THE DYNAMICS OF BIOMETRIC PARAMETERS, THE CONTENT OF N.P.K. AND THE DIGESTIBILITY COEFFICIENT OF THE SPECIES OF *POA PRATENSIS* UNDER MINERAL FERTILIZATION INFLUENCE AND THE DIFFERENT PRATO-TECHNICAL MEASURES, ON A PERMANENT GRASSLAND FROM POIANA BRASOV

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Abstract: The paper presents the results obtained from the study carried out on a long-term experimental device in Poiana Brasov (Biodiversity), a device in which are provided various preparatory measures, as well as various fertilization recipes. The remarkable aspects make it possible to identify the most appropriate pratological measures in relation to the species Poa pratensis, a valuable species present in the floral composition of the permanent quality meadows. Beyond information regarding the physiology of species and of vegetal communities, the biological characters allow the assessment of the agronomical features of the plants. The foliar biometric measurements were realized in the laboratory for a number of 10 individuals of Poa pratenis/plot. The obtained biological material was put in plastic glasses for re-hydration approximately 6 hours, after a preliminary sectioning of the steam basis of each plant. The plants had been pulled out by turns and after that was started the sampling of the foliar blade, the last sampled being the ligula. Further, there was determined the length (mm) and the dry mass (g). In the paper we presented the analysis of some morphological features (LgL – the length of the foliar blade SF – the foliar surface, SU – the quantity of dry substance at foliar level) which allowed the determination of TMS indicator – indicator of the SU/MV ratio and the chemical properties to the species Poa pratensis (POAPRA), in the experimental field – "Biodiversity" in a permanent grassland from Poiana Braşov, Romania.

Key words: Permanent grassland, biometric parameters, Poa pratensis, digestibility coefficient.

INTRODUCTION

The meadow is regarded as an ecosystem, that is, a basic unit of nature that integrates into a unitary biotope and corresponding biocenosis (COSTE, 1983). The totality of the constituent elements of the physical and biotic environment that determines the constitution and evolution of grassland ecosystems is called ecological factors that can be: abiotic factors (climatic, editorial and orographic) and biotic factors (interactions between plant, animal and microorganism populations). And man's action can be considered within the ecological factors (BARBULESCU, 1991), in the fact that man is the one who dies or graduates one or the other of these ecological factors.

Among the biotic factors, (BALENT 1984, 1987) emphasizes that soil fertility is the main determinant of the botanical composition on the studied surfaces. In this context, (BARBULESCU & MOTCA - 1983) found that fertilization provided by shearing with the sheep in the Fagaras massif completely modified the botanical composition (*Nardus stricta* from a 70% participation rate, it was replaced by *Festuca rubra* 50%, *Agrostis capilaris* 20%, *Trifolium repens* 15%). On a secondary level, the intensity of current use of the forage surfaces occurs. LOISEAU P. (2001), emphasizes that the evolution of botanical composition also depends on the

initial state of the ecosystem and on the action of ecological factors. Two large types of ecological gradients that affect the specific diversity of plant communities in a natural meadow, resource bioavailability, frequency and intensity of disturbances (BALENT, 1987; GRIME, 2001) could be considered as an environmental filter that selects a certain number of species.

WESTOBY (1998) insists that the exploitation by species of opportunities for rapid growth, ie their physiological response to different levels of disturbance, are the main elements of ecological elements that characterize them.

In long term factorial devices, in Romania and other countries too, there was observed very contrasting dynamics of the botanical composition as a result of fertilization and exploitation practices. Analysis of the global botanical composition and of the trajectories followed by it is not always sufficient to functionally characterize the changes in vegetation and the consequences regarding the utilization value. The transition to a functional description of the vegetation can be approached by analyzing the biological and chemical features of the species, especially those concerning the morphology and the chemical composition of the aerial organs. However, these features not allow a direct determination of the physiological functionality of the plant, but they can be selected to highlight, in as much possible correct way, certain functional aspects. In order to facilitate the actual research work it was introduced by the concept of Functional Species Types (TFS), defined as a set of species that similarly respond by a set of attributes to changing environmental factors. These functional types of species are considered as a very useful practice, ensuring the possibility of a floristic analysis at a narrower and more precise level, and from a conceptual point of view, providing a more realistic picture of the evolution of the vegetal communities, management.

This program aims at identifying functional species types (TFS) under changing management practices, and is based on a working protocol focused on a list of attributes proposed by WEIHER et al. (1999), a list adapted for the study of meadows.

Respectively, a working protocol, but in a more simplified form, was used to track the change in agronomic properties of vegetation on factorial devices in Poiana Braşov (Romania), in the conditions of reducing the level of use of grass, in conjunction with different levels of fertilization mineral, organic or finishing. The practical study on these devices thus contributes to completing and enhancing knowledge regarding the functioning of plurispecific grassland communities subject to different management practices.

MATERIAL AND METHODS

T he experiments had been realized within a permanent grassland from Poiana Braşov belonging to the Research and Development Institute for Grasslands Braşov. In long term factorial devices, in Romania, there was observed very contrasting dynamics of the botanical composition as a result of fertilization practices. The experimental field „Biodiversity" has been settled in a permanent mountain grassland (Poiana Braşov) placed at 1000 m altitude. These devices provides a true set of management practices that enable us to determine the most appropriate combination for "driving" a meadow. The device consists of 12 parcels of 144 m^2 each. The fertilizers with P and K had been applied in autumn, and the fertilizers with N in spring. The observations and the biometric measurements had been realized in June-September 2002-2004. The species selection (in our research field the *species*

Poa pratenis - POAPRA) for measurements had been made basing on specific composition (CS %) calculated by relating to the whole vegetal cover. From each plot there were taken 10 individuals of *Poa pratenis - POAPRA* to be measured and sampled. From each plot there were randomly selected plants, representative individuals, as possible in the first phases of vegetation.

Biometric observations and measurements

A) Field observations and sampling

Sampling: In each plot, 20 individuals of each species, previously selected based on CS%, were then sampled, constituting two lots of 10, one for foliar and NPK content measurement, and the other for analysis digestibility.

Measurements and sampling: Before taking an individual, several measurements of height (height in vegetative stage, height at maturity) were performed. The measurement of the height was made using a stick herbometer. After each, each individual was taken by cutting into a base with a scalpel wrapped in damp paper, put in a refrigerated bag and then transferred to the lab.

B) Foliar biometric measurements performed in the laboratory 10 individuals/species / plot were placed in plastic beakers for rehydration for about 6 hours after a preliminary sectioning using a scalpel of each individual's stem. The herbal glasses were then placed in the refrigerator at about 4ºC. After approx. 6 hours, the plants were removed one at a time, and the youngest adult leaf was sampled from each. For grasses, it is the limb in which the last leu appeared, and for dicotyledons it is the youngest leaf but with adult morphology, which corresponds to the number 3 or 4. After sampling, using a scalpel, each limb was determined: a) the length (mm), with a millimeter scale, b) green mass (g), with a precision balance, respectively 4 decimal places, c) surface (cm) by scanning and image analysis using the Olympus computer program, d) dry mass (g), after 48 hours at the oven, at 70ºC.

C) Determination of chemical properties

Determination of digestibility and content of N, P, K, Ca and Mg

For this purpose, the plant material was also used and the foliar biometry part, when from each plot, 20 individuals of each species, previously selected on the basis of CS%, were then sampled, constituting two lots of 10, one for foliar and NPK content measurement, and the other for digestibility analysis.

Determination of digestibility by pepsin-cellulose method

The method makes it possible to predict the digestibility of feeding stuffs in laboratory conditions, in particular for feeds where the determination of the feed on the basis of chemical-based equations poses problems. It is especially the forage plants in the natural meadows, respectively those in the mixes.

RESULTS AND DISCUSSIONS

Before the statistical analysis of data and their graphical representation there was selected the species *Poa pratenis - POAPRA* that appears in 9 studied variants in the experimental field „*Biodiversity*" (**V3 – 20 t/ha manure**; **V4 - N50 $P_2O_5$50 K_2O50 + 20 t/ha manure**; **V5 - 1.84 t/ha CaO**; **V6 - N50 $P_2O_5$50 K_2O50 + 1.84 t/ha CaO**; **V7 - 1.84 t/ha CaO + sheepfold (1 sheep/ 3 nights/m²)** , **V9 - N50 $P_2O_5$50 K_2O50 + 1.84 t/ha CaO + sheepfold (1 sheep/ 3 nights/m²)**, **V8 - N50 $P_2O_5$50 K_2O50 + sheepfold (1 sheep/ 3 nights/m²) + 20 t/ha manure**; **V11 - N50 $P_2O_5$50 K_2O50 + sheepfold (1 sheep/ 3 nights/m²); V12 - sheepfold (1 sheep/ 3 nights/m²)**, in order to observe in parallel the way that this species responds to fertilization and differents methodes of utilisation. As well, the species selection was made tacking into account a very important indicator, respectively the CS% (specific contribution), which stays at the basis of the studied species selection. This type of parallel analysis was applied also with the purpose to make observations using the concept of functional types of species (TFS). Further, there will be realized a presentation under the aspect of the way that the main production characters and features are changing under the influence of fertilization and differents methodes of utilisation in the species *Poa pratensis* - POAPRA. Utilization of the foliar features is important, to avoid the

"*plant performances*" under the influence of different amounts of fertilizers and some practices of utilisation.

A) On variant **V4** (chemical fertilize + organic fertility) the highest values for the 4 analyzed elements (P, K, Ca, Mg) are generally recorded for the Ca and Mg.

B) The species *Poa pratensis* (POAPRA) records the highest digestibility coefficient in the **V4** and the **V7**.


A)

B)
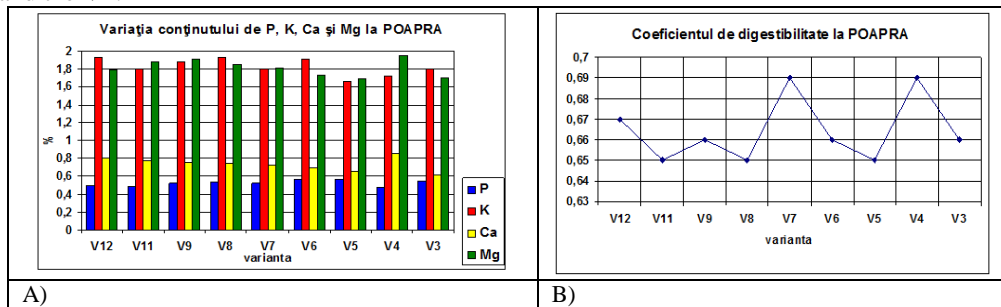
C) POAPRA is a low-lying plant at which the highest individuals (45 cm) were recorded on the variant whith the fining.

D) Regarding the foliar surface (SF), the highest values are recorded on the variant **V11**, where we have the combination of the chemical fertilization and the sheepfold;

C)

D)
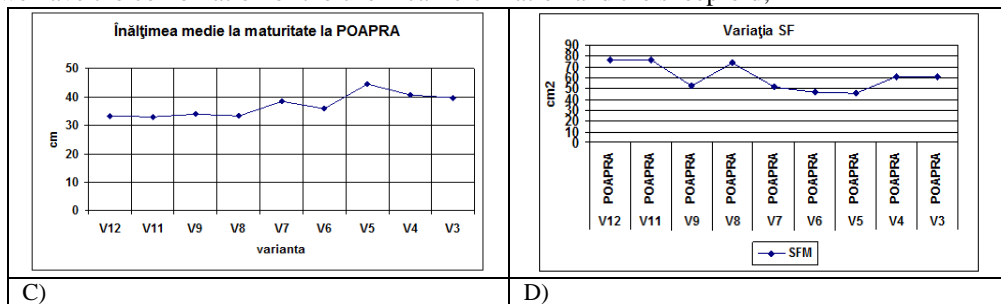
E) Concerning the green mass (MV) and the dry matter content (SU), the highest values are recorded on variant **V11**, where we have the combination of the chemical fertilization and the sheepfold;

F) Regarding the foliar surface (SF), the highest values are recorded on the variant **V11**, where we have the combination of the chemical fertilization and the sheerpfold;

E)

F)
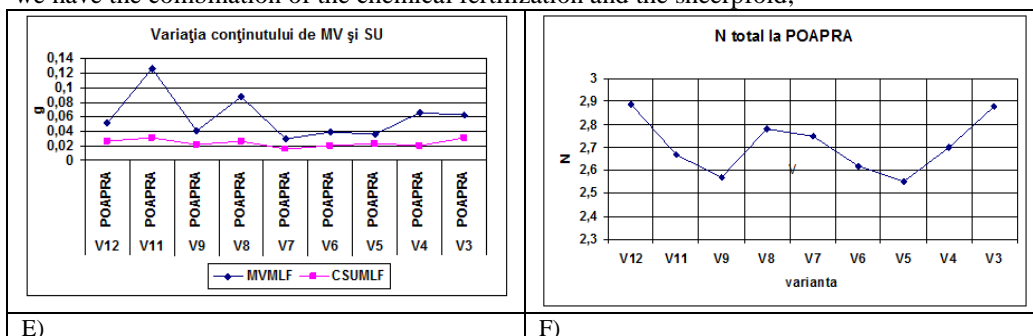
CONCLUSIONS

The study revealed that the various experimental variants and prato-technical measures have a significant impact both on biometric parameters and on chemical content. The sheepfold (1 sheep/ 3 nights/m^2) in association with mineral fertilization or organic fertilization have a significant influence to the leaf parameters (SF) and also the content in MV and SU.

Application of CaO assure a good reaction for the most of part of the morphological and the chemical parameters, especially the individual highest.

The digestibility is significant influence in the combination mineral fertilization and organic fertilization and also the combination of finnest and sheepfold.

The experimental Biodiversity device truly enables, through the multitude of practices and combinations of fertilization, fining and also sheepfold.

The information resulting from the study can provide particular solutions to ensure increased effectiveness in the management of permanent grassland, with regard to the species *Poa pratensis*, a highly valuable species from the feed point of view.

BIBLIOGRAPHY

1. COSTE I., 1986 – Ecologie agricolă. LITO I.A.T, Timişoara ;

2. BARBULESCU, C., PUIA I., MOTCA GH., MOISUC A. 1991. Cultura pajiştilor şi a plantelor furajere. Ed. Didactică şi Pedagogică, Bucureşti.

3. BALENT, G, 1987. Structure, Fonctionnement et Evolution d'un Système Pastoral. Le pâturage vu comme un facteur écologique piloté dans les Pyrénées centrales. Thèse. Université de Rennes I.

4. BALENT, G. & DURU, M., 1984. Influence des modes d'exploitation sur les caractéristique et évolution des surfaces pastorales: cas des Pyrénées centrales. Agronomie 4(2), 113-124.

5. GRIME, J.P., 2001. Plant strategies, vegetation processes and ecosystem properties. Second edition, Wiley, New York, 417 p.

6. WESTOBY, M. 1998. A leaf-height-seed (LHS) plant ecology strategy scheme. Plant and Soil 199: 213-227.

7. WEIHER, E., VAN DER WERF, A., THOMPSON, K., RODERICK, M., GARNIER, E., & ERIKSSON, O. 1999. Challenging Theophrastus: A common core list of plant traits for functional ecology. *Journal of Vegetation Science* 10: 609-620.