

**DESCRIPTION OF *TILIA TOMENTOSAE-CARPINETUM BETULI* ASSOCIATION  
FROM LĂZĂRENI HILLS (NORTHWESTERN ROMANIA)****Lacatoș (Herman) Laura Mariana\***

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**Abstract**

This paper aims to describe *Tilia tomentosae-Carpinetum betuli* association. Knowledge of its structure, distribution in time and space is a desideratum that is required more and more in the sustainable development of human area and society. The scientific newness lies in approaching a habitat that wasn't explored and in the result achieved, which involved the identification and the characterization of some endemic species and associations (*Ruscus aculeatus*, *Cephalanthera longifolia*).

**Key words:** surveys, association, phytocoenosis, ecological factors, floristic elements, life forms.

**INTRODUCTION**

This association is represented by forests, representing the largest vegetable formation from Lăzăreni Hills. They are located in the western Romania, in south central part of Bihor County, between Crișul Repede River to north and Crișul Negru River to south. Pop, Gr., (2005), (Fig.1).

In the research-documentation of this paper, was used information taken from the site, from specialty papers. Among the specialty works, we should note those about the climate regime Dragotă, C., (2006), relief Posea, Gr., (1997), soils Sabău, N., Domuța, C., Berchez, O., (2002) etc.



Fig. 1 Geographical location map of Lăzăreni Hills  
Adaptation after Gr. Pop (2005)

**MATERIALS AND METHODS**

The projection of this vegetation study, realized in Lăzăreni Hills was based on own researches, observations and notes made on site during the years 2008-2010. After 72

field works, the botanical material was collected for the herbarium, totalizing a number of 384 species.

Taxons identified on site were harvested on plates and arranged in the herbarium. Taxons were identified based on specialty determiners from the volumes „Flora ilustrată a României” by V. Ciocârlan (1988,1990) and of International Code of Botanical Nomenclature (Code de Tokyo, 1993) etc.

In parallel with the collection of the material for herbarium the specialty literature was studied, both the general one and that which directly refers to the habitat studied. Pop, I., (1967), Pop, I., (1968), Mohan, Gh., Ardelean, A., Georgescu, M., (1993), Ardelean A., (1999), Burescu P., Cheregi V., (2002), Burescu P., Doniță N., Burescu L.,(2002), etc.

To the particularities of vegetation carpet from our country, we used the phytosociological research method of the European Central School, based on the principles and methods elaborated by J. Braun-Blanquet (1964) and adapted by A. Borza, N. Boșcaiu (1965).

Sample surfaces (Fig. 2), homogeneous from florist and physiognomical point of view were chosen from the phytocoenosis of lime arbors with yoke elm, with the size of 400 m<sup>2</sup>.



Fig. 2 *Tilia tomentosae-Carpinetum betuli*, Doniță 1968

The summary table (Table 1) includes information about the species entering in the flora composition of the association, the biological form, the flora element, ecological factors (humidity, temperature, chemical reaction of soil), the order number of the survey, the altitude (m.s.m.), exposition, tilt, herbaceous layer cover (%) and the surface (m<sup>2</sup>). At the bottom of the table was registered the locality where it was met and the date of surveys.

Participation of each species to the association table was made with the help of the index of abundance–dominance after the evaluation system of J. Braun-Blanquet and J. Pavillard (1928). To the end of the table was registered and calculated the constancy (K), the phytocenotical index whose class is between I-V and expresses the coenetic fidelity degree of each species to the ambiance of the association's phytocoenoses.

For ordering and grouping the species in the association table, to superior cenotaxons, sub-alliance, alliance, order and class were considered the traditional ecological and floral systems of the authors Braun-Blanquet, J., (1964), Braun-Blanquet, J., Pavillard, J., (1928), Tüxen, R., (1955), ElleMBERG H., (1974), Soó, R., (1964-1980) and also the works recently appeared belonging to the signatories of the authors Täuber, F., (1992), Mucina L., Grabherr G., Ellmaner T., (1993), Pott R., (1995), Borhidi A., (1996), Oprea, A., (2005) etc. From the 32 surveys made, 10 were selected, being grouped in an association table.

## RESULTS AND DISCUSSIONS

In order to register the phytocenological and ecological study of the association *Tilia tomentosae-Carpinetum betuli*, we graphically represented, in the form of spectra, the repartition of biological forms, floral elements and ecological factors in phytocoenosis analyzed.

This association can be seen under the form of small islands in the area of the forests from Querco-Fagetea class. In this association, are mostly grouped mesohydrophilic phytocoenosis, frequently common in the hills area and on the plateau from the south-eastern Romania. Soils are brown, rarely brown acid, with clay and sandy texture.

From the life forms spectrum (Fig.3) it results the dominance of hemicryptophytes (48.7%), followed by megaphanerophytes (18.7%), which are almost equal to geophytes (17.5%).

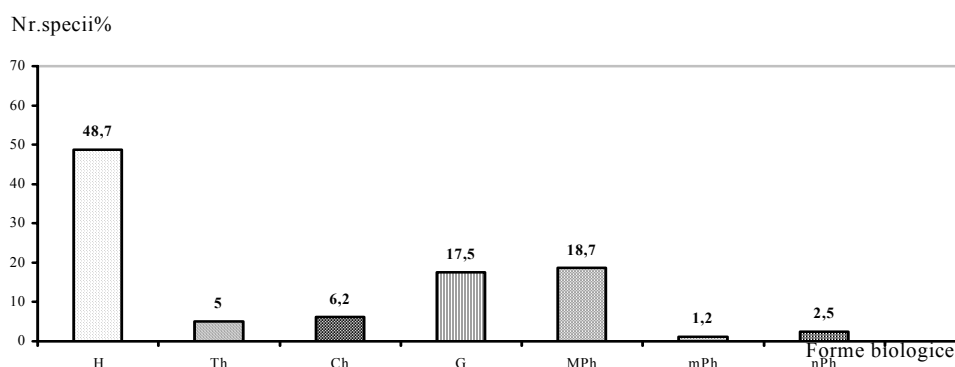


Fig.3. Life forms spectrum of the association *Tilia tomentosae-Carpinetum betuli* from Lăzăreni Hills, we have: H=hemicryptophytes; Th=therophytes; Ch=camephytes; G=geophytes; MPh=megaphanerophytes; mPh=mesophanerophytes; nPh=nanophanerophytes.

Floristic elements spectrum (Fig. 4), highlights the remarkable weight of European species (35%), in regard to Euro-Asiatic species (31.2%).

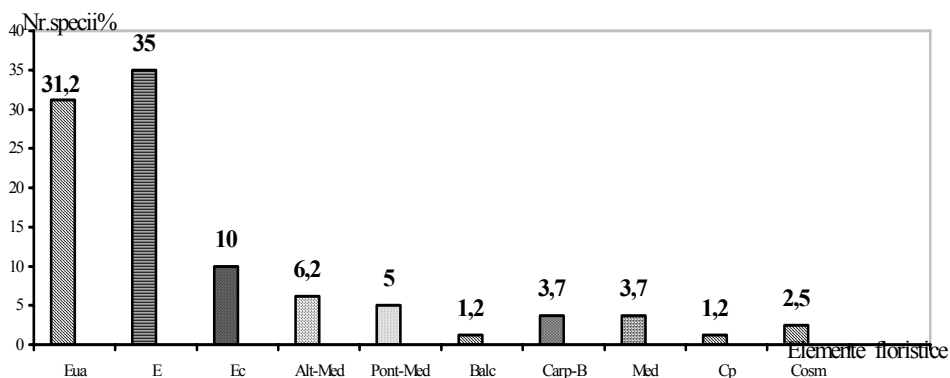


Fig.4. Floristic elements spectrum of *Tilia tomentosae-Carpinetum betuli*-association—from Lăzăreni Hills, we have: Eua=Euro-Asiatic; E=European; Ec=Central European; Alt-Med=Atlantic-Mediterranean; Pont-Med=Ponto-Mediterranean; Balc=Balkan; Carp-B=Carpathian-Balkan; Med=Mediterranean; Cp=Circumpolars; Cosm=Cosmopolitans.

The phytocoenosis analysis under the aspect of main ecological factors (Fig. 5) highlights the predominance of mesophyle species (38.7%) and of xero-mesophyle species (26.2%). The temperature is highlighted by micro-mesothermal plants (65%), and chemical reaction of neutrophile-acid (40%) and weakly neutrophile-acid (37.5%).

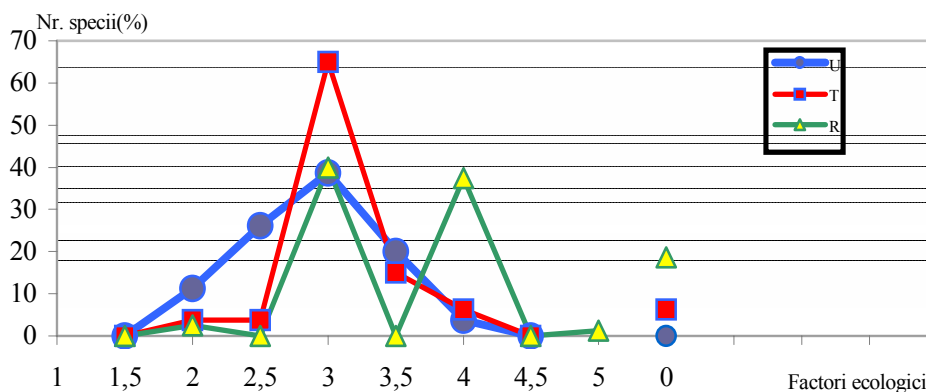


Fig. 5 Ecological factors spectrum of the association *Tilia tomentosae-Carpinetum betuli* from Lăzăreni Hills, we have: U=humidity; T=temperature; R= chemical reaction of soil.

The importance of the association *Tilia tomentosae-Carpinetum betuli* is given by the presence, in the undergrowth layer, of the evergreen frutex *Ruscus aculeatus* (Fig. 6). Popularly called “Bur”, it is declared a natural monument and it is protected by law.

In our country, it is located on the rocky and dried coasts in the underwood from Oltenia and Banat, sporadic in the western Transylvania, Dobrogea (Niculițel Forest, Mangalia, above the thermal baths), Muntenia Plain. In the work „Rezervații și monumente ale naturii din România” of Mohan, Gh., Ardelean, A., Georgescu, M., (1993), it is mentioned, with other rare and endemic species, in reservations from Valea Mare (Caraș-Severin county) and Comana Forest (Giurgiu county).

In this association, in the herbaceous layer, we also see a beautiful forest orchid *Cephalanthera longifolia* (Fig.7) rare, on the red list, which is protected by law, too.



Fig.6 *Ruscus aculeatus* L. - on Betfia Valley-Betfia locality



Fig. 7 *Cephalanthera longifolia* L. - near the observer, on Betfia Valley-Betfia locality.

Because to the warmer climate, *Ruscus aculeatus* Mediterranean plant, is also presented in Lăzăreni Hills, on coasts, abrupt and sunny slopes (under Șomleu Hill, Betfia Forest, Cordău Forest, Hidișel Hills, Boboștea Micănear Șauaieiu, Poiana Tășad Forrest).

The proportion and the distribution of *Ruscus aculeatus* frutex varies from a lot to another, having an uniform distribution, in small groups up to isolated ones.

After the study of the vegetation form Lăzăreni Hills were identified a series of issues, showing a high degree of endangerment of flora and vegetation from this area. In order to prevent the degradation and the reduction of natural surface, are required some proposals and suggestions:

- to large the area of Natura 2000 Site from Betfiei Hills;
- to establish some natural reservations which include the habitat of woody species *Ruscus aculeatus* (forests from 1 Mai, Betfia, Copăcel, Cordău and in inslands, the forests from Șumugiu, etc.);
- to introduce some legislative measures in order to transform the forestries from production units and forestry exploitation in protection units;
- to co-inters local authorities and citizens in various actions in order to protect flora and vegetation from Lăzăreni Hills;

## CONCLUSIONS

- Human impact on vegetation from this space took various types and forms, among which stands out: burning of vegetation, overgrazing, deforestation and not at least air and waters pollution.
- The result of human impact is that a large number of species, some of them having endemic value, disappeared or will disappear.
- Among floral species endangered to disappear, from Lăzăreni Hills, we mention: *Ruscus aculeatus*, *Poa megetum crispus*, *Ranunculus aquatilis*, *Cephalanthera longifolia*, *Cephalanthera damasonium*, *Plathanthera bifolia*, *Orhis morio*, *Cyperus fuscus*, *Cyperus flavescens*, *Echinochloa cru-gali*, *Najas minor*, etc.

Table 1

As. *Tilia tomentosae-Carpinetum betuli* Doniță 1968

L.f.	F.e.	U.	T.	Cr.	Nr. Land Surveys	1	2	3	4	5	6	7	8	9	10	K
					Altitude (m.s.m.)	80	90	60	80	100	60	95	110	80	70	
					Exposition	NE	V	SV	V	NV	NV	N	NV	S	NE	
					Slope	10	15	8	10	14	8	25	2	4	20	
					Surface (m <sup>2</sup> )	95	80	90	90	90	85	95	100	95	90	
					Coverage (%)	400	400	400	400	400	400	400	400	400	400	
MPh	Balc	2.5	3.5	3	<i>Tilia tomentosa</i>	4	5	4	5	5	4	5	4	5	4	V
MPh	E	3	3	3	<i>Carpinus betulus</i>	2	1	2	1	1	2	1	1	1	2	V
<b>Quercion frainetto</b>																
G	Atl-Med	2.5	4	2	<i>Ruscus aculeatus</i>	+	1	2	3	3	4	4	5	3	4	V
H	Pont-Med	3	4	3	<i>Lathyrus venetus</i>	+	+	.	+	+	+	.	.	+	+	IV
MPh	Carp-B	2.5	2.5	0	<i>Quercus polycarpa</i>	.	.	+	+	+	.	+	.	+	.	III
G	Atl-Med	3	3.5	4	<i>Tamus communis</i>	+	+	.	.	+	+	.	+	+	.	III
Ch	Carp-B	2.5	3	3	<i>Genista ovata</i>	.	.	+	+	+	.	+	+	.	.	III
H	Med	2.5	3.5	3	<i>Potentilla micrantha</i>	.	.	+	+	+	.	.	.	+	+	III
<b>Fraxino orni-Cotinetalia; Quercetea pubescenti-petraeae</b>																
G	Eua(Med)	2	3	4	<i>Polygonatum odoratum</i>	+	+	+	.	+	+	+	+	+	+	V
H	E	2.5	3	4	<i>Melica uniflora</i>	.	1	1	+	+	1	1	2	+	+	V
H	Ec	2.5	3	3	<i>Lathyrus niger</i>	+	.	+	+	.	+	+	+	+	.	IV
H	Ec	2.5	3	5	<i>Melittis melissophyllum</i>	+	+	.	+	+	.	.	.	+	+	IV
MPh	Pont-Med	2	3.5	4	<i>Cornus mas</i>	+	+	+	+	+	.	+	+	+	+	IV
MPh	E	2.5	3	4	<i>Sorbus torminalis</i>	+	.	+	.	+	+	+	+	+	.	IV
H	Eua	3	3	0	<i>Poa nemoralis</i>	+	+	+	.	+	+	.	+	+	+	IV
G	E(Med)	2.5	3	4	<i>Cephalanthera damasonium</i>	.	.	+	+	+	+	+	+	.	+	IV
H	E(Med)	2	4	4	<i>Vincetoxicum hirsutinaria</i>	+	+	.	+	.	+	+	+	+	+	IV
Ch	Pont-Med	2	3.5	4	<i>Teucrium chamaedris</i>	+	+	.	.	+	+	+	.	.	+	III
H	Eua	2	3	4	<i>Viola hirta</i>	.	+	+	.	+	.	+	+	.	.	III
MPh	E(Med)	2.5	3	3	<i>Ligustrum vulgare</i>	+	+	.	.	+	+	.	+	+	+	III
H	Ec	2	3	4	<i>Carex michelii</i>	.	.	.	+	+	.	.	+	+	+	II
MPh	Pont-Med	2	3.5	3	<i>Quercus cerris</i>	.	.	.	.	+	.	.	+	.	.	I
<b>Quercio-Fagetea</b>																
G	E	3.5	3.5	4	<i>Allium ursinum</i>	1	2	+	2	3	+	+	1	1	2	V
G	Carp-B	4	2	3	<i>Festuca drymeja</i>	1	2	3	4	2	3	3	4	+	+	V
H	Ec	2.5	3	3	<i>Dactylis polygama</i>	+	+	+	.	+	+	.	+	+	+	IV
H	Eua	3	3	3	<i>Lathyrus vernus</i>	+	+	+	+	.	+	+	.	+	.	IV
G	E	2.5	3	3	<i>Convallaria majalis</i>	.	+	+	+	+	.	.	+	+	1	IV

MPh	E	3	3	3	<i>Eunymus europaeus</i>	.	+	+	+	.	+	+	.	+	+	IV
H	Ec	3	0	4	<i>Lamium galeobdolon</i>	.	1	1	+	+	+	+	+	+	.	IV
H	E	3.5	3	4	<i>Carex sylvatica</i>	+	+	.	+	+	.	+	+	.	+	IV
H	Ec	3	2.5	3	<i>Aposeris foetida</i>	.	+	+	+	+	+	+	+	+	.	IV
mPh	E	2.5	3	3	<i>Crataegus monogyna</i>	+	+	.	.	+	+	+	+	.	+	IV
nPh	Atl-Med	3	3	3	<i>Hedera helix</i>	+	+	.	+	+	.	+	+	+	+	IV
G	Eua	3.5	3	4	<i>Circaea lutetiana</i>	+	.	.	+	+	.	+	+	+	.	IV
MPh	Eua	3	3	3	<i>Acer platanoides</i>	+	.	.	+	+	+	+	+	+	+	IV
Ch	E	3	3.5	4	<i>Euphorbia amygdaloides</i>	+	+	+	+	.	.	+	+	.	+	IV
H	Eua	2.5	3	3	<i>Carex pillosa</i>	.	1	1	2	+	+	+	2	3	.	IV
G	E	3.5	4	0	<i>Anemone nemorosa</i>	+	+	+	+	.	.	+	+	+	+	IV
G	Eua	3	3	3	<i>Galium odoratum</i>	.	.	+	+	+	+	.	.	1	2	IV
Ch	Med	3	3	3	<i>Vinca minor</i>	1	2	.	1	.	2	3	1	2	.	IV
H	Eua	3.5	3	0	<i>Scrophularia nodosa</i>	+	+	+	.	+	+	.	.	.	+	IV
H	Eua	3.5	0	0	<i>Stachys sylvatica</i>	.	.	.	+	+	+	+	+	.	+	IV
H	Atl-Med	3.5	3	4	<i>Sanicula europaea</i>	+	+	.	+	.	+	.	.	+	+	IV
H	E	3	2.5	3	<i>Rubus hirtus</i>	+	+	+	+	+	.	.	+	+	.	IV
MPh	E	3	3	3	<i>Prunus avium</i>	.	.	.	+	.	+	+	+	+	+	IV
H	Eua	3	3	0	<i>Stellaria holostea</i>	+	+	+	+	+	.	.	.	+	+	IV
Th	Eua(Med)	2.5	3	3	<i>Lapsana comminis</i>	+	+	+	.	.	+	.	.	+	+	IV
H	E	3	3	0	<i>Mycelis muralis</i>	.	.	.	+	+	+	+	+	+	+	IV
Ch	E	4	3	0	<i>Lysimachia nummularia</i>	+	+	.	+	+	.	.	+	+	.	IV
H	Eua(Med)	3	3	4	<i>Geum urbanum</i>	+	+	+	+	.	+	+	.	.	+	IV
H	All-Med	2.5	3.5	4	<i>Viola odorata</i>	+	+	.	+	+	.	+	+	.	+	IV
H	Eua	3	2	2	<i>Cruciata glabra</i>	+	.	.	+	.	+	+	.	+	+	III
H	E	3.5	3	3	<i>Pulmonaria officinalis</i>	+	.	+	.	.	+	+	+	.	+	III
nPh	E	2	3	3	<i>Rosa canina</i>	+	.	+	+	+	.	+	.	.	+	III
H	Eua	3.5	3	4	<i>Asarum europaeum</i>	+	+	+	.	.	+	+	.	.	+	III
H	Eua	3	3	0	<i>Symphytum tuberosum</i>	.	.	.	+	+	.	+	.	+	.	III
H	Eua	3.5	3	4	<i>Salvia glutinosa</i>	.	+	+	.	.	+	+	.	.	+	III
G	Ec	3.5	3.5	4	<i>Arum maculatum</i>	.	.	.	+	+	.	.	+	+	.	III
H	E	3.5	0	0	<i>Ajuga reptans</i>	+	+	.	.	+	+	.	.	+	+	III
H	E	3.5	3	4	<i>Mercurialis perenis</i>	+	+	.	.	.	+	+	2	3	.	III
G	Ec	3	3	4	<i>Cardamine bulbifera</i>	+	+	.	.	+	.	.	+	+	+	III
H	Cp	3.5	3	3	<i>Milium effusum</i>	+	+	.	.	.	.	+	.	+	+	III
MPh	E	2.5	3	3	<i>Acer campestre</i>	.	+	.	+	.	+	+	.	.	+	III
H	Eua(Med)	2.5	4	4	<i>Brachypodium sylvaticum</i>	.	+	+	.	.	+	+	+	.	+	III
H	Eua	3.5	3	3	<i>Aegopodium podagraria</i>	.	.	.	.	.	+	+	.	+	+	III
H	Eua	3	3	4	<i>Astragalus glycyphyllos</i>	+	+	.	.	.	+	+	+	+	+	III
MPh	E	3	3	4	<i>Fraxinus excelsior</i>	.	.	.	+	+	.	+	.	.	+	III
Th	Cosm	4	0	3	<i>Polygonum latifolium</i>	+	.	+	+	+	.	.	+	+	.	III
G	E	2.5	3	4	<i>Cephalanthera longifolia</i>	+	+	.	.	.	+	+	.	.	+	III
H	Eua	3.5	3	3	<i>Ranunculus auricomus</i>	.	.	.	+	+	.	.	+	+	.	III
H	Eua	3	3	3	<i>Viola reichebachiana</i>	+	+	.	.	+	+	+	.	.	+	III
MPh	E(Med)	2.5	3.5	4	<i>Staphylea pinnata</i>	+	.	+	+	.	.	.	+	+	.	III
Th	Med	2	3.5	4	<i>Smyrniun perfoliatum</i>	.	+	.	+	+	+	+	.	.	+	III
H	Eua	3	2	0	<i>Campanula rapunculoides</i>	+	.	+	.	.	+	+	+	+	.	III
G	E	3	3	0	<i>Corydalis solida</i>	.	.	.	+	+	.	.	+	+	.	II
MPh	E	3	3	0	<i>Fagus sylvatica</i>	+	+	.	.	.	.	.	.	.	+	II
<i>Accompanying</i>																
H	Eua(Med)	3	3	4	<i>Anthriscus sylvestris</i>	.	+	.	.	.	+	+	+	+	.	III
MPh	E	3	3	3	<i>Tilia cordata</i>	.	+	.	.	.	+	+	+	+	.	III
Th	Cosm	3	0	0	<i>Stellaria media</i>	+	.	+	+	.	.	.	.	+	+	III
H	Eua	3	3	0	<i>Hypericum perforatum</i>	+	+	.	.	.	+	+	+	+	.	III

**Locality:** 1, forests 1 Mai, 2.07.2010; 2, to Northwestern Şomleu Hill, 2.07.2010; 3,4, on Betfia Valley-Betfia locality, 2.07.2010; 5,6 Forest Culmea Mică Hill-Hişişelu de Sus, 08.08.2010; 7, forest from Şumugiu, 10.08.2010; 8, Forest Ilei-Cordău Hill, 10.08.2010; 9, Boboştea Mică near Şauaieu locality, 15.08.2010; 10, Forest from Poiana Tăşad, 19.08.2010;

## REFERENCES

1. Ardelean A., 1999, Flora și vegetația din Valea Crișului Alb. University Press Publishing House, Vasile Goldiș, Arad, 311. p.
2. Borhidi A., 1996, Critical revision of the Hungarian plants communities, Janus Pannonius University, Pécs, pp. 43-94.
3. Borza A., Boșcaiu N., 1965, Introducere în studiul covorului vegetal, Romanian Academy Publishing House, Bucharest, 340 p.
4. Braun-Blanquet, J., 1964, Pflanzensozologie, Spinger Verlag, Wien-New-York, 3, Aufl, pp. 12-24.
5. Braun-Blanquet, J., Pavillard, J., 1928, Vocabulaire de Sociologie Vegetale, Ed. 3, Impr. Lemair-Ardres, pp. 15-18.
6. Burescu P., Cheregi V., 2002, Flora pădurilor cu funcție recreativă componentă fundamentală a calității mediului și a vieții din stațiunea balneoclimaterică Băile 1 Mai Oradea, Analele Universității Craiova, 7: 155-159.
7. Burescu P., Doniță N., Burescu L., 2002, Flora pădurilor de șleau de pe Dealurile Hidișelului (Ocol Silvic Oradea) județul Bihor, Analele Universității Oradea, Fascicula Silvicultură, Oradea, 7:57-62.
8. Ciocârlan, V., 1990, Flora ilustrată a României, I,II. Ceres Publishing House, Bucharest, 382 p.
9. Dragotă, C., 2006, Precipitațiile excedentare în România, Romanian Academy Publishing House, Bucharest; 174 p.
10. Ellemberg H., 1974, Zeigerwerte der Gefässpflanzen Mitteleuropas. Scripta Geobotanica, Göttingen, 9:1-97.
11. Mohan, Gh., Ardelean, A., Georgescu, M., 1993, Rezervații și monumente ale naturii din România, Scaul Publishing House, Bucharest, 359 p.
12. Mucina L., Grabherr G., Ellman T., 1993, Die Pflanzengesellschaften Österreich, teil I. Anthropogene Vegetation, (Gustav Fischer) Verlag, Jena-Stuttgart-New-York, pp. 68-72.
13. Oprea, A., 2005, Lista critică a plantelor vasculare din România, University Al. I. Cuza Publishing House, Iași, 398 p.
14. Pop, Gr., 2005, Dealurile de Vest și Câmpia de Vest, University of Oradea Press, Oradea 176 p.
15. Pop, I., 1967, Studiul comparativ asupra ceretelor din Câmpia înaltă a Miersigului și de pe dealurile piemontane Crișene. Contribuții Botanice, Cluj-Napoca, pp. 115-223.
16. Pop, I., 1968, Flora și vegetația Câmpiei Crișurilor, Interfluviul Crișul Negru-Crișul Repede, Romanian Academy Publishing House, Bucharest, pp. 102-116.
17. Posea, Gr., 1997, Câmpia de Vest a României (Câmpia Banato-Crișană), Fundația „România de Măine” Publishing House, Bucharest, 235. p.
18. Pott R., 1995, Pflanzengesellschaften Deutschlands, 2 Aufl., Ulmer Verlag, Stuttgart, pp. 124-128.
19. Sabău, N., Domuța, C., Berchez, O., 2002, Geneza, degradarea și poluarea solului. University of Oradea Press, Oradea, pp. 178-183.
20. Soó, R., 1964-1980, A magyar flora és vegetacio rendszertani, növényföldrajzi kézikönyve, Akad. Kiadó, Budapest, 1-6, 14(3): 65-72.
21. Täuber, F., 1992, Contribuții la sintaxonomia carpinetelor carpo-dacice (Lathyro-Carpinetalia), Contribuții Botanice, Cluj-Napoca, pp.15-29.
22. Tüxen, R., 1955, Das System der nordwestdeutschen Pflanzengesellschaften. Mitt. D. Flor. Soz. Arbeit.,n. Folge, 5: 155-176.