Annals of the University of Oradea, Fascicle: Environmental Protection, doi.org/10.5281/zenodo.4362296, **Vol. XXXIV, 2020**
Analele Universităţii din Oradea, Fascicula: Protecţia Mediului, doi.org/10.5281/zenodo.4362296, **Vol. XXXIV, 2020**

RESEARCHE REGARDING THE INFLUENCE OF NITROGEN FERTILIZERS ON SIMPLE MIXURED OF FESTUCA ARUNDINACEA WITH MEDICA SATIVA

Stanciu Alina Ştefania*, Vidican Iuliana Teodora*, Stanciu Ioana Teodora, Cărbunar Mihaela Lavinia ****

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: as1stanciu@yahoo.com; iuliateodora68@yahoo.com
**Student of the University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: sit06stanciu@yahoo.com; carbunar@yahoo.com

Abstract

*Festuca arundin*acea is a valuable fodder plant for meadwos and lawns, given its agricultural and landscape qualities: high perennial, winter, drought, disease and ironing resistance and high production capacity. The simple mixtures with F. arundinacea with M.sativa contributes to obtaining a high quality forage, characterized by a high CP content. Analyzing the production results of dry matter obtained in the second years average is 2,91 t/ha , fertilization level with N100 has a great influence on production of dry metter. Highest yields of forage are obtained at N_{100} , by 3,43 t/ha DM at *Festuca arundinacea* +*Medicago sativa* mixture.

Key words: tall fescue, grassland, dry matter,ironing resistance

INTRODUCTION

Simple grassland mixture between a grass and a leguminous used for improving forage quality have a long practice. So, there are mixture recommended for different areas as well for our country. Culture of perennial grass and legumes mixtures have several advantages: high productivity due to usage of ecological niches in that biotope, high yields of protein due to presence of legumes, and increasing the protein content of grasses in the presence of legumes, economy of nitrogen based fertilizer, due to fixing nitrogen the atmosphere by the bacterial genus of Rhizobium sp.

Razec, 1995 emphasizes that, depending on the floristic composition, the maximum production that is achieved in the case of pure fabaceae cultivation (13.08 t / ha SU), is followed by complex mixtures in which at least one of the perennials fabaceae species is present, (12.07-12.43 t / ha SU) and simple mixtures, in which the percentage of participation of fabaceae is 30-40%, achieve very high yields even in non-fertilized variants (11.52 t / ha).).

Festuca arundinacea is a valuable fodder plant for meadwos and lawns, given its agricultural and landscape qualities: high perennial, winter,

drought, disease and ironing resistance and high production capacity. (Olar et al., 2018). This species is establish, as participation in mixtures with legumes.For this reason, in the study we chose simple mixture of Festuca arundinacea+Medicago sativa have been study in different level of fertilization.

MATERIAL AND METHOD

The experience was established in 2016 and carried out over a period of three years. (2016 - 2018). The experimental field was placed according to the method of plots subdivided into 4 repetitions with 3 variants. Statistical processing was done according to the method of analysis of variance. The annual average temperature was 10,17^{0}C and the annual average rainfall of 566,3 mm.

The two factors studied are:

Factor A - Level of fertilization - a_1 - $\mathbf{N_0}P_0K_0$; a_2 - $\mathbf{N_{100}}P_{50}$ K_{100} ; a_3 -$\mathbf{N_{200}}P_{50}K_{100}$

Factor B: simple mixture: *Festuca arundinacea* 50% + *Medicago sativa* 50% (Mădălina)

The biological material used is *Festuca arundinacea* (Adela) 30kg/ha and *Medicago sativa* (Mădălina) 18 kg/ha.The exploitation mod was as hayfield, and were harvested two annual sews.Determinations werw made regarding dry matter production and chemical composition of forage. The procecing and interpreting data, in terms of statistical synthesis, was perfomed annually in the period of experimatation 2016 – 2018. Floristic studies were performed using the gravimetric method, or the method of weighing.

SOIL - Chernozem, cambic subtype, on clays, sandy-clayey clay on medium clay (SRTS), Haplic Chernozems (WBR-SR-1998), Typic Haplustosolls (USDA-ST-1999)

Succession of horizons***: Am – Bv – C***

Analytical data

Horizons	**Am_1**	**Am_2**	**Bv**	**C**
Coarse sand % (2-0,2mm)	**0-25**	**25-48**	**48-78**	**78-100**
Fine sand % (0,2-0,02mm)	**0,50**	**0,50**	**0,40**	**0,20**
Dust % (0,02-0,002mm)	**61,7**	**51,70**	**60,10**	**56,10**
Physical clay % (sub 0,01 mm)	**13,1**	**18,00**	**12,10**	**19,40**
Texture	**LN**	**LL**	**LN**	**LL**
Carbonates	**-**	**-**	**-**	**-**
Ph in water	**7,1**	**7,25**	**6,75**	**7,85**

Humus	**2,13**	**1,40**	**-**	**-**
Total nitrogen %	**0,105**	**0,070**	**-**	**-**
Mobile phosphorus (ppm)	**12**	**3**	**-**	**-**
Mobile Potassium (ppm)	**120**	**130**	**-**	**-**
Amount of exchange bases (me./100 g. sol)	**18,3**	**-**	**-**	**-**
Exchangeable hydrogen	**3,0**	**-**	**-**	**-**
Degree of saturation in bases	**96**	**-**	**-**	**-**

Interpretation of analytical data - the texture is medium; the soil reaction is neutral at a depth of 0-48 cm and slightly alkaline at a depth of 78-100 cm; the nitrogen content is small at a depth of 0-25 cm and very low at a depth of 25-48 cm; the potassium content is low; sum of exchange bases: is small, degree of saturation in bases: indicates a eubasic soil.

RESULTS AND DISCUSSION

Fertilization with doses of N200 P_2O_5 60-100, K_2O 50-60 at *Festuca arundinacea* yields DM yields between 9-11 t / ha and around 1130 kg / ha PB (Bărbulescu et al., 1984; Breazu et al., 1993).

In the case of the simple mixture of Medicago sativa with Festuca arundinacea we have small crop differences, in the case of nitrogen fertilizers only the maximum dose gives a significant assurance due to a crop difference of 2.29 t / ha (Table 1). The difference in yield obtained as a result of the application of chemical fertilizers with nitrogen in this mixture is 2.91 t / ha significantly different from the control, and in the case of application of moderate doses a yield increase of 3.43 t / ha is obtained. statistically assured as very significant positive (table 3).

Table 1

Influence of fertilization with N on crop dry matter (2017)

Fertilization graduation	Variant	Production of DM t/ha	Difference	Percentage	Semnification
a1 - N 0	*F.arundinacea + M. sativa*	12.83	0.00	100.00	-
a2 - N 100		12.49	-0.34	97.40	-
a3 - N 200		15.12	2.29	117.90	*

LSD (p5% = 0,63) LSD (p 1%) = 1,95 LSD (P 0,1% = 1,96)

Table 2

The yield differences among variants and their significance (2017)

Variants in ascending order of harvest	DM production t/ha	Variants in ascending order of harvest		
			2	3
		SU t/ha		
			12.49	15.12
1	12.83		-0.34	2.29
2	12.49			2.63
3	15.12			

DS values 5% for different limits of comparison between variants

The mixture of Medicago sativa and Festuca arundinaceae, although developed properly, gave a smaller harvest than the previous one. For the variants fertilized with N100, the dry matter harvest is between 12.49 - 15.12 t / ha S.U. (table 1) and 12.74 - 13.26 t / ha S.U., for the variants fertilized with N_{200} (table 3). Crop yields are higher in variants fertilized with chemical fertilizers with nitrogen with a maximum dose of 2.91 t / ha U.S. and 3.43 t / ha U.S. in variants fertilized with N100, due to the fact that moderate doses of nitrogen stimulate legumes.

Table 3

Influence of fertilization with N on crop dry matter 2018

Fertilization graduation	Variant	Production of DM t/ha	Difference	Percentage	Semnification
a1 - N 0	*F.arundinacea + M. sativa*	9,83	0.00	100.00	-
a2 - N 100		13.26	3.43	134.90	***
a3 - N 200		12.74	2.91	129.60	**

LSD (p5%) = 0.76 LSD (p1%) = 1.26 LSD (p 0.1% = 2.35)

Table 4

The yield differences among variants and their significance (2018)

Variants in ascending order of harvest	DM production t/ha	Variants in ascending order of harvest		
			2	3
		SU t/ha		
			13.26	12.74
1	9.83		3.43	2.91
2	13.26			-0.52
3	12.74			

DS values 5% for different limits of comparison between variants

In the culture mixture with *Festuca arundinacea* and *Medicago sativa*, we have the weakest installation in 2016, 45% *Medicago sativa* and 20% *Festuca arundinacea*, 35% weeds.

Festuca arundinacea is a species that settles extremely slowly, being demanding to agronomic and agrotechnical factors. In the second year (2017) it manages to eliminate weeds and reach 44% at N_{100} and 36% at fertilization with N_{200}, so that in 2018 the participation will reach the value of 58% at fertilization with N_{100} and 55% at fertilization with N_{200}. We would like to emphasize that *Medicago sativa* remains at a value close to that of the establishment of the culture 57% in 2017, compared to 59% in 2016, and *Festuca arundinacea* 42%. If we compare the coverage values of *Medicago sativa* + *Festuca arundinacea* species with those of the control variant, we observe the stressful effect of nitrogen fertilization on alfalfa.

The forage quality

For temporary pastures, forage quality is greatly influenced by floral structure of mixtures of species, including legumes who play an important role in achieving a nutritionally balanced in fodder.Crude protein content is between 14,13 – 28,64 %, lignicellulose (ADF) increased at mixture and depending on the dose of fertilizer, it had a higher value at dose $N_{100.}$

Table 5

The value of quality indices

N level	Mixture	CP%	CP Kg/ha	Cellulose %	Ash %	NDF %	ADF %	ADL %	DMO %
N_0	*F.arundinacea*	14.13	1583	34.05	10.04	53.19	37.55	7.50	56.76
N_{100}	+ *M.sativa*	15.71	1983	34.96	10.20	56.44	42.30	7.81	52.41
N_{200}		28.64	2329	34.16	11.10	52.25	38.49	7.58	55.79

CONCLUSIONS

The highest crude protein production is recorded in the alfalfa-based mixture of 2327 kg / ha in the mixture of *Medicago sativa* + *Festuca arundinacea* in the N200 variant, but this decreases in the same mixture until 1583 in the non-fertilized variant. (Table 5).

The mixture of Medicago sativa and Festuca arundinacea reacts to fertilization similar to alfalfa and gourd. Thus, in 2017, when alfalfa has a share between 58% and 55%, there are slight increases in dry matter harvest of 2.29 t / ha in the USA at fertilization with N200 and a light of -0.34 t / ha S.U. at fertilization with N100, so that in 2018 as the share of tall fescue increases to values of 55-58%, the dry matter harvest will increase from 9.83 t / ha S.U. (unfertilized variant), at 13.26 t / ha S.U. (N100) and 12.74 t / ha U.S. (N200).

REFERENCES

1. Cardaşol V., Gh. Motcă, C. Bărbulescu, C. Pavel, N. Simtea, A. Ionel, A. Lăpuşan, I. Ţucra, N. Dragomir, Constantina Chiper, I. Capşa, Stela Capşa, I. Razec, V. Panait, T. Iacob, N. Petcu, Fl. Dincă, D. Ştefan, 1998, Efectul aplicării îngrăşămintelor chimice asupra producţiei şi calităţii unor pajişti permanente şi temporare din R.S.România, Lucr.ştiinţifice ale ICPCP Măgurele-Braşov, vol.XIII, pp. 1-13
2. Carlier L., I. Puia, I.Rotar, (1998). For a better grass production, Ed. Risoprint, Cluj Napoca
3. Olar M.V., Olar M., Duda M.M., Vârban D.I., Moldovan Cristina, Bărbieru V., Ghețe A.B., Olar V.M., 2018, Tall fescue variety (Festuca arundinacea SCHREBER) NAPOCA 2, RFGFC NR.17/2018,pp.27-32
4. Popovici D., M. Pop, C. Ciubotariu, N. Simtea, C. Constantinide, V. Văsui, 1979, Contribuții la stabilirea proporției optime dintre poaceae și fabaceae în amestecuri simple, pentru înființarea de pajiști temporare în diferite condiții din RS România, Lucrări științifice ale SCPCP Măgurele Brașov, vol. V, pp. 21-32
5. Razec I., 1995, Productivitatea unor asociații de poaceae și fabaceae perene în diferite stadii de vegetație. Producții substanță uscată. Lucrări științifice ale I.C.P.C.P. Brașov, vol. XVII, 125-140
6. Rotar I., 1993, Cercetări privind coacțiile de competiție în culturi pure și asociate de Medicago sativa și Dactylis glomerata în condiții de fertilizare diferențiată cu azot, Teza de doctorat, USAMV Cluj Napoca
7. Samuil, C., V. Vîntu, Gabriela Mihaela Surmei, A. Ionel, Research on the behaviour of simple mixtures of perennial grasses and legumes, under the conditions of Moldavian forest-steppe, Romanian Journal of Grassland and Forage Crops, 2010, RJGFC No.2/2010, Cluj-Napoca
8. Simtea N., M. Pop, D. Popovici, C. Pavel, C. Constantin, I. Capșa, C. Lauer,. I. Opriș, Gh. Mihai, V. Văsui, C. Ciubotariu, I. Ionescu, C. Lulea, 1979, Productivitatea unor specii de poaceae și fabaceae perene în culturi pure și în amestecuri. Lucr. șt. ICPCP Brașov, vol. V
9. Șuteu A. Ș., 1995, Rezultate experimentale parțiale privind culturile asociate de poaceae și fabaceae perene furajere,Referat bibliografic, USAMV Cluj-Napoca
10. Șuteu A. Ș., 1997, Cercetări privind tehnologia de cultură a unor specii de poaceae și fabaceae perene, cu privire specială asupra culturilor asociate, sistemului de fertilizare cu azot, densității și capacității de concurență a speciilor, Teză de doctorat, USAMV Cluj-Napoca