VEGETATION DYNAMICS IN LĂZĂRENI HILLS

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Abstract.

This paper aims at analysing the structure, the time and space distribution of the vegetation in the Lăzăreni Hills. The scientific novelty is given by the approach of an unexplored area and by the obtained result, which included the identification and the characterization of several endemic, vulnerable, rare or endangered species and associations. (Ruscus aculeatus, Ruscus hypoglossus, Quercus pubescens, Dentaria glandulosa, Crepis pannonica, Cephalanthera damasonium, Cephalanthera longifolia, Corno-Quercetum pubescentis, Polygonato latifolio-Quercetum roboris, Sedo sexangulari - Syntrichietum calcicolae, Ranunculetum aquatilis etc.

Keywords: association, vegetation succession, phytocoenoses, pollen analysis, syndynamics etc.

INTRODUCTION

The study on the vegetation dynamics from Lăzăreni Hills is based on an intense research-documentation from specialized literature, on personal research and on information and notes collected from the field research process during 2008-2011. Lăzăreni Hills cover a total area of 59460, 7 ha and include 57 localities of different statuses and dimensions. The general aspect of the vegetation from the Lăzăreni Hills is the result of the interaction between climatic, oro-ecological, animal and anthropic factors that produced major changes in the vegetation composition by placing and expanding human settlements, access roads or forest arrangements and by reducing the territory occupied by the wild flora in favour of agricultural crops and grazing lands. From a total surface of 59460,7 ha, 34145. 2 ha is occupied with natural vegetation, from which 24262,3 ha (71,1 %) is represented by deciduous forests, 9828,5 ha (28,8 %) by grazing lands, 25,9 ha (0,1 %) by swamps and 28,3 ha (0,1 %) by waters (Fig.1).

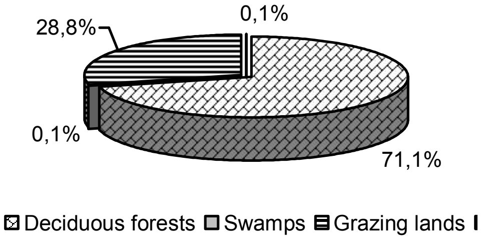

Figure. 1 The structure of the terrains from Lăzăreni Hills occupied with natural vegetation (original).

For a quantitative analysis on the areas from Lăzăreni Hills occupied with vegetation we used information extracted from the topographic map 1:50.000 and the orthophotoplan for the Lăzăreni Hills and information concerning the use of the terrains extracted from the Corine Land Cover 2000 set.

MATERIALS AND METHODS

The evolution of the studied vegetation, started in the postglacial period, can be retraced based on the succession of the vegetation phases from north-western Romania for the peat bogs of Crasna river, written out by Pop (1960), and based on the pollen analysis of the peat from Băile 1 Mai conducted by Diaconeasa (1962, 1964).

The palynological data gathered from the above mentioned sources, supported by the stages of genesis and evolution of the soil from Crişurilor Plain – Beiuşului Country (Berindei et al., 1977) allowed us to infer the main stages of evolution for the vegetation from Lăzăreni Hills. The older and recent botanical researches concerning the aspect of the flora and the evolution of vegetation in Crişurilor Plain (Pop, 1968), in north-western Romania (Burescu, 2003) proved to be really helpful (Sanda et al., 2008).

The evolution of the vegetation in north-western Romania, area in which Lăzăreni Hills are situated, can be resumed, according to Pop (1968), to two long periods: the one of the aquatic and paludal vegetation, of the xerophilous, xero-mezophilous meadows and the one of the forests.

The aquatic and paludal vegetation stage started along with the egression of the Tisei Plain, and respectively of the Lăzăreni Hilles, from under the Panonic Lake. At this stage there were a great number of flood plains fed with waters flowing from the western flanks of the Apuseni Mountains. The predominant vegetation was the aquatic one, represented by hydrophytes (*Potamion, Nymphaeion, Ranunculion*), followed by the paludal vegetation, represented by reed beds (*Phragmition*) and sedges (*Magnocaricion*).

The changes occurred in the climate and the physiognomy of the Lăzăreni Hills influenced the evolution of the vegetation from the first phase to the one of the mezo- hygrophilous, mezophilous meadows and the one of the forests.

Based on the polen analysis, Diaconeasa (1962) establishes that the pine and birch forests (the pine-birch stage) already appeared in the first postglacial stage until a cooler climate leads to a declination in what concerns pine forests and to the emergence of spruce and birch (spruce-birch stage). Later on, the pollen diagrams show heat loving species from the genera *Quercus, Ulmus, Tilia, Corylus.* This is the stage of spruce with oak and hazel (7000 – 5500 bc), marked by a warm and dry climate in which the spruce slowly disappears and the large flood plains dry.

At the beginning of the Atlanic (5500 – 2500 bc), the herbaceous xero-mezophilous vegetation extends in the Western Plain and, at the level of hills, including the ones studied in this paper, thermopile deciduous forests from the genus *Quercus* (oak forests), combined with *Ulmus* (elm) and *Tilia* (linden) extend. At the end of the Atlantic, the spruce moves in the mountains, while oak forests extend in plains. The beech and hornbeam also appears.

During Sub-Boreal (1000 – 800 bc), hornbeam expands, replacing in certain areas the spruce, while the beech forests reach the plain regions.

No significant changes appear in climate at the beginning of the Sub-Atlantic period (800 bc).

RESULTS AND DISCUSSIONS

The dynamics of phytocoenoses in Lăzăreni Hills has been studied in close association with the changes in climate and with the action of human and animal factors.

The vegetation succession scheme in the Lăzăreni Hills (Fig. 2) was elaborated based on personal observations on field and on references among which we mention: (Pop, 1960, 1968), (Diaconeasa, 1962, 1964), (Berindei et al., 1977), (Burescu, 2003), (Sanda et al., 2008).

Observing the spatial distribution of the phytocoenoses from the investigated stations and the structural changes suffered in the floristic composition, starting with pioneer coenoses and ending with the natural ones that are in an equilibrium-climax state, we established three successional series.

I. The fundamental progressive succession of hydroseres

The first plants that inhabit the surface of waters from the ponds located at the edge of streams are the natant (floating) hydrophytes, forming natant phytocoenoses belonging to the associations: *Najadetum minoris*, *Potamogetonetum crispi*, *Ranunculetum aquatilis.* In time, the organic substances resulted from the decomposition of natant hydrophytes stored on the bottom of the ponds, thus favoring their colmation process. The colmation becomes more advanced after a long time, leading to the substitution of natant phytocoenoses with those belonging to the swamp vegetation from the associations: *Scirpo – Phragmitetum, Glycerietum maximae, Glycerietum fluitantis, Sparganietum erecti, Eleocharitetum palustris, Caricetum ripariae, Caricetum hirtae, Caricetum brizoidis.* Thus, in the meadows from the valleys of the Lăzăreni Hills, the coenoses follow a natural succession, without any human intervention, and the reed beds and sedges are replaced by phytocoenoses of black alder (*Stellario nemori-Alnetum glutinosae*) and willows (*Salicetum albae*).

As time passes and as the argillic soils become more deep and less humid, the wet woodland associations will be replaced by oak forests (*Polygonato latifolio-Quercetum roboris, Querco robori-Carpinetum, Quercetum robori-petreae)*, which represent the climax stage of lithoseres.

II. The fundamental progressive succession of lithoseres

In this case, the vegetation succession occurs starting from sedges (*Caricetum hirtae, Caricetum brizoidis*), rushes (*Juncetum effusi, Junco inflexi-Menthetum longifoliae*), instead of which, in the aerated, wet soils, meadows install, composed of phytocoenoses from the associations *Holcetum lanati, Festucetum pratensis, Anthoxantho-Agrostietum capillaris.*

As the land settles down, and the soil moisture decreases (in stations with higher aridity conditions, with flanks with medium slopes and with southern exposition), xero-mezophilous meadows install, composed of phytocoenoses from the associations: *Filagini-Vulpietum, Vulpio-Airetum capillaris, Festucetum rupicolae, Poterio-Festucetum valesiaceae, Agrostio - Festucetum valesiacae.* The degradation of dry grasslands (*Poterio-Festucetum valesiaceae, Agrostio - Festucetum valesiacae*) create favorable conditions for their substitution by phytocoenoses from the *Calamagrostietum epigei* association.

In the denuded terrains and in those where the original vegetation has been destroyed by soil erosion, the evolution continued in the direction of the phytocoenoses installation: *Bromo squarrosi - Xeranthemetum annui, Ventenato dubiae-Xeranthemetum cylindraceum, Bothriochloetum (Andropogonetum) ischaemi, Cleistogeno - Festucetum rupicolae.*

On limestone rocks from Şomleu Hill and in the rocky crevices, the successional process of the vegetation occured with the appearance of phytocoenoses from the associations *Asplenio rutae - murariae – Melicetum ciliatae, Sedo sexangulari - Syntrichietum calcicolae.*

III. The fundamental succession of woody phytocoenoses

The aging of red fescue and bentgrass meadows (*Anthoxantho-Agrostietum capillaris)*, abandoned and ungrazed, led to their substitution by hawthorn and blackthorn scrubs phytocoenoses *(Pruno spinosae - Crataegetum).*

The scrubs phytocoenoses from the *Pruno spinosae - Crataegetum* association are relatively stable because in their composition permeate many woody species (*Populus tremula, Betula pendula, Carpinus betulus, Quercus cerris, Quercus petreaea),* characteristic to the forests from the *Querco - Fagetea* class (*Querco petraeae-Carpinetum, Carpino-Quercetum* *cerris, Quercetum petraeae-cerris, Tilio argenteae-Quercetum petreae-cerris, Tilio tomentosae-Carpinetum betuli, Carpino-Fagetum*).

Among the recently appeared works that presented the vegetation dynamics scheme, we mention the following: Marian (2008), Burescu (2003), Ardelean (1999), Drăgulescu (1995), Oroian (1998), Pop (1968) etc.

The comparative analysis between the results of field research and those derived from research - bibliographic documentation revealed a number of similarities and differences regarding the studied phytocoenoses. These were represented by the number of species that have entered into the structure of the associations and by the analized surface, karyotype, biological form, floristic elements and ecological factors.

The comparative analyses made between this study and the works (Ardelean 1999, Pop 1968) that deal with the evolution dynamics show that there are several similarities between them. They stem from the fact that the area investigated by the authors mentioned above is close to the Lăzăreni Hills. Hence, most of the species and associations found in the Lăzăreni Hills are present in their work, (*Salicetum albae, Stellario nemori - Alnetum glutinosae, Carpino – Fagetum, Quercetum petraeae – cerris, Querco robori – Carpinetum, Querco petraeae – Carpinetum, Pruno spinosae – Crataegetum, Corno - Quercetum pubescentis, Festucetum pratensis, Botriochloetum (Andropogonetum) ischaemi, Glycerietum maximae, Eleocharitetum palustris, Anthoxantho - Agrostietum capillaris, Trifolio repenti – Lolietum, Juncetum effusi, Junco inflexi - Menthetum longifoliae, Agrostio - Festucetum valesiacae, Sambucetum ebuli, Lolio - Plantaginetum majoris, Calamagrostietum epigei,* etc). A high similarity exists between the biological form, the floristic elements and the ecological factors found in the Lăzăreni Hills and those from their works.

As you climb the vegetation floors, from hills to mountains, dissimilitudes begin to appear in the number of species, their number increasing in the mountain associations. Deciduous forests and meadows from the mountain area, represented both by flora and by vegetation, posses a very rich biodiversity, as compared to the hilly area. This is due to oro-geographical factors (climate, soil, etc.). Compared with the specialized literature written by Marian (2008), Burescu (2003), Oroian (1998), Dragulescu (1995), we find that there are both similarities and differences in what concerns the number of species that have entered the structure of associations, the karyotype, the biological form, the floristic elements and the ecological factors.

The similarity consists of the presence of common associations as we pass through the floors of vegetation [Oroian (1998), (*Salicetum albae, Glycerietum fluitantis, Lysimachio vulgaris - Filipenduletum ulmariae, Agrostio - Festucetum valesiacae, Sambucetum ebuli, Telekio - Petasitetum* *hybridi.*), Burescu (2003) (*Najadetum minoris*, *Ranunculetum aquatilis, Cyperetum flavescentis, Glycerietum maximae, Glycerietum fluitantis, Sparganietum erecti, Caricetum ripariae, Caricetum hirtae, Juncetum effusi, Junco inflexi - Menthetum longifoliae, Bidentetum cernui.*), Drăgulescu (1995) (*Scirpo – Phragmitetum, Eleocharitetum palustris, Filagini – Vulpietum, Anthoxantho - Agrostietum capillaris, Holcetum lanati, Sambucetum ebuli, Lolio - Plantaginetum majoris, Juncetum effusi, Junco inflexi - Menthetum longifoliae, Clinopodio - Pteridietum aquilini, Salicetum albae, Pruno spinosae – Crataegetum, Querco petraeae – Carpinetum, Carpino – Fagetum.*), Marian (2008) (*Salicetum albae, Carpino – Fagetum, Querco robori – Carpinetum, Quercetum robori – petreae, Quercetum petraeae – cerris, Querco petraeae – Carpinetum, Carpino - Quercetum cerris, Quercetum robori-cerris, , Pruno spinosae – Crataegetum, Holcetum lanati, Festucetum pratensis, Filagini – Vulpietum, Sambucetum ebuli, Lolio - Plantaginetum majoris, Trifolio repenti – Lolietum, Juncetum effusi*)].

The difference lies in the higher number of associations which tends to increase in the mountains, where there are also differences in karyotype, biological form, floristic elements and ecological factors, due to the anthropic and animal influence (deforestation, vegetation fires, overgrazing) and due to natural factors (windfall, soil erosion during floods, especially in spring).

Besides the similarities and the differences with some of the many specialized works, the study realized in the Lăzăreni Hills contributes, by identifying, characterizing and presenting the associations, to the enrichemnt of the specialized scientific heritage, both in Romania and abroad. Thus, a total of 16 associations represent phytocoenoses with populations of rare plants, endemics, relicts, natural monuments subject to a special protection regime and included on the red list (Dihoru et Negrean, 2009, Oprea, 2005, Oltean et al. 1994, Boşcaiu et al. 1994 etc), (*Nymphaeetum thermalis*, *Najadetum minoris, Ranunculetum aquatilis*, *Bidentetum cernui*, *Glycerietum fluitantis, Vulpio-Airetum capillaris*, *Filagini-Vulpietum*, *Ventenato dubiae-Xeranthemetum cylindraceum, Sedo sexangulari - Syntrichietum calcicolae, Cleistogeno - Festucetum rupicolae, Asplenio rutae - murariae – Melicetum ciliatae, Bromo squarrosi - Xeranthemetum annui, Corno-Quercetum pubescentis, Polygonato latifolio-Quercetum roboris, Tilio tomentosae-Carpinetum betuli* -facies cu *Ruscus aculeatus, Querco petraeae-Carpinetum* -facies cu *Ruscus aculeatus* etc).

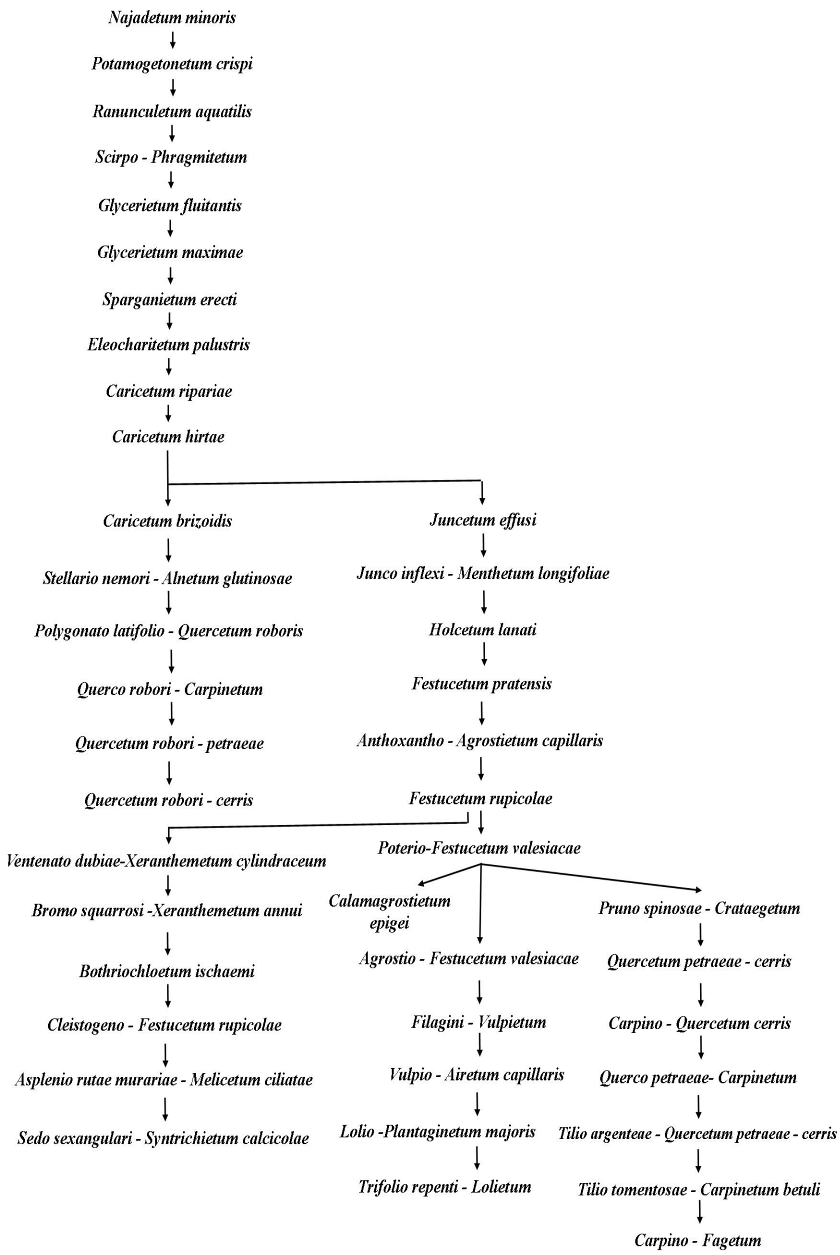

Figure. 2. Vegetation dynamics scheme (original)

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