Swards of different botanical composition: the impact of an additional fertilization under drought conditions

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Introduction & aim

High-yielding and high-quality swards are critically important for livestock production. To meet the growing demand for food, the usage of synthetic nitrogen (N) fertilizers has increased by more than 800% from 1961 (IPCC, 2019). Extensive N fertilizers production and usage contribute to greenhouse gases (GHG) emissions and long-lasting impact on the climate.

Drought is a critical factor affecting the productivity and persistence of temperate swards. Prolonged dry conditions can lead to a decline in swards yield and quality, compromising the overall stability and resilience of grassland systems. Finding nature-based solutions for sustainable swards management are crucial. One the solutions to reduce the demand in N synthetic fertilizers in swards is to implement grass-legumes mixtures. There are several benefits associated with the use of legumes in swards, including nitrogen fixation, which reduces the requirement for N fertilizer, improved herbage production and quality, and reduced N_2O emissions.

This study investigated the effects of different legume species — alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), and bird's-foot trefoil (*Lotus corniculatus*) — on the productivity of temperate swards under drought conditions and different fertilization in combination with perennial grasses.

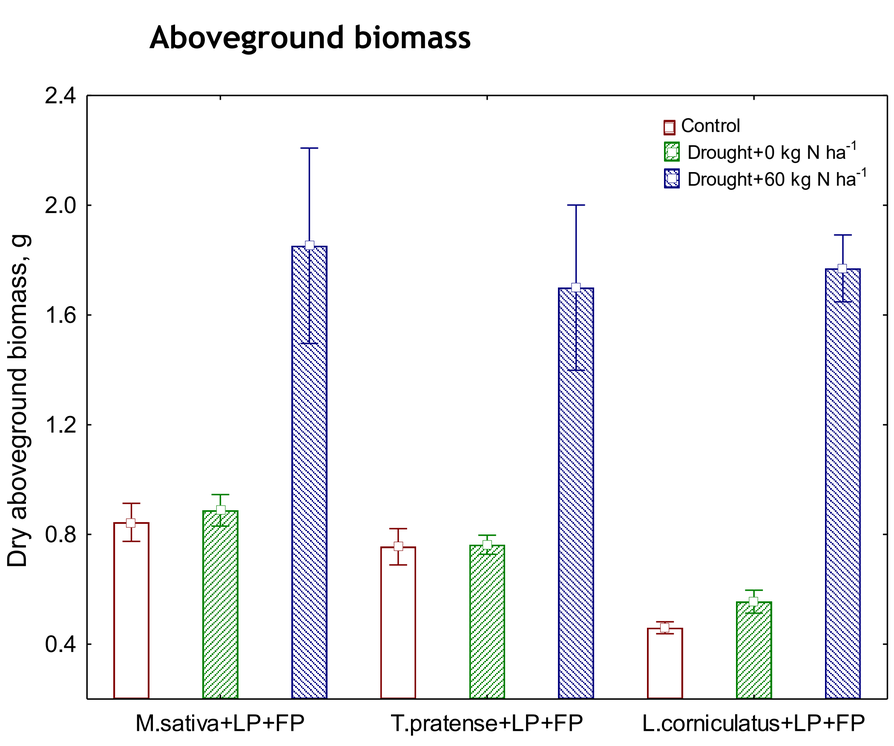
Materials & methods

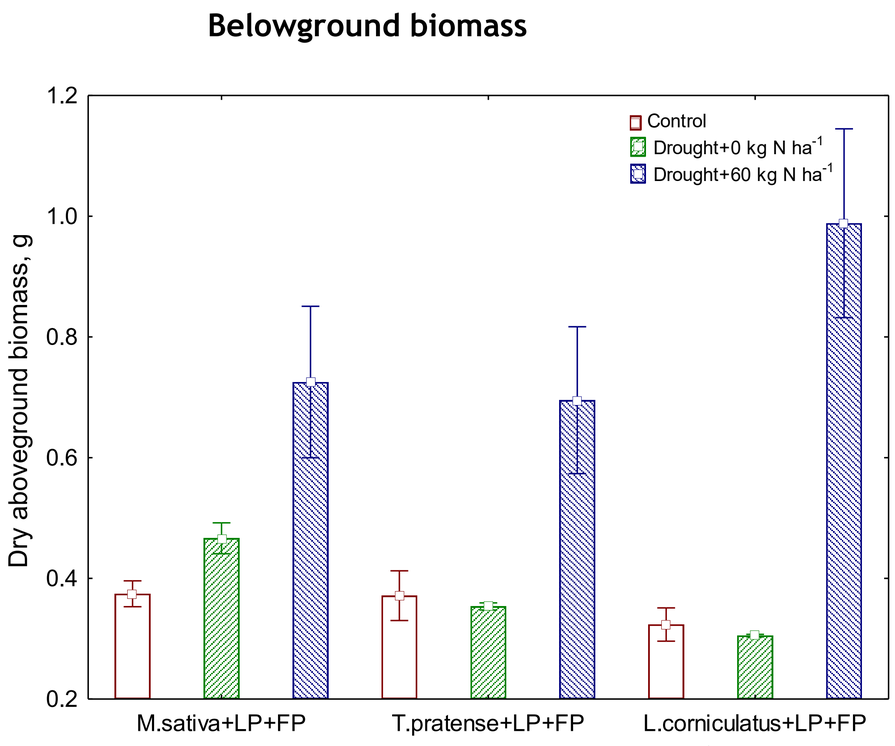
- The swards were composed: 60% legumes (Fabaceae) and 40% grasses (Poaceae).
- Perennial grasses meadow fescue (*Festuca pratensis*) and perennial ryegrass (*Lolium perenne*) were mixed with different legume species — alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), and bird's-foot trefoil (*Lotus corniculatus*).

	Legumes	Grasses
1	60% *M. sativa*	20% *L. perenne* +20% *F. pratensis*
2	60% T. *pratense*	20% *L. perenne* +20% *F. pratensis*
3	60% *L. corniculatus*	20% *L. perenne* +20% *F. pratensis*

- The pot experiment with different plant mixtures was conducted in growth chambers with a controlled environment under a completely randomized design using three factors:
  (i) soil moisture content, (ii) different plant mixtures composition and (iii) different fertilization.
- In control a volumetric soil water content (SWC) was held at 30%, in drought treatment plants were not irrigated for 7 days.
- Level of fertilization: 0 and 60 kg fertilizer N ha^{-1}.
- Mixtures productivity, measured as dry aboveground and belowground biomass, was evaluated after 56 days.

Results & conclusions





- The swards composed *with M.sativa* produced higher aboveground biomass than swards composed with *T. pratense* and *L. corniculatus*.
- The swards composed *with M.sativa showed the highest resistance to drought.*
- *Additional fertilization increased sward resistance to drought*

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