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The effect of internal and external nitrogen on needle litter decomposition in a Dutch scots pine forest.

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A litterbag experiment was carried out in 2001 in a Scots pine (Pinus sylvestris L.) stand in the southern part of The Netherlands, near Ysselsteyn. The region is characterized by high atmoshpheric nitrogen (N) deposition of about 58 kg N ha-1 yr-1. In the winter of 1988-1989 the high N deposition was experimentally decreased to pre-industrial N deposition rates by means of a transparent roof installed about 2-3 m above the forest floor. Decomposition of needles was studied under the roof in the low N deposition plot (about 6 kg N ha-1 yr-1) and in the ambient plot outside the roof, receiving natural N deposition. Needles were separately sampled from the low and the ambient deposition plot and incubated separately in both plots. This made it possible to examine the effect of internal N (origin of needles) and external N (deposition during incubation) in the different stages of decomposition. The original litter revealed significant negative correlations between N content and lignin-to-N ratio, Mn and Ca concentration were found. The lignin content was negatively correlated to Ca and Mn concentration. The N content of the litter increased from 1.3 % to the maximum of 2.0 % during the first 12-18 months. A C/N ratio of 26 was reached within 12 months. During the first three months 30 % of the mass loss occurred in all litter types. After 12 months only 60 % of the original mass remained. Decomposition for the first 18 months mass was lower for both litter types incubated in the low deposition plot. Then the decomposition rate for the low N needles in the high N plot flattened off. No difference in decomposition rate of the litter originating from low or high deposition plots was found during the whole incubation period. This would indicate that external deposition N is more important than internal tissue N in determining the decomposition rate and that low N deposition retarded decomposition in this initial stage of the decomposition process.