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The effect of mineral fertilizers on stabilization of soil organic carbon in mineral soil

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Most studies use the content of soil organic carbon (SOC) to quantify the stocks and changes in soil organic matter (SOM). One of the main mechanism responsible for the stabilization of SOM is chemical recalcitrance of OM. This is due to its inherent chemical characteristics of protection of otherwise decomposable substances by bonding to recalcitrant organic compounds. The stable pool represents that part of SOM which is strongly associated with the site specific mineral composition. In recent decades, several techniques have been refined to separate the different SOM fractions, and their location in the soil structure. The physical fractionation allows the separation of particulate OM (labile) composed of readily available material for decomposition by microbial attack (leaves, root, animal remains) and mineral-associated organic matter (stable).
The aim of this study is to assess the influence of fertilization with different N rates on composition and stabilization of SOM in mineral soil.
Soil samples used for analysis are obtained from IOSDV long-term (established in 1989) three field crop rotation (potato-wheat-barely) experiment located in Tartu, Estonia. Soil samples (Stagnic Albeluvisol) were collected from the 0-20 cm depth in the autumn of 2017. In order to evaluate organic matter and carbon in form of faster and slower turnover or light and heavy fractions, the method of density fractionation was applied. Free light (less degraded) organic matter and light occluded in soil aggregates were separated from bulk soil by density. For cleaving aggregates ultrasound energy was applied. The light fractions were collected from the surface of Na-polytungstate solution (1.6 g/cm3), the mineral-associated heavier organic material precipitated. The SOC and nitrogen (N) concentrations in soil were determined by the dry combustion method in a varioMax CNS elemental analyzer (ELEMENTAR, Germany).