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Use of biofuel ashes for fertilisation of *Betula pendula* seedlings on nutrient-poor peat soil

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ABSTRACT

Short-term effects of different doses (0.25; 0.5 and 1.0 kg m^{-2}) of wood ash (WA), peat ash (PA) and their mixture (MA) applied to peat substrate on the mineral composition and growth of seedlings of *Betula pendula* were investigated. The experiments were conducted with 1-year-old seedlings planted in vegetation pots. The pH of the substrate was increased by 0.4–0.9 units during the vegetation period compared to the control. The peat substrate was poor in nutrients, except N. The substrate treated with WA had higher concentrations of K, Mg, Mn, Fe, P, Zn, Cr and Pb, but a lower N concentration compared to the control. The substrate treated with PA had higher concentrations of Ca, Mg, N and P. The concentrations in the MA treatment were intermediate between WA and PA. The ashes increased K and lowered the concentration of Ca. A decrease in N in seedlings was found under the influence of WA and MA. An increase in K and P was found in all compartments of seedlings, while the concentrations of Ca, Mg, Cu, Zn, Cd and Cr in seedlings were affected irregularly depending on types and doses of ashes used. The uptake of Cd, Cr and Pb did not reach phytotoxic levels; however, increased concentrations of Cd and Pb were found in roots. A positive influence of ash application on growth was found. The heights and root collar diameters of all ash-fertilised treatments exceeded those of the control seedlings in most cases.

1. Introduction

Removal of forest biomass for bioenergy often increases export of nutrients from the forest, and will inevitably speed up processes leading to decreased fertility and increased acidification of forest soils. On the other hand, the use of biomass for energy produces large amounts of ash, and thus problems concerning possibilities of using or disposing of ashes will arise. An increasing amount of biomass is used for energy generation, and therefore these problems have become increasingly topical. As the ash generated by combustion of biofuels contains the nutrients necessary for plants in almost the same proportions as growing trees, the ash could be recycled to compensate for the loss of nutrients caused by removal of whole trees or logging residues from the forest ecosystem [1,2]. There is an urgent need to obtain knowledge and develop environmentally benign techniques for using ashes from bioenergy production to mitigate

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