RELATIVE NITROGEN MINERALIZATION AND NITRIFICATION POTENTIALS IN RELATION TO SOIL CHEMISTRY IN OAK FOREST SOILS ALONG A HISTORICAL DEPOSITION GRADIENT

Ralph E.J. Boerner[1] and Elaine Kennedy Sutherland[2]

This study quantified soil nutrient status and N mineralization/nitrification potentials in soils of oak-dominated, unmanaged forest stands in seven USDA Forest Service experimental forests (EF) ranging along a historical and current acidic deposition gradient from southern Illinois to central West Virginia. Among these seven sites (that spanned 8.5 ° of longitude) soil pH and Ca^{2+} decreased and soil organic C and soluble Al^{3+} increased from west to east. In general, initial soil solution NO_3^- and NH_4^+ was uncorrelated with longitude. The Fernow EF (WV), the easternmost site, was the exception to this trend. Soils from the Fernow had the highest concentrations of both NO_3^- accumulation, and the greatest N mineralization potential. Stepwise regressions of N mineralization rate, net NO_3^- accumulation, and proportional nitrification on initial soil properties produced models with overall r^2 of 0.705, 0.772, and 0.708, respectively. Rates of N turnover were positively correlated with initial NO_3^-, pH, and Ca:Al ratio and negatively correlated with soil solution Al^{3+} concentrations. Differences in oak growth and mortality may be related to the differences in soil chemical status and soil N dynamics along these seven experimental forests.

[1]Department of Plant Biology, 1735 Niel Ave., Ohio State University, Columbus, OH 43210-1293.

[2]USDA Forest Service, Northeastern Forest Experiment Station Delaware, OH 43015.