Nutritive Value of the Fodder from the Nardus stricta improved Grasslands

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Abstract
The nutritive value of the fodder from Nardus stricta grasslands improved through fertilisation, amendment, and re-sowing was pointed out by some quality indices as ADF, NDF, ADL, DDM, DMO, and DMI. The values of these nutrition indices allowed the determination of a statistic assessment index called relative fodder value (RFV). Depending on the treatments applied, RFV ranged between 109 and 123 in 2011 and between 110 and 115 in 2012. The large number of quality indices assessed allowed the study of the correlation between these indices.

Keywords: Nardus stricta grasslands; quality indices; relative fodder value; correlations.

1. Introduction

The changes in floristic composition of the permanent grasslands caused by special treatments of improvement of yield and quality influence directly the chemical composition and the nutritious value of the fodder [1, 2, 4, 5].
The paper presents the effect of some improvement works on Nardus stricta grasslands in the sub-Alpine area of the Carpathian Mountains on fodder quality determined as relative fodder value (RFV).

2. Materials and methods

Research results presented in this paper were produced by the Grassland Research-Development Institute (G.R.D.I.) of Braşov, Braşov County, Romania, in an experiment organised on Nardus stricta grassland in the Bucegi Mountains, at an altitude of 1,800 m. The experimental variants encompassed the following improvement treatments:
- A – natural grassland, not improved, and constantly grazed by cattle;
- B – natural grassland, improved with the following technology: $N_{150}P_{75}K_{75}$ (during 1996-1998) and cow folding (5 nights, 1 cow/6 m^2) in 2004 and 2010;
- C – natural grassland, improved with the following technology: amendments with CaO (7 t/ha) in 1995, fertilisation with $N_{150}P_{75}K_{75}$ (during 1996-1998) and cow folding (5 nights, 1 cow/6 m^2) in 2003 and 2009;
- D – natural super-sowed grassland improved with the following technology: super-seeding with a mixture of gramineae and perennial legumes (1995), fertilisation with $N_{150}P_{75}K_{75}$ (during 1996-1998) and cow folding (5 nights, 1 cow/6 m^2) in 2002 and 2008.
The chemical composition of the fodder and some nutritious indices (ADF, NDF) were analysed in the chemistry laboratory of the G.R.D.I. of Braşov. To assess the quality of the fodder, we measured a synthetic index, i.e. the relative fodder

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value (RFV) with the following equations: percentage DDM = 88.9 – (0.779 x percentage ADF), percentage DMI = 120/ percentage NDF, RFV = (percentage DDM x percentage DMI) 1.29 [3, 6-8]. The quality index RFV was assessed according to an assessment scale suggested by KAPPER (2004), where: RFV > 151, excellent fodder; RFV = 125-150, very good fodder; RFV = 103-124, good fodder; RFV = 87-102, poor fodder; RFV = 75-86, very poor fodder; RFV < 74, rejected fodder. The paper presents the nutritious value of the fodder as a remnant effect of the treatments applied in 2011 and 2012.

3. Results and discussions

In 2011, determining nutritious values was done in the two harvests of the year. Thus, in the first fodder harvest, mowed upon the blooming of the gramineae species, the quality indices had different values from those of the second harvest. Data presented in Table 1 show that, depending on experimental variant:

- ADF varies between 36.2 and 39.2% (minimum value in the variant D and maximum value in the variant B);
- NDF varies between 61.0 and 64.8% (minimum value in the variant D and maximum value in the variant B);
- DDM varies between 53.4 and 59.4% (minimum value in the variant D and maximum value in the variant B);
- DMO varies between 50.6 and 56.5% (minimum value in the variant D and maximum value in the variant B);
- DMI varies between 1.85 and 1.97% (minimum value in the variant D and maximum value in the variant B).

Table 1. Nutritious value of the fodder from improved *Nardus stricta* grasslands (Harvest I, 2011)

Variant	ADF %	NDF %	ADL %	DDM %	DMO %	DMI %	RFV[1)] %	Significance RFV
A	37.9	62.8	4.5	55.7	52.4	1.91	82	Very low
B	39.2	64.8	3.9	53.4	50.6	1.85	77	Very low
C	38.1	63.0	3.8	55.4	53.0	1.89	81	Very low
D	36.2	61.0	3.6	59.4	56.5	1.97	91	Low

RFV[1)] – relative fodder value

Measurements in the first harvest in 2011 show that the relative fodder value (RFV) had values between 77 and 91. From this point of view, according to an assessment scale of this index, in all the variants whose RFV is <86, the fodder value is low. In our case, except for the variant D (RFV = 91), the other variants had a very strong decreasing fodder value.

Table 2. Nutritious value of the fodder from improved *Nardus stricta* grasslands (Harvest II, 2011)

Variant	ADF %	NDF %	ADL %	DDM %	DMO %	DMI %	RFV[1)] %	Significance RFV
A	26.2	45.9	3.0	84.8	79.0	2.61	171	Excellent
B	26.7	46.4	2.9	76.2	72.6	2.58	152	Very good
C	23.6	42.2	2.6	84.0	79.3	2.84	185	Excellent
D	24.6	43.7	2.4	79.1	73.8	2.74	168	Excellent

RFV[1)] – relative fodder value

Harvesting gramineae specie at an early stage of vegetation influenced positively the nutritious value of the grassland fodder in the second harvest in 2011 (Table 2). As the table shows, the values pointing to the nutritious value of the fodder are superior to those of the first harvest. Therefore, the relative fodder value (RFV) had, in all the variants, an increased index (between 152 and 185), determining the ranging of the variants in the "Excellent fodder" category and, in the variant B, in the "Very good fodder" category.

Mean results of the two harvests in 2011 determined a relative fodder value (RFV) ranging between 109 and 123, with the fodder produced in all experimental values ranging in the "Good fodder" category (Table 3).

Table 3. Nutritious value of the fodder from improved *Nardus stricta* grasslands (Harvests I + II, 2011)

Variant	ADF %	NDF %	ADL %	DDM %	DMO %	DMI %	RFV[1)] %	Significance RFV
A	32.0	54.3	3.8	70.2	65.7	2.21	120	Good
B	32.9	55.6	3.4	64.8	61.6	2.16	109	Good
C	30.9	52.7	3.2	69.7	66.2	2.28	123	Good
D	30.4	52.3	3.4	69.2	65.1	2.30	123	Good

RFV[1)] – relative fodder value

Table 4. Nutritious value of the fodder from improved *Nardus stricta* grasslands (2012)

Variant	ADF %	NDF %	ADL %	DDM %	DMO %	DMI %	RFV[1)] %	Significance RFV
A	33.8	54.0	3.1	63.6	59.6	2.22	109	Good
B	35.8	56.9	2.8	59.5	56.8	2.11	97	Low
C	33.2	52.1	2.6	64.4	62.5	2.31	115	Good
D	33.9	53.4	2.7	62.8	60.5	2.25	110	Good

RFV[1)] – relative fodder value

The studies carried out in 2012 on the nutritious value of the fodder show that there are no significant differences between experimental variants (Table 4). Thus, depending on the indices we determined, the best results were in the variants D (fertilisation – amendment – re-sowing) and C (fertilisation – amendment), where RFV had values of 110 and 115, respectively, and ranged in the "Good fodder" category. The multitude of quality indices determined at the level of all experimental values and during several vegetation years facilitated the study of the correlations between these indices that allow a global assessment of the fodder nutritious value. These relationships allowed the identification of closer correlations assessed through the degree of significance of the correlation coefficients determined (Table 5).

Table 5. Regression equations and correlation coefficients (r) between fodder quality indices (in all experimental variants)

Quality indices	Regression equations	r
%ADF and %PB	ADF = 48.8673 – 1.2701x	-0.57*
%ADF and %CB	ADF = - 1.3678 + 1.1364x	0.98***
%NDF and %CB	NDF = 4.9252 + 1.5686x	0.97***
%ADL and %CB	ADL = -2.736 + 0.174x	0.78*
%DMO and %CB	DMO = 109.7042 – 1.5865x	-0.92***
%DMO and %DSU	DMO = - 8.5029 + 1.0991x	0.99***
%DSU and %CB	DSU = 108.6519 – 1.4786x	-0.95***

4. Conclusions

The maximum value of the index RFV (relative fodder value) – 168 – pointing to an "Excellent fodder" was in the variant D, in which they applied all improvement treatments: amendment, fertilisation (mineral and organic – through cow folding), and super-seeding.

References

1. Bărbulescu, C. şi colab., - Cultura pajiştilor şi a plantelor furajere, Ed. Didactică şi Pedagogică, Bucureşti, 1991

2. Blaj, V.A., - Cercetări privind ameliorarea şi valorificarea superioară a pajiştilor subalpine din Munţii Bucegi, Teza de doctorat, USAMV Bucureşti, 2009

3. Canbolat et al, - Prediction of relative feed value of alfalfa hays harvested at different maturity stages using in vitro gas production, Livestock Research for Rural Development, 2006, 18 (2), pag. 1 – 8

4. Constantinescu, S.,– Studiul efectului remanent al lucrărilor de îmbunătăţire a pajiştilor de Nardus stricta L. din Munţii Bucegi, Teză de Doctorat Universitatea de Ştiinţe Agricole şi Medicină Veterinară a Banatului "Regele Mihai I al României" din Timişoara, 2013

5. Dragomir, N., - Pajişti şi plante furajere, Tehnologii de cultivare, Editura Eurobit, 2005, ISBN 973-620-115-5

6. Jeranyama, P., Alvaro, D. Garcia, - Understanding Relative Feed Value (RFV) and Relative Forage Quality (RFQ), 2004, pag. 1 – 3, Cooperative Extension Service
7. Stallings, C.,– Relative feed value (RFV) and relative forage quality (RFQ). Extension Dairy Scientist. Nutrition and Forage Quality, 2006, (540) 231-3066
8. Rohweder, D. A., Barnes, R. F. and Jorgensen, N. - Proposed hay grading standards based on laboratory analyses for evaluating quality. Journal of Animal Science, 1978, 47, 747-759