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THE QUALITY OF MIXTURES OF PERENNIAL GRASSES AND LEGUMES EXPLOITED IN HAY REGIME UNDER CENTRAL OF MOLDOVA CONDITIONS

Margareta NAIE[1], Lorena-Diana POPA[1], Oana MÎRZAN[1], Maria Diana BĂRCAN[1], Alexandra LEONTE[1], Adriana MUSCALU[2], Marius Cornel ANTONESCU[3]

[1]Agricultural Research-Development Station Secuieni, 377 Principala Street, Neamt, Romania
[2]National Institute of Research-Development for Machines and Installations Designed for Agriculture and Food Industry, 6 Ion Ionescu de la Brad Blvd, Bucharest, Romania
[3]Regional Center for Financing Rural Investments 1 N-E, 3 Dumbrava Rosie Street, Iasi, Romania

Corresponding author email: dy.hemp420@gmail.com

Abstract

The study was conducted during 2017-2019, within ARDS Secuieni and aimed to analyse the influence of fertilization and species mixture on fodder quality, as well as the determination of fodder content in crude protein (CP), NDF (neutral detergent fiber), ADF (acid detergent fiber) and calculation of relative forage quality (RFQ). Experimental factors were represented by fertilization (factor A), with four graduations: a1-N0P0; a2-N40P40; a3-N80P40; a4-N80+40P40, and by the mixture of perennial grasses and perennial legumes (factor B), with five graduations: b1 - 20% perennial grasses + 80% legumes; b2 - 65% perennial grasses + 35% legumes; b3 - 70% perennial grasses + 30% legumes; b4 - 70% perennial grasses + 30% legumes; b5 - 80% perennial grasses + 20% legumes. The results showed that the lowest content in crude protein, of 15.24 g/100 g d. s. was achieved in the variant fertilized with N40P40 and the highest value of CP (15.94 g/100 g d. s.) was obtained in the non-fertilized variant (control). The applied fertilizers influenced the crude protein content of each of the studied mixtures, the differences obtained being statistically assured.

Key words: *fertilization, perennial grasses, perennial legumes, hay.*

INTRODUCTION

When making the mixtures, the biological properties of the species will be taken into account, depending on the use and the duration of the existence of the temporary grasslands. Thus, when used for hayfields, tall species are used, with a close growth rate, high speed of growth and high growth energy, resistance to soil compaction and higher vivacity (Belesky, 2002; Sanderson, 2005; Vintu et al., 2010).

The introduction of aggressive species into mixtures along with those with reduced competition capacity leads to the elimination of the latter over time. Competitiveness (competition capacity) is a species trait, but it is greatly influenced by environmental conditions and the manner of exploitation (Leconte et al., 1991; Skinner et al., 2006; Lazaridou, 2008).

Temporary grasslands established with a mixture of perennial grasses and perennial legumes, in a balanced ratio, give the obtained fodder an optimal quality and content of mineral elements, which then have positive effects on the animals. The fodder obtained from these grasslands is well consumed both in the green state and in the form of hay (Golinski, 2008; Thumm, 2008; Tomic et al., 2011).

Temporary grasslands play a remarkable role in improving soil properties, thus its structure will be more stable, the content of mineral and organic substances increases, microbiological activity develops, water and air regime improves, and subsequent crops give large yields with reduced quantities of fertilizers (Vîntu et al., 1996; Samuil et al., 1999, 2018; Carlsson et al., 2008; Tomić et al., 2011).

It is known that doses of nitrogen fertilizers are administered in smaller quantities to mixtures of perennial grasses and legumes, compared to grasses grown in monoculture, because this element is provided biologically by symbiotic bacteria, but fertilization also plays an important role in obtaining large yields in these mixtures (Rotar et al., 1994; 1995; Simtea et al., 1988; Cardaşol et al., 2001; Rotar et al., 2002; Cardaşol et al., 2003; Motca et al., 2008).

Because grasslands are constituted of species with different nutrient requirements, some react

strongly, others react more weakly to improving the dietary regime. These particularities determine the differentiation of the fertilization according to the vegetation period, the pedoclimatic conditions, the type of fertilizer and the way of using the grasslands.
The application in a timely manner and in appropriate combinations can significantly improve both fodder production and fodder quality (Aguilar et al., 2012; Al-Juhaimi et al., 2014).
The aim of this study was to analyse the influence of fertilization and mixture of species on fodder quality, by determining the crude protein content (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF).

MATERIALS AND METHODS

The placement of the experiments was carried out in the experimental field of the ARDS Secuieni, Neamț County, in the spring of 2017 and is of the stationary type. The soil on which the experiments were conducted is of the typical cambic chernozem type, characterized as well supplied with active humus (2.33%), very well supplied with phosphorus (189 mg/ kg), potassium (304 mg/kg) and poorly supplied in nitrogen (9.4 mg/kg N-NO3), being slightly acidic with a pH (in aqueous suspension) of 5.83. Given the soil content in macro elements, it was aimed to set up a 4 x 5 type bifactorial experiment, placed based on the method of subdivided plots, in four repetitions (Jitareanu G., 1998).
Factor A is represented by nitrogen fertilization (on a phosphorus background), with four graduations: a_1 - N_0P_0; a_2 - $N_{40}P_{40}$; a_3 - $N_{80}P_{40}$; a_4 - $N_{80+40}P_{40}$, and factor B, a mixture of perennial grasses and legumes, with five graduations: b_1 - 20% grasses + 80% legumes (20% *Dactylis glomerata* L. + 80% *Medicago sativa* L.) - Mt; b_2 - 65% grasses + 35% legumes (30% *Bromus inermis* Leyss + 35% *Dactylis glomerata* L. + 35% *Onobrychis viciifolia* Scop.); b_3 - 70% grasses + 30% legumes (30% *Dactylis glomerata* L. + 40% *Lolium perenne* L. + 20% *Medicago sativa* L. + 10% *Lotus corniculatus* L.); b_4 - 70% grasses + 30% legumes (30% *Festuca arundinacea* Schreb. + 20% *Dactylis glomerata* L. + 20% *Festuca pratensis* Huds. + 20% *Medicago sativa* L. + 10% *Trifolium pratense* L.); b_5 - 80% grasses + 20% legumes (45% *Festuca pratensis* Huds. + 35% *Festuca arundinacea* Schreb. + 20% *Trifolium pratense* L.).
The harvestable area of the experimental plot was 8 m^2 and the plot surface area was 10 m^2. In the year of establishing the experiment, three uniformity mows were performed.
Following the research conducted at ARDS Secuieni, three production cycles were carried out, both in 2018 and in 2019, in the phenophase of grasses sprouting and legumes efflorescence, at an interval of 53 days for the first cycle, 42 days for the second cycle and 52 days for the third cycle.
Background fertilization was done with phosphate fertilizers administered in the fall, and nitrogen-based fertilizers were administered in early spring, at the start of vegetation, except for the N80 + 40 dose, the difference of which was administered after the first mowing. Harvesting was done mechanically, using the "Bertolini" mower, at a height of 4-5 centimeters from the ground. The dry matter was determined by treating the samples at 105°C for 3 hours.
The determination of the nitrogen content was performed using the Kjeldahl method, and the Van Soest method was used to determine the NDF and ADF content. The crude protein was determined by converting total nitrogen to CP by multiplying by a factor of 6.25. RFQ (Relative Forage Quality) calculation was performed using Equation 1 (Ward R. et al, 2008; Linn J.G., et al 2012).

$$RFQ = \frac{(4{,}898 + 89{,}796x(1{,}085 + 0{,}0124xADF))x\frac{120}{NDF}}{1{,}23}$$

Equation 1

The results were interpreted statistically by analysing the variance and calculating the boundary differences. The correlations between the quantity of nitrogen applied and the fodder content in BP, NDF, ADF and RDQ for each of the studied mixtures were calculated.
The meteorological conditions recorded during the experimenting period (2017-2019) were variable, the deviation from the multiannual average of the temperatures (8.9ºC) was between 0.6ºC (2017) and 1.4ºC (2018), and compared to the multiannual average, the period was characterized as normal in 2017 and warm in 2018 and 2019 (Figure 1).

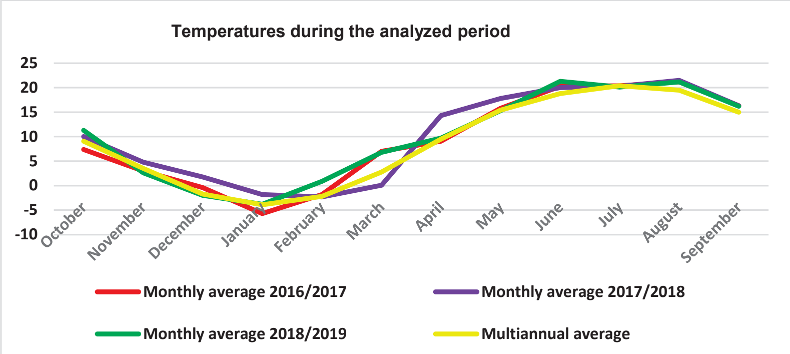

Figure 1. Temperatures recorded at the ARDS Secuieni Weather Station

From the rainfall point of view, the studied years were classified as rainy agricultural years (2016-2017), normal years (2017-2018) and less dry agricultural years (2018-2019), compared to the multiannual average which is 544.3 mm (Figure 2).

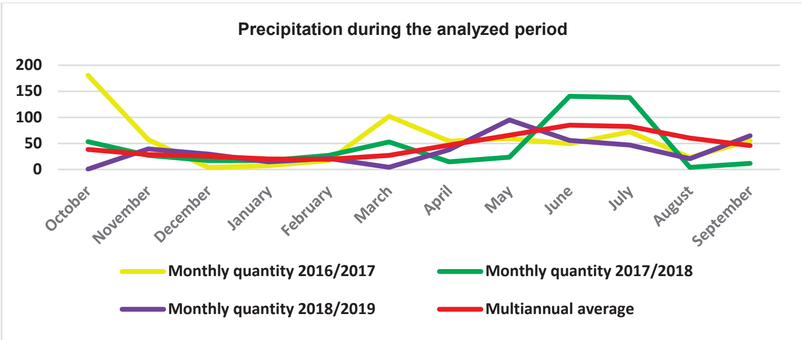

Figure 2. Precipitation recorded at the ARDS Secuieni Weather Station

RESULTS AND DISCUSSIONS

The yield is positively influenced by the fertilization with mineral fertilizers, and the results obtained depended both on the doses of nitrogen fertilizers applied and on the mixtures studied. The manner of exploitation of the temporary grasslands proved to be an important factor in the level of yields, thus in the years of experimentation, three mows (harvests) were performed for the mixtures used as meadow, and the exploitation period was 143 days.

On average, over the two years, at the first harvest, the lowest yield of 5.73 t/ha d.s. was obtained in the non-fertilized variant, sown with the mixture of *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%. Comparing the yield obtained with that of the control variant (*Dactylis glomerata* 20% + *Medicago sativa* 80%), the difference in yield was negative and very significant.

In the studied variants, the results showed that the highest d.s. yield of 11.15 t/ha d.s. was obtained for the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% variant, fertilized with $N_{80}P_{40}$. Compared to the control variant, it achieved very significant production increases (Table 1).

At the second harvest, the highest yield obtained (12.04 t/ha d.s.) was for the fertilization with $N_{80+40}P_{40}$ to the mixture of *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, the difference compared to the control being positive and very significant.

In all the other variants analysed it is observed that the differences from the control were positive and very significant. At the third harvest, yields decreased by half compared to the second harvest, due to the deficit in precipitation, the highest yield of 5.42 t/ha d.s. being achieved for the *Bromus inermis* 30% +

Dactylis glomerata 35% + *Onobrychis viciifolia* 35% fertilized with $N_{80}P_{40}$, and the lowest, for the *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20% mixture, without fertilization.

Analysing the influence of the interaction between mixtures of perennial grasses and legumes and fertilization, in the second year of production, it was observed that the highest yields of 28.01 t/ha d.s. were obtained in the case of fertilization with $N_{80}P_{40}$, in the mixture of *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35%.

Compared to the control plot (18.04 t/ha d.s.), the differences of all variants studied were positive and very significant, the exception being represented by the mixture of *Dactylis glomerata* 30% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10% without fertilization that is not statistically assured (Table 1).

Table 1. The influence of the interaction between the mixture and fertilization on d.s. average production during 2018-2019, to use as hay

Variant		Yield (t/ha d.s.) I harvest	II harvest	III harvest	TOTAL
a_1 - N_0P_0 (mt)	b_1 - D.g.20% +M.s.80%(mt)	7.50^{Mt}	6.42^{Mt}	4.12^{Mt}	18.04^{Mt}
	b_2 - B.i.30%+D.g.35%+O.v.35%	7.56	9.19***	4.32	21.07***
	b_3 - D.g.30%+L.p.40%+M.s.20%+L.c.10%	6.96^{o}	7.03***	4.60***	18.59
	b_4 - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%	7.04^{oo}	9.90***	3.76^{ooo}	20.70***
	b_5 - F.p.45%+F.a.35%+T.p.20%	5.73^{ooo}	10.00***	3.07^{ooo}	18.80*
a_2 - $N_{40}P_{40}$	b_1 - D.g.20% +M.s.80%(mt)	8.47***	7.21***	4.69***	20.37***
	b_2 - B.i.30%+D.g.35%+O.v.35%	9.45***	9.98***	4.56***	23.99***
	b_3 - D.g.30%+L.p.40%+M.s.20%+L.c.10%	8.15**	7.39***	4.54***	20.08***
	b_4 - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%	7.79	10.51***	4.34*	22.64***
	b_5 - F.p.45%+F.a.35%+T.p.20%	6.80^{oo}	10.70***	3.70^{ooo}	21.20***
a_3 - $N_{80}P_{40}$	b_1 - D.g.20% +M.s.80%(mt)	10.04***	8.12***	5.24***	23.40***
	b_2 - B.i.30%+D.g.35%+O.v.35%	11.15***	11.44***	5.42***	28.01***
	b_3 - D.g.30%+L.p.40%+M.s.20%+L.c.10%	9.45***	8.22***	5.30***	22.97***
	b_4 - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%	9.48***	11.61***	5.39***	26.48***
	b_5 - F.p.45%+F.a.35%+T.p.20%	8.59***	11.90***	5.21***	25.70***
a_4 - $N_{80+40}P_{40}$	b_1 - D.g.20% +M.s.80%(mt)	9.42***	7.83***	5.15***	22.40***
	b_2 - B.i.30%+D.g.35%+O.v.35%	10.72***	11.75***	5.00***	27.47***
	b_3 - D.g.30%+L.p.40%+M.s.20%+L.c.10%	9.38***	8.32***	5.04***	22.74***
	b_4 - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%	8.75***	11.57***	4.81***	25.13***
	b_5 - F.p.45%+F.a.35%+T.p.20%	7.47	12.04***	4.40**	23.91***
DL	*5%*	*0.43*	*0.31*	*0.21*	*0.65*
	1%	*0.57*	*0.42*	*0.28*	*0.87*
	0.1%	*0.75*	*0.55*	*0.36*	*1.15*

The quality of the fodder obtained from the temporary grasslands was influenced by the doses of fertilizers applied, by the proportion of participation of the species in the sowing norm, but also by the climatic conditions during the exploitation period.

In 2018, the lowest content in crude protein (CP) of 15.24 g/100 d.s. was obtained for the variant fertilized with $N_{40}P_{40}$, and highest CP content of the fodder, of 15.94 g/100 d.s., was obtained for the variant without fertilization (control). Compared to the control variant, all the differences obtained for the three fertilized variants were statistically assured (Table 2).

Analysing the influence of fertilization on the fodder content in NDF (neutral detergent fiber), it is observed that the variant fertilized with $N_{80+40}P_{40}$ obtained the highest fodder content in NDF, 51.40 g/100 g d.s., and the lowest, of 44.73 g/100 g d.s., was registered in the variant without fertilization. With the exception of the variant fertilized with $N_{40}P_{40}$, all differences from the control obtained were distinctly significant and very significant. Fertilization has significantly and distinctly significantly influenced the content of the fodder in ADF (acid detergent fiber), having positive differences between the non-fertilized variant (control) and the other fertilized variants. From the results obtained in the first year of exploitation, it is observed that the fertilization also influenced the fodder content in RFQ (relative forage quality). The highest forage value, 155, was recorded in the non-fertilized variant belonging to quality class 0 (excellent) (Hancock DW, 2011), and the lowest value, 128, was recorded in the variant fertilized with $N_{80+40}P_{40}$ quality class 1 (good) (Table 2).

Table 2. The influence of the fertilization on fodder quality, in 2018, to use as hay

Variant		Quality parameters			
		CP (g/100 g d.s.)	NDF (g/100 g d.s.)	ADF (g/100 g d.s.)	RFQ
a_1 - N_0P_0 (mt)		15.94^{Mt}	44.73^{Mt}	28.38^{Mt}	155^{Mt}
a_2 - $N_{40}P_{40}$		15.24^{o}	47.37	29.76	143^{o}
a_3 - $N_{80}P_{40}$		15.35^{o}	49.64**	31.20*	134^{oo}
a_4 - $N_{80+40}P_{40}$		15.44^{o}	51.40***	31.72**	128^{ooo}
DL	5%	0.49	2.89	2.20	11
	1%	0.71	4.16	3.17	15
	0.1%	1.04	6.12	4.66	23

Analysing the crude protein content of the fodder in 2019, it was found that it was between 15.40 g/100 g d.s. in the variant fertilized with $N_{80}P_{40}$ and 15.11 g/100 g d.s. in the variant fertilized with $N_{40}P_{40}$. Compared to the control variant, the three fertilized variants were not statistically assured (Table 3).

From the results obtained it is observed that the fertilization influenced the fodder content in NDF, having values between 48.53 g/100 g d.s. in the variant fertilized with $N_{40}P_{40}$ and 50.97 g/100 g d.s. in the variant fertilized with $N_{80}P_{40}$. All differences obtained from the control were positive, significant and distinctly significant.

Analysing the influence of fertilization on the quality of the fodder in the ADF, the differences obtained were between 1.85-3.35 g/ 100 g d.s. For the variant fertilized with $N_{80}P_{40}$ was obtained the highest content in ADF (31.45 g/100 g d.s.) and the smallest, of 28.10 g/100 g d.s., was registered in the non-fertilized variant. Compared to the control variant, the differences obtained in the variants fertilized with $N_{80}P_{40}$ and $N_{80+40}P_{40}$ were positive, significant and distinctly significant.

The biggest difference compared to the control variant, in terms of the influence of fertilization on the relative forage quality (RFQ) is observed in the variant fertilized with $N_{80}P_{40}$, (24 units). The highest forage value, 153 units, was recorded in the non-fertilized variant belonging to quality class 0 (excellent) (after Hancock DW, 2011), and the lowest value, of 129 units, was recorded in the variant fertilized with $N_{80}P_{40}$ belonging to quality class 1 (good). All differences obtained in the fertilized variants were statistically assured (Table 3).

Table 3. The influence of the fertilization on fodder quality, in 2019, to use as hay

Variant		Quality parameters			
		CP (g/100 g d.s.)	NDF (g/100 g d.s.)	ADF (g/100 g d.s.)	RFQ
a_1 - N_0P_0 (mt)		15.25^{Mt}	45.30^{Mt}	28.10^{Mt}	153^{Mt}
a_2 - $N_{40}P_{40}$		15.11	48.53*	29.95	139^{o}
a_3 - $N_{80}P_{40}$		15.40	50.97**	31.45**	129^{ooo}
a_4 - $N_{80+40}P_{40}$		15.24	50.76**	31.18*	130^{oo}
DL	5%	0.57	3.03	2.31	11
	1%	0.82	4.35	3.33	16
	0.1%	1.21	6.40	4.89	24

Compared to 2018, in 2019 the fodder content in crude protein was lower due to the high percentage of grasses obtained in these variants, and the NDF, ADF and RFQ values are very close.

The influence of the mixture on the quality of the fodder was also monitored, thus in 2018 the crude protein content of the fodder decreased from 16.55 g/100 g d.s. for the mixture *Dactylis glomerata* 20% + *Medicago sativa* 80% (control) to 13.64 g/100 g d.s. for the mixture *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35%. Compared to the control variant (*Dactylis glomerata* 20% + *Medicago sativa* 80%), *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% and *Dactylis glomerata* 20% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus,* 10% mixtures were statistically assured (Table 4).

The NDF content of the fodder for the mixtures studied was between 45.1 g/100 g d.s. for *Dactylis glomerata* 30% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10% mixture and 54.14 g/100 g d.s. for *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture.

Compared to the control variant sown with the *Dactylis glomerata* 20% + *Medicago sativa* 80% mixture, for the variant sown with the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture, the difference obtained was distinctly significant. For mixtures sown with *Dactylis glomerata*

30% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10% and *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, the differences obtained were negative, distinctly significant.

Analysing the fodder ADF content for the studied mixtures, is observed that for *Dactylis glomerata* 30% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10%, *Festuca arundinacea* 30% + *Dactylis glomerata* 20% + *Festuca pratensis* 20% + *Medicago sativa* 20% + *Trifolium pratense* 10% and *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, the differences obtained from the control variant (*Dactylis glomerata* 20% + *Medicago sativa* 80%) were negative, distinctly significant and very significant. For the variant sown with the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture, there were no statistically assured differences from the control variant.

In the case of the analysis of the influence of the mixture on the relative forage quality (RFQ), it is observed that between the mixture in the control variant and the other studied mixtures, the differences were assured statistically. In the variant sown with the mixture *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, the highest value of RFQ of 154 units was obtained, the fodder belonging in the quality class 0 (excellent), and the lowest, of 119 units, was recorded in the variant sown with the mixture *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35%, the feed belonging to quality class 1 (good) (Table 4).

Table 4. The influence of the used mixture on the fodder quality in 2018, to use as hay

Variant		Quality parameters			
		CP (g/100 g d.s.)	NDF (g/100 g d.s.)	ADF (g/100 g d.s.)	RFQ
b_1 - D.g.20% +M.s.80%(mt)		16.55^{Mt}	49.19^{Mt}	32.86^{Mt}	131^{Mt}
b_2 - B.i.30%+D.g.35%+O.v.35%		13.64^{oo}	54.14**	33.11	119^{o}
b_3 - D.g.30%+L.p.40%+M.s.20%+L.c.10%		14.47^{o}	45.10^{oo}	28.87^{oo}	152**
b_4 - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%		16.51	47.07	29.41^{oo}	145*
b_5 - F.p.45%+F.a.35%+T.p.20%		16.28	45.93^{oo}	27.07^{ooo}	154***
DL	*5%*	*1.62*	*3.00*	*2.18*	*10*
	1%	*2.45*	*4.55*	*3.31*	*14*
	0.1%	*3.93*	*7.31*	*5.31*	*23*

In the conditions of 2019, the crude protein content of fodder decreased from 16.29 g/100 g d.s. for the *Dactylis glomerata* 20% + *Medicago sativa* 80% mixture (control) to 13.44 g / 100 g d.s. for *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture. The difference between the control variant and the variant for which the lowest CP fodder content was obtained was of 2.85 g/100 g d.s., being negative, distinctly significant (Table 5).

Both in 2018 and 2019, the lowest fodder content of crude protein of 13.64 g / 100 g d.s. respectively 13.44 g / 100 g d.s. was achieved for the variant sown with the *Bromus inermis* 30% + *Dactylis glomerata* 20% + *Onobrychis viciifolia* 35% mixture.

Analysing the fodder NDF content, it is observed that the difference between the control variant (*Dactylis glomerata* 20% + *Medicago sativa* 80%) and the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture for which the highest fodder NDF content was obtained was of 4.39 g / 100 g d.s.

Compared to 2018, this mixture maintained the same significance compared to the control variant, the differences were positive distinctly significant.

From the analysis of the mixture influence on ADF fodder content, it is found that for the variant sown with *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20% was obtained the lowest content of ADF in the fodder, of 27.19 g / 100 g d.s., and the highest was recorded for the variant sown with the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% mixture, of 32.82 g / 100 g d.s. The differences between the control variant - *Dactylis glomerata* 20% + *Medicago sativa* 80% and the variants sown with *Dactylis glomerata* 30% + Lolium perenne 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10%, *Festuca arundinacea* 30% + *Dactylis glomerata* 20% + *Festuca pratensis* 20% + *Medicago sativa* 20% + *Trifolium pratense* 10% and *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20% were negative, significant and distinctly significant, with the exception of the variant sown with the *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% variant, where the difference did not have statistical significance.

Analysing the influence of the mixture on the relative forage quality (RFQ), it is observed that the differences obtained were statistically assured. The difference between the control variant (*Dactylis glomerata* 20% + *Medicago sativa* 80%) and the variant in which the lowest value of the feed was obtained in RFQ (*Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35%), was 11 units. Compared to the control mixture, the other mixtures studied showed significant and distinctly significant differences in both years of experimentation (Table 5).

In 2018, the studied factors had a differentiated influence on the fodder content in crude protein, in NDF, ADF and RFQ.

Table 5. The influence of the used mixture on the fodder quality in 2019, to use as hay

Variant		Quality parameters			
		CP (g/ 100 g d.s.)	NDF (g/ 100 g d.s.)	ADF (g/ 100 g d.s.)	RFQ
b$_1$ - D.g.20% +M.s.80%(mt)		16.29^{Mt}	49.24^{Mt}	32.57^{Mt}	131^{Mt}
b$_2$ - B.i.30%+D.g.35%+O.v.35%		13.44^{oo}	53.63**	32.82	120^{o}
b$_3$ - D.g.30%+L.p.40%+M.s.20%+L.c.10%		14.62	46.82	29.21^{o}	146**
b$_4$ - F.a.30%+D.g.20%+F.p.20%+M.s.20%+T.p.10%		16.02	47.77	29.06^{o}	143*
b$_5$ - F.p.45%+F.a.35%+T.p.20%		15.90	46.99	27.19^{oo}	150**
DL	*5%*	*1.82*	*2.79*	*2.38*	*10*
	1%	*2.76*	*4.22*	*3.60*	*15*
	0.1%	*4.44*	*6.78*	*5.79*	*24*

Analysing the influence of the quantity of nitrogen on the crude protein content of each of the mixtures studied, in 2018, at harvest I, it is found that there are positive correlations statistically assured as significant. The exception was the mixture of *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, where there is a negative correlation between the quantity of nitrogen and the crude protein content, the correlation coefficient was not statistically assured (Figure 3).

In 2019, at harvest I, it is found that between the quantity of nitrogen applied and the crude protein content, in most of the studied mixtures, there are statistically positive assured correlations being significant. For the mixtures *Dactylis glomerata* 20% + *Medicago sativa* 80% and *Dactylis glomerata* 30% + *Lolium perenne* 40% + *Medicago sativa* 20% + *Lotus corniculatus* 10% the correlation coefficients were not statistically assured (Figure 4).

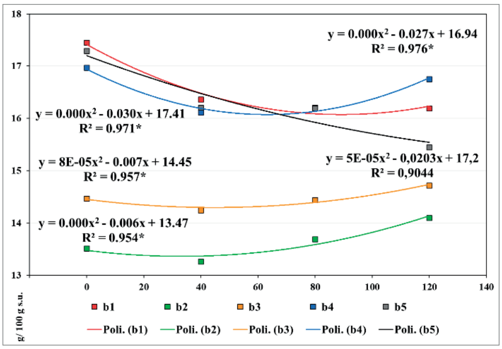

Figure 3. The correlation between the quantity of applied nitrogen and the CP content, at each of the studied mixtures, at the first harvest, in 2018, to use as hay

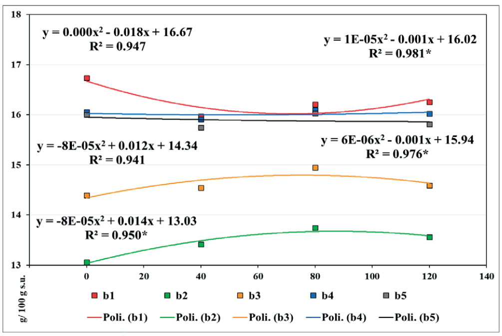

Figure 4. The correlation between the quantity of applied nitrogen and the CP content, at each of the studied mixtures, at the harvest scythe, in 2019, to use as hay

Both in 2018 and in 2019, at harvest I, it is found that there are positive correlations between the quantity of nitrogen applied and the NDF content, the correlation coefficients being statistically assured and interpreted as significant and distinctly significant (Figures 5 and 6).

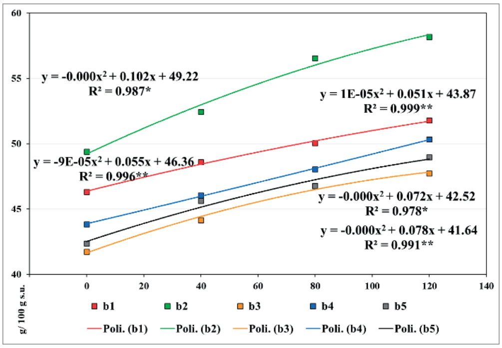

Figure 5. The correlation between the harvest of applied nitrogen and the NDF content, at each of the studied mixtures, at the first harvest, in 2018, to use as hay

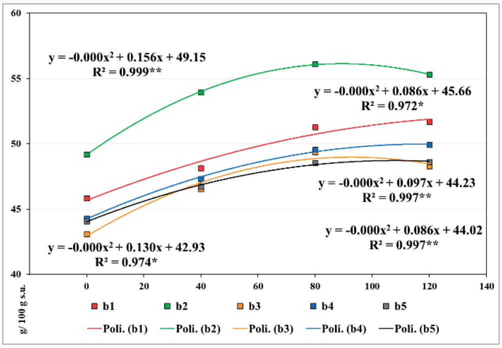

Figure 6. The correlation between the quantity of applied nitrogen and the NDF content, at each of the studied mixtures, at the first harvest, in 2019, to use as hay

Between the quantity of nitrogen applied and the ADF content, in each of the studied mixtures, in the two years of experimentation there is a direct correlation, the coefficients were statistically assured and interpreted as significant and distinctly significant (Figures 7 and 8).

The correlation between the quantity of nitrogen applied and the RFQ was analysed, in each of the mixtures studied, in 2018, at harvest I, it is found that there are negative correlations, and the correlation coefficients were not statistically assured (Figure 9).

In the second year of exploitation, 2019, it was found that between the quantity of applied nitrogen and RFQ for the studied mixtures, there are statistically significant, significant and distinctly significant negative correlations Figure 10).

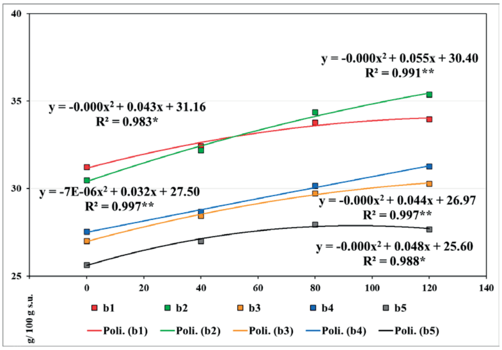

Figure 7. The correlation between the quantity of applied nitrogen and the ADF content, at each of the studied mixtures, at the harvest scythe, in 2018, to use as hay

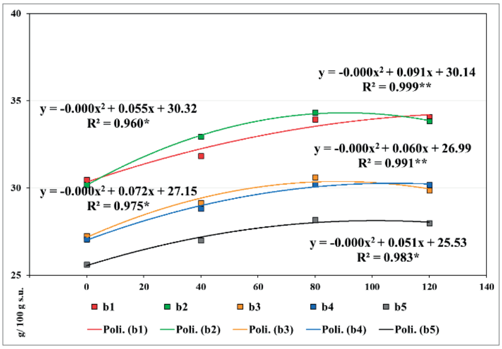

Figure 8. The correlation between the quantity of applied nitrogen and the ADF content, at each of the studied mixtures, at the first harvest, in 2019, to use as hay

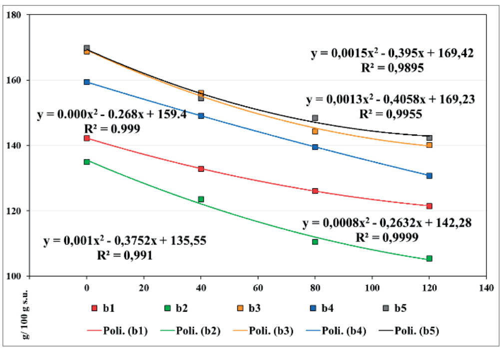

Figure 9. The correlation between the quantity of applied nitrogen and the RFQ content, at each of the studied mixtures, at the first harvest, in 2018, to use as hay

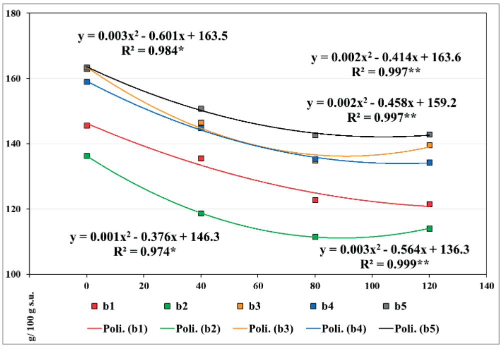

Figure 10. The correlation between the quantity of applied nitrogen and the RFQ content, at each of the studied mixtures, at the first harvest, in 2019, to use as hay

CONCLUSIONS

During the years of experimentation, for the mixtures used as hay, three harvest were performed, and the exploitation period was 143 days.

The interaction between the mixtures of perennial grasses and legumes and fertilization, in 2018, shows that the mixture with *Bromus inermis* 30% + *Dactylis glomerata* 35% + *Onobrychis viciifolia* 35% recorded the highest yields, with a maximum of 28.01 t/ha d.s. when being fertilized with $N_{80}P_{40}$.

The quality of the fodder obtained from the temporary grasslands was influenced by the doses of fertilizers applied, by the proportion of participation of the species in the sowing norm, but also by the climatic conditions during the exploitation period.

In 2018, as well as in 2019, the best relative forage quality RFQ was registered in the mixture *Festuca pratensis* 45% + *Festuca arundinacea* 35% + *Trifolium pratense* 20%, of 170 units, respectively 163 units, belonging to the quality class 0 (after Hancock DW, 2011).

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