EFFECT OF CHERNOZEM PRE-TREATMENT ON STABLE ORGANIC MATTER POOL MEASURED BY PARTICLE-SIZE FRACTIONATION TECHNIQUE

A. A. Grigorova[1], S. V. Sushko[1], A. V. Pigolev[2], S. V. Neprimerova[3], K. V. Ivaschenko[1]

[1] *Institute of Physicochemical and Biological Problems in Soil Science, Russian Academy of Sciences, 142290, Pushchino, Institutskaya ul. 2, Moscow region, Russia;*
[2] *Institute of Basic Biological Problems, Russian Academy of Sciences, 142290, Pushchino, Institutskaya ul. 2, Moscow region, Russia;*
[3] *Agrophysical Research Institute, 195220, Saint Petersburg, Grazhdansky pr. 14, Russia;*
E-mail: rogovaja7@mail.ru

Particle-size fractionation of soil organic matter (OM) into particulate (POM; particle size 53–2000 μm) and mineral-associated OM (MAOM; <53 μm) pools is a simple and widely used approach to assess OM stability against microbial degradation. Soil sample pre-treatment to break down aggregates and release the stable MAOM pool is a crucial step for this analysis. Our study was aimed at a comparative assessment of two commonly used approaches of soil pre-treatment for particle-size fractionation: chemical (0.5% hexametaphosphate solution; HMP) and physical (sonification at 60 J ml^{-1}; US). The tested soil was silt loam Chernozem, taken from the upper 0–10 cm layer (n = 30) of agricultural lands in the Samara region. Soil organic carbon content in the soil ranged from 2.7 to 5.6%, carbonate carbon from 0.02 to 3.60%, pH values from 5.9 to 7.8, clay (< 2 μm) from 22 to 34%, and silt (2–50 μm) from 51% to 65%. The mineralogical composition of the clay-silt fraction was represented by quartz, plagioclase, potassium feldspars, amphiboles, trioctahedral and dioctahedral micas, carbonates (calcite, dolomite), chlorites and montmorillonite. The particle-size fractionation of the soil samples showed that HMF treatment resulted in twice as much POM pool release compared to US treatment due to insufficient destruction of microaggregates of 50–250 μm. This resulted in an average underestimation of the MAOM pool by 41%. Therefore, for the particle-size fractionation of OM in silt loam Chernozems, the ultra-sound pre-treatment of soil samples is preferable to the treatment with sodium hexametaphosphate solution.

Keywords: sodium hexametaphosphate, sonification, particulate organic matter, mineral-associated organic matter.