RESEARCH REGARDING PRODUCTIVITYAND FODDER QUALITY IMPROVEMENT OF *Agrostis capillaris* L. + *Festuca rubra* L. MEADOW IN THE UPPER BASIN OF SUCEAVA

Stelian CHIDOVEŢ[1], Mihai STAVARACHE[1], Doina TARCĂU[1], Lucian Ciprian MELUŢ[1], Costel SAMUIL[1], Vasile VÎNTU[1]

e-mail: mihaistavarache@uaiasi.ro

Abstract

The research conducted in 2012 in the commune Putna, Suceava county, aimed to study the influence of organic fertilization on productivity and quality of forage obtained from a *Agrostis* capillaris L. + *Festuca rubra* L. meadow. It was analyzed the influence of fertilization rates of 20-50 t/ha manure on DM production and crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), total digestible nutrients (TDN) , non-fibrous carbohydrates (NFC) forage content and the calculation of relative feed value (RFV) and net energy lactation (NEL) of the forage. The results obtained showed that in all fertilization variants had been registered a positive increase in the production of DM. Forage quality obtained was positively influenced by organic fertilization, reducing NDF and ADF content and increasing the content of CP, NFC and TDN. Also, the relative feed value (RFV) and net energy lactation (NEL) increased. The results of studies showed that the doses of manure applied are correlated with the production and quality indicators.

Key words: organic fertilization, CP, RFV, NEL, TDN

The upper basin of the Suceava river is situated between 47˚46´31˝ and 47˚55´54˝ north latitude, 25˚10´59˝ and 25˚49´37˝ east longitude, between 530 and 1380 m altitude, in the northern Suceava county, near border with Ukraine, on the north eastern side of the Eastern Carpathians.

In this area we can find wide spread *Agrostis capillaris* L. + *Festuca rubra* L. grasslands, which constitutes the main source of feed for local livestock. In order to increase production and quality of these grasslands, organic fertilization is one of the most important and economically affordable measure that can be taken, also with effect on biodiversity (Surault F. et al, 2006; Velev N.I. and Apostolova Iva I., 2008; Vîntu V. et al, 2010; Păcurar F.S. et al, 2012).

Biomass production obtained by the application of fertilizers varies greatly depending on the soil type and the degree of soil nutrients supply, also depends on the floristic composition and structure, on the size of fertilizers doses applied, the climatic conditions and the use and maintenance (Jančovič J. et al, 2004; Rotar I. et al, 2012; Vîntu V. et al, 2011; Samuil C. et al, 2012).

The aim of the research was to study the influence of organic fertilization, widely practiced in the area, on the productivity and quality of forage obtained from a *Agrostis capillaris* L. + *Festuca rubra* L. meadow.

MATERIAL AND METHOD

The research was conducted in 2012 in the commune Putna, Suceava County, situated between 47º49'41,25" north latitude and 25º36'29,73" east longitude at 611 m altitude.

The experiment, established in 2010, was monofactorial, arranged in randomized plots in three replicates. The experimental factor had five graduations, represented by the fertilization with manure: V_1 - unfertilized (control), V_2 - 20 Mg·ha^{-1} annually, well fermented manure, V_3 - 30 Mg·ha^{-1} annually, well fermented manure, V_4 - 40 Mg·ha^{-1} annually, partially fermented manure, V_5 - 50 Mg·ha^{-1} annually, partially fermented manure. Fertilization was done with two types of manure: well fermented (older than two years) and semifermentat (age up to six months), very early on spring after local practice.

Yield was determined by weighing the biomass harvested from an area of 12 m^2. Dry matter was determined by drying samples at 105°C for 3 hours.

Crude protein content (CP) was determined by Kjeldahl method, crude fat content (CFat) was determined by Soxhlet method and crude ash content (CAsh) was determined by calcination method.

[1] University of Agricultural Sciences and Veterinary Medicine Iasi-Romania

Neutral detergent fiber content (NDF) and acid detergent fiber content (ADF) were determined by Van Soest method.

Relative Feed Value (RFV) was calculated using the equation (Boman R.L., 2010; Stokes Sandra R. and Prostko E.P., 2010):

$$RFV = \frac{88.9 - (0.779 \cdot ADF) \cdot \frac{120}{NDF}}{1.29}$$

Net energy lactation content (NEL), Total digestible nutrients (TDN) and Nonfibrous carbohydrates (NFC) was calculated using the equations (Linn J.G. and Martin N.P., 2012):

NEL = 1.085-0.0124·ADF (Mcal·kg^{-1})

TDN = 4.898+89.796·NEL (%)

NFC = 100-(CP+CFat+CAsh+NDF) (%)

The results were interpreted statistically by analysis of variance and calculation of least square difference (LSD). Also, were established correlation equations (quadratic regression and significance) between: applied manure dose and yield CP, NDF, ADF, RFV, TDN and NFC content.

RESULTS AND DISCUSSIONS

Analyzing the results concerning the influence of fertilization with manure on dry matter production (*figure 1*) it appears that all the variants fertilized organically registered very significant production increase with 279-427% higher than in the control variant. This aspect highlights the importance of manure in productivity of *Agrostis capillaris* L. *Festuca rubra* L. grassland from the upper basin of Suceava.

It is noted that the quantities of manure applied and the DM production (*figure 2*) are correlated ($R^2 = 0.994$*).

Production of CP was also influenced by doses of manure applied. The differences obtained from control variant were 183-321% higher with differences statistically significant.

Quadratic deviation of regression equation between doses of manure applied and the production of crude protein was distinctly significant (*figure 2*).

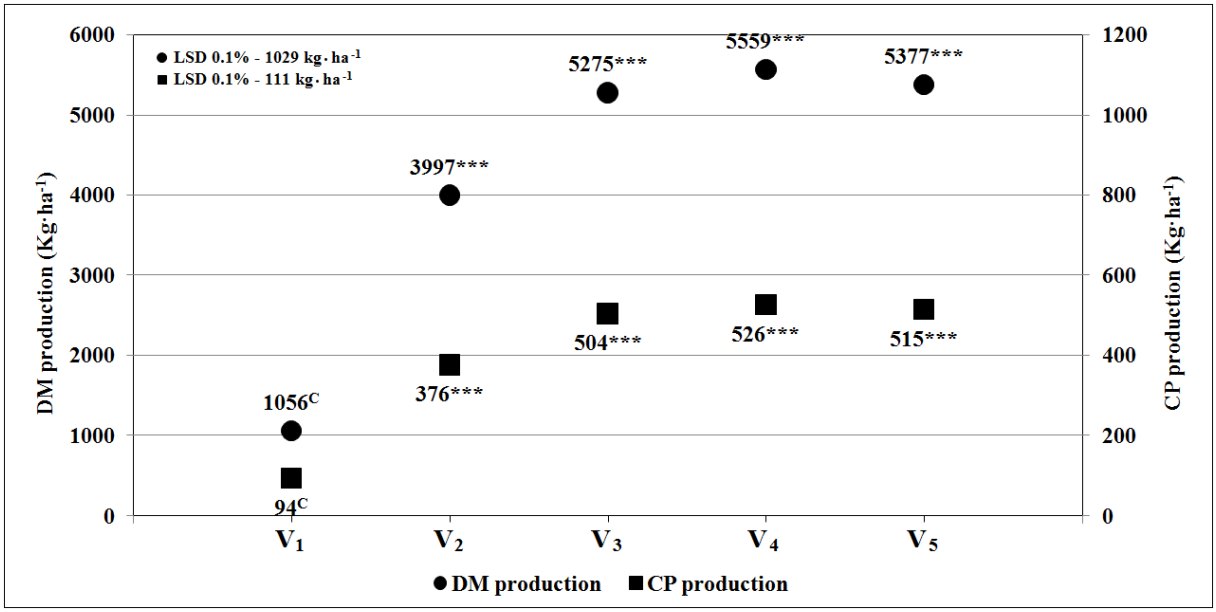

Figure 1 **Influence of organic fertilization on the DM and CP yield**

In the case of crude protein content was confirmed positive influence of organic fertilization in comparison with the control variant (*table 1*). The highest crude protein content was obtained at variant V_5, 9.58% from DM, and the smallest content was obtained at variant V_2 , 9.42% from DM.

After fertilization with manure quality of feed obtained was positively influenced. In the case of variants fertilized NDF content decreased, compared to unfertilized control. At the variants V_3, V_4 and V_5 differences were statistically assured.

In comparison with the NDF content, ADF content values obtained from fertilized variants were significant and very significantly lower (43.60-47.60% from DM) than the control variant (51.24% from DM).

The decline of NDF and ADF contents are found in higher values of the RFV, in the case of variants fertilized with manure. Of the variants fertilized, at the V_4 variant was the highest value of the RFV (95.93) and at the V_2 variant was the lowest value of RFV (91.20). In comparison with the control variant all the differences were statistically assured.

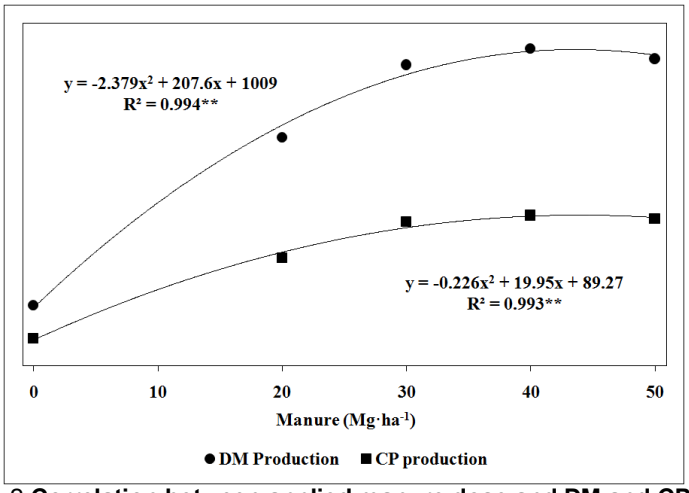

Figure 2 **Correlation between applied manure dose and DM and CP yield**

High levels of NFC, in the case of variants fertilized with manure, can be found in the high values of the NEL, 0.53-0.54 Mcal·kg^{-1} DM compared to 0.45 Mcal·kg^{-1} DM at the control variant.

The positive effect of manure can be found in the feed digestibility values obtained. The TDN is significantly higher than the values obtained in the control variant (*table 1*).

The analysis of data obtained (*figure 3*) shows that the regressions of the doses of manure applied and NDF and ADF contents were negative significant and very significant. Also, the quantities of manure applied and the RFV, TDN and CP contents are correlated.

Table 1

Influence of organic fertilization on forage quality

Experimental variant		Quality indicators						
		CP (% from DM)	NDF (% from DM)	ADF (% from DM)	RFV	NFC (% from DM)	NEL (Mcal·kg^{-1} SU)	TDN (% from DM)
V_1 (control)		8.88^{C}	59.14^{C}	51.24^{C}	77.26^{C}	23.40^{C}	0.45^{C}	45.28^{C}
V_2		9.42*	56.10	47.60^{o}	86.06*	25.23	0.49*	49.32*
V_3		9.52**	53.73^{oo}	44.76^{ooo}	93.85**	27.21**	0.53**	52.48**
V_4		9.46*	52.80^{oo}	44.58^{ooo}	95.93**	27.65***	0.53**	52.69**
V_5		9.58**	53.98^{o}	43.73^{ooo}	94.73**	26.21**	0.54**	53.64***
LSD	*5%*	*0.44*	*4.23*	*2.95*	*7.82*	*1.92*	*0.05*	*3.57*
	1%	*0.64*	*6.15*	*4.30*	*11.37*	*2.79*	*0.07*	*5.19*
	0.1%	*0.96*	*9.22*	*6.44*	*17.06*	*4.18*	*0.10*	*7.78*

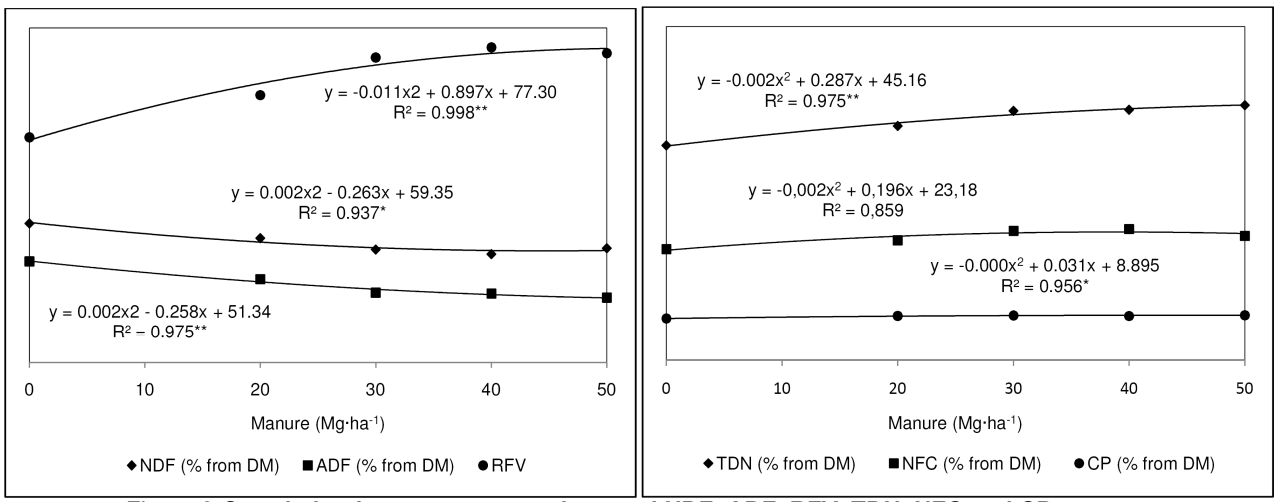

Figure 3 **Correlation between manure dose and NDF, ADF, RFV, TDN, NFC and CP content.**

CONCLUSIONS

The results showed that organic fertilization improved very significantly the production capacity of *Agrostis capillaris* L. + *Festuca rubra* L. meadow from the upper basin of the Suceava river.

Regardless of the applied dose, using organic fertilizers on grasslands determines a high-quality forage with a crude protein content and forage value significantly higher compared to unfertilized variant.

Following the results obtained from this study we recommend to use manure as a fertilizer in the grasslands of *Agrostis capillaris L.* + *Festuca rubra* L. to obtain high yields and superior forage quality.

REFERENCES

Boman R.L., 2010 - *Relative Feed Value of Alfalfa Hay*, USU Extension, available on-line at: http://extension.usu.edu/dairy/files/uploads/htms/rfv.htm

Jančovič J., Vozár Ľ., Jančovičová Ľ. and Petríková S., 2004 - *Effect of fertilization renovation on the production capacity of permanent grassland,* Plant Soil Environ., Vol. 50(3), p. 129-133

Linn J.G. and Martin N.P., 2012 - *Forage Quality Tests and InterpretationsThe University of Minnesota*, available on-line at: http://www.extension.umn.edu/distribution/livestocksystems/DI2637.html

Păcurar F.S., Rotar I., Bogdan Anca D., Vidican Roxana M. and Dale Laura M., 2012 - *The influence of mineral and organic long-term fertilization upon the floristic composition of Festuca rubra* L.*-Agrostis capillaris* L. *grassland in Apuseni mountains, Romania*, Journal of Food, Agriculture & Environment, Vol. 10(1), p. 866-879

Rotar I., Păcurar F.S., Bogdan Anca D. and Vidican Roxana M., 2012 - *The influence of mineral and organic long-term fertilization upon the floristic composition of Festuca rubra*L. - *Agrostis capillaris* L. *grassland in Apuseni mountains, Romania*, USAMV Iaşi,Lucrări Ştiinţifice seria Agronomie, Vol. 55, p. 13-20

Samuil C., Vintu V., Sirbu C., Saghin G., Muntianu I. and Ciobanu C., 2012 - *Low input management of Agrostis capillaris+Festuca rubra grasslands in Romania,* Grassland Science in Europe, Grassland Farming and Land Management Systems in Mountainous Regions, Vol. 16, p. 335-337

Stokes Sandra R. and Prostko E.P., 2010 - *Understanding Forage Quality Analysis*, The Texas A&M University System, available on-line at: http://lubbock.tamu.edu/othercrops/pdf/forage/forageanalysis.pdf

Surault F., Veron R. and Huyghe C., 2006 - *Changes in species composition of grasslands induced by some agronomic practices, Grassland Science in Europe,* Sustainable Grassland Productivity, Vol. 11, p. 499-501

Velev N.I. and Apostolova Iva I., 2008 - *Successional changes of Nardus stricta communities in the Central Balkan Range (Bulgaria)*, Phytologia Balcanica, Vol. 14(1), p.75-84

Vîntu V., Samuil C., Popovici C.I., Stavarache M. and Muntianu I., 2010 - *Management based on organic imputs of a Nardus stricta* L. *and Festuca rubra* L. *meadow from the Dorna depression*, Lucrări Ştiinţifice Seria Agronomie, Vol. 53(2), p. 253-256

Vîntu V., Samuil C., Sîrbu C., Popovici C.I. and Stavarache M., 2011 - *Sustainable Management of Nardus stricta* L. *Grasslands in Romania's Carpathians*, Notulae Botanicae Horti Agrobotanici Cluj-Napoca, Vol. 39(2), p. 142-145.