



Sequential extraction of a carbon-14 labeled soil from Halle, Germany

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Soil organic matter (SOM) is a mixture of organic-chemical substances different in composition and stability. The soil can act as a sustainable sink for CO₂, if the content of stable SOM (turnover times more than 100 years) increases. Different processes like the interaction between SOM and mineral surfaces contribute to the stabilisation of SOM. C-turnover models are used to illustrate the complex processes of C-turnover in the soil. C-pools of different stability are integrated in these models. However, there are only a few methods to analyse and validate the conceptual turnover rates and sizes of the C-pools in the C-turnover models experimentally.

Recent studies show that with a sequential extraction (SE) organic matter (OM) fractions different in stability could be isolated: Whereby the isolated Na-pyrophosphate soluble OM fractions (OM(Py)) represents more stable fractions than the water soluble OM fraction (OM(W)). Consequently a soil should contain after incubation with ¹⁴C labeled material different amounts of ¹⁴C in sequentially extracted OM fractions (OM(W) > OM(Py)), if SE is able to separate SOM according to stability. Our objective is to analyze which amounts of ¹⁴C labeled plant-derived C will be incorporated in such OM fractions to identify different metabolizing OM fractions.

Soil samples were taken from a long-term field experiment at Halle (Haplic Phaeozem). At these soil samples maize plants were grown in a closed labeling cham-

ber. 50 days after experiment start ^{14}C labeled CO_2 was injected for one day. 14 days after $^{14}\text{CO}_2$ -injection soil samples were taken, and dried at 50°C . Visible plant-residues were sorted out. OM(W) and two OM(Py) fractions (acid soluble, OM(Py_s), and acid insoluble (OM(Py_p)) OM fractions were extracted sequentially. The ^{14}C content in the OM fractions were determined according Richert et al. (2000).

The specific activity of ^{14}C from bulk sample is 21.3 Bq/mg C and range between that of OM(W) and OM(Py). The OM(W) fraction (33.8 Bq/mg C) has 6 times higher specific activities of ^{14}C than the pyrophosphate soluble OM fractions (~ 5 Bq/mg C). The different OM(Py) fractions show comparable ^{14}C -contents (OM(Py_s): 5.5 Bq/mg C and OM(Py_p): 5.0 Bq/mg C).

The water soluble fraction has a higher specific activity of ^{14}C than the OM(Py) fractions. That confirms with results of ^{14}C and $\delta^{13}\text{C}$ analysis from other studies. Therefore we conclude that the OM(W) fraction has a faster C-turnover than the OM(Py) fractions. Only small differences were found between the Na-pyrophosphate soluble fractions OM(Py_s) and OM(Py_p). Maybe the reason is that the C-translocation rate from labeled maize components into the soil is too slow within the investigated period of time (14 days) to cause differences in more stable fractions like OM(Py_s) and OM(Py_p).

The results show that SE is a possibility to isolate OM-fractions with faster (OM(W)) and slower (OM(Py)) C-turnover than the bulk soil. However, the labeling of both OM fractions takes place within short time (14 days). That means OM(Py) contains also subfractions with a relative fast turnover.