

The Study of Mixtures of Perennial Grasses and Vegetables in the Environmental Conditions of Someșelor Plateau (Cluj County) Note 2: The Evolution of Floristic Composition

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Abstract

The usage of complex mixture for temporary grassland is an important source of fodder in terms of climate changes in the last decades. The establishment of temporary pastures in Cluj County is a viable technological alternative. The research results presented in this paper show the evolution of floristic composition of complex mixtures of 8 perennial grasses and legumes, fertilized on three levels (0N0P2O5; 60N70P2O5; 120N70P2O5 kg ha⁻¹) in the environmental conditions at Jucu, a representative pratecosystem in Someșelor Plateau. In 2010, regardless of the fertilizer, the legumes developed best in mixture 7 (76%), composed of *Trifolium pratense* L., *Lotus corniculatus* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Lolium x hybridum* Hausskn. In 2011, the legumes (79%) developed best in mixture 3 (*Lotus corniculatus* L., *Onorobrychis viciifolia* Purpure., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Bromus inermis* Leys.), the unfertilized version.

Keywords: fertilization, grasses, legumes, temporary grasslands

1. Introduction

The setting up of temporary grasslands formed from complex mixtures of grasses and perennial forage legumes provide a balanced foddering regarding energy and proteins, with positive implications on the physiological condition and productivity of animals. The vegetation cover consisted of perennial species provide good soil protection; erosion is much reduced compared to land occupied by hoe culture. The varieties of perennial grasses and legumes grown in mixtures can provide fodder conveyors exploited by grazing or mowing [1, 2].

2. Material and methods

The experiment took place in the environmental conditions from Jucu, Cluj county, on a sloping land, which has a lean of 6 at 326.6 m altitude. The soil type is clay chernozem, with groundwater located at 10 m depth and the soil texture is loamy-clay. The clay presence gives to this type of soil small capacity for useful water, which leads to a fast transition of this from the saturated state with water to the fading capacity [4]. The content of humus from the soil and nutrients such as nitrogen and potassium shows a good supply, while for phosphorus a deficiency is noted. Multiannual monthly average is 8.3°C; the highest is registered in July (19.3°C), and the lowest one in January (-4.5°C). The first frosts occur between

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October 10 to 20, and last between 10 to 20 April. The yearly average of rainfall is 612.7 mm, the maximum rainfall in 24 hours taking place at the end of the spring and the beginning of summer (May, June and July), [3].

The research includes an experience with perennial forage grass, organized by the method of subdivided parcels and it's a 9x3 type (9-ways, 3-levels of fertilization). Those 9 versions include 8 complex mixtures composed of perennial fabaceous and poaceous forage, and a witness version represented by pure cultures of alfalfa. Each plot is divided in 3 versions related to 3 levels of fertilization - unfertilized witness version and two stages fertilized with nitrogen and phosphorus. The way of using the grassland is by mowing it. Those 9 versions contain the following species and mixtures (A):

A1. *Medicago sativa* L.;

A2. *Medicago sativa* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Lolium hybridum* L.;

A3. *Lotus corniculatus* L., *Onobrychis viciifolia* Scop., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Bromus inermis* Leyss.;

A4. *Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L.;

A5. *Trifolium pratense* L., *Dactylis glomerata* L., *Festulolium* Asch. & Graebn., *Phleum pratense* L., *Lolium perenne* L.;

A6. *Lotus corniculatus* L., *Phleum pratense* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Festuca pratensis* Huds.;

A7. *Trifolium pratense* L., *Lotus corniculatus* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Lolium x hybridum* Hausskn.;

A8. *Trifolium pratense* L., *Trifolium repens* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Phleum pratense* L., *Lolium x hybridum* Hausskn., *Lolium perenne* L.;

A9. *Medicago sativa* L., *Trifolium repens* L., *Bromus inermis* Leyss., *Festuca arundinacea* Schreb., *Lolium x hybridum* Hausskn.

The experience was installed at the beginning of April, 2009. Just after the sowing the fertilization of the versions was made, with 2 doses of mineral fertilizer $60N70P_2O_5$ $kg \cdot ha^{-1} \cdot y^{-1}$ și $120N70P_2O_5$ $kg \cdot ha^{-1}$. The fertilizers used were ammonium nitrate (33.5% N) and Eurobio (26% P_2O_5 ; 42% CaO). During the year of 2009 only some cleaning sew were made because the sown

species sprang very difficult and the ones who made it were affected by drought. In the second year of vegetation (2010), first year of production, the experimental variants were over-seeded in March. During the poaceous phenophase of earing the first harvest cycle was made and the second two scythes were obtained at intervals of about a month away from one another. Production of each variant was determined gravimetrically.

3. Results and discussion

In the first experimental year (2010), in the evolution of grasses (Figure 1) the unfertilized variant 0N0P2O5, best stood out mixture 2 (50%) composed of *Medicago sativa* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Lolium hybridum* L. In the fertilization version 60N70P2O5, best expressed mix 4 (60%), composed of *Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L., while at the maximum dose of fertilizer 120N70P2O5 have emerged mixtures 2, 4 and 6 with 40% participation.

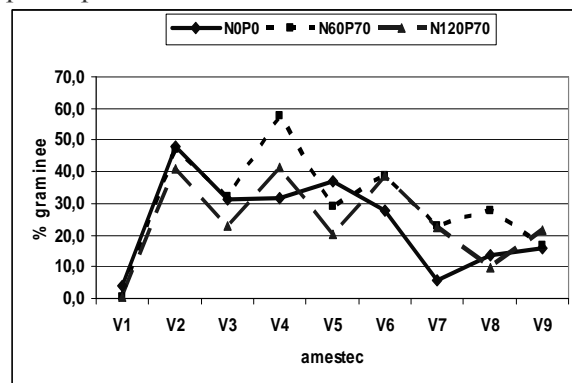


Figure 1. The evolution of floristic composition (grass) of the 9 mixtures studied in the three levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2010

Legumes in the first experimental year (Figure 2) were found best (80%) in mixture 7 (*Trifolium pratense* L., *Lotus corniculatus* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Lolium x hybridum* Hausskn.), the unfertilized variant.

In the average level of fertilization (60N70P2O5), legumes showed the highest percentage in mixture 7 (70%), and the lowest participation rate was

recorded for mixture 4 (10%), mixture of *Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L. At the maximum dose level of fertilization, 120N70P2O5, it is noted that the mixture 5 composed of *Trifolium pretense* L., *Dactylis glomerata* L., *Festulolium* Asch. & Graebn., *Phleum pretense* L., *Lolium perenne* L. recorded the highest percentage of participation (70%).

As for the medium level of fertilization (60N70P2O5), the lowest participation rate was recorded throughout the mixture 4 (10%).

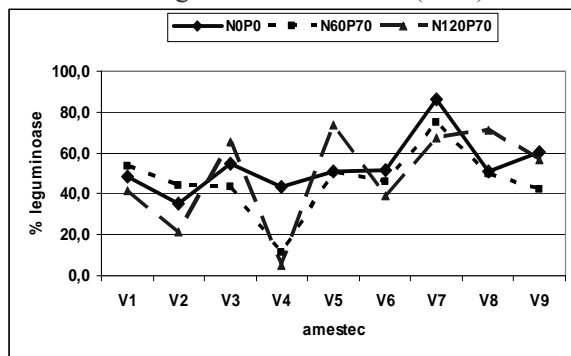


Figure 2. The evolution of floristic composition (legumes) of the 9 mixtures studied in the three levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2010

Beside the complex mixtures of perennial forage grasses and legumes grown, in the culture also appeared species from other botanical families (Figure 3) that were expressed in a high percentage (50%) for mixture 1 (pure culture of alfalfa) and in the case of mixture 4 (*Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L.), at the administration of the maximum dose of the fertilizer (120N70P2O5).

In 2011 (Figure 4), in the unfertilized variant (0N0P2O5), grasses emerge in mixture 4 (35%), composed of *Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L. At the fertilization levels 60N70P2O5, respectively 120N70P2O5, also the highest percentage of participation has been recorded for 4, with a rate of 60% (in both levels of fertilization).

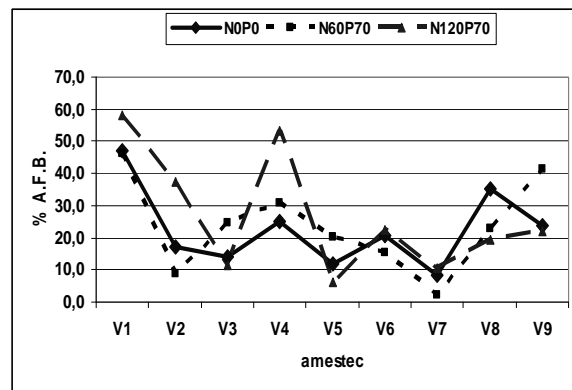


Figure 3. The evolution of floristic composition (other botanical families or AFB) of the 9 mixtures studied in the three levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2010

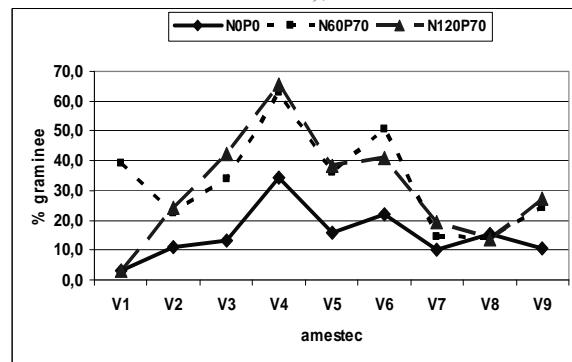


Figure 4. The evolution of floristic composition (grass) of the 9 mixtures studied in the three levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2011

Legumes in 2011 (Figure 5), have been outlined best in the unfertilized variant (0N0P2O5), at the opposite pole being the variant with the highest dose of fertilization which developed inversely to the increasing of the fertilization dose (the higher the dose of fertilization the lower was the response of the legumes). Mixture 3 (*Lotus corniculatus* L., *Onobrychis viciifolia* Purpose., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Bromus inermis* Leyss.), the unfertilized variant, recorded the highest percentage (80%) of legume participation, while at the opposite side is mixture 4 (*Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L.), with a 10% participation, both at 60N70P2O5 fertilization and also at the maximum dose of fertilizer (120N70P2O5).

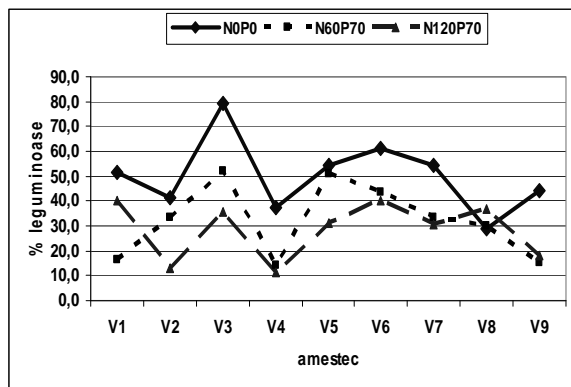


Figure 5. The evolution of floristic composition (legumes) of to the 9 mixtures studied in the 3 levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2011

The species from other botanical families (except species from the complex mixtures of grasses and perennial forage legumes that were grown), (Figure 6) that expressed in a significantly percentage during 2011 were from mixture 2, consisting of *Medicago sativa* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Lolium hybridum* L., at the maximum level of fertilization (120N70P2O5), which had a participation rate of 60%, while the opposite, the lowest percentage of participation (less than 5%) was recorded for mixture 6 (*Lotus corniculatus* L., *Phleum pretense* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Festuca pratensis* Huds.), at the fertilization level 60N70P2O5.

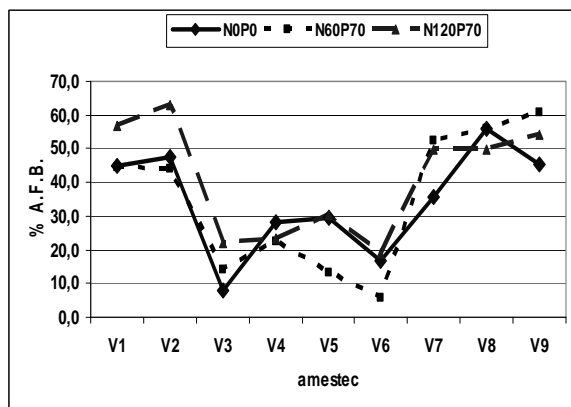


Figure 6. The evolution of floristic composition (from other botanical families or AFB) of the 9 mixtures studied in the Three levels of fertilization (0N0P2O5, 60N70P2O5, 120N70P2O5), Jucu 2011

4. Conclusions

In 2010, grasses have emerged in the case of mixture 4 (*Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L.), at an average level of fertilization (60N70P2O5), where they have achieved a participation rate of 60%. In 2011 they best expressed for all mixture 4, followed by mixture 6 (*Lotus corniculatus* L., *Phleum pretense* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Festuca pratensis* Huds.), where the fertilized variants had a participation rate of 40%. Legumes in 2010 have emerged for mixture 7 (*Trifolium pretense* L., *Lotus corniculatus* L., *Trifolium alexandrinum* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Lolium x hybridum* Hausskn.), the unfertilized variant, where was recorded a participation rate of 80% and in 2011 for the mixture 3 (*Lotus corniculatus* L., *Onobrychis viciifolia* Purpose., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Bromus inermis* Leyss.), variant fertilized, the percentage of expression was also 80%. An optimal ratio of 60-70% for grasses and 30-40% for legumes, recommended in the literature, was registered in the first year of vegetation, and also in the following year for the mixture 4 (*Medicago sativa* L., *Lotus corniculatus* L., *Dactylis glomerata* L., *Festuca arundinacea* Schreb., *Lolium perenne* L.), where grasses expressed at percentage of over 60%, in the case of the variants where fertilization was applied.

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