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ASSESSEMENT OF PLANT SPECIES DIVERSITY IN DECIDUOUS FORESTS IN THE CONTEXT OF CLIMATE CHANGE

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During recent years, biodiversity and its assessment have occupied an important position in the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests), and Climate Change. The main component of forest ecosystems, in addition to tree edificators, is the ground vegetation. The individual vegetation layers comprise an important feature of the overall biodiversity of forest ecosystems. Their composition, diversity and structure constitute both important factors in the assessment of their biodiversity and also important bioindicators of

environmental changes. Vegetation is a source of the primary production of ecosystem; it controls gas exchange with the atmosphere and plays an important role in the biocycles of both water and nutrients within the ecosystem. It is also an important indicator of the status of forest ecosystems for the relatively easy and inexpensive assessment of ground vegetation monitoring and constitutes an acknowledged basis for biodiversity assessment.

Key words: *deciduous forests, vegetation changes, biodiversity, climate change, ground vegetation.*

INTRODUCTION

Biodiversity is nowadays considered to be one of the principle criteria for the sustainability of forest production and for ensuring its non-production functions. Knowledge of the ecology of many different species enables the interpretation of changes in vegetation in relation to corresponding changes in environmental factors. Ground vegetation is any plant component of the ecosystem, with the exception of the tree layer and the epiphytic and epilithic mosses and lichens. Vegetation, in its entirety, as well as the individual species as indicators are equally considered to be specific subjects for studying the levels of the critical loads of ecosystems [7].

The main objective of the proposed research is the estimated status and changes in the diversity of plant communities in monitoring plots, in accordance with the rules required in forest monitoring (ICP Forest program). Thus, in the sample areas located in the Ivancea forest (parcel 59 L) O.S. Ivancea, ISS Orhei - SE 1, Codri Scientific Reserve (parcel 5C) - SE 2, Mereşeni forest (plots 48 A), O.S. Mereşeni, SS Hincesti-Silva - SE 3 were observed on the ground vegetation and the specific objectives were defined as follows:

- Determination of plant species and ecological requirements to humidity, soil, trophicity, light and soil requirements to Ph.
- Census and determination of plant species and relative specific abundance per vegetation layer.
- Estimation of structural density with respect to species composition, specific percentage coverage and vertical stratification.
- Detection of temporal changes in vegetation and specific average density on the ground.

Vegetation changes allow the description, explanation and modeling of dynamic processes by analyzing solutions, causes and mechanisms (including natural and anthropic environmental factors). Species diversity is one of the most important indices used for evaluating the sustainability of forest communities. This study aims to characterize the forest communities and to identify and compare the plant species diversity in the study area. Local diversity was studied with various indices, such as number of species per unit area (species richness).

These are used as indicators of the degree of complexity of the under study communities and provide information on the homeostatic capacity of the system to unforeseen environmental changes. Changes in vegetation and in underlying environmental factors can serve as indicators of the status of other organisms based on our current knowledge of the ecological niches of numerous plant species [3].

Ground vegetation assessment allow plots to be characterized within identifiable vegetation types. Vegetation changes allow describing, explaining and modelling dynamical processes, by analysis of pathways, causes and mechanisms, including natural and anthropogenic environmental factors.

MATERIAL AND METHODS

It is generally known that vegetation cover responds to environmental changes with great sensitivity and with appropriate speed. Numerous studies concerning the relationship between the forest vegetation and the environment show that any change in abiotic factors can lead to considerable changes in the vegetation.

The objectives of the vegetation assessment are to capture and to document both the current typological and phytosociological characteristics of the vegetation and their variations at individual sites and also any changes that are taking place in time based on the influence of natural and anthropogenic factors.

Long-term study of vegetation in areas of intensive monitoring is intended to provide data for the overall study of changes in forest ecosystems in relation, for example, to the soil conditions, micro- and macroclimate, is also involved, indicators of biodiversity in forest ecosystems and improved and refined methods of its measuring and evaluation were developed.

In the test areas of the three regions, data on vegetation level and composition were collected, photos of the plant species included in the studied and some indicator plants were collected and then included in a herbarium. The values of the indices of the ecological categories, the vital forms and the geo-elements were appreciated according to the fundamental works of the flora of Europe. Spectrum of bioforms, biological groups, ecological categories and phyto-geographical elements were elaborated according to the methods described in the ecological and geo-botanic study of vegetation of Romania [8].

Basic investigations are carried out during the peak growing season, during the summer aspect, and in case of significantly different seasonal aspects the spring or the late summer assessment has also been realized.

A list of all the species, including tree seedlings, was recorded in all three regions. The status of the vegetation was evaluated using classical semi-quantitative phytosociological releves. Assessment was carried out on circular plots, located at its centre, with an area of 50 m^2.

One of the problems detected in forest ecosystems, during recent decades is the exceeding of an acceptable level of nitrogen. An excess of nitrogen is suitable for those indicator plants that are able to use it effectively (*e.g. Urtica dioica, Geum urbanum, Ficaria verna, Poa nemoralis*) [4].

RESULTS AND DISCUSSION

The analysis of the composition of ground vegetation of these three studied areas is based on the number of species within each category relative to the total number of species within the flora. The amplitude of the ecological tolerance of plant species reflects the edapho-climatic conditions of the biotope. From the ecological point of view, the flora was analyzed on the basis of humidity (U), trophicity (T), light (L) and soil reaction (R), following the example proposed by N. Donita (1993) and Anca Sârbu in „Of botanical practice". Analyzing their requirements for the humidity factor (U), we note that the most numerous are mesoxerophytes and mesophils. Meso-hydrophilic species record a small percentage. The hydrophytes are not really meeting. The xerophilous species are also reduced on dry-to-dry soils from hill meadows and anthroped sites in neighboring areas [6].

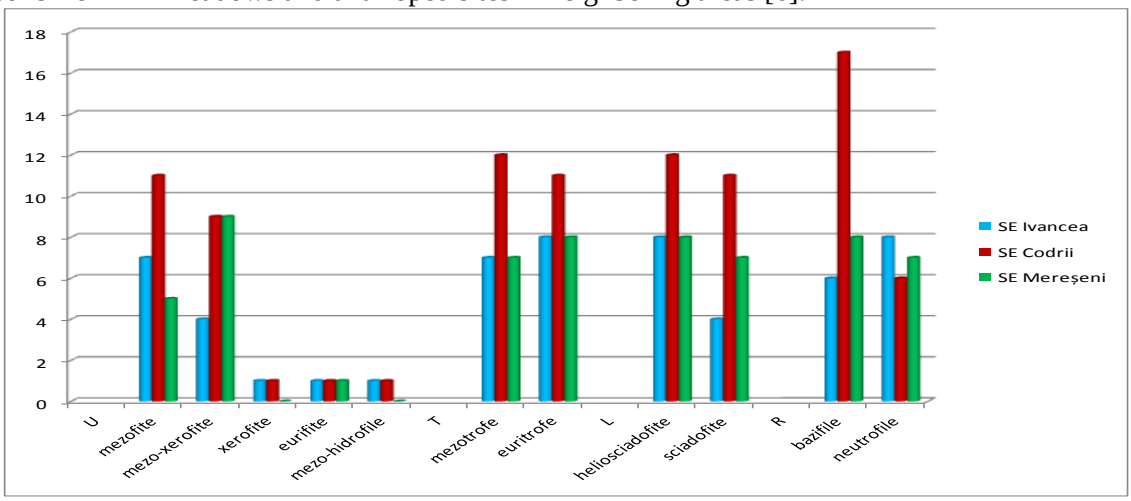

Fig. 1. *Ecological aspects of vernal plant species (spring) identified in experimental areas (March-April, 2017)*

The species adapts to the large oscillations of the humidity regime - the eurifits have a low percentage. In terms of species demand for soil trophic (T), the mesotrophic group and euritrofe predominate - which make up the majority of the specific flora composition. Moderate oligotrophic species are recorded a small percentage and the megatrophs are practically absent. From the point of view of the edaphic preferences (soil reaction (R), the predominance of basal alkaline-phyllus species, neutrophils, a less important role belongs to the neutro-basal and acidophilic species. Knowing the structure of the flora after the bioform gives us information about the balance in which it is present with the whole environmental factors, but also with the anthropic pressure exerted in various ecosystems. The analysis of these results highlights the prevalence of hemiciphophite care represents a large number of total floral composition, thus illustrating that the studied areas are situated in a temperate region. Geographically, the forest flora in these probes is predominant by species of Eurasian and European origin.

CONCLUSION:

1. The conditions (physico-geographic) of the experimental surfaces have determined the development of vernal vegetation specific to the oak forests in the central part of the country, with the predominance of meso-xerophyte and mesophyte species (relative to humidity), mesotrophs and euritrophs (versus soil trophicity), alkaline basophils and neutrophils (with respect to soil reaction), with the prevalence of hemicriptophytes (specific to the temperate zone) and of the eurasian and european species. At most of the plots changes of two types have been observed. A number of changes in the occurrence and coverage of individual species can be evaluated as short-term seasonal fluctuations caused by different weather conditions from years.

2. This statement is based on some additional assessments carried out in the approximately same period in the actually year after the regular monitoring. The most significant changes are reflected in the coverage of annual or biennial species, such as *Dentaria bulbifera* and *Galium odoratum* [2]. These species require favourable moisture conditions at the time of their germination. During the dry season these species are virtually unable to germinate, and therefore, in some years, they may temporarily disappear from the phytosociological records. In the case of perennial plants, large seasonal fluctuations occur in regard to *Lamium luteum* [5]. There are also large differences in the coverage of the moss layer species, for which a high level of dependence on rainfall was confirmed. In addition to these short-term temporary changes, longer-term changes and trends were also detected. Some of them are related to the development of vegetation and its successional changes.

3. At some sites the ground vegetation is ecologically undefined, without any significant indicator species. In the course of the classification of vegetation units, in many cases of transitional types it was necessary to assess which of the indicators are predominant and decisive. The vegetation changes there are influenced by anthropogenic impacts to a far greater extent than they are by natural processes [1].

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