Foliar delta(15)N values characterize soil N cycling and reflect nitrate or ammonium preference of plants along a temperate grassland gradient

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

ID 2106223
Author(s) Kahmen, Ansgar; Wanek, Wolfgang; Buchmann, Nina
Author(s) at UniBasel Kahmen, Ansgar ;
Year 2008
Title Foliar delta(15)N values characterize soil N cycling and reflect nitrate or ammonium preference of plants along a temperate grassland gradient
Journal Oecologia
Volume 156
Number 4
Pages / **Article-Number** 861-70

The natural abundance of stable (15)N isotopes in soils and plants is potentially a simple tool to assess ecosystem N dynamics. Several open questions remain, however, in particular regarding the mechanisms driving the variability of foliar delta(15)N values of non-N(2) fixing plants within and across ecosystems. The goal of the work presented here was therefore to: (1) characterize the relationship between soil net mineralization and variability of foliar Deltadelta(15)N (delta(15)Nleaf - delta(15)Nsoil) values from 20 different plant species within and across 18 grassland sites; (2) to determine in situ if a plant's preference for NO (3) (-) or NH (4) (+) uptake explains variability in foliar Deltadelta(15)N among different plant species within an ecosystem; and (3) test if variability in foliar Deltadelta(15)N among species or functional group is consistent across 18 grassland sites. Deltadelta(15)N values of the 20 different plant species were positively related to soil net mineralization rates across the 18 sites. We found that within a site, foliar Deltadelta(15)N values increased with the species' NO (3) (-) to NH (4) (+) uptake ratios. Interestingly, the slope of this relationship differed in direction from previously published studies. Finally, the variability in foliar Deltadelta(15)N values among species was not consistent across 18 grassland sites but was significantly influenced by N mineralization rates and the abundance of a particular species in a site. Our findings improve the mechanistic understanding of the commonly observed variability in foliar Deltadelta(15)N among different plant species. In particular we were able to show that within a site, foliar delta(15)N values nicely reflect a plant's N source but that the direction of the relationship between NO (3) (-) to NH (4) (+) uptake and foliar Deltadelta(15)N values is not universal. Using a large set of data, our study highlights that foliar Deltadelta(15)N values are valuable tools to assess plant N uptake patterns and to characterize the soil N cycle across different ecosystems.

Publisher Springer
ISSN/ISBN 0029-8549 ; 1432-1939
edoc-URL http://edoc.unibas.ch/49363/
Full Text on edoc No;
Digital Object Identifier DOI 10.1007/s00442-008-1028-8
PubMed ID http://www.ncbi.nlm.nih.gov/pubmed/18414899
Document type (ISI) Journal Article