CONTRIBUTIONS TO THE KNOWLEDGE OF *CERRIS* – EVERGREEN OAK GROVES IN THE HILLS OF ORADEA - WESTERN CARPATHIANS, ROMANIA. THE ASSOCIATION *Quercetum petraeae – cerris* - Soó cerris 1963 *- ruscetosum aculeati subass. nova*

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Abstract

Our research work is done on the association Quercetum petraeae-cerris spread throughout the hills of Oradea at altitudes varying between 180-340m in the County of Bihor, north-western Romania.

Research outcomes show that the low altitude, gentle to step slopes, the slopes' exposition towards South and South-west, and climate featured by winds blowing from South and South-west have favoured over phytohistorical ages the penetration in phytocoenoses association of a remarkable number of plants from Mediterranean - Balkan origin, totalling 15 species.

Based on ecological-floristic affinities, they form a compact population featuring differential species i.e. Ruscus aculeatus, Ruscus hypoglossum, Potentilla micrantha, Fraxinus ornus, Lathyrus venetus, Tamus communis, Quercus dalechampii based on which we propose the separation of a new sub-association, namely ruscetosum aculeatis subass., nova Holotypus hoc loco: see Table 1 no 2

Keywords: *cerris* – evergreen oak groves, new sub-association, Oradea Hills.

INTRODUCTION

Oradea Hills are located on the outskirts of Plopiş Mountains and Derna Hills, as an extension of the later in the western part of Romania (Pop, 2005). They look like long ridges with altitudes ranging from 180 meters at the contact area with Barcău Plain, 200 meters at the contact area with Miersig Plain and 300 meters at the contact area with Plopiş Mountains.

The geological foundation consists of islands of crystalline, layered limestone, diorite sands (Cretaceous), and conglomerates (Permian). Clay and sand layers (Neogene Epoch) deposited over the layers above mentioned in Pliocene Epoch by silting up the Pannonia Basin.

The Oradea Hills specific soils (Sabău and Morar, 2011) are typical Luvisols (LVti), Stagnic Luvisols (LVst) Luvisols Albic (LVab) Albic Stagnant Luvisols (LVabst) and Cambisols: Eutric Cambisols (ECti) Eutric Stagnant Cambisols (ECst).

The climate of Oradea Hills (Bogdan and Niculescu, 1999; Dumiter, 2007) is a mild, temperate continental with annual average temperatures

ranging between + 9˚C - + 10˚C. The average monthly and annual depth of rainfall (Dragotă, 2007) is 611mm nearby city of Oradea and 700 mm in the contact area with Plopiş Mountains. According to wind regime, the prevailing winds are blowing from the South (18.3%) followed by those blowing from South-west (16.8%).

MATERIAL AND METHODS

The material investigated consist of *cerris* and evergreen oak groves within Oradea Hills where we have conducted over 500 surveys in the period 2009-2012, of which we have picked up a total number of 10 sampling incursions or relevées to show in the association table presented hereunder.

Identifying phytocoenoses and analyzing the association and subassociation was based on the floristic criterion by means of characteristic, edifying, dominant and differential species.

Framing the association and subassociation surveyed under the corresponding coeno-taxonomic units to suballiance, alliance, orders, classes was made taking into consideration the traditional ecological-floristic systems developed by Tüxen (1955), Braun-Blanquet (1964), Borza and Boşcaiu (1965), Soó (1964-1980) as well as the more recent papers by researchers such as Mucina et al. (1977), Pott (1995), Rothmaler (1994-2000), Borhidi (1996-2003), Coldea et al. (1997), Sanda et al. (2008).

The sampling surfaces which are homogeneous from floristic and physionomic points of view were selected from some characteristic fragments of the *cerris* and evergreen oak groves depending on the nature and complexity of their horizontal and vertical structures. The surface of the sample area was 400 m^2.

We have input in the association table the plant species contained in the floristic composition of the phytocoenoses of the association representing association's individual while specifying for each species as the life form type, floristic type, ecology indices (H, T, R), karyotype (2n) serial number of sampling incursions (relevées), altitude, exposition, slope inclination, tree height, trunk diameter, tree canopy, coverage, herbaceous layer. Notation of plants in table was done by assessing the abundance-dominance of each species based on symbols +,1,2,3,4,5 after Braun-Blanquet methodology (scale) (1964). Phytocoenoses of the association were analyzed through histograms drawn with reference to the spectrum of life forms, floristic elements spectrum, karyotype spectrum (2n) and the diagram of ecology indices (H, T, R).

RESULTS AND DISCUSSION

While studying the Balkan - Pannonian *cerris* groves forests growing on the southern and western slopes of hills and on the Oradea plateaus we have found the *cerris* (tree) rarely occurs in pure stands called *cerris* groves, as it is usually mixed with the evergreen oak (tree) forming the so called *cerris*-evergreen groves subordinated to the Association *Quercetum petraeae-cerris*, Soó 1963.

The tree layer with overall coverage of 75% is made up of the following species: *Quercus petraea* ssp. *petraea, Quercus cerris, Tillia tomentosa, Quercus petraea* spp. *dalechampii, Acer campestre, Acer tataricum, Acer platanoides, Sorbus torminalis, Carpinus betulus, Prunus avium, Ulmus minor, Cornus mas, Pyrus pyraster.*

Shrub layer with an overall coverage of 10% is made up of the following species: *Fraxinus ornus, Euonymus europaeus, Crataegus monogyna, Ligustrum vulgare, Staphylea pinnata, Prunus spinosa, Sambucus nigra, Rosa canina*.

Herbaceous layer covers the soil at the rate of 30-40% bringing a total number of 69 species of which the following ones occur with greater frequency: *Pulmonaria officinalis, Geum urbanum, Polygonatum latifolium, Melica uniflora, Anemone nemorosa, Lathyrus niger, Potentilla micrantha, Melittis melissophyllum, Campanula glomerata, Ranunculus auricomus, Glechoma hirsuta, Galium schultesii, Cardamine bulbifera, Corydalis solida, Corydalis cava, Vinca minor, Symphytum tuberosum, Allium ursinum, Circaea lutetiana, Stellaria nemorum, Lamium galeobdolon, Mercurialis perennis, etc.*

Floristic composition of the association reaches 91 species of herbaceous and woody plants (see Table 1).

The Physionomy of association is provided by the edifying and characteristic species *Quercus petraea* ssp. *petraea*, abundance-dominance rate of 51%, maximum constancies (C = V), and *Quercus cerris*, abundance-dominance rate of 18%, maximum constancies (C = V).

Differential species *Ruscus aculeatus, Ruscus hypoglossum, Potentilla micrantha, Lathyrus venetus, Tamus communis, Fraxinus ornus, Quercus dalechampii* show common ecological-floristic affinities on which we have set - *ruscetosum aculeati* subassociation nova Holotypus hoc loco: see Table 1 no 2.

Besides the species afore mentioned, there are many species specific for the alliance *Quercion petraeae*, the order *Fraxino orni-Cotinetalia: Cornus mas, Trifolium medium, Silene italica, Pyrus pyraster*, the class *Quercetea pubescenti-Petraeae* namely *Crataegus monogyna, Tillia*

tomentosa, Ligustrum vulgare, Lathyrus niger, Calamintha menthifolia, Melittis melissophyllum, Campanula glomerata, Veronica teucrium, Acer tataricum, Viola hirta, Polygonatum odoratum.

A large number of transgressive species penetrate at the edge of the association; these belong to the class *Querco-Fagetea* namely *Carpinus betulus, Euonymus europaeus, Geum urbanum, Prunus avium, Pulmonaria officinalis, Polygonatum latifolium, Melica uniflora, Anemone nemorosa, Viola reichenbachiana, Ranunculus auricomus, Astragalus glycyphyllos, Circaea lutetiana, Asarum europaeum, Corydalis solida, Lamium maculatum, Corydalis cava, Stellaria holestea, Vinca minor, Arum maculatum, Symphytum tuberosum, Cruciata glabra, Hedera helix, Lathyrus vernus, Galium odoratum, Vicia sylvatica,* etc.

Table 1

Ass Quercetum petraeae – cerris Soó 1963

- ***ruscetosum aculeati*** subass. nova Holotypus hoc loco: Table 1 no 2:

Life Forms	F.E.	H	T	R	2n	Species/ relevées no	1	2	3	4	5	6	7	8	9	10	C
						Altitude (m)	220	240	280	180	180	170	160	170	150	160	
						Exposition	V	E	S	V	N	N-E	S	N-E	S	S	
						Slope (°)	5	10	15	2	6	12	5	8	5	10	
						Height of tree (m)	20	20	17	16	27	16	17	24	20	17	
						Trunk diameter (cm)	28	48	32	25	60	40	38	49	24	22	
						Crowing (consistency of tree layer) (%)	0.6	0.8	0.8	0.7	0.9	0.8	0.9	0.8	0.7	0.7	
						Herbaceous cover layer (%)	90	95	20	80	80	90	70	90	80	70	
						Area (m^2)	400	400	400	400	400	400	400	400	400	400	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Characteristic species of Association																	
MPh	E	2.5	3	0	P	*Quercus petraea ssp.petraea*	3	4	1	4	4	2	4	4	4	2	V
MPh	Mp	2	3.5	3	D	*Quercus cerris*	1	2	4	2	2	4	2	2	2	+	V
Diagnostic species of Aliance *Quercion petraeae*, of Order *Fraxino orni-Cotinetalia*																	
G	Atl-M	2.5	4	2	P	*Ruscus aculeatus*	2	2	+	1	1	1	+	+	+	+	V
MPh	Pont-M	2	3.5	4	DP	*Cornus mas*	1	4	4	3	3	2	-	-	-	1	IV
H	Eua	3	3	0	P	*Trifolium medium*	+	-	-	+	+	+	+	+	-	-	III
H	Eua	3	0	3	D	*Silene italica*	-	+	-	+	+	-	-	-	+	-	II
G	Atl-M	3	3.5	4	P	*Tamus communis*	-	-	-	+	+	+	-	-	-	-	II
mPh	M	1.5	3.5	5	D	*Fraxinus ornus*	+	-	+	-	-	-	-	-	+	-	II
mPh	E	2	3	4	D	*Pyrus pyraster*	-	-	+	-	-	-	+	-	+	+	II
Ch	M	3	4	3	P	*Ruscus hypoglosus*	+	-	-	-	-	+	-	-	-	-	I
Diagnostic species of Class *Quercetea pubescenti-Petraeae*																	
mPh	E	2.5	3	3	D	*Crataegus monogyna*	2	2	1	+	+	2	-	+	+	4	V
MPh	B	2.5	3.5	3	D	*Tilia tomentosa*	1	+	-	+	1	1	-	+	+	+	IV
H	Ec	2.5	3	3	D	*Lathyrus niger*	-	+	+	+	+	-	+	+	-	+	IV
MPh	E	2.5	3	3	P	*Ligustrum vulgare*	-	+	+	+	+	1	-	-	-	+	III
H	M	2.5	3.5	3.5	D	*Potentilla micrantha*	+	-	+	+	-	-	+	-	+	-	III
H	Ec	2.5	3.5	5	P	*Calamintha menthifolia*	-	+	+	+	-	+	-	+	-	-	III
H	Ec	2.5	3	5	CN	*Melittis melissophyllum*	-	-	+	-	+	-	+	-	+	+	III
H	Eua	2.5	3	4	P	*Campanula glomerata*	-	+	+	+	+	-	+	-	+	-	III
H	Ec	1.5	4	4.5	P	*Veronica teucrium*	-	-	+	-	-	-	+	-	-	-	I
H	Mp	3	4	3	D	*Lathyrus venetus*	-	-	+	+	-	-	+	-	-	-	II
MPh	M	2.5	3	0	D	*Quercus petraea ssp.dalechampii*	-	-	+	+	+	+	-	-	-	-	II
mPh	E	2.5	3.5	4	CN	*Acer tataricum*	-	+	-	-	-	-	+	-	+	-	II
H	Eua	2	3	4	P	*Viola hirta*	+	-	+	-	-	+	-	+	-	+	II
G	Eua	2	3	4	P	*Polygonatum odoratum*	+	+	-	-	-	-	-	-	-	-	I
Diagnostic species of Class *Querco-Fagetea*																	
MPh	E	3	3	3	P	*Carpinus betulus*	1	+	1	1	-	+	1	1	2	2	V
mPh	E	3	3	3	P	*Euonymus europaeus*	+	+	+	+	+	+	+	-	+	+	V
H	Eua	3	3	4	D	*Geum urbanum*	+	-	+	+	+	-	1	+	+	+	IV
MPh	E	3	3	3	DP	*Prunus avium*	1	+	-	+	-	+	+	+	1	+	IV
H	E	3.5	3	3	D	*Pulmonaria officinalis*	+	+	+	+	+	-	+	+	-	+	IV
G	P-Pan	3	3.5	4	D	*Polygonatum latifolium*	-	-	+	+	+	1	+	-	+	+	IV
H	E	2.5	3	4	D	*Melica uniflora*	-	-	+	3	-	+	2	2	3	2	IV
G	E	3.5	4	0	DP	*Anemone nemorosa*	+	+	-	-	+	+	-	-	+	-	III
H	Eua	3	3	3.5	P	*Viola reichenbachiana*	-	+	+	+	-	-	+	+	+	-	III
H	Eua	3.5	3	3	P	*Ranunculus auricomus*	+	-	+	+	-	+	-	+	-	+	III
H	Eua	3	3	4	D	*Astragalus glycyphyllos*	-	+	-	-	+	-	-	+	+	+	III
H	Mp	2.5	3	4	P	*Glechoma hirsuta*	+	-	+	+	1	+	-	-	-	+	III
G	Ec	2.5	3	3	P	*Galium schultesii*	-	-	+	+	1	+	-	+	-	-	III
MPh	E	2.5	3	4	D	*Sorbus torminalis*	-	+	+	+	+	+	-	-	-	-	III
G	Ec	3	3	4	P	*Cardamine bulbifera*	-	-	+	+	+	+	-	+	+	-	III
Ch	E	4	3	0	P	*Lysimachia numularia*	-	+	+	-	-	+	-	-	+	+	III
MPh	E	2.5	3	3	D	*Acer campestre*	1	+	+	-	+	+	-	-	-	+	III
mPh	B	2.5	3.5	4	D	*Staphylea pinnata*	-	+	+	+	-	-	+	+	-	+	III
G	Ec	3	3	0	D	*Corydalis cava*	+	+	-	-	-	+	-	+	-	+	III
H	Eua	3	3	0	D	*Stellaria holostea*	+	-	1	-	-	+	-	+	-	+	III
Th	Cosm	3.5	3	3	P	*Geranium robertianum*	+	-	+	-	+	-	-	+	-	+	III
H	Eua	2.5	3	0	P	*Carex divulsa*	-	+	-	+	-	+	+	-	-	+	III
Ch	M	3	3	3	D	*Vinca minor*	+	-	-	-	+		3	+	+	-	III
G	Ec	3.5	3.5	4	P	*Arum maculatum*	+	-	-	-	-	+	+	+	+	-	III
H	Ec	3	3	3	P	*Symphytum tuberosum*	-	+	+	+	-	-	+	-	+	+	III
H	E	3	3	3	P	*Carex digitata*	+	-	-	-	+	+	-	+	-	+	III
H	E	3	3	0	D	*Mycelis muralis*	+	-	+	-	-	-	+	+	+	-	III

Continuation *Table 1*

						Species/ relevées no											
H	Eua	3	2	2	DP	*Cruciata glabra*	-	+	-	-	+	+	-	-	+	+	III
H	Eua	3	3	3	D	*Hypericum hirsutum*	-	+	+	+	-	-	-	+	+	-	III
I-nPh	Alt-M	3	3	3	P	*Hedera helix*	+	-	-	+	-	-	+	+	+	-	III
H	Eua	3	3	3	D	*Lathyrus vernus*	-	+	+	-	+	-	+	+	-	-	III
H	Eua	3	0	4	D	*Melica nutans*	+	-	-	-	+	-	+	-	+	-	II
nPh	Eua	4.5	3	4	P	*Rubus caesius*	-	+	-	-	+	-	+	-	+	-	II
H	Eua	3	3	0	DP	*Poa nemoralis*	-	-	-	+	-	-	+	-	+	-	II
MPh	Eua	3	3	3	DP	*Acer platanoides*	1	+	-	-	+	-	-	-	-	+	II
H	Eua	3	3	4	P	*Brachypodium sylvaticum*	-	-	+	-	+	+	-	+	-	-	II
H	Ec	2.5	3	3	D	*Dactylis polygama*	-	-	+	-	-	-	+	+	-	+	II
H	E	4.5	3	3	P	*Carex remota*	+	-	-	+	-	-	-	-	+	+	II
H	Eua	4	3	2.5	P	*Festuca gigantean*	-	+	+	+	-	+	-	-	-	-	II
MPh	Eua	3	3	4	P	*Ulmus minor*	-	-	-	+	-	+	-	-	-	-	I
H	Cosm	4	3	0	P	*Dryopteris filix-mas*	-	+	-	-	+	-	-	-	-	-	I
H	Atl-M	2.5	3.5	4	P	*Viola odorata*	-	-	-	-	-	+	-	-	-	+	I
						Diagnostic species of Order *Fagetalia*											
G	E	3.5	2.5	0	D	*Allium ursinum*	4	5	1	1	2	4	-	-	2	-	IV
nPh	E	3	2.5	3	D	*Rubus hirtus*	-	+	-	+	-	+	1	+	+	4	IV
G	Eua	3.5	3	4	D	*Circaea lutetiana*	+	+	-	+	+	+	-	+	-	+	IV
H	Eua	3.5	3	4	DP	*Asarum europaeum*	-	+	+	+	+	-	+	-	+	+	IV
G	Ec	3	3	0	D	*Corydalis solida*	+	+	-	-	+	-	+	+	-	+	III
H	E	3.5	0	4	D	*Lamium maculatum*	+	+	-	+	-	-	+	+	-	+	III
Ch	E	3	3.5	4	D	*Euphorbia amygdaloides*	+	-	.+	-	+	-	-	+	+	+	III
H	Eua	3	0	4	D	*Lamium galeobdolon*	+	+	-	-	+	+	-	2	+	-	III
H	E	3.5	3	3	D	*Stellaria nemorum*	-	+	+	+	-	-	+	-	+	+	III
H	E	3.5	3	4	P	*Mercurialis perennis*	+	-	-	+	-	+	+	+	+	-	III
H	Eua	3.5	3	4	D	*Salvia glutinosa*	+	+	-	-	+	+	+	-	-	+	III
H	E	3.5	3	4	P	*Carex sylvatica*	-	-	+	1	-	-	-	+	+	+	III
H	Eua	3.5	2	0	D	*Vicia sylvatica*	-	-	+	+	+	-	+	-	+	-	III
G	Eua	3	3	3	P	*Galium odoratum*	+	+	+	-	+	-	+	-	-	+	III
H	Eua	3.5	3	0	P	*Scrophularia nodosa*	-	+	-	-	+	+	+	-	+	-	III
G	Carp-B	4	2	3	D	*Festuca drymeja*	+	-	-	-	-	+	-	+	+	-	II
						Diagnostic species of Class *Rhamno - Prunetea*											
nPh	E	2	3	3	D	*Rosa canina*	+	+	+	+	-	+	+	-	+	-	IV
MPh	E	3	3	3	P	*Sambucus nigra*	-	+	+	+	+	-	-	+	+	+	IV
mPh	Eua	2	3	3	D	*Prunus spinosa*	+	-	-	-	+	+	+	+	-	+	III
						Variae Syntaxa											
Th	Cp	3	3	2	D	*Galium aparine*	1	+	1	1	+	1	-	-	-	+	IV
Th	Eua	3	3	4	D	*Alliaria petiolata*	+	+	+	-	+	+	-	+	+	+	IV
H	Eua	3	2.5	0	D	*Fragaria vesca*	+	-	+	-	+	+	-	+	-	+	III
H	Eua	3.5	3	3	P	*Ranunculus ficaria*	+	+	-	-	-	-	-	-	+	-	II
H	Eua	3	0	0	P	*Veronica chamaedrys*	-	-	-	+	-	-	+	-	-	-	I
Th	Eua	2.5	3	3	D	*Lapsana communis ssp. communis*	-	-	-	-	-	+	-	-	-	+	I

Species present in one sampling incursion (relevée): *Milium effusum* , *Anthriscus sylvestris* (1); *Ajuga reptans* (2); *Fraxinus excelsior, Malus sylvestris* (3); *Urtica dioica, Ajuga reptans* (4); *Lisimahia vulgaris* (5); *Eupatorium cannabinum* (6); *Rumex obtusifolium* (7); *Hypericum perforatum* (8); *Quercus robur, Fagus sylvatica* (9); *Vincetoxicum hirundinaria* (10).

Place and data of sampling incursions: 1- Dealul Mare – Cetariu (27.04.2010); 2- Cetariu Forest (27.04.2010); 3- Paleu Forrest (09.06.2010); 4- Tautelec Dry Valley (11.05.2010); 5- Viile Mari Hill (10.06.2010); 6- Tautelec Forest (10.06.2010); 7- Paleu Forest (21.07.2010); 8- Ineu Forest (23.07.2010); 9- Husasău de Criş, Uileac Hill (13.07.2012); 10 –Fertisag Valley - Ineu Forest (14.07.2010).

C – constancies.

Table 2

Distribution of life forms for the phytocoenoses of the Association *Quercetum petraeae-cerris*

Life forms	**H**	**Th**	**Ch**	**G**	**Mph**	**mPh**	**nPh**	**I-nPh**
No. of species	45	4	4	14	13	7	3	1
%	49.45	4.4	4.4	15.38	14.29	7.69	3.3	1.1

Where: H- hemicryptophytes; G - geophytes; Mph, mPh, nPh - phanerophytes; Ch - chamaephytes; Th -annual terophytes; I-nPh - clumbing plants.

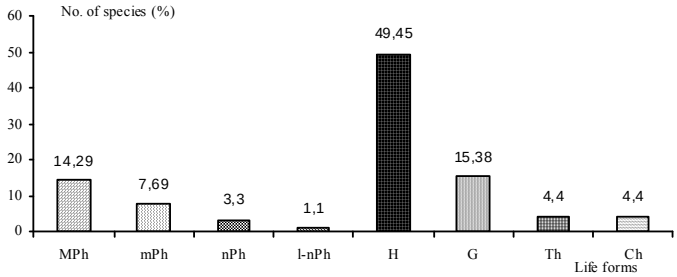

Fig. 1. Spectrum of life forms for the phytocoenoses of the Association *Quercetum petraeae-cerris*
Where: H- hemicryptophytes; G - geophytes; Mph,mPh,nPh - phanerophytes; Ch - chamaephytes; Th -annual terophytes; I-nPh - clumbing plants.

Spectrum of life forms (see fig 1, Table 2) shows the dominance of hemicryptophytes species (H = 49.45%) followed by phanerophytes (MPH + MPH + NPH = 25%), geophytes (G = 15.38%) and chamaephytes (Ch = 4.4%).

The large share of hemicryptophytes as main constituents of *cerris* and oak forests proves the consistency with a temperate climate and the phanerophytes features the physiognomy of these forests and have a great influence on the climate of the Oradea Hills.

Table 3

Distribution of floristic elements for the phytocoenoses of the Association *Quercetum petraeae-cerris*

Floristic elements	**Eua**	**Ec**	**E**	**M**	**Atl-M**	**B**	**Cp**	**Carp-B**	**Mp**	**Cosm**	**P-pan**
No. of species	35	11	26	5	4	2	1	1	3	2	1
%	38.46	12.09	28.57	5.49	4.40	2.20	1.10	1.1	3.30	2.20	1.1

Where: Eua - Eurasian; E - European; Ec – Central European; M- Mediterranean; Atl-M - Atlantic-Mediterranean; Mp –Mediterranean-Pontic; B = Balkan; Cosm – Cosmopolitan, Carp-B - Carpathian-Balkan

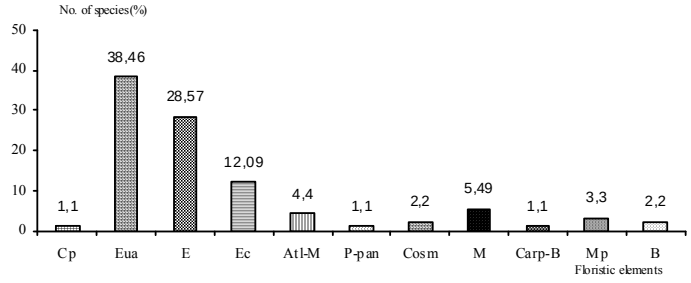

Fig 2. Spectrum of floristic elements for the phytocoenoses of the Association *Quercetum petraeae-cerris*
Where: Eua - Eurasian; E - European; Ec – Central European; M- Mediterranean; Atl-M - Atlantic-Mediterranean; Mp –Mediterranean-Pontic; B = Balkan; Cosm – Cosmopolitan, Carp-B - Carpathian-Balkan

Floristic elements (se fig 2, Table 3) are dominated by northern and western species: Eurasian (Eua = 38.46%), European (E = 28.57%), Central - Europe (Ec = 12.09%), Mediterranean (M + Mp + Atl-M + B = 13.19%) which correlates with the general characteristics of the geographical area investigated – the Dacian province, Western Carpathians region, Apuseni Mountains district.

One results that the Association *Quercetum petraeae - cerris - ruscetosum aculeati* subass. nova Holotypus hoc loco: see Table 1 no 2, makes the transition between the associations from the class *Querco-Fagetea* specific for the central Europe where the Eurasian, European, Central-European species dominate and the associations from class *Quercetea pubescenti – petraeae* specific for in southern Europe where the prevailing (dominant) are the Mediterranean species.

Table 4

Distribution of ecologic indices for the phytocoenoses of the Association *Quercetum petraeae-cerris*

Ecological indices	Classes values	1.5	2	2.5	3	3.5	4	4.5	5	0	Total species
H	No. of species	2	7	22	38	16	4	2	-	-	91
	%	2.2	7.69	24.18	41.76	17.58	4.4	2.2	-	-	100%
T	No. of species	-	3	3	62	13	5	-	-	5	91
	%	-	3.3	3.3	68.13	14.29	5.49	-	-	5.49	100%
R	No. of species	-	4	-	36	-	31	-	3	17	91
	%	-	4.4	-	39.58	-	33.98	-	3.3	18.68	100%

Where: H= humidity, T= temperature, R= chemical reaction of soil.

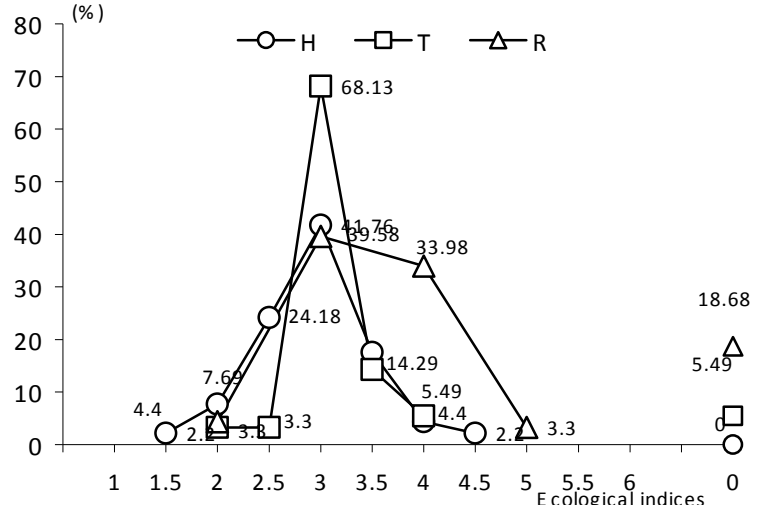

Fig. 3. Diagramatic representation of ecological indices for the phytocoenoses of the Association *Quercetum petraeae-cerris*

Where: H = humidity, T = temperature, R = chemical reaction of soil.

In terms of ecological factors (see fig. 3, Table 5) humidity (H), temperature (T) and chemical reaction of soil (R), the most species are mesophilic ($H_{3-3.5}$ = 59%), xeromesophilic ($H_{2-2.5}$ = 31.8%), micro-mesothermal ($T_{3-3.5}$ = 82%), moderately thermophilic ($T_{4-4.5}$ = 5.5%), acid-neutrophilous (R_3 = 39.6%), weak acid-neutrophils (R_4 = 34%) which are consistent with the stationary conditions of the geographical area.

Table 5

Distribution of karyotypes for the phytocenoses of the Association *Quercetum petraeae-cerris*

Karyotype (2n)	**P**	**D**	**DP**	**CN**
No.	39	43	7	2
%	42.86	47.25	7.69	2.2

Where: P=polyploid, D=diploid, DP=diplo-polyploid, CN=unknown karyotype.

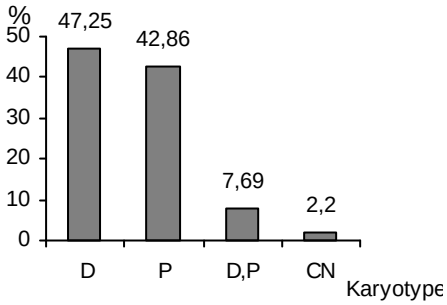

Fig 4. Spectrum of karyotypes of the vascular plants for the phytocoenoses of the Association *Quercetum petraeae-cerris*

Where: P=polyploid, D=diploid, DP=diplo-polyploid, CN=unknown karyotype.

Karyological spectrum (see fig. 4, Table 4) is dominated by the diploid species (D = 47.25%), followed by polyploid ones (P = 42.86%).

CONCLUSIONS

1. Association *Quercetum petraeae-cerris* shows within the Oradea Hills area many transgressive species belonging to the class *Querco-Fagetea*, due to the wetter climate as compared to the south Romania.
2. Phytocoenoses submitted for analysis show a very rich floral biodiversity which presents a total number of 37 European and Central European species, 33 Eurasian species, 12 Mediterranean species, 2 Balkan species, 1 Ponto - Pannonia species.
3. Plant populations consist mostly of Mediterranean species dominated by *Ruscus aculeatus, Ruscus hypoglossum, Fraxinus ornus, Potentilla micrantha, Lathyrus venetus, Tamus communis* show the same ecological affinities suggesting the separation of a new subassociation - *ruscetosum aculeati* subass. nova Holotypus hoc loco: see Table 1 no 2.

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