Analele Universităţii din Oradea Fascicula: Ecotoxicologie, Zootehnie şi Tehnologii de Industrie Alimentară, 2010

THE INFLUENCE OF THE NITROGEN ON THE DRY MATTER PRODUCTION IN THE GRASSLAND OF TULGHEŞ, HARGHITA COUNTY

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Abstract

The nitrogen fertilization is an important mean to manage the production of the permanent grasslands. The regular supplying with nitrogen is necessary to obtain important production increasing both at the beginning of the vegetation period and after each mowing. The applied amounts of nitrogen fertilizers depend on the production level that we desire to obtain and also on the presence of the organic fertilizers supplying.

Our goal is to find which of the proposed fertilization variants (three doses of ovine manure + N_{100} and three doses of bovine manure + N_{100}) is the most advantageous to obtain the largest dry matter productions with expenses as reduced as possible, taking into account the problems occurred in the management of a permanent grassland.

The experimental results achieved in the grassland of Tulgheş reveal that, in the first year, the dry matter production in the variants with bovine manure and nitrogen is net superior to those where was applied only bovine manure. In the next two years, the productions obtained under organic fertilization are net superior to those obtained in the mixed fertilization.

Key words: grassland, production, mixed fertilizers.

INTRODUCTION

Grassland is characterized by the diversity of the nitrogen sources susceptible to be used by the vegetal cover in order to assure its growth: the mineralization of the organic matter from soil, the applied mineral and organic fertilizers, the symbiotic fixation whether leguminous plants exist within the vegetal cover and finally the animal dejections received during the grazing (Griffin T. et all, 2002, Eliott D.E., Abbott R.J., 2003, Nevens, F. and Rehuel, D., 2003, Goh K.M. and Bruce G.E., 2005).

The response of the grassland regarding the vegetal production as result of the nitrogen application in various doses has been studied by very numerous authors on a large range of grasslands on different types of soil (Whitehead, D.C., 2000, Trindade, H. et all, 2001, Berry, P.M. et all, 2002, Stroia C., 2007).

MATERIAL AND METHOD

The experience has been placed in the Bistricioara Basin from Tulgheş locality, Harghita County, at an altitude over 700 m (between the years 2007-2009).

The experimental field has been placed on an alluvia soil. The land is slightly non-uniformed and presents a herbaceous mesohygrofille vegetation.

The climatic data recorded at the Phytosanitary Unit Harghita – SPA Miercurea Ciuc, highlight the fact that the mean monthly temperatures over 5°C had been registered starting with month May of each experimental year, and the largest precipitation quantities in this period were generally recorded during the summer months.

The experiment approaches the role of the mixed fertilization (bovine manure and nitrogen) comparing to the variants fertilized just with animal manure (three different doses of ovine manure and three doses of bovine manure).

The fertilization variants were: V_2-10 t/ha ovine manure, V_3-10 t/ha bovine manure, V_4-20 t/ha ovine manure, V_5-20 t/ha bovine manure, V_6-40 t/ha ovine manure, V_7-40 t/ha bovine manure, V_8-10 t/ha ovine manure + $N_{100,}$ V_9-10 t/ha bovine manure + $N_{100,}$ V_{10}-20 t/ha ovine manure + $N_{100,}$ V_{11}-20 t/ha bovine manure + $N_{100,}$ V_{12}-40 t/ha ovine manure + N_{100} and V_{13}-40 t/ha bovine manure + $N_{100.}$

The fertilization with organic fertilizers has been made in autumn, after the plant growth stopped, and the nitrogen fertilization has been made in spring at the starting of vegetation cycle.

For the statistical processing there was used the soft STATGRAPHICS plus (2000) and STATISTICA 8 package (Petersen R.G., 1994 ; Mead R., 2002).

In order to establish the production of dry matter, before each mowing there was realized a preliminary mowing on each experimental plot.

The yielding was made in hayfield regime, in the ear phase of the dominant graminaceous plants, obtaining thus two cycles of vegetation (mowing I and mowing II).

RESULTS AND DISCUSSION

In the figure 1 there are shown the dry matter productions (the average of the three replicates) obtained after organic fertilization (ovine manure, bovine manure) in doses by 10, 20 and respectively 40 t ha^{-1} and mixed doses with a singular dose of 100 kg N ha^{-1} for the two times mowing in the three experimental years.

In the year of 2007, for the first mowing the dry matter production (Figure 1) in the experimental variants without N is ranging between 1.21 ± 0.07 t ha^{-1} for V2 and 1.64 ± 0.10 t ha^{-1} for V6, while for the variants with N is ranging between 2.12 ± 0.26 t ha^{-1} for V13 and 4.31 ± 0.05 t ha^{-1} for V12. It can be observed that the obtained productions for the experimental variants with N are approximately two times larger that those obtained in the variants without N. The test of variability (ANOVA) used to compare the action of the factor nitrogen (N) upon the variable dry matter (SU) shows that the differences between the dry matter production are significant ($P<0.001$).

For the second mowing, the dry matter productions are ranging between 0.35 ± 0.01 t ha^{-1} for V3 and 0.63 ± 0.06 t ha^{-1} for V6 in the case of the variants without N and between 0.73 ± 0.03 t ha^{-1} for V13 and 1.54 ± 0.03 t ha^{-1} for V12 in the case of the variants with N. The statistical test shows that these values present significant differences ($P<0.001$).

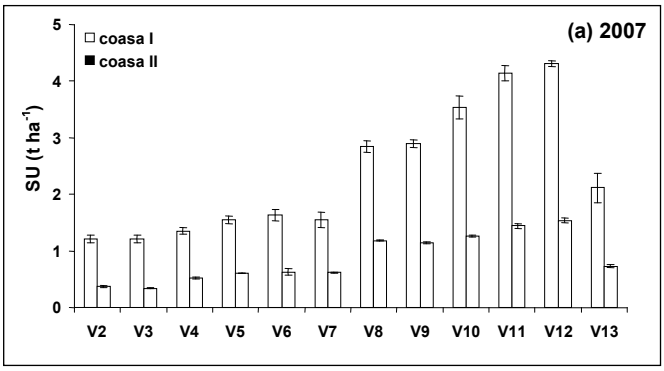

Fig. 1. The dry matter production (SU) (mowing I and II) for mixed fertilization with 100 kg N ha^{-1} (2007)

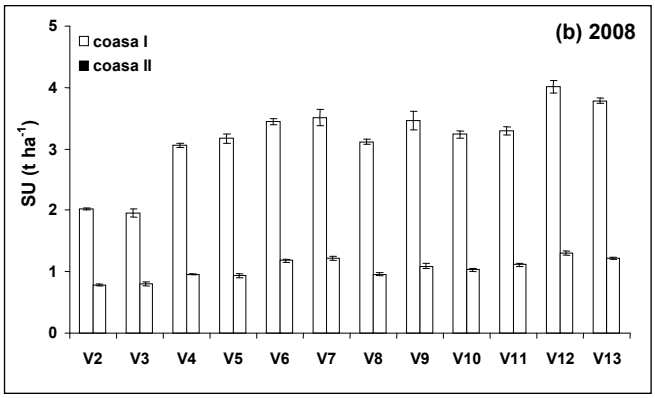

Fig. 2. The dry matter production (SU) (mowing I and II) for mixed fertilization with 100 kg N ha^{-1} (2008)

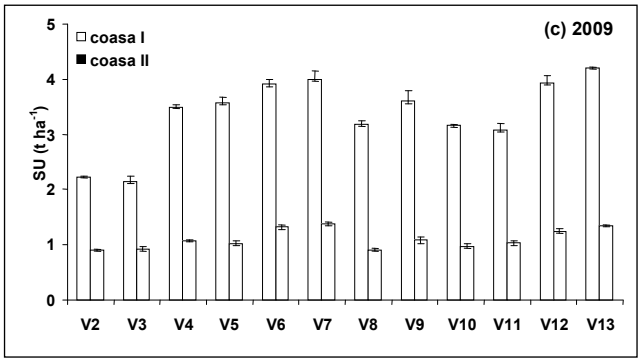

Fig. 3. The dry matter production (SU) (mowing I and II) for mixed fertilization with 100 kg N ha^{-1} (2009)

In the year of 2008 it can be observed in the Figure 2 that the dry matter productions at the first mowing, for the variants with organic fertilization are ranging between 1.96 ± 0.07 t ha^{-1} for V3 (10 t bovine manure ha^{-1}) and reach 3.51 ± 0.14 t ha^{-1} for the variant V7 (40 t bovine manure ha^{-1}), while for the variants with mixed fertilization the dry matter productions are comprised between 3.11 ± 0.04 t ha^{-1} for the variant V8 (10 t ovine manure + N_{100} ha^{-1}) and reach 4.01 ± 0.31 t ha^{-1} for V12 (40 t ovine manure + N_{100} ha^{-1}).

For the second mowing, similar to the first mowing, the dry matter productions obtained for the variants V6 and V7 are by 1.18 ± 0.03 t ha^{-1} respectively by 1.23 ± 0.03 t ha^{-1}, superior to those productions obtained in the variants V8, V9, V10 and V11 which were by 0.96 ± 0.02 t ha^{-1}, 1.09 ± 0.04 t ha^{-1}, 1.03 ± 0.03 t ha^{-1} respectively by 1.11 ± 0.03 t ha^{-1}.

The results of the statistic test show that for the year of 2007, the application of N in the same time with the organic fertilizers did not significantly influenced the dry matter production (*P>0.05*) for both of the mowing actions.

In the year of 2009, for the first mowing, the productions obtained in the variants V8 (10 t ovine manure ha^{-1} + N_{100}), V10 (20 t ovine manure ha^{-1} + N_{100}) and V11 (20 t bovine manure ha^{-1} + N_{100}) are by 3.18 ± 0.06, 3.16 ± 0.01 and respectively 3.08 ± 0.11 t ha^{-1} and they are inferior to those obtained in the variants fertilized with doses of 20 and 40 t bovine manure ha^{-1} (V4–V6). The test of variability used to compare the action of the factor nitrogen (N) upon the variable dry matter (SU) shows that there are no significant differences (*P>0.05*).

For the second mowing, the dry matter productions are comprised between 0.90 ± 0.02 t ha^{-1} for V2 and 1.38 ± 0.04 t ha^{-1} for V7 in the variants without N and between 0.91 ± 0.03 t ha^{-1} for V8 and 1.35 ± 0.02 t

ha^{-1} for V13 in the variants with N. For the second mowing it can be observed that the dry matter productions obtained in the variants without N are generally larger that those obtained in the variants where was applied only nitrogen but these differences are not significant (*P>0.05*).

Making comparisons between the three experimentation years (Figure 4 and 5), it can be observed that generally the dry matter productions are progressively increasing from an year to another, the production of the last year being almost double in comparison with the production obtained in the first experimental year. But there are also some cases when were recorded decreasing of the production, the production of the year 2007 being superior to the production from 2008 and 2009 for the variants V10 (20 t ovine manure ha^{-1} + N_{100}), V11 (20 t bovine manure ha^{-1} + N_{100}) and V12 (40 t ovine manure ha^{-1} + N_{100}). For the second mowing we have the same behavior, regarding the production differences beteen the research years, but besides the production decreasing recorded from an year to another in the variants V10, V11 and V12, we also found a production decreasing in the variant V8 (10 t ovine manure ha^{-1} + N_{100}).

If we statistically compare the productions obtained for the three years of study, it can be found that for the first mowing the production differences are significant (*P<0.05*), while for the second mowing these differences are not significant (*P>0.05*).

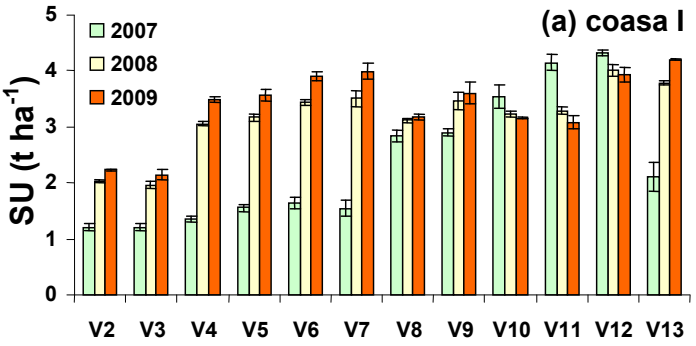

Fig. 4. The dry matter production (SU) (mowing I) for mixed fertilization with 100 kg N ha^{-1}

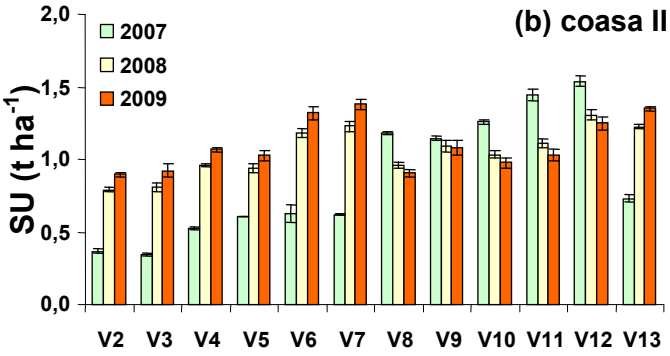

Fig. 5. The dry matter production (SU) (mowing II) for mixed fertilization with 100 kg N ha^{-1}

CONCLUSIONS

In the first experimental year, it can be observed that the dry matter production in the variants with bovine manure and nitrogen is net superior to those variants where there was applied only bovine manure.

In the next experimental years it can be observed that the production obtained under organic fertilization are superior to those obtained under mixed fertilization. This fact proves that plants efficiently valuate the nitrogen remaining from the organic fertilizers applied in this system, being well known that the nitrogen loss in the environment is lower when it is applied in organic form.

The small dry matter productions for the variants with mixed fertilization are due to the fact that in the last two experimental years the quantity of precipitations was much lower than in the first year. The hydric deficit in this time period affected the bio-availability of the mineral elements and implicitly the production of dry matter.

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