Submitted Abstract

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Title	How Shrub Encroachment Affects The Potential Function Of Saprotrophic And Mycorrhizal Fungi In Subalpine Grasslands.
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Abstract

In the subalpine belt of many mountain areas, mowing and domestic grazing have contributed to maintaining semi-natural, anthropogenic grasslands. These grasslands have multiple benefits to biota and human societies. They store large amounts of carbon, host a rich biodiversity, provide nutritionally rich resources for herbivores, and contribute to a mosaic of ecosystems which together enhance the resilience of mountain areas to various disturbances. Changes in agropastoral systems in the past decades in Europe – i.e. cessation of mowing, extensification of grazing of less productive or accessible pastures and abandonment – have led to the initiation of secondary successions with shrub encroachment.

The modifications in plant community composition induced by shrub encroachment have been shown to impact soil properties and biogeochemical cycling. Previous studies have shown that the carbon to nitrogen ratio increases with shrub encroachment while nitrogen availability generally decreases. Microbial community composition was also impacted in different ways depending on colonising shrub species. However, a clear understanding of the mechanisms involved and of the specific role of saprotrophic and mycorrhizal fungi in those processes is still lacking.

The LUCSES project – forecasting impacts of land-use and climate change on ecosystem services from shrub-encroached mountain grassland – aims to fill these knowledge gaps, with study sites in the French and Austrian Alps. In the French Alps, we investigate changes following shrub expansion, across plots selected along gradients of encroachment by various deciduous and evergreen shrubs, from pure grassland to approximately 80% shrub cover. To observe the local effects of shrubs on fungal communities and their activities, we sampled soil and plant roots directly underneath shrubs and underneath herbaceous vegetation within each plot. We quantified potential lignin-modifying enzymatic activity and assessed saprotrophic and mycorrhizal fungal community composition using DNA metabarcoding. We also measured community-level variables in each plot, such as plant functional traits, soil properties, nutrient availability, and potential functional enzymatic activity, hypothesised to influence fungal communities.

Our results highlight potential tipping points in ecosystem functioning following shrub encroachment in subalpine grasslands and its linear effects on plant and soil parameters, and the specific role of saprotrophic and mycorrhizal fungi in the underpinning mechanisms.