IDENTIFICATION OF VALUE INDICATOR SPECIES FOR INTENSITY MANAGEMENT OF MOUNTAIN GRASSLANDS

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Abstract

Over the years, on the semi - natural grasslands of the Apuseni Mountains, a traditional management was used for mowing and grazing which in some areas is practiced even today. Of the maintenance work (gathering stones, fighting woody vegetation etc.), fertilization has the greatest significance. The theory of indicator species was based on Ellenberg (1952, 1979) and developed over time in collaboration with other authors (Ellenberg et al., 1991; 1992). Plant preferences to environmental factors have been coded by numbers, an operation called ecological indexes (Cristea et al., 2004). The requirement of each species on a given environmental factor has been encoded as an indicator value within a predetermined scale. Some species have an indicator value for the phytocoenoses due to different treatments applied and implicitly for the treatment. The results come from a 4-treatment experiment: T1=control (unfertilized), T2= N50P25K25, T3=N100P50K50, T4=N150P75K75.

Keywords: semi-natural grasslands, indicator species, *Festuca rubra*, mineral fertilizers, grassland management.

INTRODUCTION

Indicator species provides us with a series of information on stationary conditions, semi-natural grassland management and anthropogenic influence.

Based on analysis of environmental, agronomic and natural spectrum it can be establish the grassland's ecosystem at one time, including how is maintain and use this ecosystem. Also, it can be develop a management strategy which will accurately try to measure the maintenance and the use of this grasslands (Pacurar e*t al.*, 2014).

A management with applying large amounts of fertilizers could improve the quality of mountain grassland fodder (Rotar *et al*, 2015). At present, in Romania, specialists are trying to assess the management of grasslands by using indicator species planning, and also to make a list of species taking into account stationary conditions (Pacurar *et al.*, 2011).

The purpose of this paper is to draw up a list of species with indicaticator value for the intensity of mountain grassland management.

MATERIAL AND METHOD

The experimental treatments designed to follow the effect of small and large inputs of mineral fertilizer on floristic composition were installed in 2001, in Apuseni Mountains, Romania. The experimental design was made according to randomized blocks method in four replications (blocks), with 4 treatments: T1=control (unfertilized), T2= $N_{50}P_{25}K_{25}$, T3=$N_{100}P_{50}K_{50}$, T4=$N_{150}P_{75}K_{75}$, included 1 cut year^{-1}, end of July. Harvesting period was chosen according to the particular site conditions, located on an altitude of 1130 m a.s.l. and characterized by an annual average temperature of 5.2°C and annual precipitation of 1122.65 mm.

Floristic composition was determined after Bran-Blanquet method modified by Păcurar and Rotar (2014).

Floristic data processing was performed with PC-ORD, version 6, which use the multivariate analysis of the ecological data entered into the spread sheet (McCune and Grace, 2011). The analysis of indicator species was elaborated according to the method developed by DUFRENE and LEGENDRE in 1997.

RESULTS AND DISCUSSION

The analysis of indicator species (ISA, table 1) shows that some species have an indicator value for the phytocoenoses determined by different treatments applied and implicitly for the respective treatment. In general, oligotrophic and oligomezotrophic species are specific to the *Festuca rubra* - *Agrostis capillaris* type of grassland that belongs to the unfertilized witness, and these are: *Briza media, Carex pallescens, Leucantenum vulgare, Scabiosa columbaria*.

Applying 50N25P25K treatment can be identified by the presence of oligomezotrophic and mesotrophic species such as *Festuca rubra, Anthonxantum odoratum, Lotus corniculatus, Viola declinata.* From the series of species that prefer richer substrates (100N50P50K; 150N75P75K) we have identified *Agrostis capillaris.*

Table 1

Indicator species specific to grassland types resulting from mineral fertilization (T-treatment, INDVAL - indicator value, N - trophic index, ADM - Abundance - mean dominance)

Species	T	INDVAL	Media	Std. Dev.	P	N	ADM (%)
Briza media	1	80.0	26.7	11.87	0.009	3	0,5
Carex pallescens	1	75.0	22.9	15.31	0.029	4	0,5
Leucanhtemum vulgare	1	59.2	31.7	13.05	0.066	3	0,5
Plantago lanceolata	1	80.8	36.9	13.30	0.010	X	2,6
Polygala vulgaris	1	66.7	27.1	12.43	0.031	2	0,5
Scabiosa columbaria	1	88.9	31.3	14.90	0.007	2	1
Thymus pulegyoides	1	92.3	29.4	14.18	0.005	6	1,5
Festuca rubra	2	87.9	62.0	9.21	0.029	6	7,25
Lotus corniculatus	2	100.0	48.1	16.92	0.029	4	1
Campanula abietina	2	100.0	41.5	18.55	0.030	4	0,5
Viola declinata	2	100.0	41.5	18.55	0.030	6	0,5
Anthonxantum odoratum	2	87.0	58.7	9.85	0.029	X	2,5
Trisetum flavescens	2	76.1	58.3	6.37	0.029	6	22,25
Agrostis capillaris	3	74.1	56.8	6.45	0.030	4	50
Agrostis capillaris	4	78.7	58.0	7.43	0.029	4	64,69

CONCLUSIONS

Following the study on the intensity of mountain grasslands management we identified 15 species with indicative value for mineral fertilization.

REFERENCES

1. McCune B. and Mefford M.J. (2011) PC-ORD. Multivariate Analysis of Ecological Data. Version 6. MjM Software, Gleneden Beach, Oregon, U.S.A.
2. Păcurar F., Rotar I., Balazsi A., Vidican R. (2014) Influence of long term organic and mineral fertilization on *Festuca rubra* grasslands.
3. Păcurar F., Rotar I. (2014) Metode de studiu si interpretare a vegetatiei pajistilor. Risoprint, Cluj Napoca.
4. Păcurar F., Rotar I., Bogdan A., Vidican R. (2011) Indicator Species for Oligotrophic Semi-Natural Grasslands in Apuseni.

5. PECK, J.E. (2010) Multivariate Analysis for Community Ecologists: Step-by-Step using PC-ORD. MjM Software Design, Gleneden Beach, OR.
6. . Rotar I., Pacurar F., Vidican R., Malinas A., Gliga A. (2015) Mineral fertilization on mountain grassland.
7. Vaida I., Rotar I., Pacurar F., Vidican R., Plesa A., Malinas A., Stoian V. (2016) Impact on the abandonment of semi-natural grasslands from Apuseni Mountains.