

ASSOCIATIONS OF THE EPILOBIETEA ANGUSTIFOLII R. TX. ET PREISING IN R. TX. 1950 CLASS FROM LEAOTA MASSIF (ROMANIA)

NEBLEA Monica

Abstract. This paper presents the phytocoenological analysis of the plant associations from Epilobietea angustifolii class identified in Leaota Massif: *Telekietum speciosae* TREGUBOV 1941, *Senecio sylvatici – Epilobietum angustifolii* (HUECK 1931) TX. 1950, *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967, and *Rubetum idaei* GAMS 1927.

Keywords: plant association, Leaota Massif, Romania.

Rezumat. Asociații vegetale din clasa Epilobietea angustifolii R. Tx. et Preising in R. Tx. 1950 din Masivul Leaota (Romania). În prezenta lucrare este realizată analiza fitosociologică a asociațiilor vegetale din clasa Epilobietea angustifolii identificate în Masivul Leaota: *Telekietum speciosae* TREGUBOV 1941, *Senecio sylvatici – Epilobietum angustifolii* (HUECK 1931) TX. 1950, *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967 și *Rubetum idaei* GAMS 1927.

Cuvinte cheie: asociații vegetale, Masivul Leaota, România.

INTRODUCTION

Leaota Massif is situated in the north-western part of the Bucegi Mountains, being delimited by the Brătei Valley (Fig. 1). The uniform crystalline geological constitution of the massif gives it, a distinct morphological aspect, compared to the neighbouring massifs (Bucegi, Piatra Craiului). The area belongs to the temperate continental climate, which controls the actual floristic diversity.

From the phytosociological point of view, it has been published a few studies regarding rocky slopes vegetation, pioneer communities on the mobile and semifixed scree, mesophilous and mesohygrophilous lawns: DIACONESCU (1973), COLDEA (1991), POPESCU & SANDA (1993), SANDA & POPESCU (1995), ALEXIU (1998), BĂRBULESCU et al. (1978, 1985).

The forest represents an element of stability, with positive effects for soil, water, microclimate, assuring a hydrographic relative constant regime, a range of good and hard to quantify services, necessary for the preservation of equilibrium between the natural capital of the investigated territory and the local socio-economic system. If the natural factors control the complexes of biocoenoses to an optimum level (predators, parasites, hyperparasites, pathogenic agents, natural clearings, floods, etc), the anthropogenic factors act chaotically, through illegal cuttings of trees, incontrollable gathering of forest fruits, medicinal plants or plants of aesthetical interest, poaching etc.



Figure 1. Physical map of Leaota Massif and the western sector of the Bucegi Mountains (<http://www.clubulnostru.org/>).

Figura 1. Harta fizică a Munților Leaota și a sectorului vestic al Munților Bucegi (<http://www.clubulnostru.org/>).

MATERIAL AND METHODS

In the analysis of the vegetal layer, we took into account Braun-Blanquet method from Zurich-Montpellier Schools. The denomination of the plant associations has been adopted according to the syntaxonomic foresights established in the Phytosociological Nomenclature Code (BARKMAN et al., 1986; WEBER et al., 2000). We realized a synthetic phytocoenological table for all the studied associations. In order to determine the similarity between different plant associations, who belong to Epilobietea angustifolii class, it had been realized dendrograms, using Jaccard qualitative index.

RESULTS AND DISCUSSIONS

The identified phytocoenoses are included in Epilobietea class and it belong to two orders and three alliances. EPILOBIETEA ANGUSTIFOLII R. TX. et Preising in R. TX. 1950

Atropetalia VLIAGER 1937

Atropion Br.– Bl. ex AICHINGER 1933

1. *Telekietum speciosae* TREGUBOV 1941

Epilobion angustifolii (RÜBEL 1933) SOÓ 1933

2. *Senecio sylvatici* – *Epilobietum angustifolii* (HUECK 1931) TX. 1950

Sambucetalia Oberd. 1957

Sambuco – Salicion capreae R. TX. et NEUMANN

3. *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967

4. *Rubetum idaei* GAMS 1927

Telekietum speciosae TREGUBOV 1941

These phytocoenoses installed on the shaded, moistened soils, at the skirt of beech forest from the northwestern part of the Leaota Mountains (1,100 m altitude). Similar groups were identified on the Secuieni Valley and Orșova Stone – the Gurghiu Valley (SĂMĂRGIȚAN, 2005). The groups dominated by *Telekia speciosa* develop on the soils with moderate humidity, after the clearings, which destroy forestry vegetation. Therefore, coenoses of this association present characteristic species from Epilobietea class (*Fragaria vesca*, *Rubus idaeus*, *Digitalis grandiflora*, *Galeopsis speciosa*, *Gnaphalium sylvaticum*, *Torilis japonica*) (Table 1).

As for the bioforms, the hemicryptophytes are clearly dominant (73.05%), being followed by other life forms: terophytes (17.29%), geophytes (3.84%), phanerophytes (3.84%) and camephytes (1.92%) (Fig. 2).

The analysis of geoelements emphasizes the presence of Eurasian species with 50% percentage, the European elements comes next (15.38%), being followed by the Circumpolar (9.61%) and Central-European (7.69%) (Fig. 3).

There are mesophilous coenoses from the humidity point of view (53.84%). As for temperature, over 53.84% of the species are micro-mesotherm, followed by microtherms (30.76%). The soil reaction emphasizes an euryionic (38.4%) character with an acid neutrophil (25%) and low acid neutrophil influences of these phytocoenoses (26.92%) (Fig. 4). The diploids and polyloids present near frequencies (50%, respectively 48.07%) and the index of ratio is 1.04 (Fig. 5).

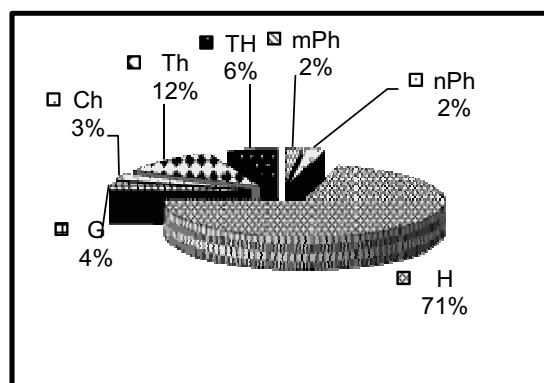


Figure 2. Bioforms of the association *Telekietum speciosae* TREG. 1941. / Figura 2. Bioformele asociației *Telekietum speciosae* TREG. 1941.

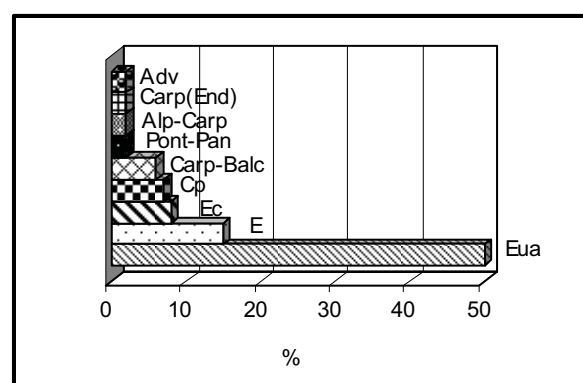


Figure 3. Geoelements of the association *Telekietum speciosae* TREG. 1941. / Figura 3. Geoelementele asociației *Telekietum speciosae* TREG. 1941.

Senecio sylvatici – *Epilobietum angustifolii* (HUECK 1931) TX. 1950

The recent clearings and windfalls produced in Leaota Massif (Albescu, Tâncava Mountains) induced the installation, for a short time, of the forest weeds belonging to the phytocoenosis of *Senecio* – *Epilobietum angustifolii* association. The soil richness in nutritive substances from both forest litter and remains from forestry exploitations represents an important factor for the installation of large-sized herbaceous species (*Epilobium angustifolium*, *Calamagrostis arundinacea*, *Senecio ovatus*). These species form tall thickets simultaneously with some pioneer ligneous species like *Betula pendula*, *Sambucus racemosa*, *Salix silesiaca*.

At the shelter of these species, there develop herbaceous and ligneous plants from the former forest, which belong to the Fagetalia order: *Luzula luzuloides*, *Mycelis muralis*, *Dryopteris filix-mas*, *Geranium robertianum*. The dominant species is *Epilobium angustifolium*, which registers a large coverage (40%), but there participates elements characteristic to Epilobion angustifolii alliance (*Gnaphalium sylvaticum*, *Galeopsis speciosa*, *Calamagrostis arundinacea*) and to Atropetalia order (*Betula pendula*, *Fragaria vesca*, *Rubus idaeus*) (Table 1).

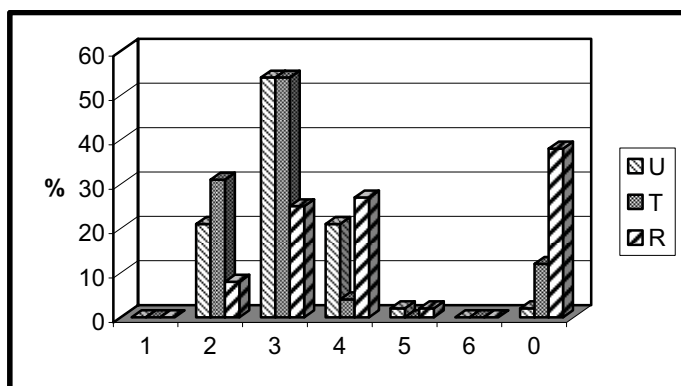


Figure 4. Ecological indexes of the association *Telekietum speciosae* TREG. 1941. / Figura 4. Indicii ecologici ai asociației *Telekietum speciosae* TREG. 1941.

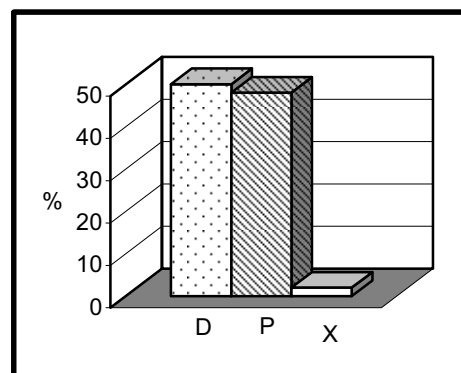


Figure 5. Caryologic indexes of the association *Telekietum speciosae* TREG. 1941. / Figura 5. Indicii cariologici ai asociației *Telekietum speciosae* TREG. 1941.

The species from Sambuco-Salicion alliance participate in the floristic composition, which emphasizes the direction of evolution of these coenoses to those of the *Sambucetum racemosae* association.

After the analysis of the surveys, we noticed the following: the bioforms spectrum emphasizes the dominance of the hemicryptophytes (54.14%), accompanied by phanerophytes (17.66%), terophytes (11.9%), and geophytes (9.52%) (Fig. 6).

The Eurasian elements register the highest percentage (38.08%) in the floristic spectrum, followed by the European (23.8%), Circumpolar (16.66%), Cosmopolite (9.52%), and Central - European species (7.14%) (Fig. 7).

The ecological spectrum reflects the high percentage of mesophilous species (59.52%) and regarding the temperature, the most numerous are microtherm (30.95%) and micro-mesotherm (59.52%). Almost 60.97% of the species in these phytocoenoses are acid-neutrophilous from the reaction of the soil and over 26% are amphy-tolerant (Fig. 8).

The polyploids (60.97%) are more aggressive in the phytocoenotic competition than the diploids (39.02%) and dominate the caryological spectrum. The index of the ratio is 0.64 (Fig. 9).

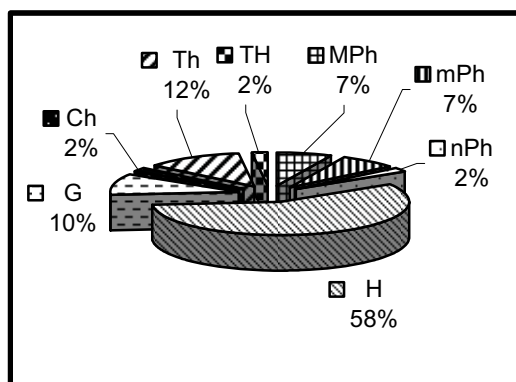


Figure 6. Analysis of the bioforms from *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950. / Figura 6. Analiza bioformelor asociației *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950.

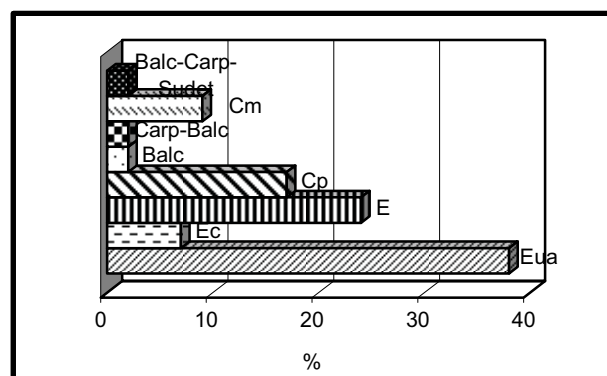


Figure 7. Geoelement analysis of the association *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950. / Figura 7. Analiza geoelementelor asociației *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950.

***Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967**

We identified this association on the Andolia and Bădeni Valleys where it forms fragmentary phytocoenoses, like a strips on the semi-shaded slopes. *Sambucus racemosa* and *Salix caprea* are the main edifying species of this group; beside these, others species from Sambuco-Salicion, Epilobion angustifolii (*Calamagrostis arundinacea*, *Sorbus aucuparia*, *Gnaphalium sylvaticum*), and Atropion (*Epilobium angustifolium*, *Rubus idaeus*, *Bromus benekeni*) participate in the structure of the floristic composition.

These phytocoenoses vegetate on moist soils, rich in nutritive substances from the beech forests, the proof being the penetration of certain elements characteristic to them. Some of the species present a high constancy as part of the analysed surveys: *Urtica dioica*, *Spiraea chamaedrifolia*, *Populus tremula*, *Veronica urticifolia*, *Prunella vulgaris* (Table 1).

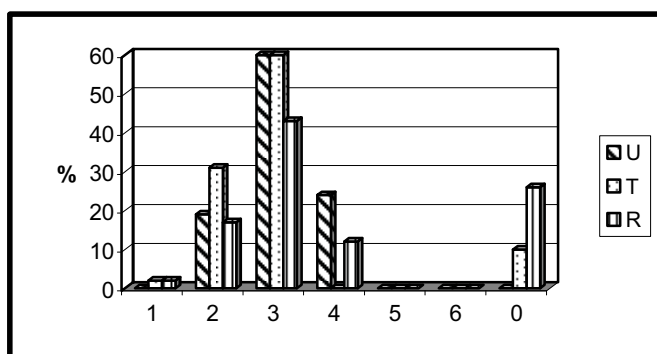


Figure 8. Ecological indexes of the *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950. / Figura 8. Indicii ecologici ai asociației *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950.

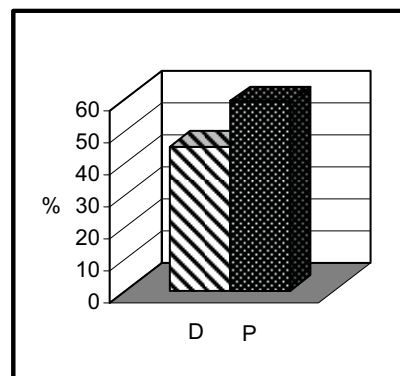


Figure 9. Caryological analysis of the *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950. / Figura 9. Analiza cariologică a asociației *Senecio - Epilobietum angustifolii* (HUECK 1931) TX. 1950.

The spectrum of the bioforms emphasizes a frequency of about 47.72% of the hemicryptophytes, 31.81% of the phanerophytes, while the others life forms have a reduced weight (Fig. 10).

The Eurasian 34.09%, European (22.72%), Central-European (13.63%), and Circumpolar (13.63%) species (Fig. 11) form the basic fund of the floristic elements.

With regard to the ecological preferences, these coenoses are mesophilous (61.3%), mesotherm (47.7%), and micro-mesotherm (43.18%) and in terms of soil reaction, they are acidophilous (25%) and acid neutrophilous (31.8%) (Fig. 12). The polyploids and diploids present closed frequencies 54.54%, respectively 45.4%, and the index of ratio is 0.833 (Fig. 13).

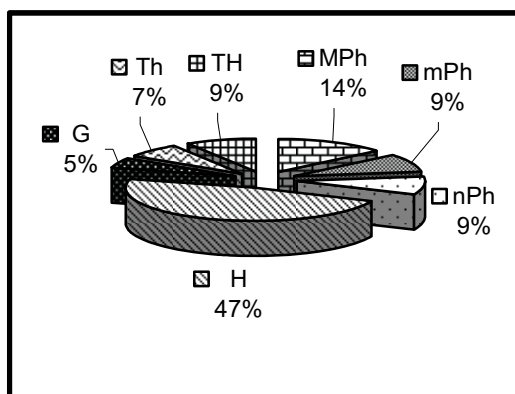


Figure 10. Spectrum of the bioforms from *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967. / Figura 10. Spectrul bioformelor asociației *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967.

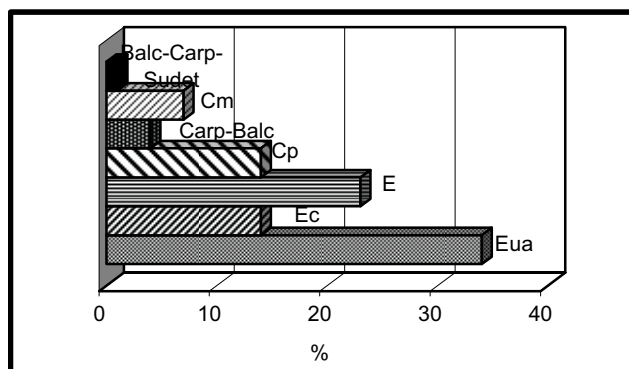


Figure 11. Spectrum of the floristic elements from *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967. / Figura 11. Spectrul elementelor floristice ale asociației *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967.

Rubetum idaei GAMS 1927

The raspberry bushes installed on the cleared lands (lower mountainous belt), sunny slopes, along the valleys, in stations with moderate humidity and east, northeast exposition. These phytocoenoses have been identified on the Marginea Domnească Valley.

The characteristic species is *Rubus idaeus*, which realizes a coverage of about 65%; there are also present species from *Epilobion angustifolii* (*Calamagrotis arundinacea*, *Gnaphalium sylvaticum*, *Galeopsis speciosa*) and *Sambuco-Salicion* alliances (*Salix caprea*, *Rubus hirtus*, *Sambucus racemosa*, *Salix silesiaca*) (Table 1).

These groups come into contact with beech phytocoenoses, which determine the presence of certain floristic elements from *Fagetalia* order (*Luzula luzuloides*, *Mycelis muralis*, *Geranium robertianum*, *Corylus avellana*, *Athyrium filix-femina*).

This territory belongs to the temperate climate, situation also confirmed by the presence of hemicryptophytes (56.25%); there develop also phanerophytes (31.24%), terophytes (6.25%), camephytes and geophytes (6.24%) (Fig. 14).

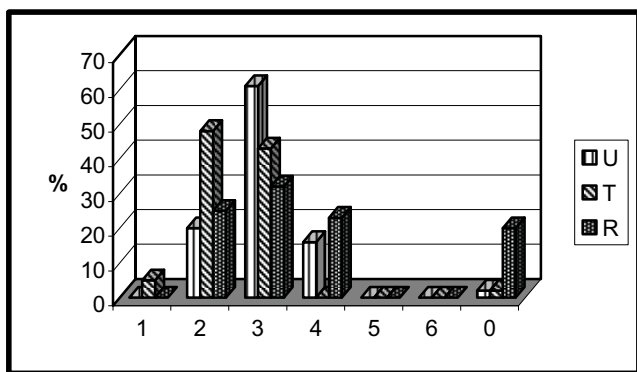


Figure 12. Ecological spectrum of *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967. / Figura 12. Spectrul ecologic al asociației *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967.

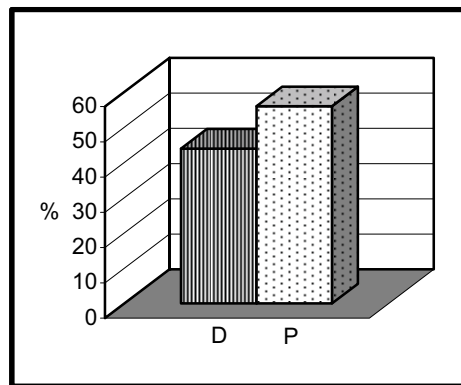


Figure 13. Caryological indexes of *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967. / Figura 13. Indicii cariologici ai asociației *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967.

Concerning the phytogeographical elements, the main components of the studied phytocoenoses are Eurasian (31.25%), European (21.87%), Circumpolar (21.87%), and Central-European (12.5%) (Fig.15).

The edapho-climatic conditions of this association favoured the development of the mesophilic (65.62%), mesohygrophilic (21.87%), micro-mesothermal (53.12%), microthermal (40.62%) and acid-neutrophil (43.75%) species (Fig. 16).

With regard to the caryological distribution, polyploids form 65.62% and diploids 34.37% of the cormophytes. The index of the ratio is 0.60 (Fig. 17).

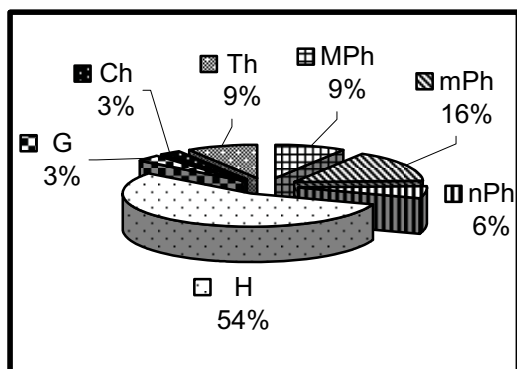


Figure 14. Bioforms of the *Rubetum idaei* GAMS 1927. / Figura 14. Bioformele asociației *Rubetum idaei* GAMS 1927.

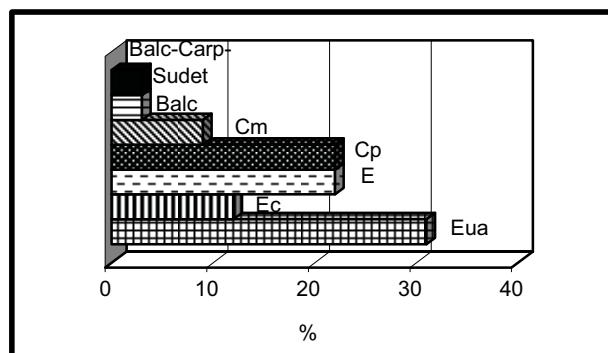


Figure 15. Geoelements of the *Rubetum idaei* GAMS 1927. / Figura 15. Geoelementele asociației *Rubetum idaei* GAMS 1927.

Analyzing the dendrograms of the associations of Epilobietea class, it can be observed that the *Senecio-Epilobietum* association presents a high degree of similitude with *Rubetum idaei*, with a value of Jaccard index-over 0.45. (Fig. 18).

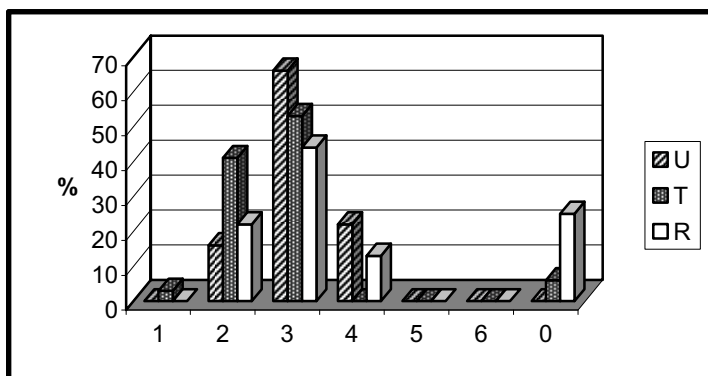


Figure 16. Ecological indexes of *Rubetum idaei* GAMS 1927. / Figura 16. Indicii ecologice ai asociației *Rubetum idaei* GAMS 1927.

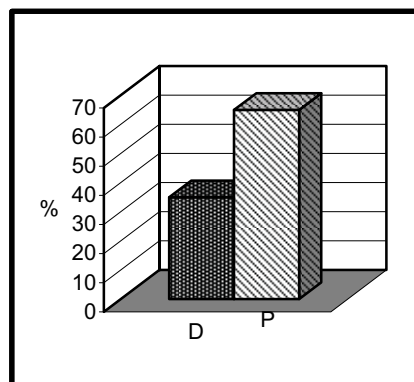


Figure 17. Caryologic indexes of *R. idaei* GAMS 1927. / Figura 17. Indicii cariologici ai asociației *R. idaei* GAMS 1927.

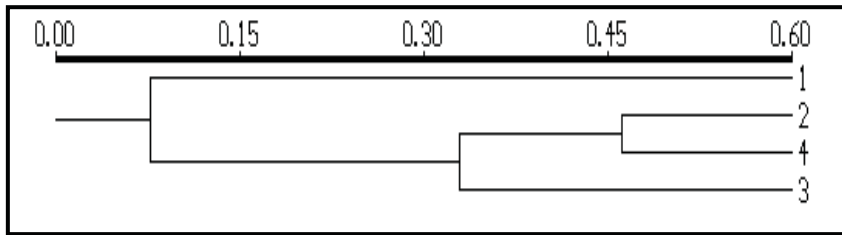


Figure 18. Dendrogram of the associations of *Epilobietea angustifolii* Tx. et Preising in R. Tx. 1950 class.

Figura 18. Dendrograma asociațiilor clasei *Epilobietea angustifolii* Tx. et Preising in R. Tx. 1950.

Legend: 1 – *Telekietum speciosae*; 2 – *Senecio sylvatici-Epilobietum*; 3 – *Sambucetum racemosae*; 4 – *Rubetum idaei*.

These groupings are serial coenoses, which developed after the destruction of the forests (especially beech and fir forests). Their floristic composition is relatively similar, representing primary stages of the normal succession to beech forests. Their reduced similarity with coenoses edified by *Sambucus racemosa* is explained by the fact the latter are installed secondary, after the cutting of the forest, but only after the early stage of succession.

The *Telekietum speciosae* is an association developed at the skirt of the forest, which vegetates in the shaded stations with moderate humidity comparatively with others plant groups of *Epilobietea* class, installed on the sunny slopes, which explains their low similarity.

Table 1. Plant associations of *Epilobietea angustifolii* Tx. et Preising in R. Tx. 1950 class.
Tabel 1. Asociații vegetale din clasa *Epilobietea angustifolii* Tx. et Preising in R. Tx. 1950.

Plant association	1	2	3	4
Number of surveys	7	6	5	5
Altitude (m)	900-1,000	900-950	900	1,100
Char. ass.				
<i>Epilobium angustifolium</i>	V	V	IV	-
<i>Senecio ovatus</i>	V	V	-	-
<i>Sambucus racemosa</i>	IV	V	II	-
<i>Rubus idaeus</i>	IV	III	V	III
<i>Telekia speciosa</i>	-	-	-	V
Epilobion angustifolii				
<i>Calamagrostis arundinacea</i>	III	III	II	-
<i>Galeopsis speciosa</i>	III	II	II	II
<i>Gnaphalium sylvaticum</i>	II	III	-	II
<i>Sorbus aucuparia</i>	-	III	-	-
Sambuco-Salicion				
<i>Salix caprea</i>	-	V	III	-
<i>Rubus hirtus</i>	-	IV	III	-
Atropion et Atropetalia				
<i>Hypericum hirsutum</i>	-	I	-	-
<i>Salix silesiaca</i>	II	II	II	I
<i>Sambucus ebulus</i>	-	-	II	-
<i>Stachys sylvatica</i>	-	-	II	-
<i>Betula pendula</i>	II	II	-	-
<i>Bromus benekenii</i>	-	III	-	-
<i>Fragaria vesca</i>	-	II	V	III
<i>Verbascum thapsus</i>	-	I	-	-
Adenostyilion				
<i>Doronicum austriacum</i>	II	-	-	-
<i>Stellaria nemorum</i>	III	-	II	-
<i>Thalictrum aquilegifolium</i>	-	-	-	II
<i>Heracleum sphondylium</i>	-	-	-	II
Fagetalia				
<i>Luzula luzuloides</i>	III	IV	II	-
<i>Dryopteris filix-mas</i>	III	-	-	-
<i>Geranium robertianum</i>	III	-	-	III
<i>Mycelis muralis</i>	III	III	II	-
<i>Corylus avellana</i>	II	-	II	-
<i>Serophularia nodosa</i>	II	-	-	II
<i>Galium odoratum</i>	II	-	-	-
<i>Salvia glutinosa</i>	II	V	-	II
<i>Pulmonaria rubra</i>	II	-	-	-
<i>Myosotis sylvatica</i>	III	I	II	-
<i>Oxalis acetosella</i>	-	III	II	-
<i>Veronica urticifolia</i>	-	III	-	-
<i>Fagus sylvatica</i>	-	III	-	-
<i>Athyrium filix-femina</i>	-	III	II	-
<i>Luzula sylvatica</i>	-	II	-	-
<i>Digitalis grandiflora</i>	-	I	-	II

<i>Torilis japonica</i>	-	-	-	II
Variae syntaxa				
<i>Urtica dioica</i>	V	V	III	II
<i>Spiraea chamaedrifolia</i>	-	IV	-	-
<i>Populus tremula</i>	-	III	-	-
<i>Picea abies</i>	-	III	-	-
<i>Poa nemoralis</i>	III	-	II	-
<i>Veronica officinalis</i>	III	-	II	-
<i>Deschampsia flexuosa</i>	III	-	-	-
<i>Deschampsia caespitosa</i>	III	-	II	-
<i>Impatiens noli-tangere</i>	III	-	-	-
<i>Prunella vulgaris</i>	-	III	-	-
<i>Valeriana officinalis</i>	-	II	-	I
<i>Rosa pendulina</i>	-	II	-	-
<i>Cirsium decussatum</i>	-	II	-	-
<i>Trifolium medium</i>	-	II	-	II
<i>Polypodium vulgare</i>	-	II	-	-
<i>Carpinus betulus</i>	III	-	II	-
<i>Veronica chamaedrys</i>	III	-	-	-
<i>Galium schultesii</i>	III	-	-	-
<i>Campanula persicifolia</i>	II	-	-	I
<i>Carex ovalis</i>	II	-	-	-
<i>Festuca drymeia</i>	II	I	-	-
<i>Galeopsis tetrahit</i>	II	II	-	-
<i>Taraxacum officinale</i>	II	-	-	-
<i>Gentiana acslepiadea</i>	I	II	II	-
<i>Hypericum maculatum</i>	I	-	-	IV
<i>Acer pseudoplatanus</i>	I	II	II	-
<i>Campanula patula</i> ssp. <i>abietina</i>	I	I	-	-
<i>Lapsana communis</i>	I	-	-	-
<i>Alnus incana</i>	-	I	-	-
<i>Silene heuffelii</i>	-	I	-	-
<i>Athyrium distentifolium</i>	-	I	-	-
<i>Solidago virgaurea</i>	-	-	II	-
<i>Centaurea phrygia</i> ssp. <i>pseudophrygia</i>	-	-	-	III
<i>Rumex sanguineus</i>	-	-	-	III
<i>Erigeron annuus</i>	-	-	-	III
<i>Aegopodium podagraria</i>	-	-	-	III
<i>Lotus corniculatus</i>	-	-	-	III
<i>Ranunculus repens</i>	-	-	-	III
<i>Circaea lutetiana</i>	-	-	-	III
<i>Lysimachia nummularia</i>	-	-	-	III
<i>Lysimachia vulgaris</i>	-	-	-	II
<i>Cirsium arvense</i>	-	-	-	II
<i>Dactylis glomerata</i>	-	-	-	II
<i>Leucanthemum vulgare</i>	-	-	-	II
<i>Astragalus glycyphyllos</i>	-	-	-	II
<i>Campanula rapunculoides</i>	-	-	-	II
<i>Salvia verticillata</i>	-	-	-	II
<i>Rhinanthus rumelicus</i>	-	-	-	II
<i>Clinopodium vulgare</i>	-	-	-	II
<i>Mentha longifolia</i>	-	-	-	II
<i>Geranium pratense</i>	-	-	-	II
<i>Ajuga reptans</i>	-	-	-	II
<i>Campanula patula</i>	-	-	-	II
<i>Origanum vulgare</i>	-	-	-	II
<i>Filipendula ulmaria</i>	-	-	-	II
<i>Arctium lappa</i>	-	-	-	I
<i>Verbascum phlomoides</i>	-	-	-	I
<i>Vicia sylvatica</i>	-	-	-	I
<i>Galium aparine</i>	-	-	-	I
<i>Achillea distans</i>	-	-	-	I
<i>Knautia arvensis</i>	-	-	-	I
<i>Alchemilla xanthochlora</i>	-	-	-	I
<i>Carex spicata</i>	-	-	-	I
1 – <i>Senecio sylvatici</i> – <i>Epilobietum angustifolii</i> (HUECK 1931) TX. 1950				
2 – <i>Sambucetum racemosae</i> (NOIRF. 1944) OBERD. 1967				
3 – <i>Rubetum idaei</i> GAMS 1927				
4 – <i>Telekietum speciosae</i> TREGUBOV 1941				

CONCLUSIONS

Vegetation research made in Leaota Massif allowed us the identification of four plant associations, which belong to *Epilobietea angustifolii* class: *Telekietum speciosae* TREGUBOV 1941, *Senecio sylvatici – Epilobietum angustifolii* (HUECK 1931) TX. 1950, *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967 and *Rubetum idaei* GAMS 1927. These plant associations have been mentioned for the first time within this territory.

Most of the bioforms are represented by hemicryptophytes;

The basic fund of the geoelements is formed by Eurasian, European, and Central-European species;

With regard to the distribution of species according to the ecological indexes (humidity, temperature, and soil reaction), we can draw the following conclusions: in *Telekietum speciosae* TREGUBOV 1941 the best represented are the mesophilic, micro-mesotherm and euryionic species; the coenoses from *Senecio sylvatici – Epilobietum angustifolii* (HUECK 1931) TX. 1950 have a mesophilic, micro-mesotherm and acid neutrophil character; in *Sambucetum racemosae* (NOIRF. 1944) OBERD. 1967) the best represented are the mesophilous, mesotherm and acid neutrophil species; in *Rubetum idaei* GAMS 1927, the preferences of the species concerning these indexes are mesophilic, micro-mesothermal and acid-neutrophil.

The caryological spectrum reveals that the polyploids are more numerous than the diploids.

REFERENCES

- ALEXIU V. 1998. *Vegetația Masivului Iezer-Păpușa*. Edit. Cultura Pitești. 362 pp.
- BARKMAN J. J., MORAVEÇ J., RAUSCHERT S. 1986. *Code der Pflanzensoziologischen Nomenklatur*. Vegetatio. Upsala. **67**(3): 145-195.
- BĂRBULESCU C., BURCEA P., MOTCĂ GH., BĂRBULESCU VIORICA, BĂRSAN A. 1978. *Cercetări privind studiul vegetației pajiștilor din Masivul Leaota*. Lucrări Științifice I.C.P.C.P. Măgurele-Brașov. București. **4**: 3-19.
- BĂRBULESCU C., MOTCĂ GH., BURCEA P. 1985. *Pajiștile din Masivul Leaota*. Lucrări Științifice I.C.P.C.P. Măgurele-Brașov. București. **10**: 203-213.
- COLDEA GH. 1991. *Prodrome des associations végétales des Carpates du sud-est (Carpates Roumaines)*. Documents Phytosociologiques. Camerino. **13**: 317-539.
- DIACONESCU FLORIȚA. 1973. *Aspecte din vegetația Masivului Leaota I*. Anale Universitatea „Al. I. Cuza”. Secț. II. Biologie. Iași. **19**: 465-474.
- POPESCU A. & SANDA V. 1993. *Caracterizarea unităților de vegetație din masivele Bucegi și Leaota (I)*. Studii și cercetări de Biologie. Seria Biologie vegetală. București. **45**(2): 193-206.
- SANDA V. & POPESCU A. 1995. *Caracterizarea unităților de vegetație din masivele Bucegi și Leaota (II)*. Studii și cercetări de Biologie. Seria Biologie vegetală. București. **47**(2): 103-118.
- SANDA V., POPESCU A., STANCU DANIELA ILEANA. 2001. *Structura cenotică și caracterizarea ecologică a fitocenozelor din România*. Edit. Conphis. București. 359 pp.
- SĂMĂRGIȚAN MIHAELA. 2005. *Flora și vegetația Văii Gurghiului*. University Press. Târgu-Mureș. 510 pp.
- WEBER H. E., MORAVEC J., THEURILLAT J. P. 2000. *International Code of Phytosociological Nomenclature*. Journal of Vegetable Science. London. **11**: 739-768.
- ***. 1952-1976. *Flora R.P.R. - R.S.R.*. I-XIII. Edit. Academieii. București.
- ***. <http://www.clubulnostru.org/> (accessed: April 25, 2010).

Neblea Monica

University of Pitești, Faculty of Sciences,
Valley Fair Street, 1, 110040, Pitești, România
E-mail: monica_neblea@yahoo.com

Received: May 2, 2010
Accepted: June 24, 2010