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Evolution of the standing hay chemical composition in natural and improved Mediterranean pastures³

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Summary: A trial with dairy sheep was conducted in North Sardinia (Italy) to determine the availability and chemical composition trends of natural and improved pastures as standing hay. In winter, available and grazed dry matter yield was higher in the improved pasture (sod-seeding of annual ryegrass + subterranean clover), than in the natural fertilized one (dominated by the spontaneous annual grasses). At the end of May, available dry matter as standing hay was 3.96 and 4.30 t ha⁻¹ respectively in the natural and improved pastures. Chemical analysis conducted on forage samples, collected from the end of May through September, evidenced higher crude protein and nutritive value, lower NDF and ADF content in the improved pasture than in the natural one. This was largely due to the different botanic composition. Although low absolute values of crude protein and high of NDF were recorded in the two treatments in comparison, there were considerable differences in relative terms; for instance crude protein content was two times higher in the improved pastures. Moreover different parts of plants can have different crude protein content and digestibility and the animal selection capacity is very important. The high amount of standing hay recorded in spring has considerable impact in terms of animal summer feed and in environmental terms for the risk of fire. Further investigations are required in order to establish the digestibility of different types of standing hay and herbage plant parts in collaboration with animal scientists.

Key-words: standing hay, chemical composition, annual pastures.

INTRODUCTION

In Mediterranean areas pastures represent the most important forage resource. Pasture production is concentrated in spring while autumn and winter productions are affected by late summer rains and low temperatures (Rivoira, 1976). Moreover high variability occurs between years according to the temperature and rainfall trends. Forage availability from pastures and nutritive requirements of the animals are very different during the year. The resting of a part of grazing surface in spring can allow the constitution of stocks as hay or standing hay for summer grazing (Caredda and Roggero, 1989). Standing hay with stubbles, crop residuals and shrubs are the main feed resources in summer or dry season for the extensive farms in Mediterranean, sub-tropical, semi-arid and arid regions (Flamants and Cocks, 1989). Standing hay is a simple and cheap method of forage conservation requiring no equipments or handlings; sometimes it is the only forage conservation system used due to the low dry matter yield and forage quality and the high harvesting costs (Skerman and Riveros, 1990). However it can be affected by two main factors: risk of fire and spoilage by summer rains with development of moulds. Because of the duration of the dry season, its important effect on dairy sheep farming and the limited knowledge on this topic in the South European

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regions, the aim of this trial was to determine the chemical composition trends of natural and improved pasture standing hay crops.

MATERIALS AND METHODS

The trial was carried out in the year 1992-93 in North-Sardinia (Italy) on flat clay calcareous soil, pH 7.5 with low N and P₂O₅ contents and adequate K₂O content. The climate of the area is classified as semi-arid Mediterranean, with a mild winter and an average annual rainfall of 547 mm.

Within a 5 ha size field low input forage system (only 20% of the land was ploughed each year) based on a 5-year rotation of natural pastures and a short term forage crop followed by a self-regenerating improved pasture, two different swards were compared in quantitative and qualitative terms.

Natural pasture: a natural sward fertilized with 100 Kg ha⁻¹ year⁻¹ N and P₂O₅.

Improved pasture: an artificial sward established by sod-seeding of a mixture of *Lolium rigidum* Gaudin 'Nurra' ecotype and *Trifolium brachycalycinum* Katzn. & Morley 'Valmoreno' variety, fertilized with 60 Kg ha⁻¹ year⁻¹ N and 100 Kg ha⁻¹ year⁻¹ P₂O₅. Sowing rate was 15 kg ha⁻¹ for each species. The swards were rotationally grazed by 30 "Sarda" dairy ewes. The improved pasture was not grazed in autumn to allow a better establishment of the introduced species. In late spring utilization was suspended to allow the self-reseeding and it was continued in summer on dry residuals. Data of total available and grazed dry matter yield on 12 sampling areas per field using movable enclosure cages and botanical composition of the forage on dry matter basis were collected. From the end of May through September dry forage samples were collected weekly for each treatment on ungrazed areas and crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), ether extract (EE) and ash were determined. The nutritive value (UFL = French milk forage units) was also estimated (INRA, 1980). All forage quality data were expressed as % of organic matter (OM).

RESULTS

Two grazings were made for each treatments in winter. Dry matter production reached 2.11 and 3.50 t ha⁻¹ respectively in the natural and improved pasture; grazed dry matter represented 41.7 and 53.5% of the seasonal forage production. The higher utilization of the improved pasture is explained by a better palatability of annual ryegrass and subclover against spontaneous species of the natural pasture. A further grazing was made in April on the improved pasture.

In the natural pasture annual grasses represented over 95% of the total dry matter. The most important species were *Haynaldia villosa*, *Bromus mollis*, *B. hordeaceus*, *Vulpia spp.*, *Cynosurus echinatum*, *Avena barbata*, *A. fatua* and *Hordeum murinum*; these were characterized by earliness of heading with rapid fall in nutritive value and palatability in early spring. In the improved pasture introduced species represented about 100% of the total available dry matter in winter. The annual ryegrass/subclover ratio was 2:1 before and 5:1 after grazing due to the selective utilization of the subclover. In spring the spontaneous species ranged from 10 to 35%. At the end of May available dry matter as standing hay was 3.96 and 4.30 t ha⁻¹ respectively in the natural and improved pasture.

During summer only one rainy day was recorded in July (2.2 mm). In September after a first rain on 9th (9 mm), effective rains following in the last ten days.

The main results of chemical analysis and the estimated nutritive value for both treatments, summarized in the table 1, showed the improved pasture to advantage.

Table 1 - Chemical composition (% OM) and nutritive value (UFL kg⁻¹ OM) of the natural (NP) and improved (IP) pasture standing hay (mean monthly values).

	CP		NDF		ADF		ADL		UFL	
	NP	IP	NP	IP	NP	IP	NP	IP	NP	IP
May 26th	5.5	10.5	63.2	59.0	39.5	36.9	6.0	5.2	0.79	0.86
June	3.5	9.3	77.7	69.8	49.6	46.4	6.0	7.6	0.59	0.67
July	3.1	7.5	83.7	77.6	49.3	47.0	5.8	7.8	0.59	0.65
August	2.5	4.3	84.9	82.8	50.8	50.1	6.2	6.7	0.56	0.58
September	3.8	4.5	86.8	84.1	53.0	51.6	6.7	7.7	0.49	0.55

At the first sample collection date (May 26th) the percentage of dry matter was higher in the natural pasture (40.7 vs 34.2) due to the earliness of the annual grasses. In June the water content was less than 20% for both treatments, while from mid July through August it ranged from 5 to 15%.

The crude protein content of the improved pasture standing hay was twice as high as that of the natural pasture in May (Figure 1), partially due to the presence of subclover. Crude protein also decreased more quickly in the natural than in the improved pasture, where was less lower until August. This can be explained by the higher leaf retention capacity of annual ryegrass and the presence of unburied pods of subclover. In September a small increase of crude protein was observed in the fertilized pasture; this was explained by the very rapid establishment of the spontaneous grasses after the first rains.

The NDF percent increased in the season from the end of May. The NDF value of the improved pasture was lower than the fertilized pasture particularly until August. After August only slight differences were recorded. The trend observed for ADF content was similar to the NDF one. ADL percentage in summer resulted higher in the improved pastures compared to the fertilized pasture presumably due to the presence of legume.

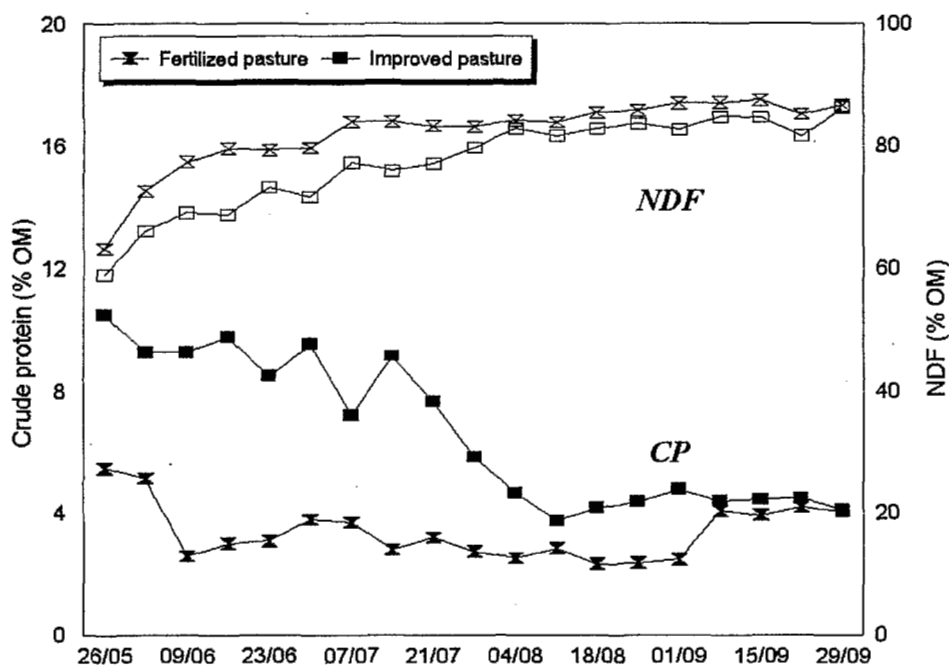


Figure 1: CP and NDF weekly evolution

DISCUSSION AND CONCLUSIONS

The results have confirmed the greater forage productivity of the improved pasture compared to the fertilized natural pasture, both in term of seasonal and total yield, and have evidenced also the high amount of standing hay in late spring. Standing hay forage quality based upon crude protein and NDF and ADF concentrations was better in the improved pasture than in the natural pasture due to the influence of annual ryegrass and subclover on the forage chemical composition (Ballard *et al.*, 1990). Moreover subclover seeds represents a good summer feed source for the sheep in Mediterranean environment (Taylor *et al.*, 1989).

Chemical analysis showed low absolute values of crude protein and high of NDF in both treatments in comparison, but there were still considerable differences in relative terms; for instance crude protein in the improved pasture was double that in the natural sward. Moreover different parts of plants can have different crude protein content and digestibility (Hume *et al.*, 1975) and the animal selection capacity is very important. The ewe is able to optimize the diet from a poor feed on whole, as demonstrated by Casu *et al.* (1981), comparing crude protein, fiber content and organic matter digestibility of natural unfertilized pasture samples collected by cut or by oesophageally fistulated wethers. The high amount of standing hay recorded in spring, respectively 80 and 60% of the total production in the improved and fertilized pastures as in real conditions, is considerable in production terms for animal summer feed and in environmental terms for the risk of fire. On these preliminary results basis further investigations are required in order to establish the digestibility of different available standing hay and parts of plant in collaborations with animal scientists.

REFERENCES

- Ballard R.A., Simpson R.J., Pearce G.R.**, 1990. Losses of digestible contents of annual ryegrass (*Lolium rigidum* Gaudin) during senescence. *Australian Journal of Agricultural Research*. 41, 719-731.
- Casu S., Motroni P., Sanna A.**, 1981. Variazioni nel contenuto in fibra e proteina grezza e nelle digeribilità della sostanza organica di campioni di pascolo prelevati mediante il taglio o da animali con fistola esofagea. *Atti del IV congresso del S.I.A.P.O.C.*, Alghero.
- Caredda S. e Roggero P.P.**, 1989. Valutazione agronomica delle potenzialità produttive dei pascoli della Comunità Montana Marghine-Planargia. In: Idda L. (ed.), *Sistemi Agricoli Marginali, lo scenario Marghine-Planargia, Rapporto conclusivo Progetto finalizzato IPRA CNR*, 138-156.
- Flamant J.C. et Cocks Ph.**, 1989. Adaptation des systemes d'élevage aux ressources fourragères en zone méditerranéenne. *Proc. XVI Congrès International des Herbages*, Nice, France. 1741-1752.
- Hume I.D. and Purser B.D.**, 1975. Ruminant and post-ruminant protein digestion in sheep fed on subterranean clover harvested at four stages of maturity. *Australian Journal of Agricultural Research*. 26, 199-208.
- INRA**, 1980. *Alimentation des Ruminants*. Paris
- Rivoira G.**, 1976. Foraggicoltura asciutta in ambiente mediterraneo. *Rivista di Agronomia*, 1, 3-22.
- Skerman P.J. and Riveros F.**, 1990. Tropical grasses. *FAO Plant production and protection series*. no 23.
- Taylor G.B., Rossiter R.C., Purser D.B. and Collins W.J.**, 1989. The intake and digestibility of dry mature subterranean clover. *Proc. XVI International Grassland Congress*, Nice, France. 809-810.