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## CONTRIBUTIONS TO THE STUDY OF VEGETATION FROM THE NATURAL PARK VANATORI NEAMT

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**Summary:** As a result of the researches carried out between 2005-2007 in The Natural Park Vanatori Neamt, we identified two association: *Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995 and *Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu et Sârbu 2001. This article describes these associations by taking into consideration main aspects of chorology, ecology, physiognomy and floristic composition, biological forms, floristic elements, ecological indexes.

**Key words:** chorology, ecology, physiognomy and floristic composition, biological forms, floristic elements, ecological indexes.

### Introduction

The results of the investigation developed between the years 2005-2007, as well as the existing literature data in the field, put into evidence the presence of two association *Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995 and *Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu et Sârbu 2001.

### Material and method

The aspects of chorology, ecology, physiognomy and floristic composition, was made on the *Vademecum ceno-structural privind covorul vegetal din România* by V. Sanda (2002). [9] The establishment of the bioforms and floristical elements was made on the basis of *Flora ilustrată a României. Pteridophyta et Spermatophyta*, by V. Ciocârlan (2000). [1] The ecological indices were noted by H. Ellenberg (1974) *Indicator values of vascular plants in Central Europe*. [8]

### Results and discussions

*QUERCETEA ROBORI – PETRAEAE* Br. – Bl. et R. Tx. 1943

*Quercetalia roboris* R. Tx. 1931

*Genisto germanicae – Quercion* Neuhäusel et Neuhäslova – Novotna 1967

*Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995

**Chorology:** We can find this vegetal association in Neamt Mountains (Chifu T., Ștefan N., 1973) and in the reserve „Brass Wood” (Mititelu D., 1992, 1993).

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We identified sub-association *quercetosum dalechampii*, that covers a large area from Neamt Natural Park, never been found before.

**Ecology:** The association *Cytiso nigricantis-Quercetum petraeae* Paucă 1941, met in hillock level is known as „durmast forests level”. This association met on slightly or strongly inclined surfaces and acid soils. *Quercus dalechampii* is a mediterranean element characteristic to oak tree forests submesophiles – thermophiles.

**Table 1**

Ass. *Cytiso - Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995

No. of survey	1	2	3	4	5	6	7	8	9	K
Altitude (m.s.m.)	600	650	600	600	650	650	600	600	600	
Exposition	E	SE	E	E	S	NE	E	E	SE	
Angle of slope (degrees)	25	20	25	20	20	40	25	40	30	
Covering – the layer (%)	90	90	95	80	95	85	80	60	80	
Covering – shrubs + sapling (%)	10	15	5	10	10	10	5	5	20	
Covering – herbaceous layer (%)	5	10	5	5	5	20	5	10	5	
Surface (m <sup>2</sup> )	400	400	400	400	400	400	400	400	400	
<b>Charact. ass.</b>										
<i>Cytisus nigricans</i>	-	-	+	-	-	+	+	+	-	III
<i>Dif. subassoc</i>										
<i>Quercus dalechampii</i>	4	5	5	4	5	4	4	3	4	V
<b>Genisto germanicae - Quercion</b>										
<i>Trifolium medium ssp. medium</i>	+	+	-	+	-	-	+	+	+	IV
<i>Veronica chamaedrys</i>	-	-	+	+	-	-	+	+	-	III
<i>Lathyrus niger</i>	+	+	+	-	-	-	-	-	-	III
<i>Genista tinctoria</i>	+	-	+	-	-	-	-	-	-	II
<b>Pino - Quercion</b>										
<i>Vaccinium myrtillus</i>	-	-	+	-	-	+	-	-	-	I
<b>Quercetalia roboris</b>										
<i>Rosa canina</i>	+	+	+	-	+	+	+	-	-	IV
<i>Calamagrostis arudinacea</i>	-	-	+	-	+	+	-	+	-	III
<i>Luzula luzuloides</i>	-	+	+	-	-	-	+	-	-	III
<i>Pteridium aquilinum</i>	-	-	+	-	-	+	-	-	+	III
<i>Hieracium umbellatum</i>	-	-	+	-	-	-	-	-	-	I
<b>Symphyto - Fagion</b>										
<i>Acer pseudoplatanus</i>	+	+	+	-	+	+	+	+	-	V
<i>Acer pseudoplatanus (juv.)</i>	-	+	+	+	-	1	+	+	+	V
<i>Campanula persicifolia</i>	+	+	+	-	-	+	-	-	-	III
<b>Lathyro hallersteinii - Carpinion</b>										
<i>Galium schultesii</i>	-	+	+	+	+	-	+	+	+	V
<i>Carpinus betulus (juv.)</i>	-	-	-	1	-	+	+	+	+	III
<i>Cerasus avium</i>	+	+	+	-	+	-	-	+	+	III
<i>Carpinus betulus</i>	-	+	-	-	-	+	+	-	-	II
<i>Dactylis polygama</i>	+	-	-	+	-	+	-	-	-	II
<i>Lathyrus venetus</i>	+	-	-	+	-	-	-	-	-	II
<i>Lathyrus vernus</i>	+	+	-	-	-	-	+	-	-	II

<i>Tilia cordata</i>	+	-	-	+	-	-	+	-	+	II
<i>Fagus taurica</i>	+	-	+	-	-	-	-	-	-	I
<i>Fagetalia sylvaticae</i>										
<i>Galium odoratum</i>	+	+	+	+	+	-	+	+	+	V
<i>Geranium robertianum</i>	+	+	+	-	+	1	+	1	+	V
<i>Rubus hirtus</i>	+	1	+	+	1	+	+	+	-	V
<i>Sanicula europaea</i>	+	-	-	+	+	+	+	-	+	IV
<i>Campanula rapunculoides</i>	-	+	-	+	-	+	-	-	-	III
<i>Hieracium murorum</i>	-	-	+	+	-	+	+	+	-	III
<i>Scrophularia nodosa</i>	+	+	+	-	+	-	-	-	-	III
<i>Carex sylvatica</i>	+	-	-	-	+	-	+	-	-	II
<b>Alnion incanae et Alno - Fraxinetalia</b>										
<i>Circaea lutetiana</i>	-	+	+	+	+	-	+	-	-	III
<i>Stachys sylvatica</i>	-	+	-	+	+	-	-	-	-	II
<i>Pyrus pyraeaster</i>	+	-	-	-	+	-	-	-	+	II
<b>Quercu - Fagetea</b>										
<i>Dryopteris filix-mas</i>	+	+	+	-	+	+	+	+	+	V
<i>Acer campestre</i>	-	+	+	+	+	+	+	+	-	IV
<i>Mycelis muralis</i>	-	-	+	+	+	+	+	-	+	IV
<i>Viola reichenbachiana</i>	+	+	-	+	+	+	+	+	-	IV
<i>Geum urbanum</i>	+	-	+	-	+	+	-	+	-	III
<i>Quercus petraea (juv.)</i>	-	+	+	-	-	+	+	+	-	III
<i>Sedum maximum</i>	+	+	+	-	-	+	+	-	-	III
<i>Poa nemoralis</i>	+	+	+	-	-	+	+	-	-	III
<i>Quercus petraea</i>	-	-	-	-	-	1	1	+	+	II
<i>Cruciata glabra</i>	-	+	-	-	-	+	-	+	-	II
<b>Quercetea pubescentis</b>										
<i>Cornus mas</i>	-	-	+	+	-	+	-	-	1	II
<i>Polygonatum odoratum</i>	+	+	+	-	-	-	-	+	-	II
<b>Vaccinio - Piceetea</b>										
<i>Juniperus communis</i>	-	-	+	-	-	-	-	-	-	I
<b>Rhamno - Prunetea</b>										
<i>Crataegus monogyna</i>	+	-	+	+	+	+	+	+	1	V
<i>Evonymus europaeus</i>	+	-	-	+	+	-	-	+	-	III
<i>Rubus sylvaticus</i>	1	1	+	+	+	+	-	-	-	III
<i>Clematis vitalba</i>	-	+	-	+	+	-	-	-	+	II
<i>Rubus idaeus</i>	-	+	-	+	-	-	+	-	-	II
<i>Epilobietea angustifolii</i>										
<i>Fragaria vesca</i>	+	-	+	-	+	+	+	+	+	V
<b>Galio - Urticetea</b>										
<i>Urtica dioica</i>	-	+	-	+	+	1	+	+	+	V
<i>Lapsana communis</i>	+	+	+	-	+	-	+	-	-	III
<b>Variae syntaxa</b>										
<i>Clinopodium vulgare</i>	+	+	+	-	-	+	-	-	-	III
<i>Galeopsis tetrahit</i>	-	+	+	-	-	+	+	-	+	III

<i>Galeopsis speciosa</i>	-	-	+	-	-	+	+	-	-	II
<i>Trifolium alpestre</i>	-	-	-	-	-	+	+	-	+	II
<i>Alliaria petiolata</i>	-	-	-	-	-	-	-	+	+	I
<i>Pinus sylvestris (juv.)</i>	-	-	-	-	-	-	-	-	+	I
<i>Torilis arvensis</i>	+	-	-	+	-	-	-	-	-	I
<i>Vincetoxicum hirsutinaria</i>	-	+	+	-	-	-	-	-	-	I

Localization and date of surveys:

Neamt Mountain: 1, 2, 3, 4, 5 – (21-08-2005); „Brass Wood”: 6, 7 - (28-08-2005); 8, 9 - (14-05-2006)

**Physiognomy and floristic composition:** The vegetation is relatively unitary from the viewpoint of physiognomy, *Quercus dalechampii* being the dominant specie. The analysis of the fitocenological table (Tab. I) reveals the species belongs to Class *Querco – Fagetea*, such as: *Quercus petraea*, *Acer pseudoplatanus*, *Viola reichenbachiana*, *Dryopteris filix-mas*, etc. Because the reserve is situated at 550-650 m high, (the upper limit of hilllock), we can observe the beginning of an infiltration of typical mountain species: *Rubus idaeus*, *Fagus taurica*, *Trifolium alpestre*, *Vaccinium myrtillus* etc. The spectrum of the bioforms (**Fig. 1**) is outnumbered by the hemicryptophyte species (43%), followed by the phanerophyte species (33%). Geophyte species (11%) are represented by numerous vernal and estival species. We can notice in the analysis of the floristic elements distribution (**Fig. 2**) the dominance of the elements with a northern character: the Euroasian elements (35%), the European element (20%) and the Central-European elements (18%), resulting 73% of the total of species. Relatively well represented are the circumpolar elements (13%).

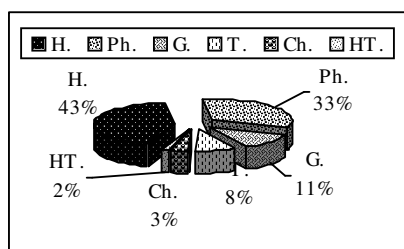


Fig. 1 – The spectrum of the bioforms

association *As. Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995

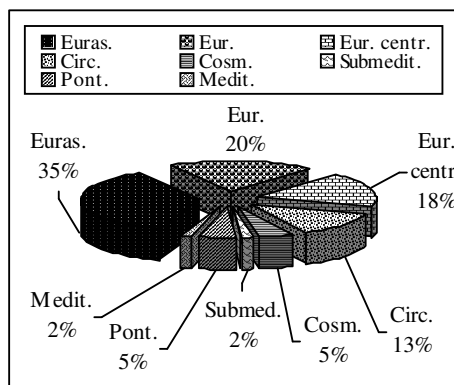
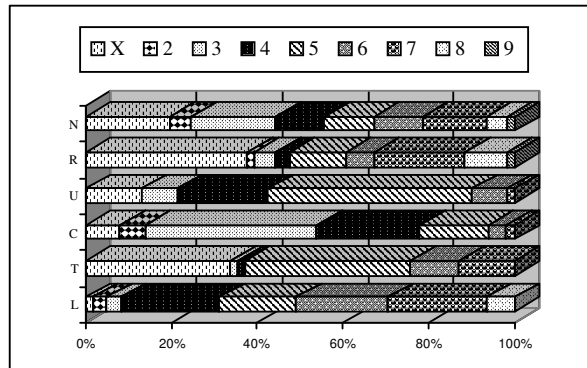


Fig. 2 – The spectrum of floristic elements of the

The analysis of the distribution of species according to the six ecological indexes (H.Ellenberg – L, T, K, F, R, N) [8], related the preferences of the species for different factors. Thus, we can draw the following conclusions: as far as the analysis of the preferences of the species for light, the best represented are the ombrophile and semiombrophile species; the greatest proportion belongs to the thermophyles species; as far as the continentalism of the species who propagate in entire Central Europe; regarding the moisture content, the greatest proportion belongs to the category of mezoxerophile species;

from the distribution of the species according to their reaction to the soil, we deduce that the majority are euriphytes; regarding the distribution of the species in relation to the amount of nitrogen available in the soil, most of the species prefer soil poor of mineral nitrogen and the same percent are amfitolerantes (**Fig. 3**). [1, 2, 3, 4, 5, 6, 7, 9]



**Fig. 3** – Distribution of the species in relation to the six ecological indexes (H. Ellenberg) of the association *As. Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995

*QUERCO – FAGETEA* Br. – Bl. et Vlieger in Vlieger 1937

*Fagetalia sylvaticae* (Pawlovski in Pawlovski 1928)

*Lathyro hallersteinii* – *Carpinion*

*Galio schultesii* – *Carpinenion* Tauber 1692

*Corylo avellanae* – *Carpinetum quercetosum pedunculiflorae* Chifu et Sârbu 2001

**Chorology:** In the studied area, the association *Corylo avellanae* – *Carpinetum* Chifu 1997 was known by different names: *Quercus robori* – *Carpinetum* Soó et Pócs 1957; *Evonymo nanae* – *Carpinetum aegopodietosum podagrariae* Chifu 1995. This association was identified by Chifu T., Ștefan N. (1973), on Brăilenei Hill, Valea Ozanei and „Dumbrava Forest”. Later, was found by some authors in „Dumbrava Forest” (Burduja C., Chifu T., 1974), (Chifu T., 1995) și (Mititelu D., 1992). On the occasion of vegetation research made in Vanatori Neamt Park, we found a new sub association: *quercetosum pedunculiflora*.

**Ecology:** This association met on plain or slightly inclined surfaces. *Quercus pedunculiflora* is rarely met in south and north forests of Moldova. This specie likes warm weather, presents resistance of drought, soil and atmosphere dryness. In Moldova, *Coryllus avellana* is a habitual shrub element of forests belongs to hillock and mountain lower level.

**Physiognomy and floristic composition:** The layer is represented by *Quercus pedunculiflora*, *Carpinus betulus*, *Pirus pyraster*. The shrubs and sapling is composed by *Cornus sanguinea*, *Crataegus monogyna* etc, the herbaceous layer being represented by forest species like: *Polygonatum latifolium*, *Brachypodium sylvaticum*, *Mycelis muralis*, *Sanicula europaea* etc. (**Tab. 2**)

The spectrum of the bioforms (**Fig. 4**) is outnumbered by the hemicryptophyte species (47%), followed by the phanerophyte species (28%). Geophyte species (16%) are well represented. The analysis of the distribution of the floristic elements (**Fig. 5**), the

dominance of the elements with a northern character: the Euroasian elements (45%), the European element (25%) and the Central-European elements. The analysis of the distribution of species according to the six ecological indexes [8], we can draw the following conclusions: as far as the analysis of the preferences of the species for light, the best represented are semiombrophile species; the greatest proportion belongs to the thermophyles species; as far as the continentalism of the species who propagates in entire Central Europe; the greatest proportion belongs to the category of mezoxerophile species; from the distribution of the species according to their reaction to the soil, we deduce that the majority are neutrophile species; regarding the distribution of the species in relation to the amount of nitrogen available in the soil, the category of the nitrophile species has the greatest proportion, and the same percent are amfitolerantes (**Fig. 6**). [1, 2, 3, 4, 5, 6, 7, 9]

**Table 2**  
*As. Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu 1997

No. of survey	1	2	3	4	5	6	7	8	9	10	11	12	K
Altitude (m.s.m.)	450	500	550	500	450	450	450	500	500	500	500	500	
Exposition	S	S	S	S	NE	S	SE	E	NE	E	NV	V	
Angle of slope (degrees)	-	-	5	5	5	-	-	-	-	-	-	-	
Covering – the layer (%)	60	85	50	60	60	50	50	50	60	55	55	60	
Covering – shrubs + sapling (%)	20	25	35	35	20	10	5	25	10	10	5	20	
Covering – herbaceous layer (%)	40	25	10	10	20	35	55	80	65	45	50	20	
Surface (m <sup>2</sup> )	400	400	400	400	400	400	400	400	400	400	400	400	
<b>Charact ass.</b>													
<i>Coryllus avellana</i>	1	+	-	1	1	1	+	2	1	+	+	+	V
<b>Dif. subassoc.</b>													
<i>Quercus pedunculiflora</i>	3	3	2	3	3	1	2	1	3	2	1	+	V
<b>Alno - Fraxinetalia</b>													
<i>Aegopodium podagraria</i>	1	+	+	-	+	-	-	-	+	1	+	+	V
<i>Sambucus nigra</i>	+	+	+	+	-	1	+	1	+	+	+	+	V
<i>Geranium phaeum</i>	+	-	+	+	-	+	-	-	+	+	+	+	V
<i>Stachys sylvatica</i>	+	+	+	+	+	-	-	-	+	+	+	+	V
<i>Impatiens noli-tangere</i>	-	-	+	+	+	-	-	-	+	+	+	+	IV
<i>Circaea lutetiana</i>	-	-	+	+	+	-	-	-	+	+	+	-	IV
<i>Glechoma hederacea</i>	1	+	+	-	+	+	-	-	+	+	+	+	
<b>Galio schultesii - Carpinion</b>													
<i>Carpinus betulus</i>	1	2	2	1	1	1	1	2	1	1	2	3	V

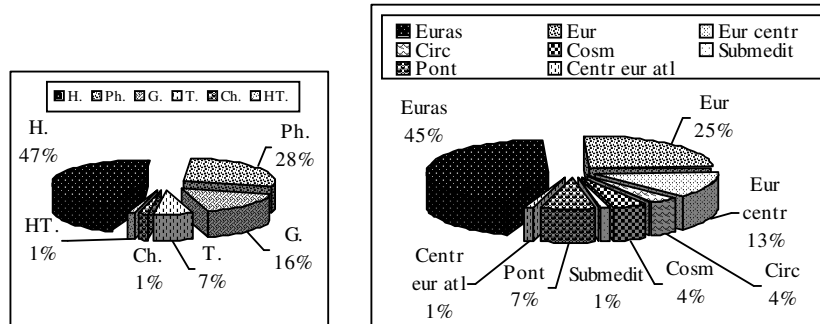
<i>Carpinus betulus</i> (juv.)	1	2	2	2	1	+	+	+	+	+	+	+	V
<i>Glechoma hirsuta</i>	-	-	+	-	+	+	+	-	+	+	+	+	IV
<i>Galium schultesii</i>	-	-	+	+	+	-	-	-	+	+	+	+	IV
<i>Cerasus avium</i>	+	-	-	+	-	-	-	-	+	+	+	-	III
<i>Campanula trachelium</i>	-	-	+	-	+	-	-	-	+	+	-	+	III
<i>Ranunculus cassubicus</i>	-	+	-	+	-	-	-	-	+	-	-	-	I
<b>Symphyto cordati - Fagion</b>													
<i>Acer pseudoplatanus</i>	+	-	+	+	+	+	+	-	+	+	+	+	V
<i>Abies alba</i>	+	-	+	-	+	+	+	-	+	+	-	-	IV
<i>Abies alba</i> (juv.)	+	+	-	-	-	-	+	-	-	-	+	-	III
<i>Epipactis helleborine</i>	-	-	-	+	-	-	-	-	-	-	-	-	I
<b>Fagetalia</b>								-					
<i>Sanicula europaea</i>	+	+	-	+	+	+	+	+	+	+	+	+	V
<i>Galium odoratum</i>	+	+	-	+	+	+	-	-	+	1	+	+	V
<i>Mercurialis perennis</i>	2	2	-	1	+	2	+	2	3	+	3	1	V
<i>Carex sylvatica</i>	+	+	+	+	+	-	-	-	+	+	-	-	IV
<i>Salvia glutinosa</i>	+	-	+	-	+	-	-	-	+	+	+	+	IV
<i>Fagus sylvatica</i>	+	1	+	-	-	+	+	-	+	+	-	-	III
<i>Asarum europaeum</i>	+	+	-	-	-	-	-	-	+	+	+	+	III
<i>Arum orientale</i>	+	-	-	-	-	+	+	+	-	-	-	-	II
<i>Rubus hirtus</i>	-	-	-	+	+	-	-	-	+	+	-	-	II
<i>Anemone ranunculoides</i>	-	-	-	-	-	+	+	2	-	-	-	-	I
<i>Corydalis solidia</i>	-	-	-	-	-	+	1	1	-	-	-	-	I
<b>Quercu - Fagetea</b>													
<i>Geum urbanum</i>	+	+	-	+	1	+	+	-	+	+	+	+	V
<i>Viola reichenbachiana</i>	+	+	+	+	1	-	-	-	+	1	+	+	V
<i>Acer campestre</i>	+	+	+	+	+	+	+	1	-	-	+	1	V
<i>Acer campestre</i> (juv.)	+	+	+	-	-	+	+	+	+	+	-	1	V
<i>Fraxinus excelsior</i>	+	+	+	+	-	+	-	-	-	+	+	-	IV
<i>Geranium robertianum</i>	+	-	+	+	+	-	-	-	+	+	+	+	IV
<i>Dryopteris filix-mas</i>	-	+	+	+	+	+	-	-	+	-	-	+	IV
<i>Ajuga reptans</i>	+	-	+	+	+	-	-	-	+	+	+	+	IV
<i>Brachypodium sylvaticum</i>	-	-	+	+	+	-	-	-	+	+	+	+	IV
<i>Polygonatum latifolium</i>	+	+	-	-	-	+	+	+	+	-	-	-	III

CONTRIBUTIONS TO THE STUDY OF VEGETATION FROM THE NATURAL PARK VANATORI ...

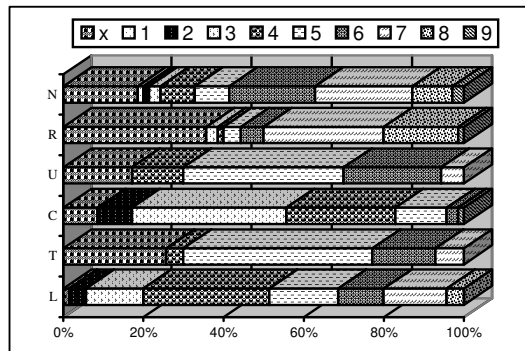
<i>Mycelis muralis</i>	-	-	-	+	+	-	-	-	+	+	+	+	III
<i>Lapsana communis</i>	-	-	-	+	+	+	-	-	+	+	-	-	III
<i>Fragaria vesca</i>	-	-	-	+	+	-	-	-	+	+	+	-	III
<i>Cornus mas</i>	+	-	-	-	+	+	-	-	+	+	+	-	III
<i>Quercus robur</i>	+	-	+	+	-	+	-	-	+	+	-	-	III
<i>Scrophularia nodosa</i>	-	-	-	+	+	-	-	-	+	+	-	-	II
<i>Acer platanoides</i>	+	-	-	-	+	+	-	-	+	-	-	-	II
<i>Convallaria majalis</i>	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Cruciata glabra</i>	-	-	+	-	-	-	-	-	+	+	-	-	I
<i>Ranunculus ficaria</i> <i>ssp. bulbifer</i>	-	-	-	-	-	+	3	2	-	-	-	-	I
<i>Paris quadrifolia</i>	-	-	-	-	-	+	+	+	-	-	-	-	I
<b>Rhamno - Prunetea</b>													
<i>Cornus sanguinea</i>	-	+	-	+	+	+	-	-	+	+	+	+	IV
<i>Crataegus monogyna</i>	-	+	-	+	+	+	-	-	+	1	-	-	III
<i>Rubus silvaticus</i>	-	-	1	+	-	-	-	-	-	-	-	-	I
<i>Pyrus pyraster</i>	+	-	-	+	-	-	-	-	-	-	-	-	I
<i>Ribes uva-crispa</i>	-	+	-	-	-	-	-	-	-	-	-	-	I
<b>Variae syntaxa</b>													
<i>Urtica dioica</i>	+	+	1	+	+	+	+	+	2	2	+	1	V
<i>Alliaria petiolata</i>	+	+	+	+	-	+	+	+	+	-	-	-	IV
<i>Galeopsis speciosa</i>	+	-	+	-	+	-	-	-	+	+	+	+	III
<i>Polygonatum verticillatum</i>	-	-	-	+	-	+	+	+	-	-	-	-	II
<i>Ajuga genevensis</i>	-	-	-	-	-	+	+	+	-	-	-	-	I

Localization and date of surveys: Dumbrava Forest: 1, 2, 3, 4, 5 - (21-08-2005); 6, 7, 8 - (22-04-2006); 9, 10, 11, 12 - (29-07-2006).





**Fig. 4** – The spectrum of the bioforms **Fig. 5** – The spectrum of floristic elements of the association *As. Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu 1997



**Fig. 6** – Distribution of the species in relation to the six ecological indexes (H. Ellenberg) of the association *As. Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu 1997

**Conclusions**

- On the occasion of vegetation research made in Vanatori Neamt Park, we identified two association *Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995 in Neamt Mountains and „Brass Wood” and *Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu et Sârbu 2001, in „Dumbrava Forest”.
- Most of bioforms are represented by hemicryptophytes (H)-
- The Eurasiatic elements are majoritary among floristic elements.
- The analysis of the distribution of species according to the six ecological indexes Ellenberg – L, T, K, F, R, N) we can draw the following conclusions: In *As. Cytiso – Quercetum petraeae* Paucă 1941 *quercetosum dalechampii* Chifu et al. 1995 the best represented are the ombrophile and semiombrophile species, thermophyles who propagate in entire Central Europe, mezoxerophile and most of the species prefer soil pour of mineral nitrogen and the same percent are amfitolerantes. In *ass. Corylo avellanae – Carpinetum quercetosum pedunculiflorae* Chifu 1997, the best represented are semiombrophile species, the greatest proportion belongs to the thermophyles species who propagates in entire Central Europe, mezoxerophile, neutrophile and nitrophiles.

### References

1. CIOCĂRLAN V, 2000 – *Flora ilustrată a României – Pteridophyta et Spermatophyta*, Edit. Ceres, București.
2. BURDUJA C., CHIFU T., 1974 – Flora și vegetația pădurii Dumbrava, Vânători-Neamț, *St. Cerc. Ști. Geol.-Geogr.-Biol., Bot.-Zool., Muz. Ști. Nat. Piatra Neamț*, secț. II: 161-172.
3. CHIFU T., MITITELU D., DĂSCĂLESCU D., 1987 – *Flora și vegetația Județului Neamț*, Mem. Secț. Ști. Acad. Rom., X, 1: 281-302.
4. CHIFU T., 1972 – Cercetări micocenologice în asociația *Abietetum dacicum* din Depresiunea Neamțului, *Stud. Com., Muz. Ști. Nat. Dorohoi (Botoșani)*: 57-66.
5. CHIFU T., 1972 – Cercetări micocenologice în asociația *Abieti-Fagetum* din Depresiunea Neamțului, *Lucr. Ști. Inst. Pedag. Constanța*: 167-173.
6. CHIFU T., 1972 – Cercetări micocenologice în asociația *Querco petraea-Carpinetum* din Depresiunea Neamțului, *St. com. Muz. Ști. Nat. Bacău* : 35-46 pp.
7. CHIFU T., 1973 – Cercetări micocenologice în asociația *Carpino-Fagetum* din Depresiunea Neamțului, *St. cerc. șt. Inst. Pedag. Bacău*: 73-82.
8. ELLENBERG H., 1974 – *Indicator values of vascular plants in Central Europe*, Göttingen, 9: 7- 97.
9. SANDA V., 2002 – *Vademecum ceno-structural privind covorul vegetal din România*, Edit. Vergiliu, București: 104 – 123, 206 – 210.