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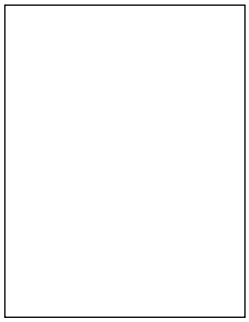

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Evaluating Soil Dissolved Organic Matter Extraction Using Three-Dimensional Excitation Emission Matrix Fluorescence Spectroscopy

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ABSTRACT

Soil dissolved organic matter (DOM) consists of many compounds and plays an important role in contaminant transport in the ecosystem. However, the effect of different extraction methods on concentrations of different organic components is poorly understood. In this study, DOM was extracted from three soils using different extraction times, solid to liquid ratios (SLR), and extracting solution concentrations, and was evaluated with a three-dimensional excitation emission matrix (EEM) fluorescence spectroscopy. The dissolved contents of protein-, fulvic-, and humic-like components in the extracts were different among three soils, and their concentrations were affected by the extraction variables used. The total dissolved contents of protein-, fulvic-, and humic-like components increased by 0.6 to 3.5 times ($p<0.05$) when SLR decreased from 1:2 to 1:10. Furthermore, the organic components increased 2.5 to 3.9 times and 0.11 to 0.37 times ($p<0.05$), respectively when extracting solution concentration (0.01 M to 1.5 M) and extraction time (10 min to 300 min) increased. The three-dimensional EEM fluorescence spectroscopy is a useful tool to characterize the components of dissolved organic matter in soils.

Keywords: dissolved organic matter (DOM), extraction time, KCl concentration, solid to liquid ratio (SLR), three-dimensional excitation emission matrix (EEM) fluorescence spectroscopy

INTRODUCTION

Soil dissolved organic matter (DOM) is defined as the organic matter that passes a 0.45 μm filter and is a complex mixture of many organic compounds (Herbert *et al*., 1995; Kalbitz *et al.*, 2000; Karavanova, 2013). DOM is mostly composed of humic substances and other organic compounds such as amino acids, carbohydrates, aliphatic and aromatic acids and hydrocarbons (Herbert *et al.*, 1995; Ros *et al.*, 2010). These compounds have different molecular weights (MW) and functional groups with abundant active sites (such as phenol, hydroxyl, carboxyl, thio and amino subunits) (Wei *et al.*, 2014). Thus, they play different and important roles in the fate and transport of contaminants in soils (Liu and Chen, 2012; Prado *et al.*, 2014; Shi *et al.*, 2013; Weng *et al.*, 2002).