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Excrement distribution by different grazing animals in mountain pastures of Cansiglio upland plain (NE Italy)

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SUMMARY – In order to contribute to a better understanding of the excrement distribution on mountain pastures by grazing animals, at the end of the grazing season of 1996 the faeces concentration was assessed in a rotational grazing experiment, conducted for six years on a natural and improved pasture. Five treatments were compared: cattle grazing at low, medium and high stocking rates; and sheep and goats grazing at medium stocking rate. The results showed that, in the low cattle stocking rate treatment, the faeces distribution was proportional to the forage value of the pasture type. On the contrary, in the medium and high cattle stocking rates treatments the faeces distribution was independent of the forage value of the *ecofacies*. At the medium stocking rate adopted for goats and sheep, the results were similar to the medium cattle stocking rate. The only exception was represented by the sheep grazing on the natural pasture that caused a faeces distribution which was proportional to the forage value of the *ecofacies*.

Keywords: Mountain pastures, excrements distribution, stocking rate, cattle, sheep, goats.

RESUME – *"Distribution des fèces par diffèrents animaux au pâturage dans la montagne du haut plateau du Cansiglio (NE Italie)". Afin de contribuer à une meilleure compréhension de la distribution des excréments des animaux se trouvant dans des pâturages de montagne, la concentration de fèces a été déterminée à la fin de la saison de pâture en 1996 sur une expérience de pâturage tournant, conduite pendant 6 ans dans des pâturages naturels et améliorés. Cinq traitements ont été comparés : bovins en pâturage avec une charge faible (T1), moyenne (T2) et élevée (T3) ; moutons et chèvres en pâturage avec une charge moyenne (respectivement, T4 et T5). Les résultats ont montré que la distribution des fèces obtenue avec T1 est proportionnelle à la valeur fourragère du type de pâturage. Par contre, cette relation n'était pas valable avec les traitements T2 et T3. Avec la charge moyenne adoptée pour les moutons (T4) et chèvres (T5) les résultats sont similaires à ceux obtenus avec T3. La relation proportionelle entre la distribution des fèces et la valeur fourragère a été obtenue seulement dans le cas de moutons placés sur des parcours naturels.*

Mots-clés : *Pâturages de montagne, distribution des fèces, charge, bovins, moutons, chèvres.*

Introduction

In order to allow the continuous renewal of the production and to avoid the gradual deterioration of soil fertility, sustainable management of pastoral surfaces should imply the return of the mineral elements removed by grazing.

In this regard it is important to note that, while potassium is returned almost entirely to the soil in the liquid and solid excrements and nitrogen is restored by the same excrements, by the symbiotic and not symbiotic organisms and by the wet and dry nitrogen deposition from the atmosphere, the phosphorous content is only partially restored by the faeces.

Sustainable pasture management should guarantee a favourable distribution of the animal excrements on the grazed surfaces and, particularly, ensure proportionality between withdrawal and return of mineral nutrients.

Apparently, this objective seems easy to achieve, since a greater production of pasture should correspond to an increasing time for its use by the animals and therefore also a greater quantity of excrements arriving on the grazed surface. In fact, this hypothesis may not be true because of the

requirements or the preferences of the grazing animals.

In order to contribute to a better understanding of the distribution of solid faeces on mountain pastures by grazing animals, the work reports the results obtained in a rotational grazing experiment aimed to study the effects of different grazing animals (cattle, sheep and goats) and, in the case of cattle, of different stocking rates on two pasture types of Carnia Pre-Alps (Veneto region).

Materials and methods

The experiment was carried out on 13 ha of pasture in the farm "malga Vallorch" (1050 m a.s.l.) located in Pian Cansiglio (Farra d'Alpago municipality, Belluno province, NE Italy). The bedrock is calcareous and the soils are cambisols and of rendzinic type. The mean annual rainfall amounts to 1883 mm and has a sub-equinoctial distribution with maxima in June (201 mm) and November (199 mm). The mean annual temperature is 4.9°C; the winters are relatively cold (mean temperatures of January and February are -4.6 and -3.4°C, respectively) and summers relatively mild (mean temperatures of July and August 14.2 and 13.7°C).

In the experimental trial, the following five grazing treatments were compared: (i) cattle at 0.85 SLU (Standard Livestock Unit)/ha; (ii) cattle at 1.1 SLU/ha; (iii) cattle at 1.31 SLU/ha; (iv) sheep at 1.1 SLU/ha; and (v) goats at 1.1 SLU/ha. The animals used in treatments 1-3 were seven Brown heifers; in treatments 4 and 5 sheep of the local race Alpagota and goats of the races Saanen and Camosciata delle Alpi were used, respectively.

The surface used for the experiment was 5 ha of a *Festuca rubra*-dominated natural pasture and 8 ha of improved pasture (reseeded with *Phleum pratense*). Each of the five animals groups grazed rotationally in two paddocks of the natural pasture and in three paddocks of the improved pasture. The different stocking rates were obtained using paddocks of different sizes. In the experimental period (1991-1996) the grazing period went from June to September included. In each study year the floristic composition of the two pasture types was assessed and the main *ecofacies* were identified and mapped. Their forage value was calculated according to Stählin (1970) and Klapp (1971).

At the end of the grazing period of 1996, the surface of each paddock was subdivided into 6x10 m rectangles that were attributed singularly to the predominant *ecofacies* and where the present solid faeces were counted.

Results and discussion

In all the paddocks studied, regardless of the pasture type, animals and stocking rate, the greater concentration of faeces was found in the surfaces located near the watering points. This was particularly true where the surfaces were flat or slightly sloped because they were also frequently used by the animals for resting.

With reference to the other surfaces, it was found that in the natural pasture and in the two pasture types considered together, the faeces concentration at the low cattle stocking rate (0.85 SLU/ha) was significantly correlated with the forage value of the pasture type (Fig. 1).

No similar correlations were found for the two higher cattle stocking rates.

It seems, therefore, that, at low stocking rate conditions, the cattle preferred the pasture surfaces with higher forage value, where they grazed for a longer time and deposited more faeces.

On the contrary, at higher stocking rate levels, the animals did not find enough forage in the surfaces with higher forage value and, therefore, used also the less valuable ones.

Regarding goats and sheep, only for the latter grazing on the natural pasture was a similar result found, as for low cattle stocking rate treatment, even if, due to low regression points, the relation was not statistically significant (Fig. 2).

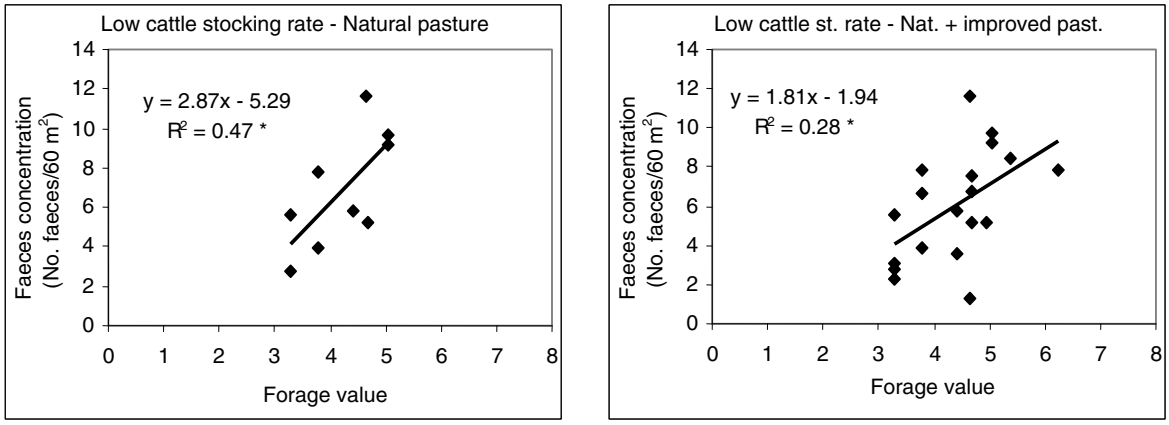

Fig. 1. Linear regression between forage value and faeces concentration in the low cattle stocking rate treatment in the natural pasture and in the natural and improved pastures considered together.

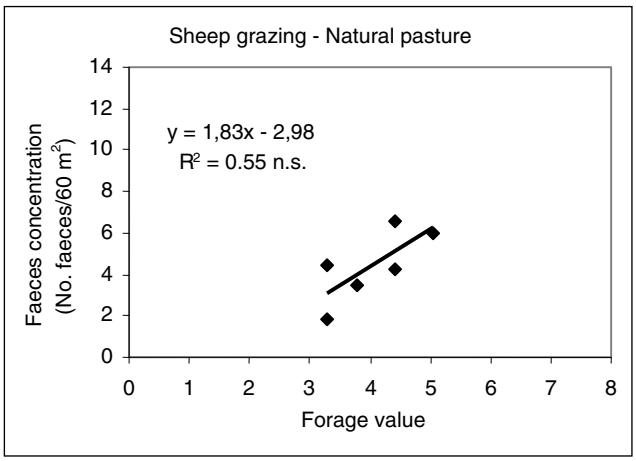

Fig. 2. Relationship between forage value and faeces concentration in the medium sheep stocking rate treatment.

Conclusions

In the mountain pastures considered in the present study, a low cattle stocking rate caused a distribution of the solid excrements, which was proportional to the forage value of the pasture types. In such a situation, the greater utilisation of the grasslands was achieved in those having a higher forage value. In this manner, the return of the nutrients could be proportional to the quantity removed and the maintenance of the pastures fertility should be ensured.

On the other hand, a higher cattle stocking rate determined a nearly uniform faeces distribution in all pasture types, which could lead to an improvement of the pastures with lower forage value (Cavallero *et al.*, 2000).

At the medium stocking rate adopted for goats and sheep, the results were similar to the corresponding cattle stocking rate. The only exception was represented by sheep grazing on the natural pasture: probably because of their high forage selection, the sheep produced a faeces distribution, which was proportional to the forage value of the *ecofacies.*

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