THE VARIATION OF SOME QUALITY INDICATORS OF THE FODDER PRODUCES ON THE BĂLĂCEANA MEADOW

Ana Leahu, I.M. Rîşca
„Ştefan cel Mare" University, Suceava
analeahu@usv.ro, marian_risca@yahoo.com

Abstract
The fodder quality is depending on there digestibility in the animal organism and are couch in starch unities. The bigger is the amount of proteins, lipids, non-nitrated extracts and smaller those of heavy digestible compounds (cellulose, hemicelluloses, lignin), the greater is his quality. In the published papers concerning the fodder quality, a special attention is given to the amount of brute and pure protein, the total amount of phosphorous, calcium, magnesium, potassium and sodium, and, not at least, the amount of nitric ions as compound that can affect the productivity and the animal's health.
Key words: nitric ions, easy assimilated phosphorous, easy assimilated potassium, the brute protein.

Résumé
La qualité du fourrage dépende de sa digestibilité dans l'organisme animal et elle s'exprime dans des unités d'amidon. Plus grande est la quantité des protéines, lipides, extraites pas azotiques et plus petite la quantité des produits peu digestibles (cellulose, hémicellulose, lignine) plus que sa qualité est meilleure. Dans les travaux publiés, concernant la qualité des fourrages, une atteinte spéciale est donnée à la concentration de la protéine brute, aux montants totaux du phosphore, calcium, magnésium, potassium et sodium et, pas dans le dernier lieu, le montant des ions nitriques, dans leur qualité des produits qui peuvent affecter la productivité bien que la santé ders animaux.
Mots clef : ions nitriques, phosphore facilement assimilé, potassium facilement assimilé, proteine brute

Rezumat
Calitatea furajelor depinde de digestibilitatea acestora în organismul animal şi se exprimă în unităţi de amidon. Cu cât cantitatea de proteine, lipide şi extracte neazotice este mai mare şi cu cât cantitatea de produse greu digestibile (celuloză, hemiceluloză, lignină) este mai mică, cu atât mai bună este calitatea acestor furaje. În lucrarile publicate pe tema calităţii furajelor, o atenţie deosebită se acordă conţinutului de proteină brută şi proteină pură, conţinutului total de fosfor, calciu, magneziu, potasiu şi sodiu, şi nu în ultimul rînd conţinutului de NO_3^- ca substanţă ce ar putea influenţa nefavorabil productivitatea şi sănătatea animalului.
Cuvinte cheie: ioni nitrici, fosfor uşor asimilat, potasiu uşor asimilat, proteină brztă.

Introduction

The quality of the fodder and other fodder products depends - among other - on the amount of the nitrate ions (harmful, in high concentrations, for the animal organism), on the minerals used for the normal physiological processes from the animal body (phosphorus, calcium, magnesium, potassium, sodium, microelements), and also on the fodder's contamination with heavy metals with noxious potential or with a series of organic compounds, like nitrosoamines, micotoxines etc.

The literature mentioned that a high amount of NO_3^- in the animal's food produces metabolism troubles and affects them the health. The result is a decreasing of meat and milk production and a lethal general toxicity [8].

The brute protein percentage in the meadow's fodder depends [1, 7] on the existing species that creates the vegetation and on the harvesting age. It also depends on the soil abundance in nutritive elements, especially the mineral forms of nitrogen. The leguminous species are richer in protein than the graminaceae. The literature [5] mentions the following mean values for the brute protein (given to dried substance): 16,3% for the alfalfa fodder, 15,4% for the vetch fodder, 12,3% for the mixture vetch + oat, 10,2% for the red clover, 8,3% for the river meadow, 9,3% for the steppe meadow, etc.

Although the variability of the brute protein yield depending on the nature of the fertilizing resources suggests some tendencies [3, 6, 9] however, due to the characteristics of structure of the vegetation (alive or dead), the data from Bălăceana presents some specific features.

Experimental

The main research method was the continuation of the activities in the experimental fields of S.C.D.A. Suceava from the Bălăceana commune. In order to fulfill the variants on the Bălăceana meadow there were used the following fertilizers types:

- super phosphate with 17% P_2O_5;
- ammonium nitrate with 33,5% N;
- nitro limestone cu 17,6% N and 40% $CaCO_3$;
- urea with 46,2% N;
- manure with cu 0,46% N, 0,32% P_2O_5, 0,21% K_2O, to dried substance.
- dolomite with 54% $CaCO_3$ and 45% $MgCO_3$;
- potassium salt with 40% K_2O;

The fertilization with manure and mineral fertilizers increases the brute protein yield of the fodder simultaneous with the increase of the applied nitrogen dose.

The analyzed plant samples were harvested in two vegetation phases, the first at 18 May 2000 (growth phase) and the second at 21 June (complete flourishing phase of the dominant species).

Chemical determinations:

- Easy assimilated phosphorous (P_{ppm}), determinated with the Egner-Riehm Domingo method (2), the phosphorous is extracted from the soil with an acid solution of ammonium acetate lactate buffered at pH 3,7;
- Easy assimilated potassium (K_{ppm}), the potassium cations were measured by flam-photometry from the buffered ammonium acetate-lactate extract at pH 3,7 (Egner-Riehm-Domingo method)(4);
- The total nitrogen (N_t) from dry substance (s.u.)were measured by the classical Kjeldahl procedure;
- The brute protein (P_b), were calculated by the multiplication of the N total content with 6,25;
- The nitric nitrogen ($N\text{-}NO_3$), were calorimetrically measured, from fresh material, through extraction in acetic acid solution 2%, and the measurement of the extract were fulfilled with pfenoldisulphonic acid, in alkaline milieu.

Results and discussion

The obtained data from the analysis demonstrate that there exist big differences concerning the brute protein yield, depending on the vegetation's development stage and also of soil's fertilization (table 1). At the variants fertilized only with mineral products, there are variations depending on the nitrogen dozes, on the fertilizer type and of the age of plants.

Table 1 The yield of brute protein (percents of dry material) to the Bălăceana's fodder, obtained in two vegetation's phases: growing (18.05.) and flourishing (21.06.).

Variant	NH_4NO_3		Nitro limestone		Urea	
	18.05	21.06	18.05	21.06	18.05	21.06
Soil fertilized with mineral fertilizer, without manure						
$N_0P_0K_0$	11,75	12,32	11,75	12,32	11,75	12,32
$N_{80}P_{32}K_{64}$	11,94	12,62	13,56	13,94	12,69	13,06
$N_{160}P_{64}K_{128}$	12,20	13,12	13,75	14,12	13,56	13,69
$N_{240}P_{96}K_{192}$	12,56	12,94	13,87	14,18	13,69	13,69
Sol fertilized with mineral fertilizer + 20 t/ha manure						
$N_0P_0K_0$	11,75	12,32	11,75	12,32	11,25	12,32
$N_{80}P_{32}K_{64}$	11,90	12,48	12,37	13,20	12,25	13,24
$N_{160}P_{64}K_{128}$	12,25	13,16	12,82	13,29	12,47	13,27
$N_{240}P_{96}K_{192}$	13,32	13,27	13,21	13,37	13,18	13,41

The harvested plants in the first phase have less brute protein had a smaller yield of brute protein then those harvested at the second phase when is the optimal period for the harvesting of the fodder. That fact demonstrates that the often grazed grass contains less brute protein then those mowed at the complete flourishing of the plants. Further on we presents some dependencies of the brute protein yield from the Bălăceana's meadow (expressed in % s.u. (dried substance)), of the dependencies of some agrochemical characteristics of the soil, as a result of various fertilization schemes.

Unlike the other interdependences, the variation of the brute protein amount depending on the soil supplies with *soluble phosphorous* (Figures 1 and 2), is overlapped almost totally on the dependence between the dry substance output and his presence in the soil.

The biggest values of the brute protein yield were recorded in the presence of 30 – 35 ppm phosphorous in the soil without organic fertilizer (Figure 1) and in the presence of 40 -50 ppm in the lots that beneficed of the long lasting effect of the manure (Figure 2) .

Because the mean output of the meadows without organic fertilization were with 0,5 t/ha dried substance smaller then the output of the organic fertilized meadows [9], the yield of brute protein in the fodder was, on average, with 0,5 % bigger that in the first case.

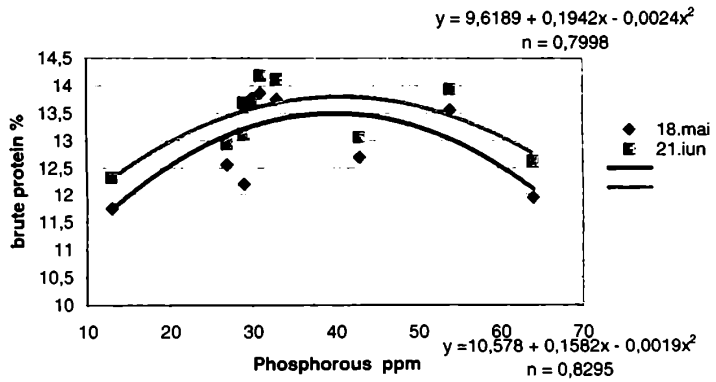

Figure 1: The relationship between the brute protein yield from the fodder harvested at 18 May and 21 June and the ppm of phosphorous from the Bălăceana soil , fertilized with NPK 1:0,4:0,8 (P+K applied at 3 years)

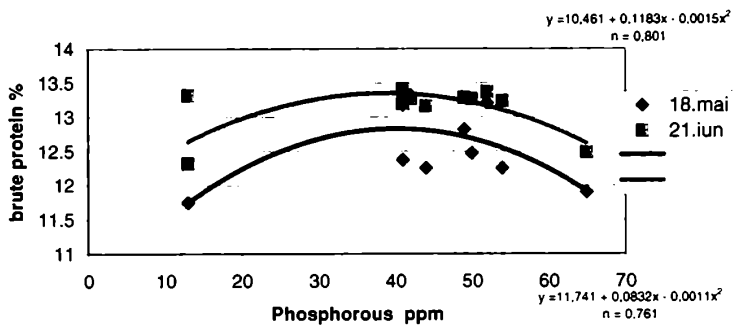

Figure 2: The relationship between the brute protein yield from the fodder harvested at 18 May and 21 June and the ppm of phosphorous from the Bălăceana soil, fertilized with NPK 1:0,4:0,8 (P+K applied at 3 years) and 20 t manure.

Great similitude were observed between the potassium induction over the brute protein percent (Figures 3 and 4) and his influence on the output of dry substance. the parallelism between the regression curves were so much evident like in the case of the phosphorous.

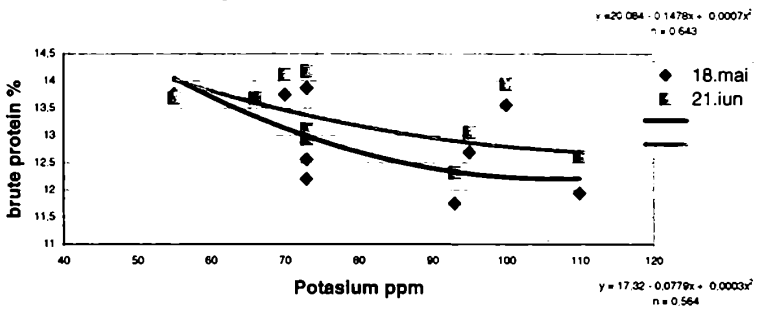

Figure 3. The relationship between the brute protein yield of the fodder harvested at 18 May and 21 June and the ppm of potassium from the Bălăceana soil, fertilized cu NPK 1:0,4:0,8 (P+K applied at 3 yars)

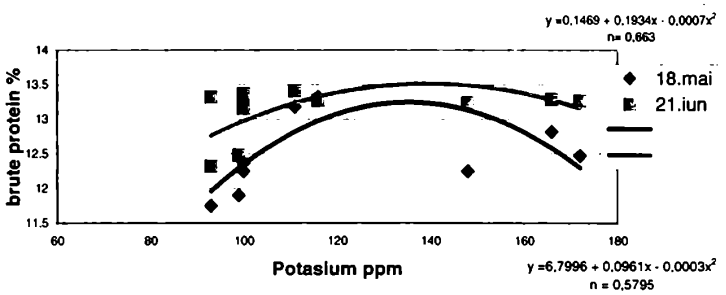

Figure 4. The relationship between the brute protein yield of the fodder harvested at 18 May and 21 June and the ppm of potassium from the Bălăceana soil, fertilized cu NPK 1:0,4:0,8 (P+K applied at 3 yars) and 20 t manure.

In the situation of the manure's neutralization (Figure 4) the biggest percent (13,5 – 14,5 %) of brute protein were recorded in the case of 65- 75 ppm potassium in the soil, and for the fodder harvested from the lots fertilized with manure, the biggest amount of brute protein were associated with 90 – 120 ppm potassium (Figure 4). A high yield of protein was obtained in some lots with 150 – 165 ppm K, but with a decreasing of the fodder output.

Table 2:The effect of the fertilizers with nitrogen applied 8 years at the Bălăceana meadow, on the nitrates content in the fodder (ppm $N\text{-}NO_3$)

Variant	Fertilizer with nitrogen		
	NH_4NO_3	Nitro limestone	Urea
$N_0P_0K_0$	328	328	328
$N_{80}P_{16}K_{32}$	328	432	328
$N_{160}P_{32}K_{64}$	314	514	361
$N_{240}P_{48}K_{96}$	334	491	375

The only fertilizer which produced an important growth of the $N\text{-}NO_3$ yield was the nitro limestone; to the unfertilized control the yield was 328 ppm $N\text{-}NO_3$ and he raised at 514 ppm $N\text{-}NO_3$ in the case of fertilization with 160 kg N/ha and at 591 ppm at 240 kg N/ha. Because the superior admitted limit at the fodder is 0,07 % $N\text{-}NO_3$ (= 700 ppm $N\text{-}NO_3$) it results that the superior limit admitted is far to be touched.

Conclusions

The yield of brute protein in the fodder was positively influenced by the nitrogenous fertilizers applied at the soil. The growing plants, usually grazed, contains less brute protein that those in the flourishing phase, when there are harvested in order to obtain the hay.

The biggest values of the brute protein yield were recorded in the presence of 30 – 35 ppm P in the unfertilized soil with manure (Figure 1) and in the presence of 40 -50 ppm in the lots that beneficed of the long-lasting effect of the manure (Figure 2).

The biggest percent of brute protein were recorded at a yield of 65 - 45 ppm K in the soil, and at he harvested hay from the lots fertilized with manure; the biggest yield of brute protein was associated with 90 – 120 ppm K.

The nitrites amount from the plants increased only under the influence of the ammonium sulphate but without to reach the maximal admitted limit of 700 ppm $N\text{-}NO_3$, accepted by the references. The nitric nitrogen from the control plants represented only 1,66 % from the total amount existing in the dry substance and 2,21 % at the plants fertilized with nitro limestone, which represents no biological importance.

The application of the nitrogen fertilizers in two – three rounds is the reason for the maintaining of the $N\text{-}NO_3$ level under the maximal admitted limit of 700 ppm $N\text{-}NO_3$.

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