54th Symposium of the International Association for Vegetation Science

Vegetation in and around water: patterns, processes and threats

ABSTRACTS

June 20 – 24, 2011
Lyon, France
GRASSLAND RESPONSE TO LONG-TERM MANAGEMENT AND LEVELS OF NUTRIENTS IN STANDING BIOMASS

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Keywords: Grazing, Fallow, Leaf dry matter content, Mowing, Standing biomass.

On a large scale, it is recognized that community-weighted leaf dry matter content (community LDMC) is negatively related to grassland productivity and N, P and K concentrations in biomass. Hence, higher total levels of nutrients in above-ground standing biomass should be linked to lower community LDMC. However, current research has provided evidence that community LDMC is substantially modified by a defoliation regime. We asked whether management supporting vegetation with the lowest community LDMC also provides the highest amount of standing biomass and highest total levels of N, P and K. We used three long-term management experiments (sites) with four management treatments (grazing with spring burning, grazing, mowing in mid-July and fallow), which were set up in Bromion erecti, Cynosurion cristati and Violion caninae in the grasslands of the White Carpathian Mountains (Czech Republic) in 2004. At each site, twenty management plots (each five m × five m in size) were arranged in five blocks. During 2010, the first growth biomass was sampled at the end of May, in mid-June and in mid-July, each time from one randomly allocated one m² subplot within each plot. The total levels of N, P and K in a sample were calculated from dry matter standing biomass and laboratory analyses of nutrient concentrations. Community LDMC was calculated from the sample proportions of species biomass and LEDA database values. All analyses were performed with linear mixed models (REML method), where management was treated as a fixed effect, while site and date were treated as random effects. Variation in community LDMC was in 80% explained by the site; by contrast, variations in standing biomass and the total levels of N, P and K were explained by the site only up to twenty five %. Filtering out the random effects, all characteristics were significantly affected by management. We found, consistent with current studies, that community LDMC was significantly the lowest under mowing, but, unexpectedly, the total levels of N, P and K were also significantly the lowest under mowing. In summary, higher total levels of N, P and K in standing biomass may not be expected for vegetation with lower LDMC when analyzing grasslands under different management regimes.

EFFECTS OF ELEVATION ON THE NUTRIENT LIMITATIONS OF SOME TREE SPECIES TO PLANT GROWTH ON MT. FUJI

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Keywords: Nitrogen, Phosphorous, Volcanic soil, Nutrient resorption efficiency, M:P ratio

Nitrogen (N) and phosphorus (P) frequently limit plant growth in early-succession soils. The vegetation on Mt. Fuji, a young volcano in central Japan, may be affected by deficiencies of N and/or P. The limitation of soil nutrients may be more severe at higher altitudes. The aim of this study was to clarify the role of N-P limitation on the growth of tree species along an altitude gradient on the north-facing slope of Mt. Fuji. At the three sites that are characterized by different altitudes, the soil nutrient conditions were examined, and the N and P concentrations in living and dead leaves of several dominant tree species (three broadleaf trees and three conifers) were measured. The nutrient resorption efficiency (NRE, %) during leaf senescence and the N:P ratio in foliage were used as indices of nutrient limitation. The concentration of available soil N and P tended to decrease with elevation. The NRE in deciduous trees indicated that nutrient limitation changed from N-limitation to P-limitation with elevation. On the other hand, the NRE of conifers did not indicate any change in nutrient limitation. The N:P ratio exhibited no trend along the elevation gradient regardless of the species or based on the criteria proposed by Koerselman and Meuleman (1996) for wetland vegetation. Further studies are needed for applying the N:P ratio to forest ecosystems.