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ON PASTURE AND FORAGE CROPS
AND ON SHEEP AND GOAT NUTRITION

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Book of Abstracts



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Joint Seminar of the FAO CIHEAM Networks on Pasture and Forage Crops and on Sheep and Goat Nutrition

Alternative feed resources and their management for transiting towards a sustainable ruminant production

Catania, 27-29 September 2022

Boosting the contribution of livestock and forage productions to sustainable agri food systems

The Mediterranean basin is highly affected by climate change, while certain countries still need to increase livestock production in order to achieve food self-sufficiency. Producing «better» is an urgent issue.

In this respect, ruminants have an asset: they can be fed on plants, plant parts and agro-industrial by products which are not directly recoverable for humans.

The Mediterranean landscapes are composed of an agro-silvo-pastoral mosaic, which offers opportunities for interactions between livestock production, agriculture and natural areas. Mediterranean grasslands are an important source of forage; cultivated forage, possibly associated to perennial or annual crops, provides high-quality feed for periods of high nutrient requirements; agro-industry produces a variety of typical by-products which may be included in ruminant diets.

This joint seminar of the «Ruminant nutrition» and «Mediterranean pastures and forage crops» sub-networks aims at exploring the various opportunities in terms of novel or underexploited local feed resources, which could be valued better in the future and used to secure small ruminant feeding systems and boost animal production. Joining these two sub-networks gives the opportunity to consider the question from two complementary points of view, thus encouraging system approaches

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Responses of Mediterranean rangelands to increased summer droughts

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Take home Message Successive drier summers alter more community structure than biomass productivity of rangelands.

Introduction Under climate change, temperatures and drought are expected to increase around the Mediterranean basin (IPCC, 2019) with an extended period of water stress in summer (Giannakopoulos et al., 2009). For Mediterranean rangelands, summer drought is a chronic stress factor that depends on soil types and water retention capacities. Water deficit was shown to be buffered by “adjusted” biomass production across a range of rangelands in contrasting soils (Barkaoui et al., 2017). However, we question to which extent increased drought can still be buffered to ensure the long-term resilience of this rangeland. We hypothesise that successive increased summer droughts could alter the community towards a new state with a loss of ecosystem functions especially for communities on shallow soils with low water reserve.

Material and methods The study was carried out on dry calcareous rangelands of southern France, at the INRAE-La Fage experimental (43°55'N, 3°05'E, 790 m asl). The vegetation is dominated by perennial grasses with different species communities according to soil depth and texture. Four sites with sub-areas of sandy shallow soil (18±5 cm) and deep silty soil (85±17 cm) were identified. Increased summer drought treatment was applied in comparison with ambient summer drought treatment. Since June 2016 and for 5 years, we simulated a drier summer by setting a temporary rainout shelter for ~ 75 days from mid-June to end of August to create a warmer and drier micro-climate. Climatic parameters and soil moisture were monitored. Spring and autumn Aboveground Net Primary Production (ANPP) were measured in June and December each year, respectively. Vegetation cover (% bare soil) and the community structure (% monocots) were regularly assessed.

Results and discussion Rainout shelters intercepted between 105 to 25 mm (44 to 99 %) of rainfall water, increased average temperature of 0.7 to 1.52°C and reduced relative humidity of 0.8 to 2.3 %, for shallow and deeper soil respectively, creating warmer and drier conditions (among the driest summers in 35 years). Soil moisture was reduced by ~15 % in the summer for both types of soil. Legacy effect of repeated drought was observed in soil moisture in autumn for deep soils all years, but all soils were re-filled entirely every winter. No difference was detected between treatments for cumulative ANPP across the first period (2016–2018, Years 1-2) and neither during the second period (2019–2021, Years 4-5) for deep soil communities, but cumulative ANPP was reduced in the second period for shallow soils communities (Fig. 1.A). Bare soil increased under drier condition for both periods and soils, mostly in shallow soils where it reached very critical levels, higher than 50% (Fig. 1.B). The proportion of monocots (mainly grasses) was stable across the first period in all communities (Fig. 1.C). Conversely, the proportion of monocots increased in deep soil and decreased in shallow soil communities towards the end of the experiment under drier summers (Fig. 1.C).

Conclusion ANPP of herbaceous communities subjected to five successive increased summer droughts, was buffered more for rangelands on deep than on shallow soils. Drier summers contributed to a degradation of communities in shallow soils, with increased bare soil and significant species turnover.

References

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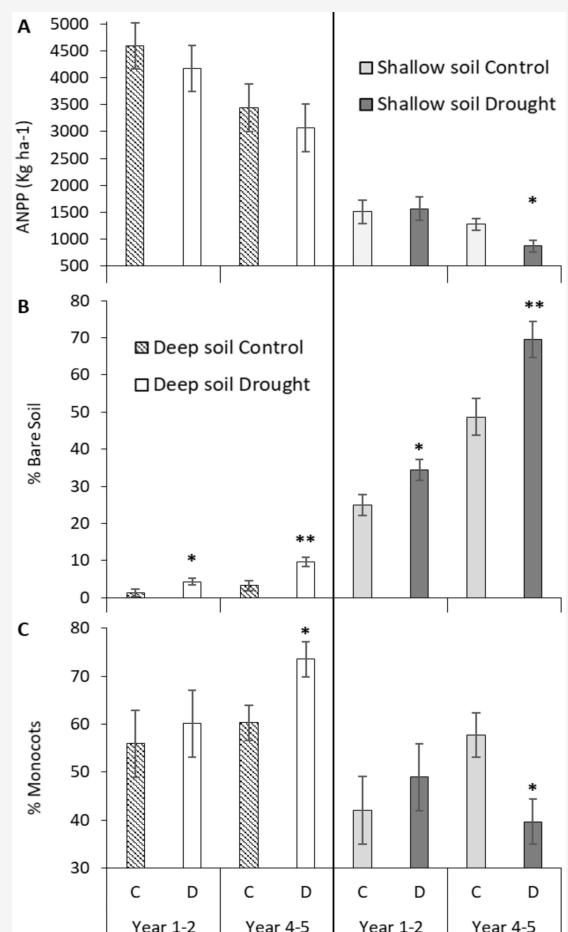


Figure 1 Cumulative ANPP (kg ha⁻¹) (A), bare soil % (B) and Monocots % (C), for each treatment (C-control and D- increased summer drought) and period (2016–2018 and 2019–2021). Mean and EE; *p<0.05; **p<0.01.