Red Clover's Contribution to the Increase of Forage Quality on Temporary Pastures, Cultivated in Hill Regions

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Abstract

The temporary pastures cultivated in hill regions generate, beside a big dry matter yield, a special forage quality as well. In this direction, the researches performed show that in the temporary pastures consisted of a complex structure of perennial gramineae and red clover in different proportions, forage quality is determined by the following indices: the ratio Ca/P ranges between 2.06 and 4.20, the ratio K/Ca + Mg has values below 2.2, the Mg content is between 0.35 and 0.55%, the digestibility between 70.10-75.42% and the amount of crude protein between 1203 and 1340 kg/ha.

Keywords: temporary pasture, quality indices.

1. Introduction

Within the current durable agriculture system, animal breeding relies on the provision of quantitatively sufficient forage, and also on the production of minerally and organically-balanced forage, necessary for animal physiological requirements and also for the increase of animal productivity [1 - 4]. This direction includes the work below, which presents the contribution of red clover, cultivated in association with some gramineae species, to the increase of forage's nutritional value, under conditions of pasture utilization as hayfield and also for grazing.

2. Materials and methods

The researches were carried out at the Research-Development Station for Sheep and Goats Caransebeş, on a brown luvic soil, with pH = 5.92 and a humus content of 1.40%.

The experimental device comprised a bifactorial experience, with the following factor graduations: A – method of utilization (a_1= hayfield, a_2= grazing with 2 CCU/ha, a_3= grazing with 4 CCU/ha, a_4= grazing with 6 CCU/ha) and B – types of red clover-based associations (b_1= *Trifolium pratense* 60% + *Festuca pratensis 40%,* b_2= *Trifolium pratense* 60% + *Lolium perenne 40%,* b_3= *Trifolium pratense* 60% + *Phleum pratense 40%*).

The experience lasted for 3 years. We applied the following fertilization dose: before planting, we applied $P_{70}K_{70}$-based fertilizers; we applied Nitrogen-based fertilizers every year, in dose of N_{90} (N_{30} early in the spring, N_{30} after the first cutting or grazing cycle, N_{30} after the second cycle or grazing cycle).

In the variants with grazing, we used adult sheep belonging to the Romanian Ţurcana breed, and each grazing variant was surrounded by fix fences.

The forage quality, determined with the help of specific laboratory methods, was determined

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every year, on samples taken during the second grazing cycle or at the second cutting. This work presents the mean results of these three years.

3. Results and discussion

Forage quality, given by the chemical content, expresses the participation of some chemical elements (P, K, Ca, Mg, etc.) existent in plants, which define forage's balance status. According to the literature, the lack of elements in animal nutrition appear when Phosphorus is below the value of 0.20%, Potassium below 1%, Calcium below 0.30% and Magnesium below 20%.

According to our researches, the floristic structure of the associations studied and the method of pasture utilization strongly influence forage's chemical content.

There were not any significant differences between the associations studied as regards the chemical content. However, the associations of *Trifolium pratense* with *Festuca pratensis* or *Lolium perenne* presented a little bit bigger values in the case of almost all chemical elements studied. The P and Mg contents presented similar values in all the three association types, while the K content presented bigger values in the associations of red clover with perennial ryegrass or orchard fescue. At the same time, the Calcium content was bigger in the associations of red clover with orchard fescue or with perennial ryegrass (Table 1).

The method of utilization influenced the chemical forage content, too. In this viewpoint, the values of chemical elements were the highest in the cut variants; in the variants used for grazing (especially the ones with animal loads of 4 and 6 CCU/ha), we recorded more reduced values. In the case of some elements (P, Ca, Mg), the values were below the optimal limits for animal nutrition. The ratio Ca/P is 1.5 (considered to be optimal) in the associations with orchard fescue or perennial ryegrass, and smaller in the associations with timothy-grass. As regards the ratio K/Ca+Mg, it is almost 2.2 in all associations studied (the maximal limit admitted).

According to Table 2, we may draw the conclusion that forage's nutritional value is correlated with association's floristic structure and with the method of utilization. Excepting the crude protein content, there are some differences between the experimental variants in all the other parameters. On the contrary, as regards the other quality indices, the first position is occupied by the association consisted of *Trifolium pratense 60% + Lolium perenne 40%.* Regarding the crude cellulose content, this association presents a mean value of 22.77%, more reduced than in the variants with *Trifolium pratense 60% + Festuca pratensis 40%* (23.78%) and respectively *Trifolium pratense 60% + Phleum pratense 40%* (25.17%).

The digestibility coefficients value is bigger in the associations of *T. pratense 60% + L. perenne 40%* (75.43%) and smaller in the other types: 71.06% in *T. pratense 60% + F. pratensis 40%* and 65.75% in *T. pratense 60% + Ph. p.40%.*

The nutritional value and organic matter digestibility are bigger in the variants used for sheep-grazing, indifferently of the association type. The grazing during earlier plant development phenophases, compared with the forage resulted successive to plant cutting during later phenophases, generates the production of better quality forage, which influences the increase of animal-breeding efficiency on temporary pastures.

Table 1. Chemical content of the associations between red clover and gramineae, under different methods of utilization (mean for three years, % of dry matter)

Association	Method of utilization	P	K	Ca	Mg	Ca/P	K / Ca + Mg
Trifolium pratense 60% + Festuca pratensis 40%	Hayfield	0.33	1.49	0.45	0.31	1.36	1.96
	2 CCU/ha	0.30	1.41	0.43	0.27	1.43	2.01
	4 CCU/ha	0.26	1.35	0.37	0.24	1.50	2.14
	6 CCU/ha	0.21	1.30	0.35	0.23	1.66	2.24
	Mean	0.28	1.38	0.38	0.26	1.46	2.05
Trifolium pratense 60% + Lolium perenne 40%	Hayfield	0.29	1.52	0.44	0.32	1.51	2.00
	2 CCU/ha	0.24	1.46	0.41	0.28	1.70	2.11
	4 CCU/ha	0.22	1.36	0.40	0.25	1.81	2.09
	6 CCU/ha	0.19	1.37	0.40	0.23	2.70	2.17
	Mean	0.23	1.42	0.41	0.27	1.78	2.08
Trifolium pratense 60% +Phleum pratensis 40%	Hayfield	0.26	1.39	0.38	0.34	1.46	1.93
	2 CCU/ha	0.26	1.26	0.36	0.30	1.38	1.91
	4 CCU/ha	0.21	1.21	0.28	0.24	1.37	2.32
	6 CCU/ha	0.19	1.13	0.26	0.22	1.36	2.35
	Mean	0.23	1.24	0.32	0.27	1.39	2.10

Table 2. Nutritional value and organic matter digestibility in the associations of red clover and gramineae, under different methods of utilization (mean of the years)

Association	Method of utilization	CP %	CC %	Coefficient of digestibility	UN per 1 kg DM	UN per ha	DM yield, t/ha
Trifolium pratense 60% + Festuca pratensis 40%	Hayfield	18.63	23.87	69.96	0.86	6106	7.10
	2 CCU/ha	18.81	23.89	70.52	0.90	7461	8.29
	4 CCU/ha	18.93	23.60	71.55	0.95	6545	6.89
	6 CCU/ha	19.27	23.77	73.12	1.03	5901	5.73
	Mean	18.91	23.78	71.06	0.93	6510	7.00
Trifolium pratense 60% + Lolium perenne 40%	Hayfield	18.46	22.76	73.71	1.03	6122	5.95
	2 CCU/ha	18.92	23.00	74.85	1.06	8003	7.55
	4 CCU/ha	19.13	23.72	75.82	1.14	7330	6.43
	6 CCU/ha	19.38	22.61	77.35	1.19	6687	5.62
	Mean	18.97	22.77	75.43	1.10	7018	6.38
Trifolium pratense 60% +Phleum pratensis 40%	Hayfield	18.56	24.98	63.66	0.71	5445	7.67
	2 CCU/ha	18.75	24.88	65.19	0.79	6841	8.66
	4 CCU/ha	18.84	25.12	62.22	0.84	5770	6.87
	6 CCU/ha	19.40	25.72	67.22	0.88	5139	5.84
	Mean	18.89	25.17	65.75	0.81	5881	7.26

4. Conclusions

From the point of view of the forage's chemical content, we observed that there are not any significant differences between the associations studied, but the grazing with an animal load bigger than 2 CCU/ha generated a reduction of nutritional elements.

A bigger nutritional value was observed in the association consisted of *Trifolium pratense 60% + Lolium perenne 40%,* with the following parameters: 18.97% CP, 22.77% CC and 75.43% DMO.

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