

Effects of losing keystone oak species on soil microbial community composition in temperate forests in the USA



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RESULTS

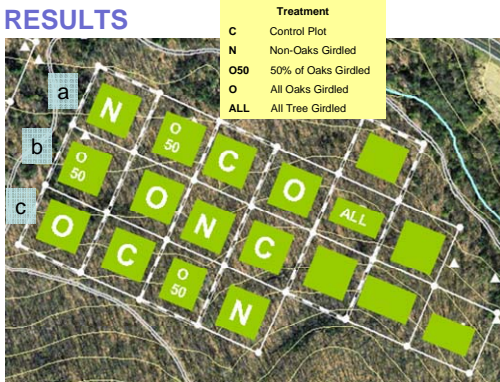


Fig.1: Black Rock Forest's North slope experimental area

Treatment (girdling)	WC [%]	pH (in H ₂ O)	C [%]	C:N
C	54.4 (11.3)	4.2 (0.4)	19.4 (0.4)	20.9 (0.4)
N	48.5 (10.9)	4.4 (0.5)	16.3 (0.5)	20.1 (0.5)
O50	45.6 (2.8)	4.4 (0.1)	12.1 (0.1)	18.4 (0.1)
O	49.3 (6.8)	4.7 (0.5)	11.9 (0.5)	18.2 (0.5)
All	33.2	4.9	5.0	16.8

Fig.2: General soil parameters (0-10 cm depth). Mean values with standard deviation given in parentheses (n = 3, for All n = 1)

INTRODUCTION

The main objective of this study is to mimic pathogen-induced cascade mortality of the genus *Quercus*, which represents one of the foundation tree taxa in the Eastern North America forests and subsequently to follow its specific impact on the soil microbial community composition.

Phospholipid fatty acid (PLFA) patterns were used to describe the changes in soil microbial community composition 1 year after the tree-girdling treatments (Fig. 1).

SUMMARY

- Soil pH increased from 0.2 to 0.7 units at the girdled sites with a concomitant increase of nutrient cations (data not shown) probably as a result of disturbed absorption (Fig.2).
- A decrease of C:N ratio led to an increase in N supply and consequently to the termination of the belowground C (Fig.2).
- The microbial communities were compositionally distinct among different treatments and the slope position, suggesting an important indirect effect of soil chemistry on the microbial composition (Fig.3).
- Increases in the microbial biomass, expressed as Total PLFA, were related to soil pH and nitrogen content (Fig.4).
- Termination of the belowground tree C supply led to a considerable reduction of fungal biomarker, 18:2ω6,9 by 6% at O50 plots and 27% at all oak girdled plots. Furthermore, at the fully oak girdled plots the fungal community shifts significantly from the other treatment; however, no differences were noticed for 50% oak girdled sites (Fig.4).
- Bacterial biomass remained unaffected but the increase in cyclopropy fatty acids emphasize the stress conditions (e.g. starvation) at the studied plots (Fig.4).

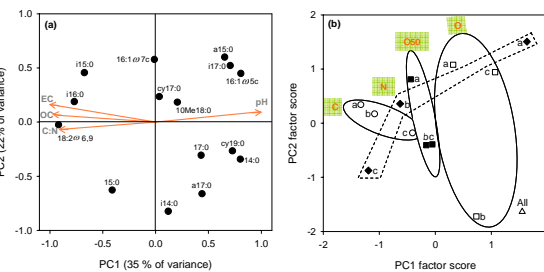


Fig.3: (a) Loadings for the first two principal components (PC1 and PC2) of 15 PLFAs (mol%). Arrows indicate correlation of soil parameters with PC1 and PC2 (n = 5). (b) Score plot of PCA showing the separation of the five treatments along the studied slope.

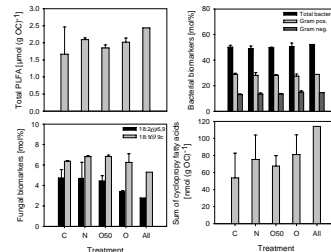


Fig.4: Sum of PLFAs of various microbial groups in soils (0-10 cm depth) among the studied different treatments. Mean and standard deviation (n=3 and for All n = 1)