RIO18 21st World Congress of Soil Science
21 WORLD CONGRESS OF SOIL SCIENCE
Sunday 12 – Friday 17 August 2018
Rio de Janeiro, Brazil
Rio de Janeiro August | 12 - 17

Magnetism of the Archaeological Black Earth as an agricultural and environmental indicator

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The Amazon region presents a great diversity of soils, especially those with anthropic horizon known as Indian Black Earth (IBE) or Archaeological Black Earth (ABE), which are of great economic importance to the region and to the world. The aim of this work is to understand the spatial variability of environmental attributes (soil CO_2 emission), and agricultural (related to physics and fertility) attributes, using a methodology to understand the sustainability of soil with Indian Black Earth in the Amazon, using magnetic susceptibility as an agricultural and environmental indicator, relating these attributes to the mineralogical composition of this soil, located in the southern region of Amazonas, Brazil. The study was realized in Argissolo Vermelho (Ultisol) whit anthropic horizon or Archaeological Black Earth. In the área grids of 70 × 70 m were established, and the soil was sampled in regular spacing of 10 m in the depth of 0.0-0.20 m. Was determination of chemical properties (pH in water, organic matter, phosphorus, sum of bases (SB), cation exchange capacity, base saturation (V%), organic carbon (OC), stock of organic carbon (STOC)), iron forms (oxide free extracted with dithionite–citrate–bicarbonate (Fe_d) and low crystallinity oxide extracted by ammonium oxalate (Fe_o)) physical properties (texture, and bulk density, magnetic susceptibility and CO_2 flux of soil (FCO_2).To characterize the variability, descriptive and geostatistical statistics were performed through the use of scaled semivariograms to evaluate the spatial relationship between magnetic susceptibility and physical, chemical, iron and FCO_2 attributes. The SM can be used to understand the variability of some agricultural and environmental attributes in Indian Black Earth.The high values of SM can be associated with the presence of maghemite found in the soils and in the ceramic fragments present in the Indian Black Earth.Magnetic susceptibility presents a pattern of spatial variability similar to the CO_2 flux, with the same semivariogram adjustments, presenting a positive spatial correlation between FCO_2 and ?fd and negative spatial correlation between FCO_2 and SMbf. Sites with higher magnetic susceptibility (4.7 to 5.1 ? 10^{-6} m^3 kg^{-1}) presented 1.2 times more CTC and emitted 1.4 times less CO_2 compared to areas with lower magnetic values (3.5 to 3.9 ? 10^{-6} m^3 kg^{-1}).

Keywords: magnetic susceptibility, spatial variability, CO2 flux of soil.

Financial Support: Unesp, FAPEAM e IFPA.