

ECOPHYSIOLOGICAL PECULIARITIES OF SOME DOMINANT SPECIES FROM NATURAL RESERVE OF COMMUNITY INTEREST, MOVILA LUI BURCEL AND GLODENI (VASLUI COUNTY), ROMANIA

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Abstract

The purpose of this paper is to assess the human impact on the physiological behaviour of the dominant species of grassland in Northeastern Romania. Ecophysiological researches were made at codominant and dominant plant species in natural grasslands (natural reserves) and anthropic in Plateau Moldavian Central. Were analyzed relative variation of photoassimilatory pigments (chlorophylls and carotenoids) and sugars parameters of carbohydrate metabolism (mono, di-, polysaccharides soluble and insoluble). They have studied plant species in the flowering phenophase from mid-July. Analyses of these parameters showed relatively small variations of photoassimilatory pigments and carbohydrates in leaves of species in natural reservations (Movila lui Burcel and Glodeni) and wider variations but with high values in secondary and coastal meadows.

Key words: natural reserve, chlorophylls, carotenoids, sugars leaf

The ecophysiological researches were carried out at codominant and dominant plant species in natural grasslands (natural reserves) and anthropic in Plateau Moldavian Central. Thus, the protected areas of interest in the study were Movila lui Burcel and Glodeni Hayfield (Vaslui County) as part of geographical unit, Central Moldavian Plateau. Implementation of Nature 2000 (ecological network of protected areas in Europe) in Romania, grace of EU Habitats Directive made through the declaration of natural areas as protected areas.

Reserve Botanical Movila lui Burcel, the area of 12 hectares, in Vaslui County, in 2003 is a protected area, is a genuine vestige of primary vegetation, abundant in parts Pontic Mediterranean and continental contains rare plants for Moldavia.

Natural floristic reserve, Glodeni hayfield-6.0 ha, proposed protected area in 2007 has a great scientific significance as as well as biological and the phytogeographic. Great pedodiversity - climate favoured phytogenofond installation and maintenance of a rich and varied flora and rare species for our country (<http://www.informatii publice.ro/turism/vaslui-turism> / [arii-protejate-rezervatii-naturale-si-monumente-naturale-vaslui](http://www.arii-protejate-rezervatii-naturale-si-monumente-naturale-vaslui)).

flowering phenophase when the physiological indices analyzed were in the maximum concentration. It were analyzed the following indicators: chlorophylls *a* and *b*, carotenoids and sugars content from leaves(mono, di and polysaccharides).

Spectrophotometric method for determination of pigments was solving in 85% of fresh leaves of the species investigated (Meyer-Berthrand Știrban,1985). Results were expressed in mg/g of fresh weight (mg/g fr.w).

Bertrand method combined with method Borel, 1953, made determination of carbohydrates in dried plant material. Results were expressed as g% of dry matter.

Characterization of stations: these chosen including: flora reserves (Movila lui Burcel respectively, Glodeni), and also the grasslands, Solești I-secondary grassland hill, meso-xerophilous, Solești II-meadow pasture mesophilic and meso-higrophillous and Pribești-pasture lower terrace, overgrazing.

Statistical analysis included the arithmetic mean, standard deviation and coefficient of variability calculated for every station.

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RESULTS AND DISCUSSIONS

The purpose of this paper consists in assessing human impact on behaviour and physiological analysis of the variability coefficient

MATERIAL AND METHOD

Biological material used consisted of fresh leaves of dominant species of studied grassland. Collections of material were made in July, the middle of summer. They used plants that were

of dominant species in grasslands with different degrees of human intervention in NE Romania.

Some authors consider that synphysiological variability in plant communities from different grassland ecosystems could be an indirect indicator of biodiversity, reflecting also the stress ecosystem (Fóti et al., 2002). The concept of stability studied observing that mature ecosystems are more stable and resistant to stress conditions, while poor communities (removal of species) lose their ability to compensate the fluctuations in microclimate (Acatrinei, 2006, Fóti et al., 2002). Considering these studies, we followed the variation of ecophysiological parameters in dominant species of grasslands with different degrees of human intervention.

In addition, it was performed the analysis of the variation of coefficient of variability depending on the type of ecosystem: natural reserve, meadow or pasture to assess the stability of its ecosystem to external pressures (anthropogenic pressures, climate fluctuations, changes in biotope resources etc.).

Analysis of photoassimilatory pigments in dominant species reflected their photosynthetic capacity and the adjustment to conditions in the station biotope.

Changes in chlorophylls and carotenoids is limited in nature reserves (Glodeni hayfield and Movila lui Burcel), which showed an exploitation ecosystem in a balanced and equal mode for each existing phytocoenosis.

Thus, chlorophyll *a* varied from 0.8 to 0.9 mg/g fr.w (Movila lui Burcel) and 0.8 to 1.2 mg/g fr.w. (Glodeni) (fig.1). Range of

photoassimilatory pigments increasing for species from Bobota grassland and for the species from pastures Solești I and Solești II.

In this case, chlorophyll *a* recorded a range from 0.37 to 0.87 mg / fr.w (Bobota, eight years of secondary grassland after agricultural land), from 0.63 to 1.0 mg / fr.w (Solești I, a coastal grassland) and from 0.73 to 1.64 mg / g fr.w (Meadow grassland, Solești II). One particular case stands out in wet pastures and salted from Pribești where chlorophyll *a* values are relatively small ranges between 1.17 to 1.48 mg / fr. w.

High values and low amplitude of variation is found also in chlorophyll *b* and carotenoids from all species analyzed in Pribești station, these species recording the highest values of photosynthetic parameters in all analyzed stations from Moldavian Central Plateau (fig. 1).

Combined actions of different factors (acid pH, humidity, amount of salts in the soil) provides a development for only certain species better adapted to these biotope conditions. Similarly, as the chlorophyll *a*, regarding the degree of anthropic intervention in the grassland (nature reserve as control, in comparison with coastal grassland or respectively, with pasture), there are variations of chlorophyll *b* and carotenoid pigments. Thus, chlorophyll *b* ranged from 0.27 to 0.3 mg/g fr.w (Movila lui Burcel, natural reserve), 0.2 to 0.38 mg/g fr.w. (Glodeni reserve), 0.13-0.24 mg/g fr.w (Bobota, grassland), 0.19-0.33 mg/g fr.w (Solești I secondary grassland), 0.24 to 0.62 mg/g fr.w (Solești II - meadow pasture), from 0.37 to 0.51 mg/g fr.w (Pribești, salted pasture).

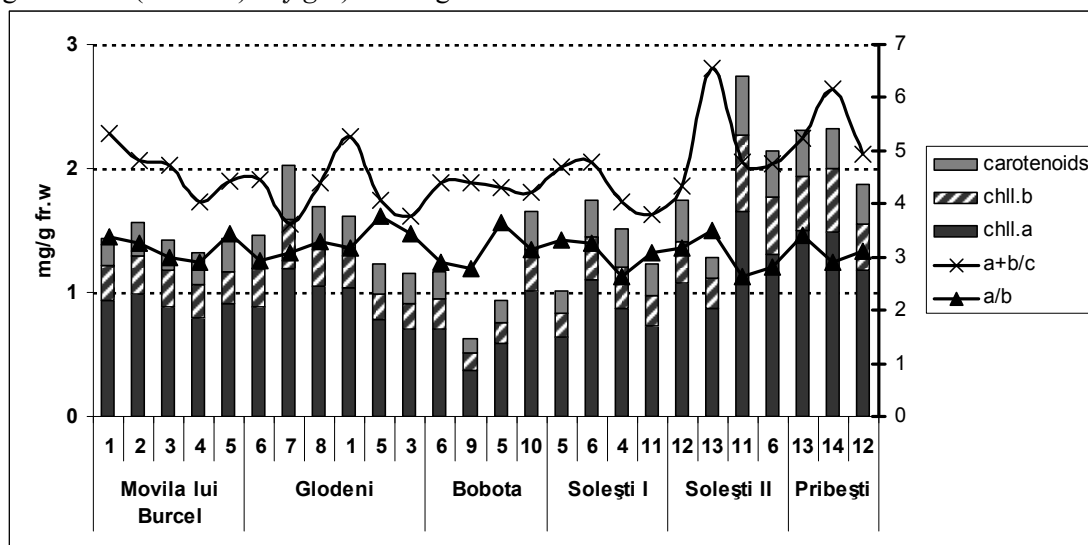


Figure1 Variation of photoassimilatory pigments in dominant species of natural and anthropic grassland ecosystems of Moldavian Central Plateau

Legend: 1-Medicago falcata, 2-Astragalus onobrychis, 3- Stipa capillata, 4- Festuca valesiaca, 5- Botriochloa ischaemum, 6- Lotus corniculatus, 7- Genista tinctoria, 8- Agropyron intermedium, 9-Festuca arundinacea, 10-Agropyron repens, 11-Agrostis stolonifera, 12-Lolium perenne, 13-Trifolium fragiferum, 14- T.repens; a/b= chlorophyll a/ chlorophyll b; (a+b)/c= chlorophylls/carotenoids

Carotenoid pigments of the following ranges: 0.22 to 0.26 mg/g fr.w (Movila lui Burcel), 0.24 to 0.43 mg/g fr.w (Glodeni), 0.11-0, 24 mg/g fr.w (Bobota), from 0.2 to 0.31 mg/g fr.w (Solești I grazed grassland), 0.17 to 0.47 mg/g fr.w (Solești II meadow pasture) and 0.31 to 0.37 mg/g fr.w (Pribești, salted pasture).

Efficiency of photosynthetic capacity measured by the ratio between chlorophyll *a*/chlorophyll *b* (*a/b*) generally showed a variation around value of 3 at analyzed species showing a balance between the two pigments and primary role of chlorophyll *a* in these species of grassland exposed to isolation.

Chlorophylls/carotenoids ratio (*a+b/c*) recorded the value of 4 in average, in most analyzed species in majority stations and

exceeding the value of 5 in species of Pribești(salted pasture), where are observed the prevalence of chlorophylls photoassimilation compared with photoprotection offered by carotenoid pigments (fig. 1).

Analysis of carbohydrate metabolism indicators showed a good representation of all parameters analyzed (mono-, di- and polysaccharides), disaccharides and polysaccharides insoluble of them showed higher values (fig. 2).

Of the species examined largest amounts of sugars were determined in leaves and stems of grasses, in comparison with legume family. Their accumulation in some grasses, in large quantities is possible because of flowering and fructification phenophase.

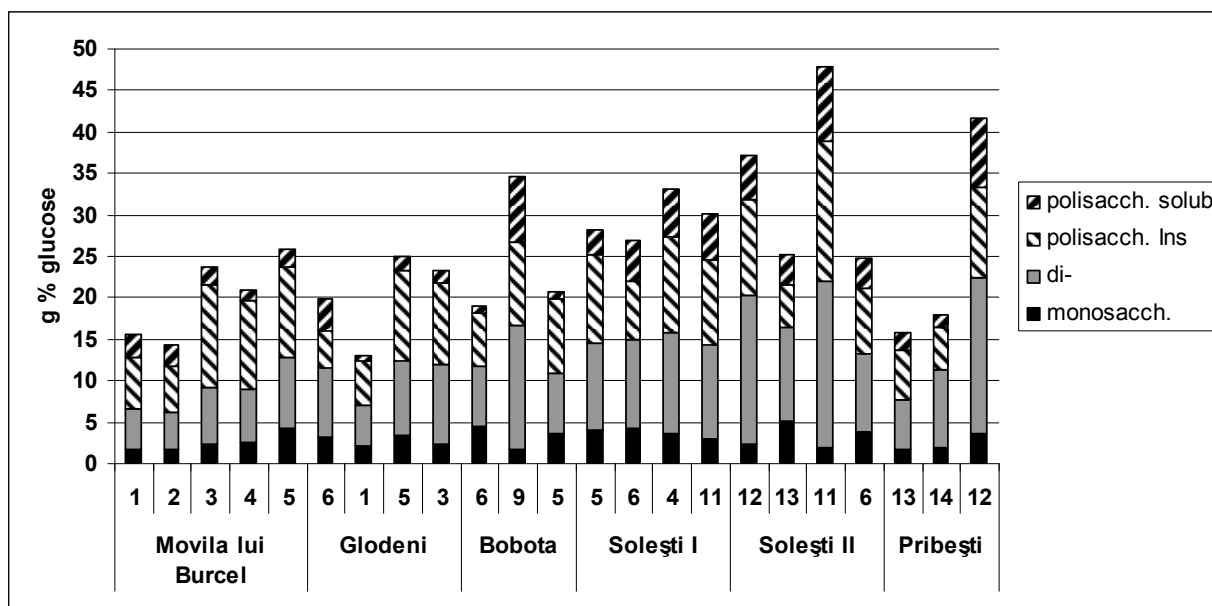


Figure 2 Variation of carbohydrates indicators in dominant species of natural and anthropic grassland ecosystems of Moldavian Central Plateau

Legend: 1-Medicago falcata, 2-Astragalus onobrychis, 3- Stipa capillata, 4- Festuca valesiaca, 5- Botriochloa ischaemum, 6- Lotus corniculatus, 7- Genista tinctoria, 8- Agropyron intermedium, 9-Festuca arundinacea, 10-Agropyron repens, 11-Agrostis stolonifera, 12-Lolium perenne, 13-Trifolium fragiferum, 14- T.repens

Total carbohydrate content indicators were lower in variation of the species from the reserves, which are between 14-25 g % glucose (Movila lui Burcel) and between 13-23 g % glucose (Glodeni), such as shown in fig. 2.

Sugars accumulation in leaves of species from secondary grassland Bobota ranged between 19-35 g %, those of Solești I (coastal grassland) between 26-33 g%, those of Solești II (meadow pasture) between 25-47 g % and those of Pribești between 15-41 g%.

In some species can be observed a high accumulation of total sugars leaves above the average of the station, as, for example, *Festuca arundinacea*-Bobota, 35 g% (station average is 25 g%), in *Agrostis stolonifera*- Solești II, 47 g % (station average is 34 g%), *Lolium perenne*-Pribești, 41 g % (station average is 14.38 g %) (fig.2). The lowest values of sugars leaves recorded accumulating in leguminous species, these one instead accumulated in their larger amounts of protein.

Table 1

Coefficient of variation of some ecophysiological indicators in different type of grassland ecosystems

Station	Degree of human intervention	CV of total assimilatory pigments (%)	CV of total sugars leaf (%)
Movila lui Burcel	Hayfield, Natural Reserve	5.96	25.04
Glodeni	Hayfield, 3 Years old Natural Reserve	20.84	26.12
Bobota	Hayfield, fallow for eight years	39.60	34.24
Solești I	Coastal grazed grassland	23.38	9.078
Solești II	Meadow pasture	31.35	32.58
Pribești	Salted and humid pasture, anthropic	11.76	57.22

In the middle range (20%) are coastal meadows, Solești I and Glodeni. An interesting aspect is the CV value of Pribești by 11.76%, standing rather lower limit of this coefficient, after the old natural reserve "Movila lui Burcel".

The coefficient of variation related to carbohydrate accumulation in leaves showed that the lowest value (9.07%) recorded in species of Solești I and highest in species of pasture Pribești (57.22%). Coefficient of variation of approximately 25% recorded in the leaves of species of natural reserves as Movila lui Burcel and Hayfield Glodeni I and 30% in leaves of dominant species in Bobota, secondary hayfield and Solești II, meadow pasture (table 1).

In conclusion, it is obvious that the lowest coefficient of variation values were obtained in natural reserves, where individuals of the community exploited equally the biotope condition and nutrient reserves. From previous works about grasslands, we observed that ecophysiological parameters are more stable in natural ecosystems than in those with any degree of anthropic intervention (Acatrinei, 2006, Antohe, 1988).

Transitional stages of an ecosystem are given by the increased values of the coefficient of variation (Bobota Hayfield and meadow pasture of Solești II). Different microclimatic conditions (Solești I), herbivores action, removal of vegetative organs of the plant and the concentration of metabolic products in the remaining organs (pasture salted from Pribești) is reflected in the survival strategy of ecosystem through extensive changes and great variation of the coefficient of variation of ecophysiological parameters studied.

CONCLUSIONS

This present study discussed the investigation of photoassimilatory parameters (chlorophylls and carotenoids) and of carbohydrate metabolism in dominant species from different grassland ecosystems from Central Moldavian Plateau. Analyses of these parameters showed

relatively small variations of assimilatory pigments and carbohydrates in leaves of species in nature reserves (Movila lui Burcel and Glodeni hayfield) and extensive variation with high values in Hayfield Bobota and secondary coastal grassland grazing Solești I. The lower values of photosynthetic parameters recorded species of meadow pasture of Solești II, although carbohydrate metabolism indicators have quite high values in these species. Humid and salted pasture species from Pribești recorded the highest values of photoassimilatory pigments but the lowest values of the carbohydrate leaf accumulation of all analyzed leguminous species and high in *Lolium perenne*.

Optimal and physiological steady state revealed by small variations and the correlation between photoassimilation and carbohydrate accumulation is reached in species of nature reserves, followed by the species from Bobota Hayfield and species from secondary coastal grassland of Solești I. Anthropogenic effect aggressively pursued in pastures from Solești II and Pribești stimulated competitiveness among species, which revealed the highest values of chlorophylls and carotenoids in some species (*Agrostis stolonifera*-Solești II, *Trifolium fragiferum* and *T.repens*- both from Pribești) and respectively, elevated sugars leaf metabolism in the species (*Agrostis stolonifera* - Solești I, *Lolium perenne* -Pribești).

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