FERTILIZATION INFLUENCE ON NUTRITIVE AND ENERGETIC VALUE OF THE FODDER OBTAINED ON AN *AGROSTIS CAPILLARIS* L. – *FESTUCA RUBRA* L. MEADOW

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Abstract:

To concrete the fodders' nutritive value was established multiple regression equations in which the independent variables are connected with their content in raw protein, raw cellulose and ash. For hay, the equations that presents the nutritive value of the fodders expressed in milk nutritive units (UNL), meat nutritive units (UNC) and digestible raw protein (PDIN and PDIE) on a kg of dry matter, were calculated after Demarquilly system. The net energy (EN) of the fodders represents the quantity of energy totally used by animals to maintain the vital functions and for synthesis of different husbandry products. In 2008, on a meadow from Iaşi area, at control variant were obtained 0.82 UNL/kg DM and 0.78 UNC/kg DM, and at N_{64} fertilization these values increased to 0.85 respectively 0.82, and at $N_{128}P_{72}$ variant the values were 0.85 UNL/kg DM and 0.81 UNC/kg DM. The quantity of digestible protein at one kilo of DM at control variant was of 72 g in the case of digestible protein based on the energy from the quota (PDIE) and 53 g in the case of digestible protein based on the nitrogen from quota (PDIN). At fertilization with nitrogen fertilizers or with nitrogen on a phosphorous agro-fund, protein increased together with the doses increasing from 78 g PDIE and 62 g PDIN at N_{64} variant, to 81 g PDIE and 70 g PDIN at $N_{128}P_{72}$ variant. To calculate the milk quantities, respectively weight increase, it was taken in consideration that for one litre of milk with 4 % fat are necessary 0.7 UNL, and for a kg weight increase, around 8 UNC. At control variant could be obtained 2027 l milk and 169 kg weight increase, and at N_{64} variant cu the quantities increased to 3813 l milk and 322 kg weight increase. At fertilization with $N_{128}P_{72}$ could be obtained 5186 l milk and 432 kg weight increase, and at the variant with 7 t/ha vinassa + P_{108} the obtained milk quantity, increases at 5876 l, and the weight increase to 497 kg. The fodders' nutritive value expressed in UNL and UNC increased at the same time with the increasing of the mineral and organic fertilizers doses. Regarding the energetic value it was observed that both milk net energy (ENL) and meat net energy (ENC) recorded increases function of kind and dose of the administrated fertilizers. The number of UNL and UNC recorded at a hectare of permanent meadow was function of the fertilization level. The level of fertilization also, influenced the milk quantities and weight increases.

Keywords: Nutritive value, energetic value, fodder, fertilization.

INTRODUCTION

Organic and mineral fertilizers have a strong influence on fodder quality by modifications in chemical structure, consumption and digestibility and also in plants hysto-anatomic structure, with implications on nutritive and energetic values. For each specie, even if chemical composition is genetic determined could be recorded variation of it in quite large limits, function of certain factors. Fodders' chemical composition offers us a first clue regarding its quality, being a start point for a scientific concretion of nutrition rates for different categories of animals. By fertilization are induced essential modifications in floral composition of grassy cover, which will also influence the quality of fodder. For fertilization we used nitrogen, phosphorous, potassium and mixtures of them in different doses per hectare, cattle manure and also vinassa. Fertilizers based on nitrogen are favourable for grasses growth and inhibit the growing of legumes [1], [3]. Phosphorous increase the yield and the content in dry matter [1], [3], [4]. Potassium has an

important role in plants' metabolism, in synthesis of carbon hydrates and chlorofilium, as well as in increasing plants' resistance during cold periods (winter) [1], [2], [5]. Cattle manure enriches soil in micro and macroelements and also in organic mattre which influence the meadow productivity [1], [3], [4], [5]. Vinassa is a product resulted after evaporation of residual waters from bakery yeast factories and has more nitrogen in comparison with cattle manure (3–3.2 %) [4], [8], [9]. In Romania was homologated as organic fertilizer in 2003 under the name of "Vinassa Rompak".

MATERIAL AND METHOD

The study was carried out on an *Agrostis capillaris* L – *Festuca rubra* L. permanent meadow between 2007 and 2008. The experiment was set up as a random block system in four replications, with 11 variants: V_1 – control (unfertilized); $V_2 – P_{36}$; $V_3 – N_{64}$; V_4 - $N_{64}P_{36}$; $V_5 – N_{128}P_{72}$; V_6 - $N_{64}P_{36}K_{40}$; $V_7 – N_{128}P_{72}K_{40}$; V_8 – cattle manure 20 t/ha; V_9 – cattle manure 30 t/ha; V_{10} – 4 t/ha vinassa + P_{36}; V_{11} – 7 t/ha vinassa + P_{108}. Mineral fertilizers were applied in the both years of experience, those based on phosphorous and potassium in autumn and those based on nitrogen early in spring. Cattle manure was applied only in the autumn of 2007. Vinassa was yearly applied, early in spring before start of vegetation. Harvesting was performed under the form of hay fields, on each variant, at grasses earing and at budding and blossoming of legumes.

To concrete the fodders' nutritive value was established multiple regression equations in which the independent variables are connected with their content in raw protein, raw cellulose and ash.

For hay, the equations that presents the nutritive value of the fodders expressed in milk nutritive units (UNL), meat nutritive units (UNC) and digestible raw protein (PDIN and PDIE) on a kg of dry matter, were calculated after Demarquilly system [6], [7].

The net energy (EN) of the fodders represents the quantity of energy totally used by animals to maintain the vital functions and for synthesis of different husbandry products.

The system used in Romania for net energy (EN), is based on a mathematical model for simulation of energetic and proteic metabolism at ruminants, being different for dairy and meat productions.

Nutritive value of fodder in UNL and UNC increased at the same time with the increasing of mineral and organic fertilizers administrated.

RESULTS AND DISCUSSIONS

The number of UNL/kg DM and UNC/kg DM increased at the same with the increasing of fertilizers doses (table 1). At control variant were recorded 0.82 UNL/kg DM and 0.78 UNC/kg DM, at N_{64} variant the number of UNL/kg DM increased to 0.85, and UNC/kg DM up to 0.82, at $N_{128}P_{72}$ variant were recorded 0.85 UNL/kg DM and 0.81 UNC/kg DM.

At fertilization with 20 and 30 t/ha cattle manure the number of UNL/kg DM was of 0.83, and the UNC/kg DM one was of 0.79.

At fertilization with 4 t/ha vinassa + P_{36} were recorded values of 0.85 UNL/kg DM and 0.82 UNC/kg DM, and at variant with 7 t/ha vinassa + P_{108} the number UNL/kg DM increased to 0.87, and the one of UNC/kg DM to 0.84.

At fertilization with 20 and 30 t/ha cattle manure the number of UNL/kg DM was of 0.83, and the one of UNC/kg DM was of 0.79.

At fertilization with 4 t/ha vinassa + P_{36} were recorded values of 0.85 UNL/kg DM and 0.82 UNC/kg DM, and at 7 t/ha vinassa + P_{108} variant the number of UNL/kg SU increased to 0.87, and the one of UNC/kg DM up to 0.84.

The quantity of digestible protein at 1 DM kilogramme at control variant was of 72 g in the case of digestible protein based on the energy from the quota (PDIE) and of 53 g in the case of digestible protein based on the nitrogen from quota (PDIN).

Table 1
The influence of fertilization on nutritive and energy value of the forage, on the meadows of *Agrostis capillaris* L. - *Festuca rubra* L.

Variant	UNL/kg DM	UNC/kg DM	g PDIE/kg DM	g PDIN/kg DM	ENL (kcal)	ENC (kcal)
Control (unfertilized)	0.82	0.78	72	53	1270	1211
P_{36}	0.82	0.77	72	53	1260	1199
N_{64}	0.85	0.82	78	62	1316	1266
$N_{64}P_{36}$	0.84	0.80	78	63	1301	1248
$N_{128}P_{72}$	0.85	0.81	81	70	1315	1264
$N_{64}P_{36}K_{40}$	0.84	0.80	78	63	1300	1246
$N_{128}P_{72}K_{40}$	0.85	0.81	82	70	1314	1262
Cattle manure 20 t/ha	0.83	0.79	76	60	1279	1221
Cattle manure 30 t/ha	0.83	0.79	77	61	1280	1223
4 t/ha vinassa + P_{36}	0.85	0.82	80	68	1315	1264
7 t/ha vinassa + P_{108}	0.87	0.84	85	77	1348	1303

At fertilization with nitrogen fertilizers or with nitrogen on a phosphorous agro fund, digestible protein increased at the same time with doses' increasing, from 78 g PDIE and 62 g PDIN at N_{64} variant, to 81 g PDIE and 70 g PDIN at $N_{128}P_{72}$ variant.

At fertilization with 20 t/ha cattle manure were recorded 76 g PDIE and 60 g PDIN, and at fertilization with 30 t/ha cattle manure the values increased to 77 g PDIE and 61 g PDIN.

At 4 t/ha vinassa + P_{36} fertilization the values were of 80 g PDIE and 68 g PDIN, and at 7 t/ha vinassa + P_{108} the recorded values were of 85 g PDIE respectively 77 g PDIN (table 1).

Regarding the energetic value was noticed that both milk net energy (ENL) and meat net energy (ENC) recorded increases function of fertilizers king and administrated doses.

Fodders' energetic value increase from 1270 kcal ENL and 1211 kcal ENC at control variant, to 1316 kcal ENL respectively 1266 kcal ENC at variant fertilized with N_{64}, to 1315 kcal ENL and 1264 kcal ENC at $N_{128}P_{72}$ variant, to 1280 kcal ENL and 1223 kcal ENC at 30 t/ha cattle manure variant and at 1348 kcal ENL and 1303 kcal ENC at variant fertilized with 7 t/ha vinassa + P_{108}.

The number of UNL şi UNC recorded at 1 hectare of permanent meadow was function of fertilization level (table 2).

Milk quantities and weight increases were also influenced by the fertilization level. At control variant could be obtained only 2027 l milk/ha and 169 kg weight increase, and at variant N_{64} milk quantity was 3813 l/ha and weight increase was 322 kg/ha.

The highest milk quantities and the highest weight increases per 1 hectare of permanent meadow were recorded at fertilization with $N_{128}P_{72}$ and the values are 5186 l milk and 432 kg weight increase per hectare, an at fertilization with 7 t/ha vinassa + P_{108} the recorded values were of 5879 l milk/ha (table 2) and 497 kg weight increase/ha (table 2).

Table 2
The number of UNL, UNC and of animal products at a permanent meadow of *Agrostis capillaris* L. - *Festuca rubra* L.

Variant	UNL/ha	Milk (4 % fat)		UNC/ha	Meat weight increase	
		l/ha	%		kg/ha	%
Control (unfertilized)	1419	2027	100	1349	169	100
P_{36}	1829	2613	128	1717	214	126
N_{64}	2669	3813	188	2575	322	190
$N_{64}P_{36}$	2915	4164	205	2776	347	205
$N_{128}P_{72}$	3630	5186	256	3459	432	256
$N_{64}P_{36}K_{40}$	3041	4344	214	2896	362	214
$N_{128}P_{72}K_{40}$	3842	5489	271	3661	458	271
Cattle manure 20 t/ha	2743	3919	193	2615	327	193
Cattle manure 30 t/ha	3096	4423	218	2947	368	218
4 t/ha vinassa + P_{36}	3247	4639	229	3132	392	232
7 t/ha vinassa + P_{108}	4115	5879	290	3973	497	294

CONCLUSIONS

At *Agrostis capillaris* L. – *Festuca rubra* L. meadow the nutritive value expressed in UNL and UNC increase at the same time with the increasing of mineral and organic fertilizer doses.

ENL and ENC values had the same evolution, being higher at the variants with increased doses of fertilizer.

Milk quantities and meat weight increase realised at one hectare, were also influenced by the level of fertilization, these ones being at *Agrostis capillaris* L. – *Festuca rubra* L. meadow of 2027 litres of milk and 169 weight increase at control variant, of 5186 litres of milk and 432 weight increase at $N_{128}P_{72}$ and of 5879 litres of milk and 497 weight increase at variant fertilized with 7 t/ha vinassa + P_{108}.

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