the other hand, presented a direct and positive relationship with a linear correlation value, indicating a very strong dependence on the content of TOC. Han et al. (2017) working in long-term reforested areas, detected an increase of between 25 and 41% in the total soil carbon derived from the increase in OCp coming directly from litter and root residues.

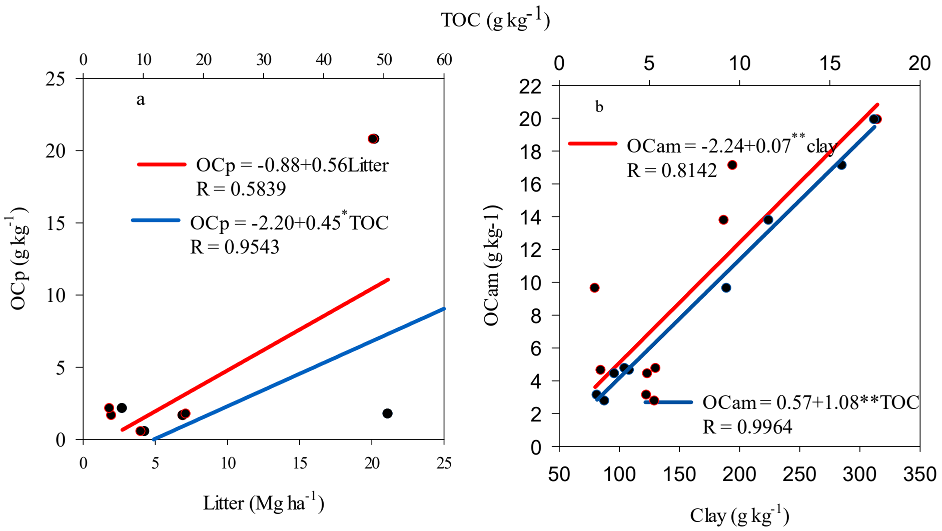

Figure 3: Particulate organic carbon (OCp) as a function of litter and total organic carbon (a) and carbon associated with the mineral fraction of the soil (OCam) as a function of clay content and total organic carbon (b).

Regarding the carbon associated with the mineral fraction of the soil (OCam) due to the clay and the TOC, both are also described by a first degree polynomial (Figure 3 b). These polynomials have a strong and very strong correlation (CALLEGARI-JACQUES, 2003) with clay and TOC, respectively. These results are confirmed by Cai et al. (2016) in a work carried out with forest and pasture soils in which they observed the contribution of mineral particles from the soil and organic carbon in OCam.

Carbon stock

The transformation of land use under CCS and CCL in agricultural areas must take into account the low carbon stock they have in the natural condition. In a study conducted by Assefa et al. (2017), they found that the removal of natural forests resulted in substantial losses of carbon stock. This loss was attributed to erosion and the low surface density of the soil.

Due to the large amount of roots in the superficial layer and the natural grass to have footpaths, the high value of OCp stock in these soils is justified. The OCp stock fraction is more sensitive to changes in soil management (OADES et al., 1988; SCHIAVO et al., 2011) therefore the suppression of the natural vegetation of these soils for the implementation of agriculture must be done with the adoption of practices that keeps the OCp. In addition, these losses can accelerate due to the high sand content of the region's soils (MARQUES et al., 2015).

The soils under the CCS and CCL phytophysiognomies with the lowest OCam stock values in the surface layer presented low clay content (Table 2). Thus, the change in the use for agriculture of the management that frequently turns the soil, can promote the breakdown of aggregates, exposing them to decomposing agents, which implies in the reduction of soil organic matter. Campos et al. (2020), working in the sandy soils of Western Bahia, found areas with a carbon decrease of up to 26% in relation to native vegetation.

The higher clay content and expressive litter volume of the soils under CRD and VRD meant that the carbon stock index was more than 100% above the ground under CSS. According to Santos (2017) and Vieira

(2019), clay strongly influences the production of dry vegetable mass and the number of trees per area, which relates this granulometric fraction to the higher carbon content in the soil. The results of this work show that the soils under the phytophysiognomies of CRD and VRD confirm this statement.

The labile constituents decline rapidly when the natural system is turned and even if after a certain time a balance is achieved in this area, after plant suppression, it tends to show lower values of organic matter (PILLON et al, 2002). Losses of organic carbon after the suppression of new areas can still be justified by erosion in the superficial layers of the soil and by the increased decomposition of organic matter (ASSEFA et al., 2017; COSTA et al., 2020).

CONCLUSIONS

The soils under the different vegetation types of the cerrado have TOC, OCp and OCam different, depending on the granulometry and density of trees. OCp has a direct relationship with the litter and TOC and OCam with clay and TOC. The largest stocks of total carbon were found in the phytophysiognomies of CRD and VRD, the largest stock of OCp in VRD and the stock of OCam in soils under CRD and VRD.

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