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Determination of aggregate stability using laser diffraction method in soil with varied texture and carbon content

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Lubbers et al. (2017) emphasised that earthworm by creating macroaggregates increase the amount of organic carbon in the soil. Such macroaggregates contain particulate organic matter, fungal hyphae, or roots, and afterwards, during the decomposition of macroaggregates, the organic matter becomes more resistant to microbial attack (Pulleman et al. 2005). Earthworms, through feeding and burrowing, are important elements in C cycling (Curry and Schmidt 2007). However, the type of introduced organic matter (Huang et al. 2018) and abiotic factors (Six et al. 2004) are equally important in creating stable organic-mineral components as well as the presence of earthworms.

A six-month experiment was carried out to test how the soil structure (the stability of soil aggregates) behave under the influence of various organic additives. For each soil, except the reference samples, one of the listed additives was introduced, i.e. straw, straw with fulvic acid, peat (garden soil), compost, compost with active bacteria cultures and straw with fulvic acids, humus and active bacteria cultures. The research was carried out on soils with four types of texture, i.e. sandy, loamy, silty and clayey soil. In the project, three different species of earthworms commonly occurred in Polish soils were a structure-forming factor (*Apporectodea rosea, Apporectodea calliginosa* and *Dendrobena rubillus*). After the experiment, the amount of organic carbon in the soil, dissolved organic carbon, humus forms and microbiological activity of the soil were evaluated. The stability of the soil aggregates was determined using two methods: the sieve method (Kemper and Rosenau 1986) and laser diffraction method (Bieganowski et al. 2018),

Based on this research it was noted that the aggregate stability is correlated mainly with soil texture. The applied additives had the most significant influence on the transformation of organic carbon in the soil. Soil organic carbon, which may be incorporated into the soil in the form of the organic-mineral colloids, is an essential element in the balance of the carbon in nature. Among the tested additives, organic carbon from compost, peat and compost with active bacteria cultures was in the highest amount associated with fine earth particles (about 36-48%). For comparison,

only less than 8.5% of the organic carbon from the straw was incorporated into the mineral part of the soil.

Two methods to measures aggregate stability are not comparable for sandy soils. In the wet-sieving method the sand fraction higher than 0.25 mm pretend to be stable aggregates.

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