Abstract

Ecological stoichiometry is a useful tool for understanding of ecological dynamics and related processes. There are only rare informations about nutrient cycling and nutrient dynamics in plant-soil system in restoration areas after coal mining. Different plant species have developed own strategies and treat differently with nutrients which can influence nutrient cycling and consequent nutrient return to the soil. In thesis, I investigated ecological stoichiometry as one of key factors which controls soil development in post mining sites. In general introduction, known facts are summarized about e.g. plant traits, decomposition process, nutrient cycling and consequences for soil development and restoration practices. But still, relationship between leaves, plant litter, and soil is poorly understood in restoration areas. The results of a doctoral thesis are presented in five papers, out of which three have been published, one has been already submitted and one manuscript is prepared for publication in an international journal with impact factor. In the first presented publication, the influence of soil fauna was studied (especially earthworms) on soil development. Soil development differed significantly between sites afforested with different tree species and it is strongly influenced by the presence and activity of soil fauna, especially by earthworm bioturbation. Second publication examines the life cycle of Penthetria holoserica and its correlation with C:N ratio of alder litter fall. The life cycle of P. holosericea is not dependent on seasonal changes in the quality and quantity of food. Third publication focused on nutrient competition strategy of Calamagrostis epigejos. C. epigejos reabsorbed most nutrients before the senescence of leaves at older sites while reabsorbing much less at the younger sites in spontaneous succession. C. epigejos reduced the availability of N for other plant species especially at the beginning of the growing season in spring especially at younger nutrient poor sites, when C. epigejos can use N stored during the previous season. In fourth publication was studied if the addition of N into the system have negative effects on soil development which seems to be important especially in poor nutrient conditions. In the reclaimed sites, the higher amount of N released from plant litter caused a higher loss of nutrients (Ca, Mg, K, P) from the ecosystem which can lead to earlier depletion of nutrients in these sites. And last publication focused on seasonal changes in tree foliage and litter fall composition. Different foliage composition was found between individual tree species and between sites, especially in concentration of N, Ca, Mg, K and content of lignin. This thesis provides broader insight into the ecological stoichiometry and its influence on plant-soil and soil fauna development at restoration areas. The thesis also summarizes the consequences of the influence of plant for soil development and possible recommendation for restoration practices.