RESEARCH ON THE INFLUENCE OF FERTILIZATION ON THE STRUCTURE OF VEGETATION COVER IN TEMPORARY MEADOWS WITH MIXED USE UNDER THE CENTER OF MOLDOVA CONDITIONS

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Abstract

At the A.R.D.S. Secuieni it was researched the evolution of different mixtures of perennial grasses and legumes with mixed use, evidenced by their contribution to the structure of the vegetation, considering the percentage of participation of the species in the seed norm and mode of use. The results obtained on the evolution of the structure of vegetation cover at the mixtures with mixed use, was observed that was obtained five harvests, the first harvest being done in hayfield regime, and the next four were harvested by grazing simulation, at an interval of 28 days. At the mixture b_2, composed of *Dactylis glomerata* 20% + *Lolium perenne* 70% + *Lotus corniculatus* 5% + *Trifolium pratense* 5%, in 2014, in the hayfield regime, in structure of vegetation cover the dominant percentage was in favor of the perennial grasses, comprised between 57% in the fertilized variant with $N_{40}P_{40}$ and 67% at the $N_{80}P_{40}$ variant. On the other four harvests, the perennial grasses tended to slightly decrease from one harvest to another except for the fertilized variant with $N_{80+40}P_{40}$, where the participation of the grasses had a tendency to increase between 46-61%. In 2015, the percentage of participation of the perennial grasses in the structure of the vegetal cover was maintained throughout the five harvests. The highest percentages of legumes were in fertilized variants with $N_{40}P_{40}$ and $N_{80}P_{40}$, the values being between 12-15%.

Key words: mixture, fertilization, legumes, grasses.

The composition of perennial grasses and legumes mixtures is the most important work in the cultivation technology of temporary grassland, on which depends the productivity of the meadows, the fertilization system, the way and the duration of use, as well as the evolution of the vegetation cover composition.

The floral composition used for setting up temporary meadows is maintained or evolves according to the stability of the pedoclimatic elements of the area and by human intervention, by the specific methods of maintenance and capitalization of the meadow. Thus, the number of species can be reduced to one or new species from the soil seed reserve (annual weeds) may appear.

Generally, after two years of use, there are a number of changes in the vegetation cover structure, compared to the graminee - leguminous ratio used for sowing. There was a decrease in the participation of plants from the diverse group until their disappearance from the vegetation cover (Janicka M., Stypinski P., 1991; Barsczewski J. *et al*., 2007).

When choosing species in mixtures, an important role is the length of their vegetation phases (Plancquaert P., 1971). The culture of perennial grasses and legumes mixtures is limited mainly by the weight of maintaining a balanced ratio between components and by the inability to optimally ensure the biological requirements of each species. For pastures, medium or low-sized species are used, different growth rates (to achieve a better distribution of green weight on grazing cycles), high speed and energy of threshing, resistance to soil compaction and higher vivacity (Belesky D.P. *et al*., 2002, Sanderson M. A. *et al*., 2005, Vîntu V. *et al*., 2010, Naie Margareta *et al*., 2015).

The unilateral application of nitrogen on temporary grasslands, consisting of grasses and legumes mixtures, is not recommended because substantial changes occur in the floristic composition, by decreasing and eventually the disappearance of perennial legumes, and thus implicitly decreasing the nutritional value (of the protein content) of the feed (Lupaşcu M., 2004).

The results of research carried out by Ionescu I., 2003 and Motcă Gh. *et al*., 2004, highlight the fact that, irrespective of the doses and the relations between the fertilizing elements, the

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economic duration of the meadow exploitation does not exceed six years, after which the execution works of partial or total regeneration thereof. When the temporary pasture is fertilized annually and exploited according to the principles of rational pasture, the yield can be maintained at an acceptable level and for a period of more than six years.

MATERIAL AND METHOD

The researches were carried out in 2013 – 2015 agricultural years, in the experimental field of the Agricultural Research –Development Station Secuieni, on a typical cambic faeoziom (chernozem) type of soil (SRTS, 2012) with medium and neutral texture (pH_{H2O} – 7.26). The soil on which the experiment was placed was characterized as being well supplied in active humus (2.33 %), very well supplied in phosphorus (189 mg/kg), potassium (304 mg/kg), excessively supplied in Mg (253 mg/kg) and Mn (369 mg/kg), poorly supplied in nitrogen (9.4 mg/kg N – NO_3) and Zn (1 mg/kg).

The experience was established after the subdivision parcel method with two factors, being of A x B type, in four repetitions. The studied factors were: A - fertilization, with four graduations: a_1-N_0P_0; a_2-$N_{40}P_{40}$; a_3-$N_{80}P_{40}$; a_4-$N_{80+40}P_{40}$; B – the perennial legumes and grasses mixtures with three graduations: b_1 – 85 % grasses (60% *Dactylis glomerata* L. + 25% *Lolium perenne* L.) + 15% legumes (80% *Medicago sativa* L.); b_2 – 90% grasses (20% *Dactylis glomerata* L. + 70% *Lolium perenne* L.) + 10% legumes (5% *Lotus corniculatus* L. + 5% *Trifolium pratense* L.); b_3 – 90% grasses (70% *Dactylis glomerata* L. + 20% *Bromus inermis* Leyss.) + 10% legumes (10% *Lotus corniculatus* L.).

The way of using the experience was in grazing simulation mode, the first scythe was done in the dominant grasses sprouting phenophase and legumes blossom phenophase, and the 2nd and the 4th scythe at a 28-day interval of each other. The harvesting of the experimental variants was done with the Bertolini 411 bumper, at a height of 5 cm from the ground. The sowed area of the experimental plot was 10 m^2, of which 8 m^2 were harvested. Fundamental fertilization was done with phosphate fertilizers administered in the autumn, and those based on nitrogen were given early spring at start of vegetation, except for the N_{80+40} graduation, whose difference was given after first scythe.

For the determination of the floristic composition samples were taken after the gravimetric method from each plot, to each scythe and the floristic evolution was observed by groups of species (grasses, legumes and species from other botanical families).

RESULTS AND DISCUSSIONS

From the analysis of the obtained results it is observed that in the case of the b_1 mixture made of *Dactylis glomerata* 60% + *Lolium perenne* 25% + *Lotus corniculatus* 15%, in 2014 ***(****figure 1)*, the structure of the vegetation carpet was favorable to the grasses, at the first scythe were recorded the highest values ranging from 64% in the variant fertilized with $N_{40}P_{40}$ to 86% in the variant fertilized with $N_{80}P_{40}$. The legumes had the highest share, at the first scythe of 32-35%, in the unfertilized variant and the variant fertilized with $N_{40}P_{40}$, and on the other scythes the tendency was of slight decrease. In the case of the variants fertilized with $N_{80}P_{40}$ and $N_{80+40}P_{40}$, the percentage of participation of the grasses began to decline from one scythe to the other, in favor of legumes, with the tendency to maintain from one scythe to the other.

At b_2 mixture, consisting of *Dactylis glomerata* 20% + *Lolium perenne* 70% + *Lotus corniculatus* 5% + *Trifolium pratense* 5%, in 2014, *(figure 2.)*, at the first scythe, in the structure of vegetation cover the highest percentage was in favor of grasses, ranging from 57% in the variant fertilized with $N_{40}P_{40}$ and 67% in the variant fertilized with $N_{80}P_{40}$. At the other scythes the grasses tended to slightly decrease from one scythe to another except for the variant fertilized with $N_{80+40}P_{40,}$ where the share of the grasses had a tendency to increase between 46-61%. The participation percentage of the different group species was higher at the fifth scythe, the recorded values being between 10.2-18.5%.

In the case of b_3 mixture, consisting of *Dactylis glomerata* 70% + *Bromus inermis* 20% + *Lotus corniculatus* 10%, in 2014 *(figure 3)* at the first scythe, the structure of the vegetation cover was favorable to grasses, with values of 73% in the variant fertilized with $N_{40}P_{40}$ and 86% in the variant fertilized with $N_{80+40}P_{40}$. At the other scythes, the grasses participation percentage in the structure of the vegetation cover remained constant. The largest share of leguminous crops, compared to the participation percentage in the sowing norm was in the variant fertilized with $N_{80+40}P_{40}$, having values between 22-25%. The species in the diverse group recorded the highest values at the fifth scythe, being of 7-19%.

Compared to 2014, in 2015 the legumes participation percentage fell in favor of grasses.

In 2015 at b_1 mixture, the grasses were dominant in the structure of the vegetation cover at all analyzed fertilization variants *(figure 4)*. During the five scythes, both grasses and legumes kept

their participation percentage in the structure of the vegetal cover. At the variant fertilized with $N_{80+40}P_{40}$, the grasses recorded values between 83-62%. The species from the different group had the highest percentage at the fertilization with $N_{80+40}P_{40}$, of 19%.

In case of b_2 mixture, the grasses participation percentage in the structure of the vegetation cover was maintained during the five schytes *(figure 5)*. The highest percentages of legumes were in the variants fertilized with $N_{40}P_{40}$ and $N_{80}P_{40}$, the recorded values being between 12-15%. The highest percentage of the species from the different group was in the variant fertilized with $N_{80+40}P_{40}$.

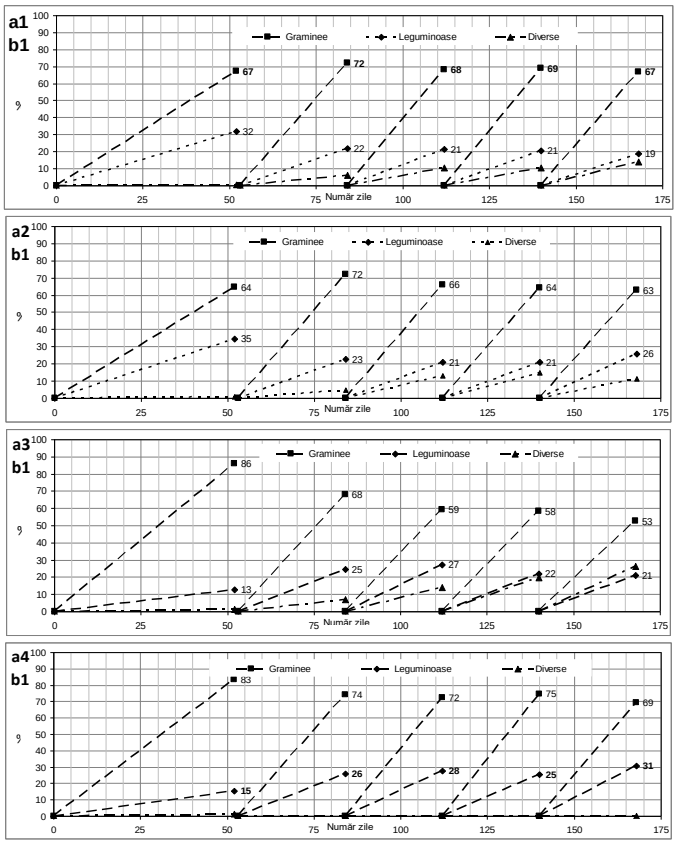
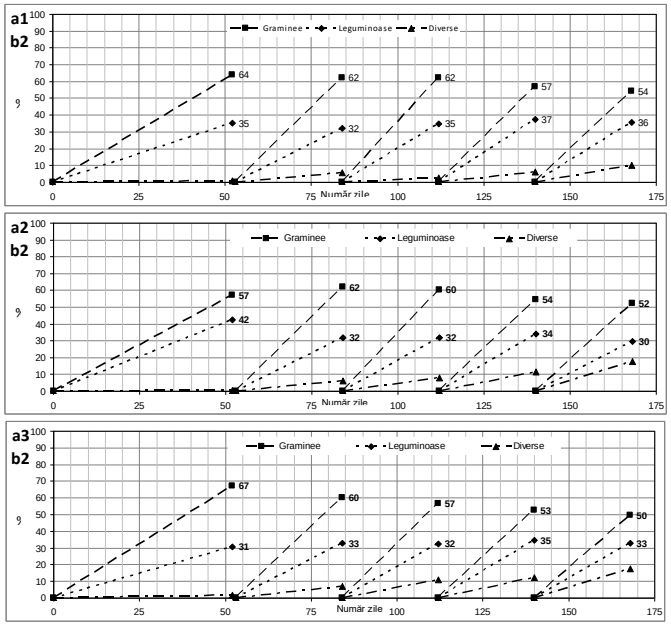


Figure 1. **The vegetation cover structure dynamics at the b_1 *(Dactylis glomerata* L. 60% + *Lolium perenne* L. 25% + *Lotus corniculatus* L. 15%*)* mixture, in 2014, to mixed usage**



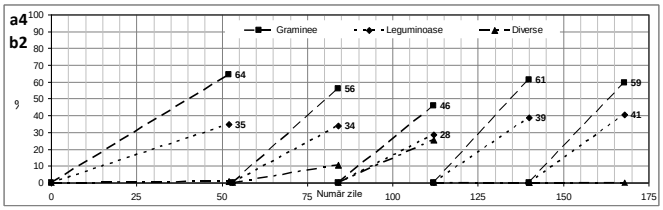


Figure 2. **The vegetation cover structure dynamics at the b_2 (*Dactylis glomerata* L. 20% + *Lolium perenne* L. 70% + *Lotus corniculatus* L. 5% + *Trifolium pratense* L. 5%) mixture, in 2014, to mixed usage**

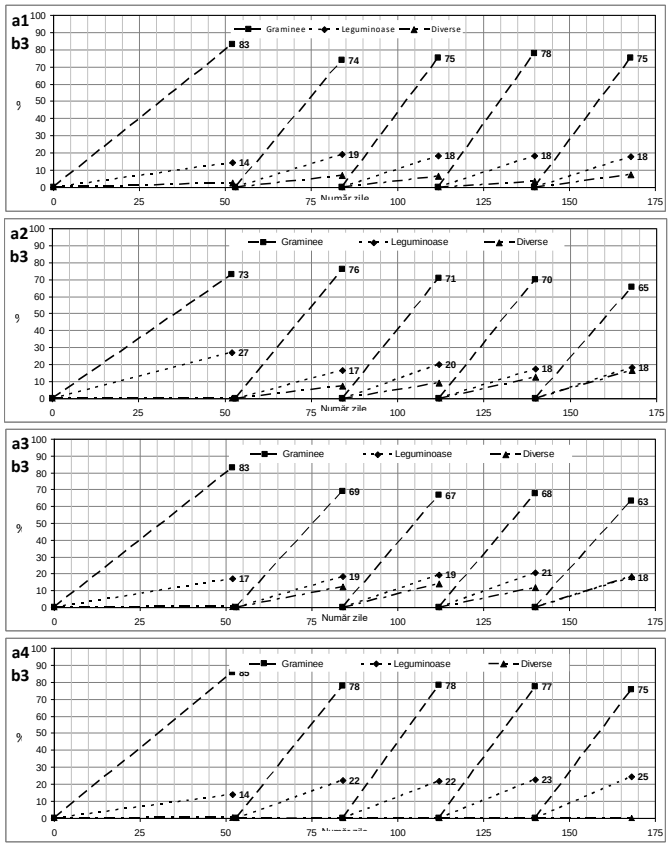
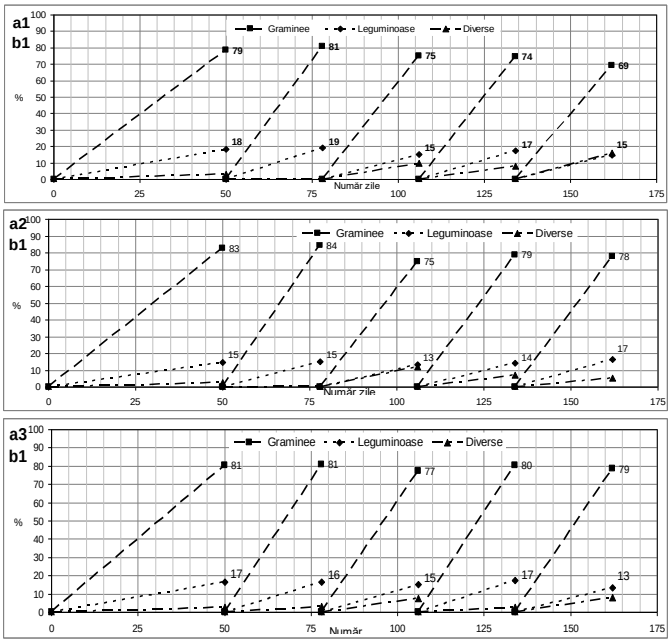


Figure 3. **The vegetation cover structure dynamics at the b_3 (*Dactylis glomerata* L. 70% + *Bromus inermis* Leyss 20% + *Lotus corniculatus* L. 10%) mixture, in 2014, to mixed usage**



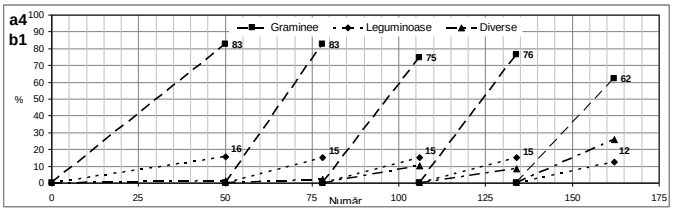


Figure 4. **The vegetation cover structure dynamics at the b_1 (*Dactylis glomerata* L. 60% + *Lolium perenne* L. 25% + *Lotus corniculatus* L. 15%) mixture, in 2015, to mixed usage**

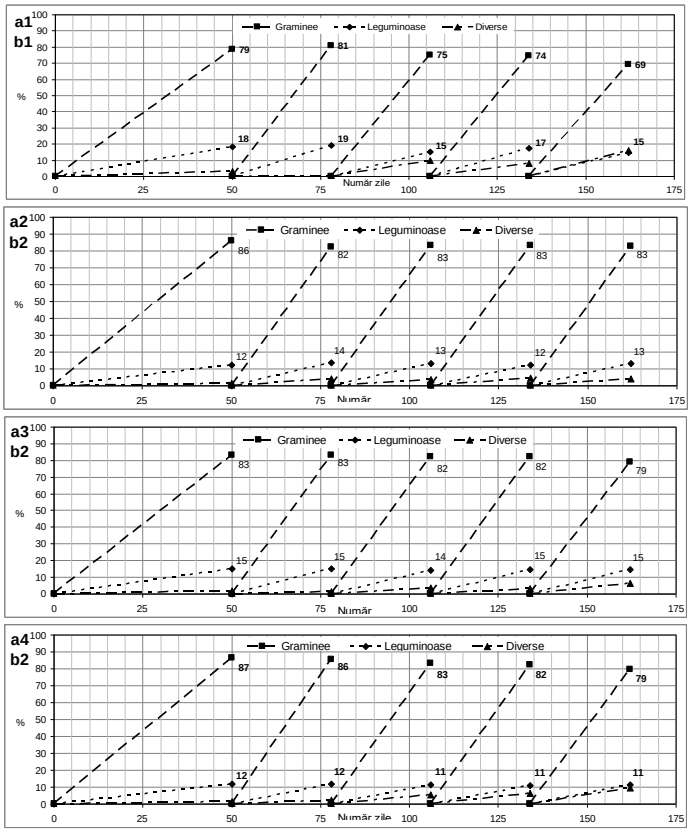
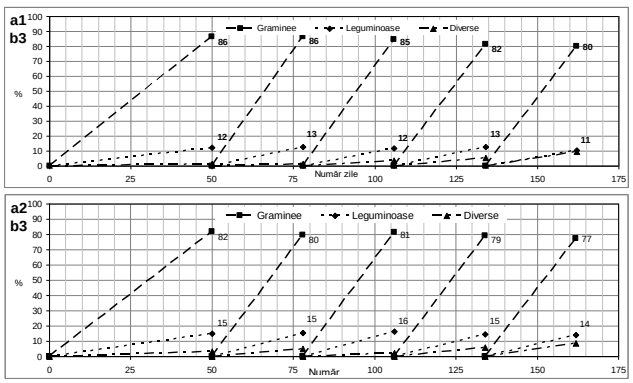


Figure 5. **The vegetation cover structure dynamics at the b_2 (*Dactylis glomerata* L. 20% + *Lolium perenne* L. 70% + *Lotus corniculatus* L. 5% + *Trifolium pratense* L. 5%) mixture, in 2015, to mixed usage**

At b_3 mixture, in 2015, at the first scythe, the grasses dominated the structure of the vegetation cover, the obtained values being between 82% in the variant fertilized with $N_{40}P_{40}$ and 86% in the variant fertilized with $N_{80+40}P_{40}$ *(figure 6)*. At the grazing simulation scythes, the grasses participation percentage have been kept constant throughout the growing season.

The lowest percentage of legumes in the structure of the vegetation cover was at the fifth scythe, the recorded values being between 10-14%. The coverage degree of the species from the different group progressed with the number of the scythe, so at the fifth scythe the coverage degree was of 9-16%.



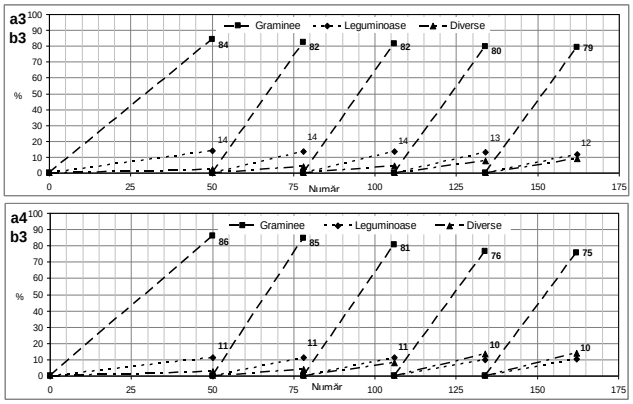


Figure 6. **The vegetation cover structure evolution at the b3 (*Dactylis glomerata L.* 70% + *Bromus inermis* Leyss 20% + *Lotus corniculatus* L. 10%) mixture, in 2015, to mixed usage**

CONCLUSIONS

At the mixtures with mixed usage, in 2014, were obtained a number of five scythes, the first being harvested by mowing, and the next four were harvested by grazing simulation, at an interval of 28 days;

The results obtained in 2014, showed that in the structure of the vegetation cover the legumes dominated over the grasses that were present in smaller percentages from one scythe to another, and the species from the diverse group participated with 0-26.2%;

In 2015, the legumes participation percentage in the structure of the vegetation cover grew slightly, and the grasses had a decreasing trend compared to the percentage of participation in the sowing norm, the species from the diverse group were present with 0-38.7%.

REFERENCES

Barsczewski J., Wolicka M., Burs W., 2007) - *Dynamic of changes in botanical composition of meadow sward in conditions of differentiated fertilisation and optimal moisture*. Grassland Science in Europe vol. 12. s. 114-117.

Belesky D.P., Fledhake Ch.M., Boyer D.G., 2002 - *Herbage productivity and botanical composition of hill pasture as a function of clipping and site features*. Agronomy Journal, vol. 94, No. 3, U.S.A.

Ionescu I., 2003 - *Cultivation of temporary meadows in the sub-Carpathian area of Oltenia*, Ed. SITECH, Craiova, ISBN 973-657-354-0.

Janicka M., Stypinski P., 1991 - *Mixtures of grass and legumes for reseeding and renovation of grassland in the central region of Poland*, A Conference held at Graz, Austria.

Lupaşcu M., 2004 - *Lucerne: the ecological and fodder importance*. Î.E.P. Ştiinţa, Chişinău. ISBN 9975-67-385-6.

Motcă Gh., Lidia Geamănu, Dincă N., 2004 – *The effects of 2000-2003 drought period on the perennial grasses and legumes vegetal cover*, Scientific Session of Teachers and Students ", U.Ş.A.M.V. Bucureşti, Faculty of Agriculture. Volume of summaries, Bucureşti.

Naie Margareta, Vîntu V., Trotuş Elena, Pochişcanu Simona, 2015 - *The behavior of some perennial grasses and legumes mixtures exploited in mixed regime under the Center of Moldova conditions*, Lucrări ştiinţifice. Seria Agronomie, Iaşi.

Plancquaert P., 1971 - *Fourrages* 46, 29-50.

Sanderson M. A., Soder K.J., Muller L.D., Klement K.D., Skinner R.H. şi Goslee S.C., 2005 - *Forage mixture productivity and botanical composition in pastures grazed by cattle.* Agron. J., Vol. 97, pag. 1465-1471.

Vîntu V., Talpan Irina, Ionel A., Samuil C., 2010 - *Influence of mixture and fertilization on the behavior of some grasses and perennial legume species on temporary pastures in the Moldavian forest speppe*. Romanian Journal of Grassland and Forage Crops, No 1. ISSN 2068-3065, pag. 81-91.