COMPARISONS BETWEEN GREEN MASS PRODUCTIONS OBTAINED BY FERTILIZATION IN THE GRASSLAND OF VÂRCIOROVA, CARAŞ-SEVERIN COUNTY

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Abstract: *One of the causes determining low productions in grasslands are the soil depletion in nutritive elements, which are extracted through each crop without be replaced. A poor supply determines a slow growth of plants and reduces in the same time the concentration of these elements in the harvested biomass (AERTS AND CHAPIN, 2000). The main goal of this paper is to compare the green mass productions obtained in the grassland of Vârciorova, as result of fertilization with mineral fertilizers, using the Duncan test. In order to do this, we settled an experiment with 10 experimental variants of fertilization with nitrogen, phosphorous and potassium in different doses (V1-V10). To elaborate this paper we considered the mean production obtained within the experimental cycle 2006-2008. Results showed the existence of production differences statistically assured between V1 – the unfertilized variant and all other variants fertilized with chemical fertilizers, and concerning the gradually application of nitrogen it was found that it determines production increases, fact highlighted by the production differences between V7, V9 and V10, which are statistically assured.*

Key words: *natural grassland, chemical fertilization, production, Duncan test.*

INTRODUCTION

One of the causes determining low productions in grasslands is the soil depletion in nutritive elements, which are extracted through each crop without be replaced.

Unfortunately, there are many surfaces on which no fertilization was performed, not for years, but for decades (MOISUC AL., DUKIC D., 2002).

Plant growth and grassland productivity are significantly affected by the bioavailability of the nutritive elements, the nitrogen, phosphorous and potassium generally being the main limiters (PARFITT et al., 2005).

A poor supply determines a slow growth of plants and reduces in the same time the concentration of these elements in the harvested biomass (AERTS AND CHAPIN, 2000).

Within the complex of measures aiming to increase the grassland production, fertilization is the most important. The strong reaction of the grassland vegetation to this intervention is due, on the one hand, to the high requirements in nutritive elements as a consequence of the biological particularities of plants which form the herbaceous cover: perenniality, multiple regeneration during a vegetation period, reduced edaphic volume for roots etc., and on the other hand to the grassland location, generally on fields with low fertility (http://www.ipipotash.org/pdf/countrysp/rombroschwe3.pdf).

Practically, grassland fertilization considerably increases both the production of fodder biomass and the other components of it: rate of plant growth, optimal phase of harvesting, number of harvests, floristic structure, and nutritive value of the forage.

An inappropriate usage of fertilizers can lead to disorders of the animal metabolism and implicitly of the consumer of the animal products – the humans. Therefore, the application of the fertilizers in grasslands involves several particularities (PARFITT et al., 2005, MOISUC, COJOCARIU, 2000).

MATERIAL AND METHODS

The experiments have been settled in a permanent grassland from Vârciorova (Caraş Severin County).

The Vârciorova village is located in the south-western side of Romania, respectively in the eastern side of Banat, at the foot of the Mountains Ţarcu and Muntele Mic, at 18 km distance from Caransebeş city. The territory of the village is delimitated by the northern parallels 45°15' and 45°24', respectively by the eastern meridians 22°15' and 22°30'.

The experiments have been established in the autumn of 2005 in a permanent grassland from Vârciorova (Caraş Severin County).

The experiments have been arranged as randomized blocks in four replicates.

The surface of a plot is by 20 m^2 (4m x 5m).

The experimental variants are the following: **V1**-Control ($N_0P_0K_0$), **V2**-$N_{100}P_0K_0$, **V3**-$N_{200}P_0K_0$, **V4**-$N_{200}P5_0K_0$ - autumn, **V5**- $N_{200}P_{50}K_0$ - spring, **V6**-$N_{200}P_{50}K_{50}$ - autumn, **V7**-$N_{200}P_{50}K_{50}$- spring, **V8**-$N_{100+100}P_0K_0$, **V9**-$N_{100+100}P_{50}K_{50,}$ **V10**-$N_{100+50+50}P_{50}K_{50}$.

All ten variants have been studied for three years (2006-2008).

The variants have been harvested each year in the second half of June, when the graminaceous were in the ear formation phase (first mowing).

The second mowing was performed around 15 August.

To establish the production, the direct method of repeated mowing was used.

The production results were statistically processed. The calculation and interpretation of data achieved through the up mentioned measurements and determinations have been performed using the soft package STATISTICA 8.

RESULTS AND DISCUSSIONS

Results showing the greeceau

In mass production obtained during the three years of experimentation are presented in the figure 1 and table 1.

In the figure 1 can be observed that, by applying the three elements: nitrogen, phosphorous and potassium, singularly or in complex, the green mass productions increased.

The largest productions have been obtained in the variant where nitrogen was gradually applied (in three repetitions - 100 kg/ha in early spring, 50 kg/ha when plants reach 15 cm height and 50 kg/ha after the first mowing) and the phosphorous and potassium have been applied in autumn, in doses of 50:50.

However, we want to affirm that the economic optimum is not the highest in the largest production; this fact will be demonstrated in the table 1.

In the table 1 can be observed differences of green mass productions between **V1**-the unfertilized variant and all other variants fertilized with chemical fertilizers, which are statistically assured.

From these clearly occurs the efficiency of the chemical fertilization.

There are production differences statistically assured between: **V2 ($N_{100}P_0K_0$)** and V5 ($N_{200}P_{50}K_0$ spring – all three chemical elements), V6 ($N_{200}P_{50}K_{50}$ autumn – all three chemical elements), V9 ($N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

If we consider only the nitrogen, we can certainly affirm that **increase of the dose from 100 kg/ha to 200 kg/ha, regardless how nitrogen was divided, determines an increase of the green mass production.**

As well, there are production differences statistically assured between **V3 ($N_{200}P_0K_0$)** and V9 ($N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

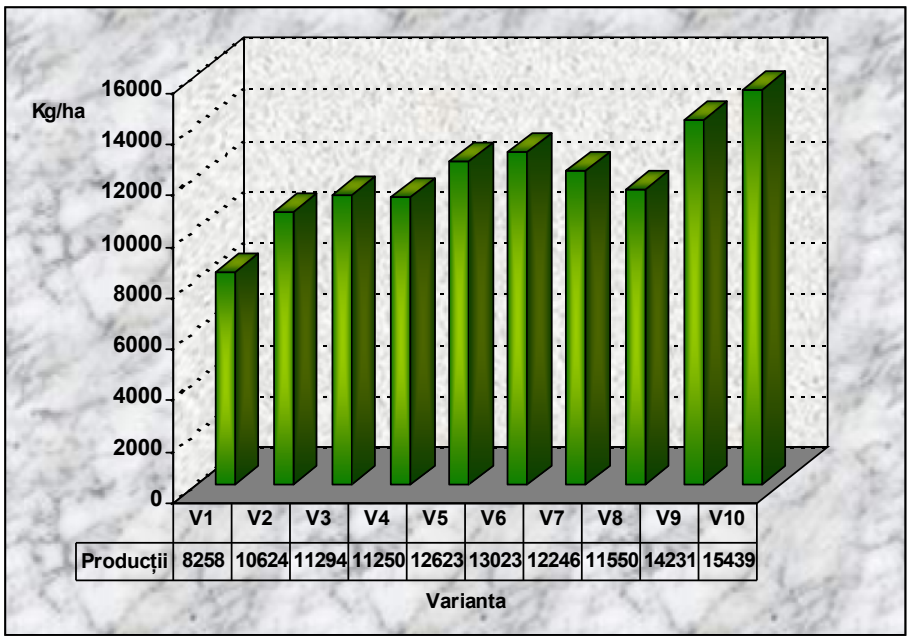

Fig. 1. Mean productions of green mass obtained in the grassland of Vârciorova – chemical fertilization (2006-2008)

Table 1.

Comparisons between the mean productions of green mass obtained in the grassland of Vârciorova – chemical fertilization (2006-2008), using the Duncan test

Crt. no.	Variant	{V1} 8258	{V2} 10624	{V3} 11294	{V4} 11250	{V5} 12623	{V6} 13023	{V7} 12246	{V8} 11550	{V9} 14231	{V10} 15439
1	V1		0,006	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000
2	V2			0,420	0,426	0,030	0,011	0,071	0,283	0,000	0,000
3	V3				0,954	0,128	0,055	0,256	0,743	0,002	0,000
4	V4					0,123	0,053	0,249	0,716	0,002	0,000
5	V5						0,609	0,630	0,202	0,060	0,002
6	V6							0,352	0,093	0,132	0,006
7	V7								0,377	0,026	0,001
8	V8									0,004	0,000
9	V9										0,132
10	V10										

From these aspects clearly arises the idea that **the gradual application of the nitrogen determines obviously production increases**, fact highlighted by production differences statistically assured between **V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in**

spring) and V9 **(**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

Another aspect deserving to be mentioned is the existence of production differences statistically assured between **V4 (**$\mathbf{N_{200}P5_0K_0}$ **– autumn)** and V9 **(**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

In this situation could be concluded that **nitrogen must be applied in spring,** case when the green mass increases are larger.

There are production differences statistically assured as significant between variant **V8 (**$\mathbf{N_{100+100}P_0K_0}$ **)** and **V9 (**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

Therefore, the conclusion is that **nitrogen, gradually applied, together with moderate doses of phosphorous and potassium (applied in autumn), lead to production increases** in the grassland of Vârciorova.

Another aspect distinguished in the table 1 is that there are no significant differences between green mass productions recorded in the variants V2 ($N_{100}P_0K_0$) and V3 ($N_{200}P_0K_0$), V8 ($N_{100+100}P_0K_0$).

In other words, **in the absence of fertilization with phosphorous and potassium there are no significant differences between the doses of 100 and 200 kg/ha nitrogen**.

In this situation the economic dose is N_{100}.

As well, there are no significant production differences between **V3 (**$\mathbf{N_{200}P_0K_0}$ **)** and V4 ($N_{200}P5_0K_0$ – autumn), V5 ($N_{200}P_{50}K_0$ spring – all three chemical elements), V6 ($N_{200}P_{50}K_{50}$ – autumn – all three chemical elements), V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in spring) and V8 ($N_{100+100}P_0K_0$).

Another conclusion arising from the table 1, is that there are no significant differences between green mass productions recorded in the variants **V4 (**$\mathbf{N_{200}P5_0K_0}$ **– autumn)** and the green mass productions harvested in the variants: V5 ($N_{200}P_{50}K_0$ – spring – all three chemical elements), V6 ($N_{200}P_{50}K_{50}$ – autumn – all three chemical elements), V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in spring) and V8 ($N_{100+100}P_0K_0$).

These aspects suggest the idea that **phosphorous and potassium play a role not very important in the grassland of Vârciorova and regardless the moment when the dose of 200 kg/ha is applied, the production increases even different they are not statistically significant**.

The same thing can be observed in the variant **V5 (**$\mathbf{N_{200}P_{50}K_0}$ **– spring – all three chemical elements)** and in all other variants where the nitrogen input was in dose of 200kg/ha, respectively: V6 ($N_{200}P_{50}K_{50}$ – autumn – all three chemical elements), V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in spring) and V8 ($N_{100+100}P_0K_0$)**,** V9 **(**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates)**.**

To the first idea also subscribed the fact that there are no significant differences between the green mass productions recorded in the variant **V6 (**$\mathbf{N_{200}P_{50}K_{50}}$ **– autumn – all three chemical elements)** and in the variants: V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in spring) and V8 ($N_{100+100}P_0K_0$), V9 **(**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates)**.**

There are no significant differences between the green mass productions recorded in the variants fertilized with 200 kg/ha nitrogen in three replicates: V9 **(**$N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

In this situation economic is to **apply the nitrogen gradually, in two replicates.**

CONCLUSIONS

We can conclude that between the green mass productions recorded in the variant V1 – the unfertilized variant and all other variants fertilized with chemical fertilizers there are production differences statistically assured.

Concerning the application moment, clearly arises the idea that the gradual application of the nitrogen determines production increases, fact also highlighted by production differences statistically assured between V7 ($N_{200}P_{50}K_{50}$ – the whole amount was applied in spring) and V9 ($N_{100+100}P_{50}K_{50}$ – nitrogen divided in two replicates) and V10 ($N_{100+50+50}P_{50}K_{50}$ – nitrogen divided in three replicates).

The nitrogen, gradually applied, together with moderate doses of phosphorous and potassium (applied in autumn), lead to production increases in the grassland of Vârciorova, and the absence of fertilization with phosphorous and potassium determine no significant differences between the doses of 100 and 200 kg/ha nitrogen.

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