Changes in phyto-diversity on *Festuca rubra* L. – *Agrostis capillaris* L. grasslands

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ABSTRACT

Diversity is a term no longer alien to any social category (the ordinary peasant political class) and became the main topic in any actual problem. Phytodiversity are in decline and all policies try to focus their attention to this problem. The importance of grassland ecosystems is increasingly exploited demonstrated and changes lately whether political, economic and / or social affects not only the ecosystem but the whole agricultural system in the world especially fertilization. This is the reason why our experience include a study on semi-natural grassland based on combined form of organic and mineral fertilization. The experiment was placed after experimental technique method and includes six different fertilized treatments in four replications. Experiment is establish in Baisoara Commune, Cluj County. The experience includes four variants in three repetitions, which are: V1 – control variant, (unfertilized); V2 – variant fertilizer with 10 t/ha manure; V3 – variant fertilizer with 10 t/ha manure + 50N25P25K; V4 – variant fertilizer 20 t/ha manure; V5-variant fertilizer with 10 t/ha manure + 100N50P50K and V6-variant fertilized with 100N50P50K. Like is known, mineral fertilization reduce more than organic fertilization the phytodiversity and in our experiment this are very good highlighted. The studied phytocenosis present a Shannon diversity even if large mineral inputs are are provided.

Keywords: *diversity, fertilization, grasslands, mountains.*

INTRODUCTION

In many other parts of Europe, grasslands on low productive soils have been transformed into forests either by being planted with coniferous trees or by being abandoned (Nillson et al, 2013). This changed management has had a substantial negative effect on flora and fauna, and many species are declining and are on the verge of regional extinction (Mace et al, 2008). Currently various initiatives are undertaken across Europe to develop and assess the potential of biodiversity-based management practices by farmers, industry, researchers and governmental and non-governmental organizations (Bianchia et al, 2013).

In many industrialized areas of Europe, semi-natural grasslands with high biodiversity presents a relict spread (Stoie, 2011). Global biodiversity is in decline (Baeten et al, 2014), so Target 1 of

the Convention of Biodiversity says that by 2020 at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use sustainably (www.cdi.gov.ro). *Festuca rubra* L. is a perennial grass very persistent and tolerant to a wide range of ecological conditions (Vázquez de Aldana et al, 2014). Our aims was to determine the floristic composition under the organic, mineral fertilization or combined these two types of fertilization.

MATERIALS AND METHODS

The experiment was established in 2014 in the place “Cross”, in Băișoara Commune, Apuseni Mountains, Romania on a *Festuca rubra* L.- *Agrostis capillaris* L. grasslands type, at the altitude of 1240 m. It was delimited experimental field to remove any unwanted danger or grazing has been cleaned

of woody vegetation and rocks. The experience was placed after experimental technique method. The surface of experimental plots is 20m². The experience includes four variants in three repetitions, which are: V1 – control variant, (unfertilized); V2 – variant fertilizer with 10 t/ha manure; V3 – variant fertilizer with 10 t/ha manure + 50N25P25K; V4 – variant fertilizer 20 t/ha manure; V5-variant fertilizer with 10 t/ha manure + 100N50P50K and V6-variant fertilized with 100N50P50K.

Floristic studies were performed before mowing after scale vegetation interpretation given by Braun-Blanquet (1932).

Cattle and horse manure and also the mineral inputs were applied in early springtime on the plots (in the beginning of March), according to the treatments. The research has been carried out.

RESULTS AND DISCUSSION

The variant fertilized only with mineral fertilizer reduce the species number despite of variants which were fertilized organic. The combined fertilizer produced also changes in floristic composition (Fig. 1).

Regarding *Poaceae* family it can be noticed that only when 20 t/ha manure are applied are decreasing their percent. In all other variants (with 10 t/ha manure, only mineral fertilization or combined this two fertilization) they increase.

The *Cyperaceae* and *Juncaeae* family do not present a spectacular evolution and in all variants

they decrease their cover, despite *Fabaceae* family which increase their average in all treatments.

It is known that mineral fertilization decrease *Fabaceae* family a fact demonstrated by V4 (variant fertilizer 20 t/ha manure), where are the highest coverage degree.

Plants from other botanical families (AFB) after one year decrease in all variants, especially when 100N50P50K is applied (V5).

Regarding phyto-diversity of grasslands it can be seen that the number of species is higher in all variants compared to the control. The highest average is in variant with 10 t/ha manure (V2) with 39.5% and the lowest is in variant with 100N50P50K (V6) where has only an average of 36% (Tab. 1).

The *Shannon Index* average is 2.489 which means this phytocenosis is rich in species. The value of a diversity index increases both when the number of types increases and when evenness increases.

Even if diversity does not differ very much, management practices (fertilization) strongly influence plant community. Hrevušová *et al.*, in a study in 2009, show that the effect of long-term fertilisation on high-productive *Alopecuretum* grassland is still significant 17 years after its cessation. The residual effect of high nitrogen doses is indicated by the higher dominance of the high grasses group, mainly *Holcus lanatus*.

Other example is Păcurar 2005 when he show that *Shannon index* (index showing richness) while

Fig. 1. Floristic composition of grassland on botanical family

treatments applied decrease from 3.05 when natural grasslands at 2.62 at the application of 10 t / ha manure + 100N:50P:50K. Inputs technology reduces biodiversity through extinction of vegetal cover the following species: *Carex pallescens* L., *Arnica montana* L., *Cardaminopsis halleri* L., *Carlina acaulis* L., *Heracleum sphondylium* L., *Hypericum maculatum* Crantz., *Leontodon autumnalis* L., *Plantago lanceolata* L., *Plantago media* L., *Thymus pulegioides* L., *Tragopogon pratensis* L. and *Viola canina* L.

Therefore, although the *Shannon index* is high after first experimental year, we believe fertilization will change the determined type of grasslands.

CONCLUSION

All treatments present differences when were compared to the control. Applied fertilizer produces changes in floristic composition and in diversity.

The difference in the floristic composition between organic fertilization and mineral fertilization after just one year is not recorded in our phytocenosis. We put this fact that the period was too short and this contributes to maintain plant diversity especially in mountain areas where traditional farming system has declined.

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Tab. 1. Summary of the variants

Variants	S	E	H	D'
V1R1	34	0.698	2.462	0.8278
V1R2	33	0.721	2.520	0.8330
V1R3	33	0.719	2.515	0.8337
V1R4	30	0.697	2.370	0.8217
V2R1	35	0.678	2.410	0.8398
V2R2	43	0.702	2.640	0.8590
V2R3	41	0.706	2.621	0.8579
V2R3	39	0.692	2.535	0.8468
V3R1	32	0.684	2.372	0.8240
V3R2	37	0.695	2.508	0.8359
V3R3	34	0.699	2.465	0.8391
V3R4	38	0.679	2.472	0.8301
V4R1	38	0.703	2.556	0.8589
V4R2	37	0.739	2.669	0.8788
V4R3	34	0.735	2.591	0.8745
V4R4	38	0.712	2.590	0.8675
V5R1	37	0.675	2.436	0.8294
V5R2	38	0.663	2.413	0.8259
V5R3	34	0.673	2.374	0.8292
V5R4	38	0.672	2.446	0.8324
V6R1	40	0.669	2.468	0.8246
V6R2	36	0.699	2.505	0.8397
V6R3	36	0.677	2.424	0.8238
V6R4	32	0.687	2.381	0.8285

Note: S = Richness = number of non-zero elements in row

E = Evenness = $H / \ln(\text{Richness})$

H = Diversity = $-\sum (P_i \cdot \ln(P_i))$ = Shannon's diversity index

D = Simpson's diversity index for infinite population = $1 - \sum (P_i \cdot P_i)$

where P_i = importance probability in element i (element i relativized by row total)

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