

Background: Increased soil phosphorus (P) caused by agricultural intensification has been associated with decreased plant species richness (SR) in central Europe. How plant communities and soil P gradients are related in unimproved open habitats remains unclear.

Aims: The aim of this article was to characterise the relationship between soil chemical parameters and plant species composition and richness in unimproved open habitats.

Methods: The influence of soil chemical parameters (pH, P, K, Mg) on species composition was assessed, using data from 40 heathland and 54 grassland plots, by non-metric multidimensional scaling and permutational multivariate analysis of variance. The relationship between soil chemical parameters and SR was tested by linear mixed effects models.

Results: A direct relationship between heathland community composition and pH was observed, explaining 10% of variation in species composition, while P, Mg and pH together explained 17% of variation in grassland composition. In heathlands, SR increased with increasing pH, whereas in grasslands, SR decreased with increasing soil P.

Conclusions: Soil chemical parameters were substantially related to plant community composition and richness. In an area spared from a century of agricultural intensification, reduced pH appeared to constrain SR in heathlands, while even slight P increases ($<10 \text{ mg kg}^{-1}$) depressed plant SR in semi-natural grasslands.