

Land Use Systems in Grassland Dominated Regions

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Vegetation typology as a management tool for intra-alpine summer pastures

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Abstract

The ecological and management features are quite homogeneous in the summer pastures of the intra-alpine zone including mid to upper Maurienne and Tarentaise in France, and Valle d'Aosta, in Italy. The alpine level shows its maximum development in the inner Alps and is characterised by a wider variety of plant communities because of the bio-geographic conditions. In these regions, the economical and ecological role of upland pastures is of primary importance for farming systems and for preservation of the environment. A classification of plant communities in alpine pastures on both sides of the north-western Alps is proposed within a common research framework. This typology, based on multivariate analysis of the abundance of species in about 600 vegetation relevés, is for use by technicians and is presented with a simplified dichotomous key. Physiognomy, vegetation composition and phytosociological features are presented for each type, as well as the detailed environmental conditions and the utilisation value of the pastures. The characterisation of the vegetation, from a floristic and an agronomic point of view, provide the basic knowledge to define appropriate management schemes.

Keywords: NW Alps, botanical composition, potential stocking rate, diversity, diagnosis

Introduction

Summer pastures represent a key resource in the forage systems on dairy farms on both sides of the north-western Alps (Tarello *et al.*, 2000). Since their floristic composition is influenced by the combined effects of physical environment and management practices, it is necessary to apply a management scheme adapted to their production potential, precocity and fragility if these grasslands, with their economic and ecological value, are to be preserved. For these reasons, different studies have been carried out over the last few years in order to provide field technicians with practical diagnostic tools for recognizing the main vegetation types and evaluating the correct stocking rate and the best period for grazing (Bornard and Dubost, 1992; Jouglet, 1999). Since any typology has only limited geographical application potential, those types identified in the outer valleys of the French Alps were difficult to apply to the inner Alps, where the bio-geographic conditions are particular. Because the high mountain massifs isolate these regions from Atlantic and Mediterranean influences, they receive relatively low precipitation: the annual rainfall, at 2000 m asl, ranges between 1000 and 1500 mm. The absence of summer mist, the wide temperature range and the accelerated snow melting due to the foehn wind lead to a lengthening of the growing season and to the raising of the altitudinal limits of the vegetation belts: the alpine level is at its maximal development and a wider variety of plant communities is observed.

Materials and methods

This work was carried out in the intra-alpine zone of the north-western Alps: Valle d'Aosta (I) and Vanoise (F). The floristic database was made up of 578 linear relevés carried out according to the Daget and Poissonet method in 83 mountain pastures (380 in 38 mountain pastures on the Italian side and 198 in 45 mountain pastures on the French side), thus

embracing the regional variation in geological, topographical and management features. To follow grass production trends, phytomass samples were taken weekly in 33 sites during several summers, from 1987 to 1998, and another 76 samples were cut to evaluate herbage production in different pastures. Vegetation relevés were analysed by Factorial Correspondence Analysis followed by Hierarchical Cluster Analysis.

Results and discussion

All the floristic relevés were clustered into 23 types of vegetation: 19 grasslands, 3 heaths and one community on stony slopes. The initial hypothesis that the plant communities in the Italian and French inner Alps were substantially similar was confirmed: only one type (S6, dominated by *Festuca paniculata*, *Carex sempervirens* and *F. rubra*) was not common to both regions, due to the absence of *F. paniculata* in the Valle d'Aosta. Grassland types consisted of 6 subalpine, 3 transitional and 10 alpine plant communities (Table 1).

Table 1. Main species of the plant communities in the summer pastures of the study area.

Subalpine grasslands	
S1	<i>Nardus stricta</i> , <i>Festuca rubra</i> , <i>Plantago alpina</i>
S2	<i>Festuca rubra</i> , <i>Alchemilla xanthochlora</i> , <i>Agrostis capillaris</i>
S3	<i>Dactylis glomerata</i> , <i>Festuca rubra</i> , <i>Agrostis capillaris</i>
S4	<i>Onobrychis montana</i> , <i>Festuca ovina</i> , <i>Sesleria albicans</i>
S5	<i>Brachypodium pinnatum</i> , <i>Carex sempervirens</i> , <i>Festuca ovina</i>
S6	<i>Festuca paniculata</i> , <i>Carex sempervirens</i> , <i>Festuca. rubra</i>
Subalpine-alpine grasslands	
SA1	<i>Sesleria albicans</i> , <i>Carex sempervirens</i>
SA2	<i>Helianthemum nummularium</i> , <i>Carex sempervirens</i>
SA3	<i>Dryas octopetala</i> , <i>Carex sempervirens</i> , <i>Sesleria albicans</i>
Alpine grasslands	
A1	<i>Plantago alpina</i> , <i>Festuca ovina</i> , <i>Potentilla grandiflora</i>
A2	<i>Festuca violacea</i> , <i>Carex sempervirens</i> , <i>Festuca. rubra</i> , <i>Potentilla grandiflora</i>
A3	<i>Helictotrichon parlatorei</i> , <i>Helianthemum nummularium</i> , <i>Festuca violacea</i>
A4	<i>Festuca halleri</i> , <i>Potentilla aurea</i> , <i>Avenula versicolor</i>
A5	<i>Carex curvula</i> , <i>Trifolium alpinum</i> , <i>Avenula versicolor</i>
A6	<i>Kobresia myosuroides</i> , <i>Avenula versicolor</i> , <i>Festuca quadriflora</i> , <i>Carex rosae</i>
A7	<i>Trifolium alpinum</i> , <i>Festuca halleri</i>
A8	<i>Nardus stricta</i> , <i>Carex sempervirens</i> , <i>Trifolium alpinum</i> , <i>Festuca rubra</i>
A9	<i>Alchemilla pentaphyllea</i> , <i>Salix herbacea</i> , <i>Carex foetida</i> , <i>Plantago alpina</i>
A10	<i>Alopecurus gerardii</i> , <i>Plantago alpina</i>
Heaths	
L1	<i>Loiseleuria procumbens</i> , <i>Vaccinium uliginosum</i> , <i>Avenula versicolor</i>
L2	<i>Juniperus nana</i> , <i>Vaccinium uliginosum</i> , <i>Arctostaphylos uva-ursi</i> , <i>Vaccinium. myrtillus</i>
L3	<i>Rhododendron ferrugineum</i> , <i>Vaccinium uliginosum</i>
Stony slopes	
E	<i>Achillea nana</i> , <i>Salix retusa</i>

The results have been summarized in a field guide, published both in Italian and in French (Bornard and Bassignana, 2001), intended for technicians and advisors in the extension services. In the field, the identification of types follows a dichotomous key relying upon locality and topography of the site, sward appearance and, lastly, identification of the main species. Overall physiognomy, dominant and indicative species and phytosociological classification are presented for each type, as well as sub-communities, if they occur. The presentation of the agro-environmental features takes into account the altitudinal limits, prevailing aspect, topography, geological substratum and soil type, as well as usual management practices. The utilisation value of pastures includes: palatability evaluation,

average dry matter yield and Pastoral Value index, potential forage resource expressed in Feed Units for Milk (UFL) per hectare (Figure 1), sustainable stocking rate for cows, heifers or sheep, aptitude to regrow after grazing and best grazing period(s).

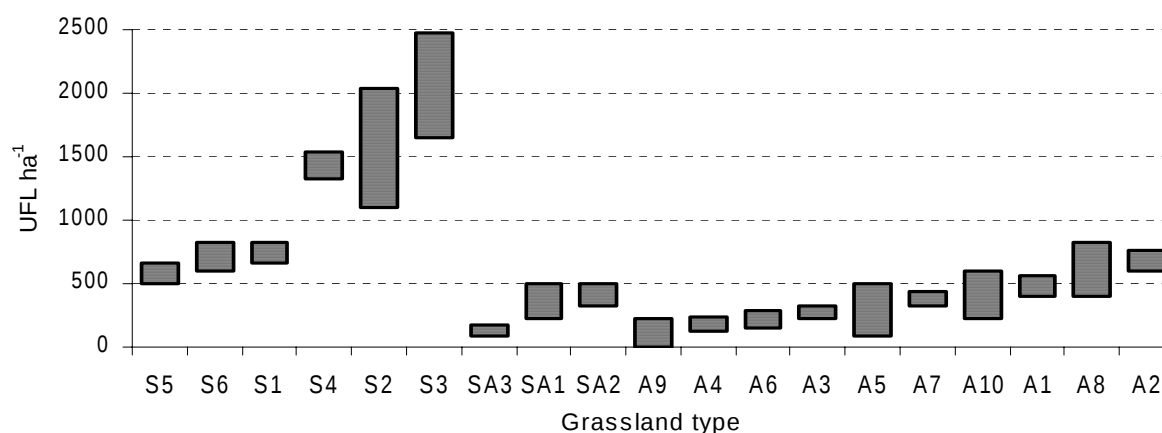


Figure 1. Ranges of potential forage resource (UFL ha⁻¹) in grassland types (code explanation in Table 1).

Conclusions

To complete the field guide, more detailed information will be required for each vegetation type concerning its classification according to Corine Biotope and to Natura 2000, its floristic diversity, different life forms, importance for wildlife, changes in management over the last decades, fodder potential, possible development and, finally, management suggestions to ensure sustainable utilisation of pastures, preserving both pastoral resources and diversity.

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