Mineral nutrition in relation to the Norway spruce forest decline in the region Horny Spis (Northern Slovakia)

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In this contribution we present the results of analyses of selected mineral nutrients in assimilatory tissues of spruce trees at different developmental phases (plants, adult trees) in the region Horný Spiš. The very close connection between mineral nutrient cycling and other physiological processes in the plants has been well recognised. The presented analyses of mineral nutrient cycling were done within comprehensive eco-physiological research assessing the physiology and health status of spruce stands in the study area. The research was conducted directly in the stand (Hliníky locality, Horný Spiš – two research plots: 1. plot with spruce stand in advanced decline, 2. control plot – without visible decline symptoms) and, at the same time as a pot experiment. The objective of the pot experiment was to verify the supposed negative influence of soil environment (in the locality with advanced decline of spruce stands) on the growth of spruce trees and their mineral nutrient conditions. The analyses of the material sampled from the stands revealed high amounts of manganese (MnT) that were in the toxicity range on both examined plots. Another negative finding was high amounts of toxic aluminium, primarily in needles of adult trees growing on the plot with symptoms of acute stand decline. This reflects a very low value of pH/H_2O – 3.7 (pH/KCl – 3 to 2.8) and total exhaustion of the soil suffering, moreover, from the lack of soil water. As for the differences in amounts of individual macronutrients between the plot with intensive decline and the control plot, no significant differences were found, with the exception of Fe. On the other hand, evident significant differences in risk elements Pb, Hg and Al were found. As for the differences in nutrient contents in spruce seedlings in the pot experiment (variants 1 to 6), we can see significant differences in macronutrient contents (N, P, Ca, K, Mn), in some cases also in risk element contents (Al).

Keywords:

nutrition; Norway spruce; stress; spruce decline

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