Soil aggregate size affects C sequestration and microorganisms inside aggregate under straw addition

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As the basic unit of soil, aggregates are considered as a stable soil organic (SOC) pool. Changes in organic subtract due to straw addition induce variations in soil microbial community or activity, which may effect the C sequestration in aggregates. Most of the previous studies on soil microorganisms assessment was done at large scale i.e. larger quantities of soil, however, few studies on SOC is known in aggregate size fractions. This study investigated the effects of soil aggregate size on the distribution of microorganism and SOC, and the relationship of microorganism and C sequestration inside aggregate size fractions with $^{13}$C-labelled straw addition. Soil samples were collected from 0-15 cm and classified into 5 aggregates sizes classes ( >5 mm, 2-5 mm, 1-2 mm, 0.25-1 mm and <0.25 mm ), and the graded aggregates were incubated for 180 days at 20 °C, with or without $^{13}$C-labelled straw residue. The incorporation of $^{13}$C into the five aggregate size fractions was analyzed.

After incubation, the SOC, DOC and ROC contents were increased more rapidly and significantly in aggregate ( >5 mm ) than that in aggregate ( ≤5 mm ) under straw addition, with the same trend of new carbon derived from straw. The total PLFAs was increased most significantly in aggregate ( >5 mm ), especially fungi and negative bacteria ( G- ), while the positive bacteria ( G+ ) increased slightly in aggregate ( ≤0.25 mm ), with no significant change in total PLFAs. The proportion of bacteria in total microorganism increased gradually, as the aggregate size increased in straw treatment. The results imply that aggregate ( >5 mm ) have more space for C sequestration and greater contribution to new carbon turnovering in soil than other small aggregates, and it gradually tended to be bacterial with the enrichment of carbon. In addition, the SOC contents were strongly related to the amount of fungi and G- in aggregate ( >5 mm ), while related to G+ in aggregate ( ≤0.25 mm ) under straw addition.