Managing resources by grazing in grasslands dominated by dominant shrub species

D. Magda[2], C. Agreil[1], M. Meuret[1], E. Chambon-Dubreuil[2] and P.-L. Osty[2]
[1]INRA-Sad Ecodéveloppement. Site Agroparc. F-84 914 Avignon Cedex 9, France, Email: agreil@avignon.inra.fr and [2]INRA-Sad Orphée, BP 27, Chemin de Borde-rouge,. F-31 326 Castanet-Tolosan Cedex, France

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Introduction The European natural grasslands are attracting new attention because of their environmental value as habitats for threatened fauna and flora species and their contribution to the diversity of landscapes. Those responsible for the implementation of the European agri-environmental policy are hence encouraging livestock farmers to adopt grazing practices that contribute to the conservation of grassland biodiversity especially by limiting encroachment by dominant shrubs. However, current scientific knowledge and technical information are often insufficient to connect flock feeding and the impact of grazing on shrub dynamics and livestock farmers are not very enthusiastic about restoring or conserving "plant mosaics" including shrubs that support biodiversity in their fields. This paper presents results of an interdisciplinary study on interactions between small ruminant feeding strategy and population dynamics of dominant shrub species with the objective of managing by grazing the structure of plant community and thus to provide the renewal of resources on a multi-year scale.

Methods Concerning the ruminants' feeding strategy, experiments with dry ewes were carried out on farm, by recording their foraging behaviour and adjustments in response to varied and variable feeds on offer. The direct observation method of bites was recently improved for highly diversified environments, which allowed the recording of intake rate changes during bouts and the estimation of daily intake. In order to analyse the demographic strategy of the dominant plant population, recording of the different demographic parameters of the dynamics of broom populations (seed germination and dormant rate, adult fecundity and survival rates) were carried out on an ungrazed shrubland. A grazing experiment was conducted at different phenological stages of the broom population to identify the edible plant parts and quantify their consumption rate. The demography was modelled using Leslie matrices

Results During a paddock-grazing sequence, the dry ewes progressively expanded the range of their daily bite masses which contributed to maintaining the stability of daily intake. This adjustment was associated with a regular temporal pattern: the alternating between bouts of high and low intake rate with a pseudo-period of approx. 15 min. The development of approaches that considers the "functional feeds" is advocated. These cannot only be described by grass height and nutritive value alone. Concerning the dominant shrub population, several plant parts are consumed (flowers, young pods, young shoots and mature stems) offering multiple potential demographic interactions. A major response of repeated grazing was the process of adult bushes becoming vegetative and then creating a new demographic category within the population structure. Simulations of potential grazing impact at different seasons pointed out the importance of the role of rejuvenation of adults and mortality of juveniles. These results led to the building of a model capable of linking two biological processes that are generally treated separately, i.e. the feeding strategy of small ruminants and the population dynamics of species with a strong dominance capacity. The model was designed as an account of a real grazing situation in which a livestock farmer pursues a two-fold aim: to feed a flock of small ruminants and, simultaneously, to maintain the species diversity in a plant community by controlling the dynamics of a dominant species (in this case broom) at a paddock scale. By distinguishing four time scales, we argue in favour of interlinking the two processes at the level of the plant part. Plant parts can be classified according to the role that they play in the organization of the feeding strategy and to the effects of their removal on the dominance dynamics. The model is useful for identifying "target plant parts" to be grazed. From the management point of view, paddock adjustment practices and the season of utilisation (in relation to the functional feeds on offer) should be tailored to fit the animals' motivation to consume these target plant parts. From a scientific point of view, the model encourages an in-depth study of the spatial dimension of processes and related practices.