Soil microbial biomass C and N determination by the fumigation extraction method

C and N released from microbial cells after chloroform fumigation are directly measured (Vance et al., 1987).

Principle

The difference between soluble C and N extracted from soil after fumigation and before fumigation correlates with their content in microbial cells.

Method

- weigh 10 g of soil to NTS bottle (100 ml) (2 replicates)
- one replicate is extracted and the second one is fumigated using chlorophorm

The extraction of C and N (the same procedure for nonfumigated and for fumigated samples)

- add 40 ml of 0.5 M K_2SO_4 to the bottle with 10 g of soil
- close the bottles and shake them on an end-over-end shaker for 45 minutes
- then centrifuge the suspension at 4000 g for 10 min
- the supernatant is filtrated through glass fibre filtr (0,45 um)
- store the filtrate frozen till analyzes

Fumigation

- the bottles with soil are inserted into dessicator together with beaker with chlorophorm and with wet filtr paper on the bottom of dessicator
- then the dessicator is evacuated till the chlorophorm starts to boil
- after 24 hours chlorophorm is removed by ventilation and evacuation of dessicator (the ventilation and evacuation must be repeated several times until no chlorophorm remains in the soil)
- then soil is extracted using the procedure described above

C and N analyzes

- the filtrate is analyzed on LiquiTOC for organic carbon and for total nitrogen content

Calculation of soil microbial biomass

$C_{mic} = C(F) - C(NF) / k_{EC}$ (µg C g^{-1} dry soil)

conversion factor k_{EC} = 0.38 (Vance et al., 1987)

$N_{mic} = C(F) - C(NF) / k_{EN}$ (µg N g^{-1} dry soil)

conversion factor k_{EN} = 0.45 (Jenkinson, 1988)

Literature

Jenkinson D.S., 1988. The determination of microbial biomass carbon and nitrogen in soil. In: Advances in Nitrogen Cycling in Agricultural Ecosystems. Silson J.R. (ed.) CAB International, Wallingford, 368-386.

Vance, E.D., Brookes, P.C., Jenkinson, D.S., 1987. An extraction method for measuring soil microbial biomass C. Soil Biology and Biochemistry **19**, 703-707.