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ADVANCES IN FORESTRY RESEARCH

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Feathermosses lose N to the atmosphere during wet and dry cycles

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Most boreal pine and spruce stands dominated by feathermosses are nutrient-poor. Fertilization of these stands with nitrogen (N) is often considered by forest managers as necessary to improve stand productivity. However, the improvement of productivity and the



availability of N in these stands are often short-lived and may completely disappear a few years after fertilization.

As feathermosses dominate the forest floor in these forests, we asked if feather mosses play a role in the N retention of these forests. In two growth chamber studies we explored what role feather mosses play in the release of N to the atmosphere during wet and dry cycles.

Study I Feathermoss shoots were pre-treated either with a N fertilization or a control, and these pre-treated shoots were either kept moist or allowed to dry. Shoots were rewetted and placed in tubes which were sealed and incubated after the air in the tube, was replaced

with a mixture of helium and oxygen. After 20 hours, the gas in the tubes was analysed for nitrogen and nitrous oxide gases.

C – control, F – fertilized, D – dried first and rewetted, FD – fertilized and dried first and rewetted.

Both treatments with dried and rewetted feathermosses released significant amounts of N₂ and N₂O gas – suggesting denitrification in the range of 1% of total N.

Study II Pots filled with a mat of feather moss (including undecomposed dead shoots) were subjected to 5 wet-dry cycles in a well-lighted environment. The N concentrations in the feathermoss mat were recorded at each cycle.

Over the course of 5 dry-wet cycles, the feathermosses lost 7-10% of its N which is the equivalent of 5 kg/ha of N.

During the drying process, membranes of cells in the feathermoss tissue break which will allow leakage of some of the cell contents. We suggest that during a short period following re-hydration, the acidic environment of the moss layer provides conditions for aerobic denitrification of N and chemical nitrate reduction resulting in the formation of nitrogenous gases.

Implications: This study indicates that feathermosses lose up to 5 kg/ha of N after 5 dry-wet cycles. This might explain the apparent loss of N from these forests a few years after fertilization. Feathermosses may play a role in keeping late-successional conifer forests nutrient-poor. In addition, re-wetting of dried feather mosses results in production of nitrous oxide which is a greenhouse gas.

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Further Information:

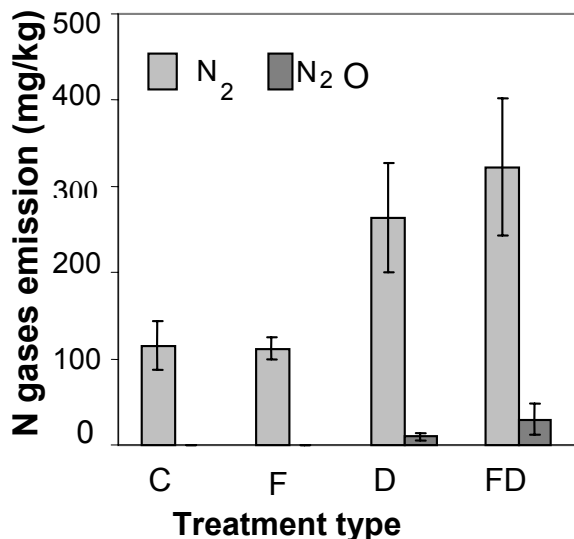
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