
Extreme drought on grasslands: presence of *Trifolium repens* promotes aboveground recovery through complementarity effects

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Abstract

The frequency and magnitude of extreme drought events are expected to increase with climate change, affecting ecosystem services provided by grasslands such as forage production. In this context, grassland communities which are more diverse in species or functional groups are more likely to be resilient against environmental perturbations such as extreme drought ("insurance hypothesis"). We assume that the presence of the legume *Trifolium repens* lead to higher biomass production of grass mixtures under well-watered conditions through complementarity of water use and N facilitation. Similarly, we hypothesized that the presence of *Trifolium repens* can lead to a better resilience in diverse grass mixtures after an extreme drought event. We used a 20-months mesocosm experiment to investigate the effects of species richness (single species, two- and five-species mixtures) and functional group diversity (presence of *Trifolium repens*) on a set of traits related to light, N and water use and measured at community level. An extreme summer drought lasting two months was applied to half of the mixtures using a large rainout shelter. From two months following rewetting, we found a positive effect of *Trifolium* presence on biomass production and complementarity effects in the two-species mixtures. We also observed a time-dependence for positive complementarity effects possibly due to the slow development of *Trifolium* in mixtures subjected to severe water deficit. Our first results highlight the importance of *Trifolium repens* presence and abundance for a fast aboveground recovery after extreme drought through complementarity effects.

Keywords: legume, overyielding, mixtures, extreme drought

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