ASA, CSSA, and SSSA
2010 International Annual Meetings
Oct. 31-Nov. 3 | Long Beach, CA

SOIL PARTICULATE CARBON AS INDICATOR OF MANAGEMENT PRACTICES IN NO-TILLAGE SYSTEM

José Eduardo Corá[A], Adolfo Valente Marcelo[B], Carolina Fernandes[A] & Márcio dos Reis Martins[B]

[A] Faculty of Soil Science, Sao Paulo State University, Jaboticabal, SP, Brazil, Email cora@fcav.unesp.br , carol@fcav.unesp.br
[B] Ph. D. student, Sao Paulo State University, Jaboticabal, SP, Brazil E-mail, adolfovalente@yahoo.com.br, reismartins@yahoo.com.br.

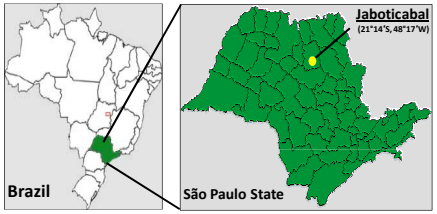
Green Revolution 2.0: Food+Energy and Environmental Security

INTRODUCTION

The capability to detect management effects for sustained production in no-tillage system depends on knowledge of how different soil organic fractions are impacted by cropping systems and how they are related to carbon storage in the soil.

MATERIAL AND METHODS

Location: Jaboticabal, Sao Paulo State, Brazil (21°14'S, 48°17'W).

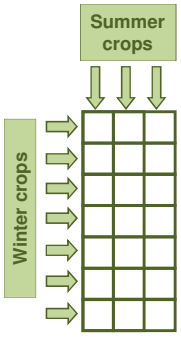


Climatology: Tropical/Megathermal zone or Köppen's Aw Savannah Climate; Mean annual rainfall: 1,417 mm, with the highest concentration during October to March.

Soil: Rhodic Eutrudox, under no-tillage system.

Experiment establishment: October, 2002.

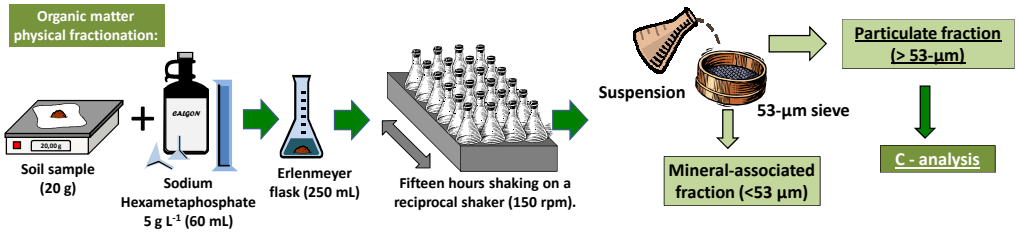
Experimental design: Split-block design, with 3 replications.



Summer crops sequences: **continuous corn, continuous soybean and soybean/corn rotation.**

Soil sampling: October, 2008, before sowing the summer crops of the next growing year (2008/2009);

Soil evaluations: Total soil organic carbon (TOC) in the bulk soil sample and in both fraction of soil samples: >53 µm (particulate C - POC) and <53 µm (C associated to soil mineral).



OBJECTIVE:

The purpose of this study was to evaluate how crop sequences influence soil total carbon, soil carbon associated to soil aggregates (particulate C) and soil carbon associated to soil minerals, in a Rhodic Eutrudox, under no-tillage system since 2002.

RESULTS

Table 1. Soil total C (TOC), particulate C (POC), mineral-associated C, microbial biomass carbon (MBC) and basal respiration microbial activity (C-CO_2), evaluated on 0-10 cm soil depth layer.

	Organic C			POC:TOC Ratio	MBC	C-CO_2
	Total	Particulate	Mineral-associated			
	g kg^{-1}			%	µg g^{-1}	mg 100g^{-1}
Summer crop sequences						
Soybea/corn rotation	10.7 b	2.5 c	8.2 b	24 b	266.5 a	16.2 a
Continuous corn	12.8 a	3.4 b	9.4 a	26 b	180.6 b	13.5 b
Continuous soybean	12.9 a	4.5 a	8.4 b	35 a	176.7 b	13.5 b
F test [(1)]	20.70**	39.3**	14.99*	37.29**	5.67ns	8.04*
Coefficient of variation (%)	10.3	20.9	9.0	15.9	46.0	21.7
Winter crops						
Corn	12.1	3.7 ab	8.4	30	125.7 c	13.0
Sunflower	11.5	3.1 b	8.4	27	186.5 bc	13.4
Oilseed radish	11.8	3.4 ab	8.5	29	246.9 ab	14.4
Pearl millet	11.9	3.2 ab	8.6	27	317.0 a	13.4
Pigeon pea	12.2	3.2 ab	8.9	27	174.4 bc	14.0
Grain sorghum	12.7	3.9 a	8.8	30	226.6 abc	14.7
Sunn hemp	12.7	3.6 ab	9.1	28	178.2 bc	18.1
F test [(1)]	1.65^{ns}	3.34*	0.99^{ns}	1.91^{ns}	6.73**	2.66^{ns}
Coefficient of variation (%)	8.8	13.6	10.0	11.5	34.0	22.0
Summer crop sequences x winter crops						
F test (interaction) [(1)]	1.25^{ns}	0.45^{ns}	1.66^{ns}	0.73^{ns}	23.44**	1.74^{ns}

[(1)]: * e ** = significant (p<0.05) and (p<0.01), respectively. ns = not significant (p<0.05). Means followed by the same letter, in column, are not significantly different by the Tukey test (p<0.05).

CONCLUSION:

- The soybean/corn rotation showed lowest TOC and POC contents when compared to continuous corn or continuous soybean. In the soybean/corn rotation was observed higher microbiological activity, which explains the lower TOC soil contents due to the utilization of the carbon compounds by the microorganisms as a source of energy.
- Higher differences between crop sequences were observed when soil particulate carbon was determined, which indicates higher sensitivity for detecting management practices when this fraction of carbon is determined in the soil.