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Sward characterization and grazing value of a hilly Mediterranean natural pasture[1]

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Summary: Within the EEC MEDALUS II project, aimed at the study of the climate-water-soil-sward-grazing interations on the desertification process, a trial was conducted in North Sardinia (Italy) to compare the effects on a natural pasture sward of two different management types (overgrazing *vs* no-grazing). The results of the 1st year experiment carried out in two homogeneous basins (10 ha each one) are reported in this paper.
Wide differences were recorded on the sward characteristics due to the animal grazing. Surface sward height, available and residual dry matter at the end of the spring were higher in the ungrazed pasture than in the grazed one. The grazing reduced the percentage of grasses and legumes on green available DM. On average the covering rate was lower in the grazed basin. The most important botanical families were *Compositae, Graminaceae* and *Liliaceae*. The pastoral value (Daget and Poissonet method) was very low because of the presence of many species with low specific index (unpalatable and thorny species). The results showed the characteristics of the natural pasture in quantitative and qualitative terms. The hight amount of residual dry matter recorded at the end of the spring in the ungrazed basin is an important factor of fire hazard. The effects of overgrazing on soil erosion and desertification processes need to be studied for several years.

Key-words: surface sward height, dry matter production, covering rate, pastoral value.

INTRODUCTION

In some areas of the Mediterranean basin due to the overgrazing, the use of inadequate agronomic techniques to improve pastures (Caredda *et al.*, 1994), the irrational use of fire and the gradual land abandoning, a progressive land degradation occurs and soil erosion and desertification processes become relevant (Harrington, 1981).

The MEDALUS II project (MEditerranean Desertification And Land USe) is aimed at studing with an interdisciplinary approach the climate-water-soil-sward-grazing interrelations on soil erosion and its desertification (Enne, 1994). With regard to the MEDALUS II activity in Sardinia, the main objective of this research was the monitoring of the variations on the sward structure and its pastoral value in two different management levels of a natural pasture (overgrazing *vs* no-grazing). At the same time, another important aspect is represented by the characterization of the pasture in productive, qualitative and floristical terms. The results of the 1st year research activity are reported in this paper.

MATERIALS AND METHODS

The trial was carried out during 1993-94 in North-Sardinia (Italy) in two experimental basins (10 ha each one) in the same farm, on soils characterized by high slope (mean slope 40%, from 235 to 379 m a.s.l.) and high percentage of stone (Madrau *et al.*, 1994).

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The two basins were similar for physical-chemical characteristics of the soil (sandy loam texture, pH 6.2, adequate N and K_20 content, low P_2O_5 content) and for floristic compositions of the sward.

The climate of the area is classified as semi-arid Mediterranean, with a mild winter and an average annual rainfall of 544 mm (Pulina, 1994).

The effects on the sward of two treatments were compared:

- continuous stocking by 2 heifers ha^{-1} (overgrazing) from early January;
- no grazing.

Data on total and green available dry matter (DM) and its evolution were collected monthly on sampling areas, using movable exclosure cages. Permanent exclosure cages were used to determine the total undisturbated dry matter production. Botanical composition was determined, on dry matter basis, by separating grasses, legumes, other families and dead residuals. Surface sward height was measured monthly using a HFRO sward stick (500 measurements in each basin).

On twenty linear sites (20 m long each one) the covering rate of green herbage, dead residual, rocks and bare soils was monitored monthly in the two basins. In the ungrazed basin, on 10 linear sites of sampling, the contact specific contribution (CSC) was evaluated in May according to Daget and Poissonet methodology (1969). The pastoral value (PV) was determined using CSC data and specific indices calculated by Roggero (personal communication).

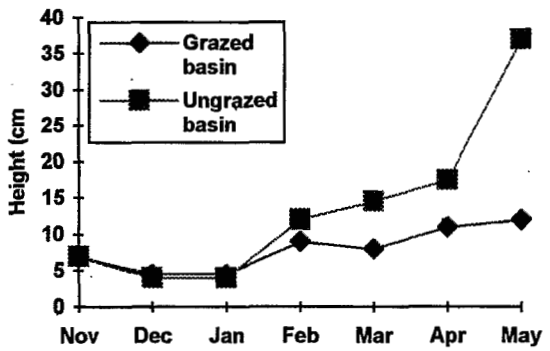

Figure 1: Sward surface height

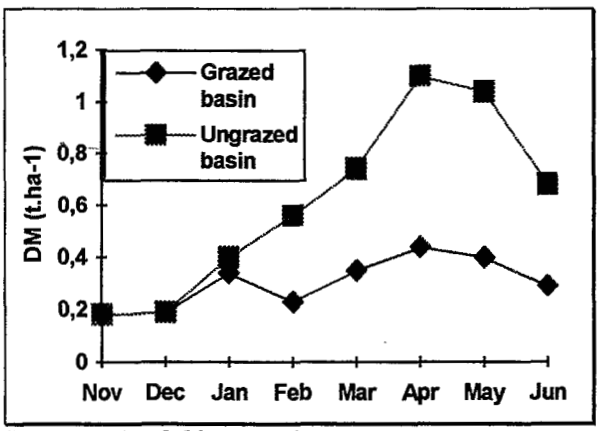

Figure 2: Available green forage (on DM basis)

RESULTS

During the 1993-94 year, the total rainfall from September to August were about 450 mm, concentrated mainly in winter and April (60 mm).

The mean surface sward height increased from the winter to the spring and its trend (fig.1) evidenced the higher values in the ungrazed basin from February to May, when it reached over 35 cm, while about 11 cm was recorded in the grazed basin. The absolute values ranged from 0.5 in winter to 125 cm in May. The maximun value was recorded on *Asphodelus spp.* in spring and very high values were recorded during the year mainly on *Galactites tomentosa* and *Carlina corimbosa* (thorny species).

Green forage availability (fig.2) increased progressively from the winter to the spring in the ungrazed basin. The contribution of other families, mainly represented by *Compositeae*, to the total dry matter ranged from 80 to over 90%. The peak value was reached in April corresponding to 1.08 $t.ha^{-1}$ of DM.

In the first three months the forage availability was similar in the two basins and low herbage accumulation rates were recorded. In January after the start of the grazing a reduction on the available DM of the grazed basin was observed when compared to the ungrazed basin. The peak value was reached in April corrisponding to 0.44 t.ha^{-1}. Due to the animal selection in the grazed basin the percentage of grasses and legumes was lower than in the ungrazed one.

In early June (end of the reproductive stage), the total residual DM reached 0.39 and 1.63 t.ha^{-1} and dead residuals represented from 25 to 60% of the total DM in the grazed and ungrazed basin respectively.

Slight differences were observed on the sward covering rate: on average it was lower in the grazed basin than in the ungrazed one. During the growth season, it ranged from 41 to 78% and from 53 to 88% in the grazed and ungrazed basin respectively. The maximum value was reached in April in the grazed basin and in May in the ungrazed one. In the two experimental basins there was a similar presence of rocks (5%) but different value of bare soil (in the grazed basin it ranged from 8 to 38% and in the ungrazed one from 3 to 22%). During the 1994 spring over 100 herbaceous species (mainly annuals) and 15 shrubby species were identified. The CSC of the main botanical families and the relative contribution to the pastoral value are shown in table 1. Among the others families the most important was represented by *Liliaceae* (14% of total contacts) with *Asphodelus microcarpus.*

The mean pastoral value of the sward was 26.4 and it ranged from 21.7 to 31 in the sites of sampling.

Table 1: Percentage of total contacts and contribution to PV of several species groups in May (ungrazed basin).

Families	Total contact (%)	Contribution to pastoral value (%)
Graminaceae	28	35.0
Leguminosae	5	8.5
Compositeae	14	30.5
Thorny species	20	0.0
other families	33	26.0

DISCUSSION AND CONCLUSIONS

The DM production recorded in the basins was comparable to the mean Sardinian natural pasture production in relation to the annual rainfall (Bullitta *et al.*, 1987). Noticeable differences were recorded on sward characteristics due to the effects of animal overgrazing. Sward height, available and residual dry matter and percentage of dead residuals on total DM in late spring were higher in the ungrazed pasture than in the grazed one. On average the presence of bare soil was higher in the grazed basin. The sward characterization showed that in terms of CSC the most important botanical families were *Compositae, Graminaceae,* and *Liliaceae.* The pastoral value was very low, if compared with other results obtained in North Sardinia. (Bullitta *et al.* 1992), because of the relevant presence of unpalatable thorny species. Because of the high percentage of unpalatable species on total DM and their low PV the pasture resulted of low quality on the whole.The results have defined the natural pasture in quantitative and qualitative terms and this represents a necessary step at the beginning of the experiment in relation to the multidisciplinary approach of the research.

The amount of residual DM, recorded at the end of spring in the ungrazed basin, is relevant in relation to the hazard of wildfire.

Presumably effects of overgrazing on soil erosion and the desertification processes need to be monitored for several years.

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