ORGANIC MATTER AND STRAW INFLUENCE ON SOIL MOITURE IN AN OXISOL UNDER DIFFERENT TILLAGES

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SUMMARY: The objective of this study was to analyze the influence of the spatial variation of maize straw and organic matter content on soil moisture of a Hapludox in the municipality of Jataí, southwest of Goiás. It was used nine sampling points within one hectare, in three different types of soil tillage (No-Till - NT, Crop-Livestock Integration - CLI and Conventional Planting - CP). For the study of organic matter, soil samples were collected in nine points and three depths (from 0 to 0.12 m, from 0.12 to 0.24 m and from 0.24 to 0.36 m) for each point. It was also analyzed the dry mass of trash (crop residues deposited on the soil surface) determined using an arc with internal area of 1.0 m², released randomly near the sampling point. Immediately after sampling, the straw was determined soil moisture at the same location, using a TDR sensor (time domain reflectometry). The results indicated good distribution of straw on both systems, but there was no correlation of straw with soil moisture. The organic matter content was highly correlated with soil moisture, especially in more conservation systems (NT and CLI).
KEYWORDS: physical attributes of the soil; water content in the soil; soil management systems.

INFLUÊNCIA DE MATÉRIA ORGÂNICA E PALHADA NA UMIDADE DE UM LATOSSOLO DISTROFÉRRICO SOB DIFERENTES MANEJOS

RESUMO: Objetivou-se com este trabalho analisar a influência da variação espacial da palhada de milho e do teor de matéria orgânica na umidade de um LATOSSOLO VERMELHO Distroférrico, no município de Jataí, sudoeste de Goiás. Utilizaram-se nove pontos de amostragem dentro de um hectare, alocado em três diferentes tipos de manejos do solo (Plantio Direto - PD, Integração Lavoura-Pecuária - ILP e Plantio Convencional - PC). Para o estudo da matéria orgânica foram coletadas amostras de solo nos nove pontos de cada área e em três profundidades (0-0,12 m, 0,12-0,24 m, 0,24-0,36 m) para cada ponto. Também se analisou a massa seca de palhada (restos culturais depositados na superfície do solo) determinada com uso de um arco com área interna de 1,0 m², lançado aleatoriamente próximo ao ponto de amostragem. Imediatamente após amostragem da palhada determinou-se a umidade do solo no mesmo local, por meio de um sensor TDR (reflectometria no domínio do tempo). Os resultados indicaram boa distribuição da palhada em ambos os sistemas, porém não se observou sua correlação com a umidade do solo. O teor de matéria orgânica apresentou alta correlação com a umidade do solo, principalmente nos sistemas mais conservacionistas (PD e ILP).

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PALAVRAS-CHAVE: atributos físicos do solo; conteúdo de água no solo, sistemas de manejo do solo.

INTRODUTION

During the whole development, the plant absorbs water and loses using the ground as a reservoir of water and nutrients. The amount of water consumed by a crop during its development varies with the spatial and temporal distribution of climate, the variety of culture and management of the agricultural system, which modifies the physical properties of the soil directly related to storage of water (Moreti et al., 2007).

Soils are naturally heterogeneous and their properties vary continuously in space and time. Among the factors responsible for the variability, we can mention the processes of training, involving the physical and chemical characteristics, interactions with the biological system and anthropogenic interference.

It is observed that the cultivation system is one of the main parameters inherent in the dynamics of water in the soil, therefore, several studies indicate that in conservation system as tillage and crop-livestock integration, soil quality is maintained and/or even improved by greater input of organic matter, due to the straw kept the soil surfasse (Carneiro et al., 2009; Salton et al., 2008).

Therefore, the aim of this work was to analyze the influence of the spatial variation of maize straw and organic matter content in the humidity of a Hapludox in the municipality of Jataí, southwest of Goiás.

MATERIAL E METHODS

The experiment was conducted in an experimental area at the Federal University of Goiás (UFG), Regional Jataí, in the southwest of the State of Goiás - Brazil (Figure 1), 17º 52 '53 "S latitude and 51 ° 42' 52" W longitude, with 700 m of altitude, located in a climatic region type Cw, tropical savanna, mesothermal, with well-defined dry and rainy season, according to Kopen rating. The average annual rainfall varies around 1600 mm (Koetz et al., 2010). The studied soil was classified as Hapludox, according to the classification of Embrapa (2009).

The experimental area was composed of three sub-areas of approximately 1 ha each, cultivated with soybean (*Glycine max*) in the season 2013/2014 (first crop) with different soil management systems (Figure 1, b and c).

Subareas have been cultivated over the years with soybean in the first crop (crop) and maize (*Zea mays*) and sorghum (*Sorghum bicolor*) in the second (off-season) in no-tillage (NT) since the year 2008 (subarea 1) in crop-Livestock Integration system (ILP), consorting soybean crops and pasture since 2009 (subarea 2) and conventional tillage (CONV) associated with the use of harrowing at the time of planting. Each subfield is divided into a regular grid containing nine cells measuring 30 x 30 m each considering the center of each cell as the reference point for sampling.

On predetermined points, it was collected the trash (crop residues deposited on the soil surface) using an arc with internal area of 1.0 m², released randomly near the sampling point. Immediately after sampling the straw at each point, it was made monitoring of soil moisture. Moisture data were collected on nine points on each soil management system (NT, ICL and CT) at depths from 0 to 0.12, from 0.12 to 0.24 and 0.24 to 0.36 m, between the months of November 2013 and February 2014, with instantaneous readings every 14 days, by means of an equipment type TDR (time domain reflectometry). At the same points, deformed samples were collected for determination of soil organic matter (SOM). Four repetitions, collected randomly within a radius of 1 m from the reference point were made.

RESULTS AND DISCUSSION

Although Schneider et al. (2008) mention that the continuing existence of the pattern of the water content in the soil can be influenced by the topography, the relief of the areas used in the study (the gently rolling plan) significantly reduces the interference of relief in the spatiotemporal pattern of moisture soil in these areas, significantly reducing the influence of the topography in the temporal analysis of soil moisture (Figure 1).

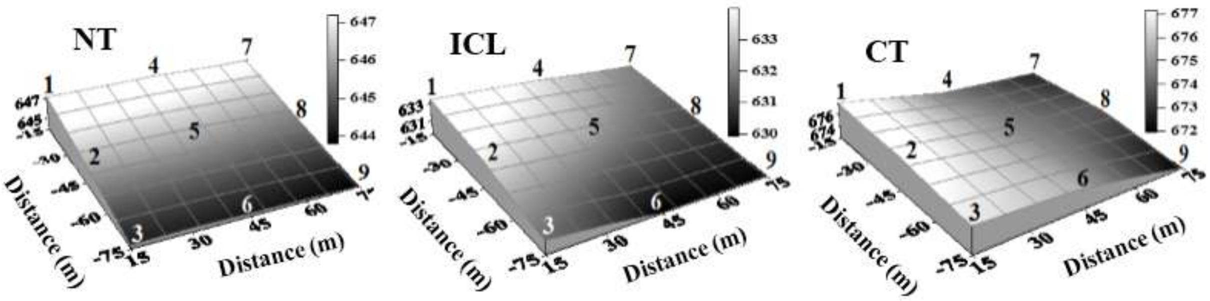

Figure 1. Topography in the study areas. NT: No-tillage; ICL: integrated crop livestock; CT: conventional tillage.

As the topography, vegetation also had little influence in the comparative analysis of soil moisture between the three types of soil management (NT, ICL and CT), since the plantation was carried out with the same crop (soybean) and on the same date for both.

Noticed a statistical difference between the means of SOM values, by analysis of variance and test "Scott-Knott" the 5% significance (Table 1).

Table 1. Organic matter content of the studied Latosol (ANOVA and test "Scott-Knott," α = 0.05, n = 9)

Items	Parâmeter	NT-A	NT-B	NT-C	ICL-A	ICL-B	ICL-C	CT-A	CT-B	CT-C
SOM (%)	Mean	3.10b	2.70c	2.20d	3.40a	3.30a	2.60c	3.50a	3.40a	2.70c
	Max	3.61	3.59	2.97	4.10	4.04	3.56	4.05	3.61	3.25
	Min	2.56	2.27	1.69	2.71	2.48	1.80	2.56	2.47	2.23
	σ	0.24	0.25	0.32	0.40	0.37	0.38	0.40	0.37	0.36
	CV	7.80	9.38	14.48	11.96	11.15	14.74	11.60	12.29	13.40
	Default E.	0.04	0.04	0.05	0.07	0.06	0.06	0.13	0.12	0.12

SOM = soil organic matter (n = 36); σ = standard deviation; CV = coefficient of variation; Default E. = standard error of the mean; n = sample size; Means followed by the same letter on the line, do not differ statistically; NT: tillage; ICL: integrated crop livestock; CT: conventional tillage; The m = 0 to 0.12; B = 0.12 to 0.24 m; C = 0.24 to 0.36 m

As for SOM, differences were found between the treatments, but with a tendency to lower values with increasing depth in all treatments (Table 1). This observation demonstrates a typical profile of soils in general, since the deposition of dry matter concentrated on the soil surface.

It was perceived difference in spatial distribution between the two managements, when on NT, higher straw values (lighter color) are concentrated at the ends and ICL are concentrated in the central areas of study (Figure 2).

Similar to Gao & Shao (2012), the correlation coefficient of "Pearson" was used to examine the dependence of the water content in the soil (WCS) in relation to the soil properties to NT, ICL and CT at three different depths (Table 2).

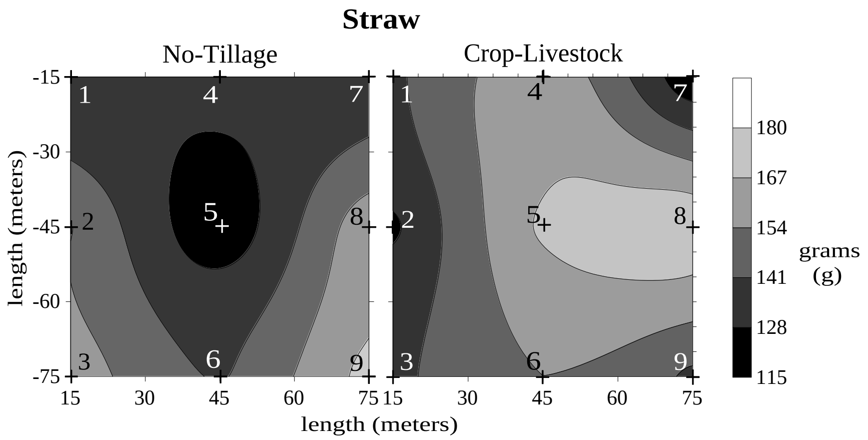

Figure 2. Spatial distribution of the dry mass of straw coming from remains of previous crops on the ground in three management systems and three depths.

Table 2. Correlation coefficient of "Pearson" between soil moisture and variables investigated for the three types of management in different soil depths

Management System	Depth	SOM	Straw
NT	A	0.68**	0.20
	B	0.10	0.29
	C	0.51**	0.51**
ICL	A	0.65**	0.22
	B	- 0.33	0.13
	C	0.86**	- 0.01
CT	A	0.21	-
	B	0.06	-
	C	0.18	-

** Significant to 1% (ANOVA); A = 0 to 0.12 m; B = 0.12 to 0.24 m; C = 0.24 to 0.36 m; SOM: soil organic matter; NT: tillage; ICL: integrated crop livestock; CT: conventional tillage.

The results in Table 2 show that MOS exerted greater influence on soil moisture (in accordance with Zhao et al., 2010; Biswas and Si, 2011) in relation to straw. This behavior is characterized by the largest number of events with significant correlation coefficient values of "Pearson", which are greater than those found by Zhao et al. (2010) and Gao & Shao (2012). All SOM significant events were positively correlated, ie, higher SOM levels favor the maintenance of WCS thereof.

CONCLUSIONS

There was great influence of organic matter on soil moisture.

The organic matter content was highly correlated with soil moisture, especially in more conservation systems.

There was a good distribution of straw on both systems, but there was no correlation with soil moisture.

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