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Soil Organic Matter Quality of an Oxisol Affected by Plant Residues and Crop Sequence under No-Tillage

Jose Cora and Adolfo Marcelo
Sao Paulo State University - Campus Jaboticabal, Brazil (cora@fcav.unesp.br)

Plant residues are considered the primarily resource for soil organic matter (SOM) formation and the amounts and properties of plant litter are important controlling factors for the SOM quality. We determined the amounts, quality and decomposition rate of plant residues and the effects of summer and winter crop sequences on soil organic C (TOC) content, both particulate organic C (POC) and mineral-associated organic C (MOC) pools and humic substances in a Brazilian Rhodic Eutrudox soil under a no-tillage system. The organic C analysis in specifics pools used in this study was effective and should be adopted in tropical climates to evaluate the soil quality and the sustainability of various cropping systems. Continuous growth of soybean (Glycine max L. Merrill) on summer provided higher contents of soil POC and continuous growth of maize (Zea mays L.) provided higher soil humic acid and MOC contents. Summer soybean-maize rotation provided the higher plant diversity, which likely improved the soil microbial activity and the soil organic C consumption. The winter sunn hemp (Crotalaria juncea L.), pigeon pea (Cajanus cajan (L.) Millsp), oilseed radish (Raphanus sativus L.) and pearl millet (Pennisetum americanum (L.) Leeke) enhanced the soil MOC, a finding that is attributable to the higher N content of the crop residue. Sunn hemp and pigeon pea provided the higher soil POC content. Sunn hemp showed better performance and positive effects on the SOM quality, making it a suitable winter crop choice for tropical conditions with a warm and dry winter.