Tagungsnummer
P66

Thema
Kommission III: Bodenbiologie und Bodenökologie

Bodenorganismen-Pflanzen Interaktionen

Autoren
S. Zimmermann[1], A. C. Risch[2], M. Schütz[2]
[1]Eidg. Forschungsanst. WSL, FE Waldböden/Biogeochemie, Birmensdorf; [2]Eidg. Forschungsanst. WSL, Ökologie der Lebensgemeinschaften, Birmensdorf

Titel
Net N mineralization in subalpine grasslands: effect of aboveground vertebrate and invertebrate herbivores

Abstract
Aboveground herbivores have strong effects on grassland nitrogen (N) cycling. They can accelerate or slow down soil net N mineralization depending on ecosystem productivity and grazing intensity. We assessed how a diverse herbivore community affects net N mineralization in subalpine grasslands. By using size-selective fences, we progressively excluded large, medium, and small mammals, as well as invertebrates from two vegetation types, and assessed how the exclosure types (ET) affected net N mineralization. The two vegetation types differed in long-term management (centuries), forage quality, and grazing history and intensity. To gain a more mechanistic understanding of how herbivores affect net N mineralization, we linked mineralization to soil abiotic (temperature; moisture; NO3, NH4, and total inorganic N concentrations/pools; C, N, P concentrations; pH; bulk density), soil biotic (microbial biomass; abundance of collembolans, mites, and nematodes) and plant (shoot and root biomass; consumption; plant C, N, and fiber content; plant N pool) properties.

Net N mineralization differed between ET, but not between vegetation types. Thus, shortterm changes in herbivore community composition and, therefore, in grazing intensity had a stronger effect on net N mineralization than long-term management and grazing history. We found highest N mineralization values when only invertebrates were present, suggesting that mammals had a negative effect on net N mineralization. Of the variables included in our analyses, only mite abundance and aboveground plant biomass explained variation in net N mineralization among ET. Abundances of both mites and leaf-sucking invertebrates were positively correlated with aboveground plant biomass, and biomass increased with progressive exclusion. The negative impact of mammals on net N mineralization may be related partially to (1) differences in the amount of plant material (litter) returned to the belowground subsystem, which induced a positive bottom-up effect on mite abundance, and (2) alterations in the amount and/or distribution of dung, urine, and food waste. Thus, our results clearly show that short-term alterations of the aboveground herbivore community, can strongly impact nutrient cycling within ecosystems independent of long-term management and grazing history.

Literatur
Risch, A.C., Schütz, M., Vandegehuchte, M., van der Putten, W.H., Duyts, H., Raschein, U., Gwiazdowicz, D.J., Busse, M.D., Page-Dumroese D.S., Zimmermann, S., 2015: Aboveground vertebrate and invertebrate herbivore impact on net N mineralization in subalpine grasslands. Ecology 96(12): 3312-3322.