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Effect of enhanced nitrogen input on release of nutrients and nutrient availability in stands of tall fern Athyrium distentifolium

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Improved light conditions, after destruction of tree canopy, soil acidification and increased nitrogen availability, support intensive spreading of acidophilous perennial grasses and stands of tall fern (Athyrium distentifolium) on deforested sites in the Moravian-Silesian Beskydy Mts. (the Czech Republic). The aim of the study was to determine how higher inputs of nitrogen affect the release of nutrients during decomposition processes of fern litter. The experimental site was chosen on a southwest–facing slope of the Kněhyně Mt. (49o31´ N, 18o 32´E, 1170 m a.s.l.) in the Moravian-Silesin Beskydy Mts. in the Czech Republic. The area is characterized by an annual mean air temperature of 5.6 oC and annual precipitation of 1110 mm. A large fern stand was divided in four blocks (5x3 m) and on two of them higher doses of nitrogen were applied (50 kgN/ha in five doses in the course of the growing season). Similarly, mesh-bags with fresh natural litter of fern were used to determine rate of litter decomposition during one year. Samples were inserted in both nitrogen treated and untreated fern stands in autumn 2006 and 2007 collected in autumn 2007 and 2008. On the basis of litter amount estimated at the start and at the end of exposure and of actual content of minerals in original and exposed litter, the release and/or accumulation of minerals during decomposition were calculated. The availability (more or less in the case of ammonia-nitrogen) and movement of percolated nitrogen (mainly in the case of nitrate-nitrogen) was estimated in situ by the trapping of mineral N into the ion exchange resin (IER) inserted into special cover. The decomposition rate of native A. distentifolium litter was approximately the same (29-30 %) at both nitrogen availability, however the element release from decomposed litter was higher for N, P and Ca in both years and for K and Mg in the first year as well. However, decomposition rate of cellulose was two times greater in fern stands than in adjacent spruce stands without ferns. The values are expressed as the captured mineral nitrogen into ion exchange resins exposed in situ. The availability of soil ammonia- as well as nitrate- nitrogen in control stockings, and after the addition of different sources (raw silk and cellulose) were, in general, not very different below fern plants and in the bare soils. It can be concluded, that the microbial competition for available nitrogen is very high after the addition of cellulose, which consequently restrict the rate of mineral nitrogen trapped into the ion exchange resin. In contrary higher amounts of captured mineral nitrogen were estimated after the addition of raw silk.
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