Branch litter quality and decomposition in drained peatlands predicted by IR spectroscopy.

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Branch litter is a potentially important but little studied component in the carbon cycle of forests. We have studied the decomposition of branch litter in three drained (meso-) oligotrophic fen sites forming a climatic gradient from central Estonia to northern Finland. At each site dead branches were harvested from four live Scots pines (the dominant tree species) and divided into two size classes: diameter ≤ 1 cm and diameter > 1 cm. For each tree individual and branch size class, decomposition (mass loss) has been measured separately using the litterbag method with 5 replicates per site for annual recovery. The initial chemical composition: the amount of soluble compounds, holocellulose, acid insoluble and acid soluble lignin, was analyzed of each tree and size class using a sequential extraction method. All samples were scanned by Fourier transform infrared (FT-IR) spectroscopy over the wave number range from 4000 to 500 cm^{-1}. Regression models were constructed for the relationship between the FT-IR spectra and the carbon fractions from the sequential extractions and between the FT-IR spectra and mass loss data.

The preliminary results show differences between initial litter quality and decomposition rates of branch litter coming from different climatic regions. Very strong relationships were found between specific wavelengths in the FT-IR spectra and the different carbon fractions. The models created for the mass loss data show that FT-IR spectroscopy can explain large amount of variation in branch litter decomposition.

Our further interest will be focused on long-term decomposition rates (up to ten years), chemical changes of the litter during decomposition and a relation between initial chemical composition of the litter and its mass loss rates (both short- and long-terms). Models will be constructed to identify ecological factors controlling the variation in the mass loss of the branch litters. FT-IR spectroscopy will be further tested as a tool in decomposition studies.