Shifts in mycorrhizal types of fungi and plants in response to fertilisation, warming and herbivory in a tundra grassland

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Résumé

Climate change is expected to hit high latitudes regions in a much heavier way than in the rest of the globe. In the Arctic tundra, climate warming may lead to increased soil nutrient availability and interact with simultaneous changes in grazing pressures. It is presently unknown how these simultaneously occurring global change drivers affect the root-associated fungal communities, particularly mycorrhizal fungi, and whether changes coincide with shifts in plant mycorrhizal types. We therefore investigated the response of root-associated fungi and mycorrhizal types of the plant community to 10 years of warming, increased nutrient availability and grazing exclusion in a full-factorial field experiment, in a Finnish tundra grassland. We found that fertilisation had the strongest effect on the root-associated fungal community, but responses were depending on the other treatment combined. We observed alterations in the fungal community composition that were directly related to plant: the relative abundance of putative plant pathogens was systematically increased by fertilisation and mycorrhizal fungi had contrasted responses to the treatments. For instance ecto- and ericoid mycorrhizal fungi were favoured by warming, while the relative abundance of arbuscular mycorrhizal fungi was generally increased by fertilisation. In terms of vegetal cover, results demonstrate important shifts in the plant mycorrhizal types, which mostly but not always aligned with fungal community ones. Particularly, the combination of the three treatments led to a system highly dominated by arbuscular mycorrhizal plants. Our results highlight the importance of considering multiple global change factors to predict symbiotic and antagonistic fungal communities, as they interactively shape plant and fungal communities.

Mots-Clés: global change, fertilisation, warming, grazing exclusion, tundra

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