

Influence of Association Type with *Festuca Rubra* L. on Forage Quality

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Abstract

Forage quality has a great importance in animal nutrition and is much influenced by the floristic composition structure of the temporary pastures. Legumes play an important role in the production of nutritionally-balanced forage. Analyzing the values of some quality indices of forage (crude protein, crude cellulose, organic matter digestibility, lignin, hemicellulose, ash, ADF, NDF), we may observe a significant increase of these indices in the variants planted in association (*Festuca rubra*, *Trifolium repens*, *Lotus corniculatus*).

Keywords: association type, *Festuca rubra*, forage quality.

1. Introduction

The level of forage quality, determined by the cultivation technology complexity, exerts a great influence on animal nutrition. In the case of temporary pastures, forage quality is much influenced by association's floristic structure, of which the legumes have a remarkable role in the production of nutritionally-balanced forage[1 - 3].

2. Materials and methods

The researches were performed at the Research-Development Station for Pastures Timișoara, on a brown vertic eumesobasic soil, moderately gleyed, alkaline in the depth (low below 100 cm), moderately decarbonised, strongly clogged up by water, on medium fine/medium fluvial deposits, medium loam/medium clayey loam, during 2004-2007.

The experimental display of our researches comprised a bifactorial experience, with the following graduations:

A. Types of association: a₁ = *Festuca rubra* (100%); a₂ = *Festuca rubra* (60%) + *Trifolium repens* (40%); a₃ = *Festuca rubra* (60%) + *Lotus corniculatus* (40%); a₄ = *Festuca rubra* (60%) + *Trifolium repens* (20%) + *Lotus corniculatus* (20%)

B. Nitrogen doses: b₁ = N₀; b₂ = N₅₀; b₃ = N₁₀₀

Starting with the second year of vegetation, we applied the Nitrogen doses as follows: N₅₀ at the end of the spring and N₁₀₀ in two steps (N₅₀ at the end of the spring and N₅₀ after the first cutting);

The biological material used for planting was represented by the following Romanian varieties: for *Festuca rubra*: Pastoral; for *Trifolium repens*: Carmen; for *Lotus corniculatus*: Nico.

Forage quality determination was carried out in concordance with the current methods used for sample taking from the experimental variants, in quantity of 200 g, followed by stove-drying at 60°C and grinding.

The determination of cell wall constituents (cellulose, lignin and hemicellulose) was performed according to Van Soest method with

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neutral detergent fibers (NDF) and acid detergent fibers (ADF).

3. Results and discussion

According to the data of chemical analyses presented in Table 1, compared with the variants planted with pure *Festuca rubra* crop, the associations of *Festuca rubra* with the two perennial legume species studied are characterized by significant nutritive value increases of the forage, determined by several quality indices.

The crude protein content increased from 9.72%, in the variant with *Festuca rubra* in pure crop and not fertilized with Nitrogen, to 12.83% (respectively with 32%), in the case of the complex association consisted of *Festuca rubra* 60% + *Trifolium repens* 20% + *Lotus corniculatus* 20%, fertilized cu N₁₀₀.

Also, when the Nitrogen-based fertilization was not applied, the CP content slightly increased in all the variants planted in association with legume species: 10.46 %, in the association of *Festuca rubra* 60% + *Trifolium repens* 40%; 10.12 %, in the association of *Festuca rubra* 60% + *Lotus corniculatus* 40%; 10.87 % in the association of *Festuca rubra* 60% + *Trifolium repens* 20% + *Lotus corniculatus* 20%.

The crude cellulose recorded a remarkable decrease, from 33.4%, in the case of the variant planted with pure *Festuca rubra* crop and not fertilized with Nitrogen, to 24.3%, in the variant

planted in complex association with the two legume species. Legume introduction in association and the application of Nitrogen doses contributed to the decrease of crude cellulose content.

Organic matter digestibility (DMO) presented an increase that was proportional with the application of Nitrogen doses and with the participation of legume species in the association. SO, from the value of 55.82%, recorded in the case of the pure *Festuca rubra* crop, without N-based fertilization, DMO increased to 65.38%, in the variant planted in association with the two legumes and fertilized with N₁₀₀.

The lignin content, which represents the part of the plant cell constituents not digested in animal rumen, recorded a significant decrease, from 3.89% to 2.55% (with 65.5%), respectively from the variant with pure *Festuca rubra* crop, not fertilized, to the variant planted in association with the legumes studied and fertilized with N₁₀₀.

Another cell wall constituent, the hemicellulose, presented a constant content in all the experimental variants, with a slight increase in the associations of *Festuca rubra* and legume species, fertilized with Nitrogen.

The ash content recorded a remarkable decrease, from 9.27%, in the case of the variant planted with pure *Festuca rubra* crop, not fertilized, to 7.73%, in the variant with the association with the two legumes, fertilized with N₁₀₀.

Table 1. Values of forage quality indices *)

Association type	Nitrogen doses	Crude protein %	Crude cellulose %	Organic matter digestibility %	Lignin %	Hemicellulose %	Ash %	ADF	NDF
<i>Festuca rubra</i> (100%)	No	9,72	33,4	55,82	3,89	30,18	9,27	37,29	67,47
	N50	10,01	32,1	58,61	3,62	30,59	8,83	35,72	66,31
	N100	11,33	29,6	60,22	3,43	30,94	8,14	33,03	63,97
<i>Festuca rubra</i> (60%)+ <i>Trifolium repens</i> (40%)	No	10,46	27,5	58,87	3,28	31,24	8,63	30,78	62,02
	N50	10,81	26,8	60,46	3,06	31,33	8,41	29,86	61,19
<i>Festuca rubra</i> (60%)+ <i>Lotus corniculatus</i> (40%)	No	10,12	28,1	61,22	3,46	30,88	8,74	31,56	62,44
	N50	10,77	27,5	62,03	3,21	31,16	8,32	30,71	61,87
<i>Festuca rubra</i> (60%)+ <i>Trifolium repens</i> (20%)+ <i>Lotus corniculatus</i> (20%)	No	10,87	26,3	62,12	2,89	31,46	8,62	29,19	60,65
	N50	11,46	25,1	63,98	2,73	31,82	8,14	27,83	59,65
<i>Festuca rubra</i> (60%)+ <i>Trifolium repens</i> (20%)+ <i>Lotus corniculatus</i> (20%)	No	10,87	26,3	62,12	2,89	31,46	8,62	29,19	60,65
	N100	12,83	24,3	65,38	2,55	32,43	7,73	26,85	59,28

*) The analyses of forage quality were determined in the second production year, the second cutting.

To analyze the forage nutritional value given by the chemical structure of plant cell walls, we determine the following quality indices:

- ADF (Acid-Detergent-Fibre), that represents the total fibers in forage (cellulose, lignin), after the application of an „acid treatment” on the respective forage;

- NDF (Neutral-Detergent-Fibre), that determines the total fibers in forage (cellulose, hemicellulose, lignin), after the application of a „neutral detergent treatment” on the respective forage.

The ADF content presents a decreasing tendency, from 37.29 %, in the variant with pure *Festuca rubra* crop, not fertilized with Nitrogen, to 26.85 %, in the variant cultivated in association and fertilized with N₁₀₀.

The NDF, which comprises the lignin content, too, decreases from 67.47 %, in the variant planted with pure *Festuca rubra* crop, to 59.47 %, in the variant with association, fertilized with Nitrogen.

4. Conclusions

The results obtained prove that, compared with the variants planted with pure *Festuca rubra* crops, the associations between *Festuca rubra* and the two perennial legume species are characterized by remarkable increases of forage nutritional value, determined by several quality indices.

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