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in

Dubeuf J.-P. (ed.).
L'évolution des systèmes de production ovine et caprine : avenir des systèmes extensifs face aux changements de la société

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 61

2004
pages 189-192

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SUMMARY – In order to identify negative aspects connected with the extensive grazing management actually adopted in Italian protected areas, the forage selection by sheep on the plants and pastures (1500-2450 m a.s.l.) in the Monti Sibillini National Park is described and discussed. 81 surveys, performed on 12 different pasture types showed a high forage selection both on the plants and on their parts. Based on direct observations of the animal movements and grazing management, a selective behaviour was also observed on the pasture types. In fact, because of the low stocking rates [globally around 0.38 Standard Livestock Units (SLU)/ha] and of a limited presence of shepherds, the sheep could select the forage and therefore prefer the pastures with higher pastoral values.

Key words: Sheep, extensive grazing systems, forage selection, mountain pastures, Central Apennines.

RESUME – *"Sélection du fourrage par les moutons dans les systèmes de pâturage extensif dans le parc national des "Monti Sibillini" (Apennin Central, Italie)". Afin d'observer les aspects négatifs liés à une exploitation extensive du pâturage dans les zones protégées d'Italie, une étude sur la sélection du fourrage effectuée par les moutons sur : (i) les plantes ; et (ii) sur les pâturages (1500-2450 m) a été réalisée dans le parc national des "Monti Sibillini". Le travail a compris 81 analyses effectuées sur 12 pâturages différents. Les résultats de l'étude ont mis en évidence une forte sélection du fourrage aussi bien pour les plantes que pour leurs différentes parties. Les observations directes effectuées sur les animaux et la gestion du pâturage ont permis d'observer un comportement sélectif sur les différents pâturages examinés. En effet, à cause des taux de charge toujours bas [généralement autour de 0,38 Unité Gros Bétail (UGB)/ha] et d'une présence limitée des bergers, les moutons pourraient sélectionner le fourrage et donc préférer les pâturages qui présentent les plus hautes valeurs pastorales.*

Mots-clés : *Moutons, exploitation extensive, sélection du fourrage, pâturages montagneux, Apennin central.*

Introduction

The ovine number reductions and the production systems transformations occurred in the last century in Central Italy strongly reduced the stocking rates in the mountain pastures traditionally grazed by sheep.

In order to avoid permanent modifications of the natural resources, especially in protected areas, the negative effects connected with the extensive grazing management actually adopted need to be considered.

In this context, the present research aims to analyse the forage selection by sheep on plants and pastures in the Monti Sibillini National Park, on which to address future investigations in order to prevent long-term modifications of the botanical composition of the pastures and of its related characteristics.

Materials and methods

The research was conducted in the territory of Castelluccio di Norcia (1453 m a.s.l., Perugia) where the rocks are calcareous and the climate is characterised by mean annual temperature of 6.3°C and mean annual precipitation of 840 mm with maximum values occurring in spring and autumn and minimum in August.

The considered pastures (1500-2450 m a.s.l.) have an area of about 800 ha: those located below to

1800 m a.s.l. were obtained from original *Fagus sylvatica* woods deforested in the past centuries in order to increase the grazing areas (Pedrotti, 1969).

Eighty-one vegetation surveys, performed according to Braun-Blanquet (1964) during two consecutive summers, led to the definition of 12 pastures types characterized by different species composition.

According to Dunant (1977), the plants and their parts (leaves, flowers and stems) grazed by the sheep were assessed on each plot of the vegetation survey at the beginning and at the end of the grazing period, adopting a scale (0-3) increasing with the frequency and the intensity of their utilisation. Besides, based on direct observations of the animal movements and the grazing management performed throughout the grazing periods (June-beginning of autumn), the stocking rates on the pastures types and their corresponding pastoral values, calculated according to D'Ottavio *et al.* (2000), were assessed.

Results

Table 1 shows as, among 213 species, only 83, that globally resulted the most abundant, were clearly grazed by the sheep; 106 were totally refused (around 19.6% of the total abundance) and for 24, only 3.4% of the total abundance, were not recorded enough information to allow an evaluation of their utilisation.

Table 1. Number and mean percentage abundance (% Ab.) of the grazed, refused or not relieved plants

Species†	Clearly grazed		Totally refused		Not relieved		Totals	
	Number	% Ab.	Number	% Ab.	Number	% Ab.	Number	% Ab.
Grasses	20	51.8	3	5.8	6	2.4	29	60.0
Legumes	14	3.4	1	0.9	–	0	15	4.3
Others	49	21.8	102	13.0	18	1.0	169	35.7
Total	83	77.0	106	19.6	24	3.4	213	100.0

†Average % abundance of the different species groups in the 12 pasture types weighted up their extensions.

Table 2 shows as, globally, although in the most cases the grasses were clearly grazed (Table 1), their utilisation was meanly low mostly because of the rejection of their flowers and stems during all the season. In fact, the leaves presented indexes of good utilisation that, especially in the case of some species (*Sesleria nitida* Ten., *Cynosurus cristatus* L., *Festuca circummediterranea* Patzke), resulted frequent and intensive.

Table 2. Mean utilisation indexes of the clearly grazed species of the different groups at the beginning and at the end of the grazing season

Species†	Utilisation indexes								
	Beginning grazing season			End of grazing season			Total means		
	Leaves	Flowers + stems††	Totals	Leaves	Flowers + stems††	Totals	Leaves	Flowers + stems††	Totals
Grasses	1.5	0.3	0.9	1.4	0.3	0.9	1.5	0.4	1.0
Legumes	1.8	1.9	1.8	1.3	1.5	1.4	1.6	1.8	1.7
Others	0.3	1.0	0.7	0.6	0.5	0.6	0.6	1.2	0.9
Total	1.2	0.6	0.9	1.1	0.5	0.8	1.3	0.7	1.0

†Average of the indexes of the species of the group or of all the species weighted up their abundance.
††For grasses and "other species" flowers + stems means only flowers (stems are systematically rejected).

On the contrary, in spite of their low abundance, the legumes (e.g. *Trifolium montanum* L. ssp. *rupestre* (Ten.) Nyman, *Anthyllis vulneraria* L., *Medicago lupulina* L.) were more consistently affected by the grazing as the leaves, stems and flowers were eaten throughout the grazing period. In general, the "other species" presented the lowest utilisation indexes in comparison with the others groups.

The higher values recorded for the flowers throughout the season were due to the high utilisation of plants particularly selected by the sheep (*Anthemis cretica* L. ssp. *cretica*, *Dactylorhiza sambucina* L. Soó ssp. *sambucina*, *Senecio scopolii* Hoppe et Hornsch. ex Bluff et Fingerh.).

Figure 1 shows the linear regression between the stocking rate and the pastoral value of the 12 vegetation types found in the studied area (continuous line) compared with a situation characterised by a good grazing management (broken line), that is adequate stocking rates and rotational grazing (Cemagref, 1983).

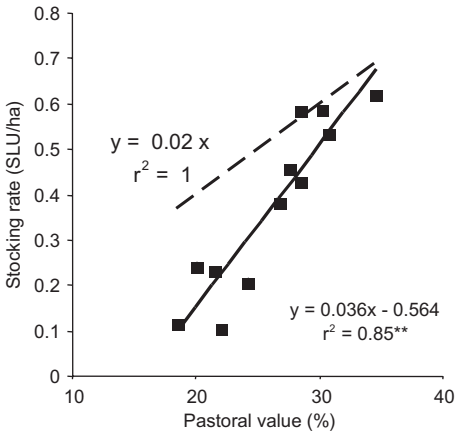

Fig. 1. Linear regression between the stocking rate and the pastoral value of the 12 vegetation types.

The regression coefficient, equal to 0.036 SLU/ha (Standard Livestock Units per hectare) per percentage point of pastoral value, is much higher than the value of 0.020 SLU/ha found in France. At this regard, it could be remembered that in the studied area the 2000 sheep were divided into homogeneous flocks according to their state (pregnant, which have lambed, in lactation, no more in lactation, flock replacement) to which were assigned one or more unfenced grazing sectors with characteristics (topography, altitude, productivity) suitable to their needs (D'Ottavio *et al.*, in press). Each sector was normally composed by different pasture types. Among these, as a consequence of the low stocking rates (globally around 0.38 SLU/ha) and of the no strict control of the flock, the sheep could select the types to graze. The difference between the two values is a consequence of this non correct pasture utilisation, in which the animals tend to prefer and to overgraze the pastures types with higher pastoral value.

Conclusions

Based on the exposed results, the forage selection adopted by the sheep in an extensive grazing system with no strict flock control presents a risk of an excessive reduction of the presence of species, as the legumes, which are not abundant but have high importance for their contribution to the formation of the pastoral value (D'Ottavio *et al.*, 2000).

In order to reduce this negative consequence and prevent long-term modifications of the botanical composition of the pastures, it seems reasonable to suggest the adoption of an improved grazing management and, in particular, of an adequate rotational grazing system and, when possible, proportioning the stocking rate to the pastoral value.

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