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THE MIXED FORESTS IN THE PĂDUREA CRAIULUI MOUNTAINS

GHEORGHE GROZA

*University of Agricultural Science and Veterinary Medicine, Faculty of
Agriculture, Nr. 3-5 Mănăştur St., 400372 Cluj-Napoca, România, e-mail:
ghgroza@yahoo.com*

Abstract. In the Pădurea Craiului Mountains, the mixed forests cover a rather large area. On the basis of the phytosociological surveys, these forests have been classified into five associations belonging to QUERCO-FAGETA class: *Carpino-Fagetum silvaticae* Paucă 1941, *Quercus petraeae-Fagetum silvaticae* Resmeriță 1974, 1975, *Quercus petraeae-Carpinetum* Borza 1941, *Quercus cerris-Carpinetum* Boşcaiu et.al. 1966 and *Quercetum petraeae-cerris* Soó 1957. In this paper, the said associations have been analysed from an ecological viewpoint as well as from the viewpoints of the geographical elements and bioforms.

Key words: Pădurea Craiului Mountains, mixed forests, ecological studies, vegetal association, phytosociological table.

The Pădurea Craiului Mountains are situated in the north-western part of the Apuseni Mountains [The Western Mountains], mostly composed of limestone, with heights between 350 and 986 m and a climatic regimen with the annual average temperature of circa 7,5 °C, precipitations of 856, 6 mm. Abundant vegetation developed in these conditions, dominated by forests and grasslands.

Important areas of these mountains are covered by mixed leafbearing forests, which are included in the following coenotaxonomic system:

QUERCO-FAGETEA Br.-Bl. et Vlieger 1937 emend. Soó 1964

Fagetalia silvaticae (Pawl. 1928) Tx. et Diem 1936

Lathyro-Carpinion Boşcaiu 1974

1. *Carpino-Fagetum silvaticae* Paucă 1941

2. *Quercus petraeae-Fagetum silvaticae* Resmeriță 1974, 1975
3. *Quercus petraeae-Carpinetum* Borza 1941
- Quercetalia pubescenti-petraeae* Klika 1933, corr. Morav.
- Quercion pubescenti-petraeae* Br.-Bl. 1932 emend. Rivas-Mart. 1972
4. *Quercus cerris-Carpinetum* Boșcaiu et al. 1966
5. *Quercetum petraeae-cerris* Soó 1957

Carpino-Fagetum silvaticae Paucă 1941 (Table 1)

The hornbeam and beech forests are widespread in the Padurea Craiului Mountains at heights between 380 and 480 m. They can also be found in higher areas, on slopes looking southward. Generally they grow on sunny mountain sides having slopes between 5-6 and 40 degrees. The two telling species are rarely co-predominant, in most cases one or the other is prevailing. In general in higher areas and on less sunny mountain sides the beech is dominant, while the hornbeam prevails in lower areas and on sunny slopes, and this can be explained on one hand by the ecological preferences of the two species, and on the other hand by the greater anthropic impact on the more accesible woods at the mountain feet.

The formation of the top crowning is generally between 70 and 85%. The grassy layer is reduced in most cases, its coverage is in inverse proportion to the top crowning formation. The floristic composition is rich, a number of 81 cormophyte species were found during the 16 surveys.

The analysis of the phytocoenosis behaviour confronted by the ecological indices shows a characteristic mainly mesophilous (71,6%) with slight xero-mesophilous influences (19,7%) of the association. Considering the temperature factor, a strong micro-mesothermic characteristic (76,5%) with slight microthermic influences (18,5%) is made evident. In the hornbeam-beech forests the species acido-neutrophilous and weakly acido-neutrophilous are rather numerous (R_3 -41,9%; R_4 -30,8%).

From the quantitativ viewpoint, the echodiagram shows in a suggestive way the participation of the mesophilous species (microthermic and euryionic) at the formation of the association, compared to a very small contribution of the micro-mesothermic species.

The biomorphic spectrum is dominated by the phanerophytes (29%), hemicryptophytes (33%) and geophytes (22%).

In the geoelement spectrum, the Euro-Asiatic (29%), European (33%) and Central-European (20%) species are prevailing.

The association is rather stably balanced, and consequently, in a natural way, none of the species has the tendency to replace the other one. But as the beech is superior to the hornbeam from the qualitative and economic viewpoint, the first one is extracted by forestry operation more than the latter

Table 1

No. of survey		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	AD med. (%)
		45	42	44	40	40	50	38	39	40	40	45	48	78	70	50	40	
Altitude (×10 m)		NV	V	E	E	E	V	V	E	E	NV	SE	N	NE	V	V	V	
Looking		25	18	25	40	40	5-6	30	20	45	20	10	5	15	22	12	15	
Slope inclination in degrees		75	80	75	75	65	70	85	80	85	80	75	75	85	85	85	70	
Formation of top crowning (%)		5-6	5	25	30	15	7	5	5	5	5	8	10	5	10	15	30	
Grassy layer covering (%)		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Surface (× 10 m ²)		Car. aș.	3	4	4	4	4-5	5	5	5	4-5	3-4	4-5	5	5	5	2	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5	5	3-4	V
		3	2	4	4	4	4-5	5	5	5	4-5	3	4	5	5			

Table 1 continued

[illegible]

Place and time of the surveys: 1 – Vârciorog, between Semnelor Valley and Urzicarului Valley, 10.06.1992; 2 – Vârciorog, Culmea Poienii, 10.06.1992; 3 – Urzicarului Valley, 10.06.1992; 4 – Șuncuiuș, Dumbrava Hill, 26.06.1992; 5 – Bucuroaia, Petroasa Valley, 8.06.1992; 6 – Vârciorog, Culmea Bulzului, 9.06.1992; 7 – 10 – Vîda Valley, 15.07.1990; 11, 12 – Vîda Valley, Băniil Hill, 15.07.1990; 13 – between Meziad cave and Leșu Lake, 17.08.1994; 14 – Meziad Valley, left slope, 18.08.1994; 15 – between Călișteța and Vârciorog, Sighileș Valley, 29.08.1996; 16 – Șerghiș, Pleșa Hill, 30.08.1995.

one, and consequently the latter becomes prevailing in time or even mere bush.

At the lowest limit of these woods, the beech is replaced by the common oak, so that there is an evolution of this tree group to the *Quercus petraeae*-*Carpinetum*.

Quercus petraeae-Carpinetum Borza 1941 (Table 2)

						Table 2			
						No. of survey	1	2	3
						Altitude (×10 m)	70	45	42
						Looking	S	S	V
						Slope inclination in degrees	40	8-10	30
						Formation of top crowning (%)	60	75	85
						Grassy layer covering (%)	15	5	5
						Surface (× 10 m ²)	100	100	100
U	T	R	Biof	Geoelement	Car. as.				
2,5	3	0	PhM	Ec	<i>Quercus petraea</i>	4	1-2		
3,5	3	0	PhM	Ec	<i>Carpinus betulus</i>	+	4		5
					<i>Quercus petraea (reg.)</i>	+	.		+
					<i>Carpinion et Symphyto-Fagion</i>				
3	3	0	PhM	Ec	<i>Cerasus avium</i>	.	+		.
2,5	3	3	G-H	Med	<i>Festuca drymeja</i>	+	+		.
3,5	2,5	3	H	D	<i>Melampyrum bihariense</i>	.	+		.
				Ec	<i>Aposëris foetida</i>	+	+		.
					<i>Fagetalia</i>				
3	2,5	0	PhM	Ec	<i>Fagus silvatica</i>	.	+		.
2,5	3	0	G	Cp	<i>Anemone nemorosa</i>	+	+		.
3	3	3	Ch	Ec	<i>Euphorbia amygdaloides</i>	+	+		.
3,5	3	3	H	Ec	<i>Pulmonaria officinalis</i>	+	.		.
3,5	3	3	H-G	Eua	<i>Asarum europaeum</i>	+	.		.
3,5	3	3	H	Eua	<i>Asperula odorata</i>	.	+		.
3,5	3	3	H	Ec	<i>Luzula luzuloides</i>	+	+		.
3,5	3	3	H	Eua (Med)	<i>Sanicula europaea</i>	.	+		.
3,5	3	3	H	Ec	<i>Hepatica nobilis</i>	.	+		.
3,5	3	3	H	Atl-Med	<i>Primula acaulis</i>	.	+		+
3,5	3	3	H	Ec	<i>Salvia glutinosa</i>	.	+		.
3,5	3	3	H	Eua (Med)	<i>Digitalis grandiflora</i>	.	+		.
3,5	3	3	H	Ec	<i>Lamium galeobdolon</i>	.	.		+
3,5	3	3	H	Ec (Med)	<i>Carex digitalis</i>	.	.		+
2,5	3	4	H	DB	<i>Helleborus purpurascens</i>	.	.		+
					<i>Quercus-Fagetea</i>				
2,5	3	3	Phn	Eua	<i>Crataegus monogyna</i>	.	+		.
3,5	3	3	Phn	Ec (Med)	<i>Ligustrum vulgare</i>	.	+		.
3,5	3	3	Phn	Ec (Med)	<i>Corylus avellana</i>	.	+		+
3,5	3	3	Phn	Eua	<i>Poa nemoralis</i>	.	+		.
3,5	3	3	Phn	Ec	<i>Symphytum tuberosum</i>	+	+		.
3,5	2,5	0	H-Ch	Eua	<i>Galium sculthesii</i>	+	+		.
					<i>Ajuga reptans</i>	.	+		.
					<i>Quercetalia pubescentis</i>				
2,5	3	2	Ch	E (Med)	<i>Genista tinctoria</i>	+	.		.
2,5	3	2	Phm	Ec	<i>Cornus mas</i>	.	.		+
3,5	3	2	Phn	Ec	<i>Cytisus nigricans</i>	+	.		.
3,5	3	2	Ch	Eua	<i>Veronica officinalis</i>	.	+		.
2,5	3	3	H	Eua	<i>Calamintha vulgaris</i>	+	+		.
					<i>Melittis melisophyllum</i>	+	+		.
					<i>Accompanying</i>				
2,5	3	2	H-G	Eua	<i>Calamagrostis arundinacea</i>	1-2	.		.
3,5	3	2	H	Cosm	<i>Asplenium trichomanes</i>	.	.		+
3,5	3	2	H	Eua	<i>Veronica chamaedrys</i>	.	.		+
3,5	3	2	H	Ec	<i>Hieracium sabaudum</i>	.	+		+
3,5	3	2	H	Ec	<i>Hieracium maculatum</i>	+	.		.
3,5	3	2	H	Cosm	<i>Pteridium aquilinum</i>	+	.		.
3,5	3	2	H	Ec	<i>Moehringia muscosa</i>	.	.		+
3,5	3	2	H	Balc	<i>Doronicum columnae</i>	.	.		+

Place and time of the surveys: 1 – Meziad, Dumbrăvița Hill, 25.06.1994; 2 – Șuncuius, Dumbrava Hill, 8.07.1996; 3 – Șuncuius, Mișid Valley, 1.06.1994.

The common oak-hornbeam forests establish on sunny mountain sides having rather big slopes, at heights between 420 and 700 m. They prefer acid brown-yellow soils, having a low humus content.

The formation of the top crowning is of 60-85%, the coverage of the grassy layer is of 5-15%. The flora of this association includes 42 cormophyte species.

The analysis of the phytocoenoses considering the main ecological indices shows the characteristic mesophilous (53,3%) to xero-mesophilous (42,8), micro-mesothermic (76,1%) and acido-neutrophilous (33,3%) of the association. As far as the chemical reaction of the soil is concerned, the acido-neutrophilous (33,3%) and weakly acido-neutrophilous (19%) species are dominant, followed by a rather great number of acidophilous species (16,6%). We mention there is a high percentage of euryionic species in this association.

The biomorphic spectrum is dominated by the hemicryptophytes in the grassy layer (45,2%) followed by phanerophytes (18,9%), geophytes (11,9%) etc. The spectrum of the geographic elements shows as follows: Ec – 28,4%, Eua – 26,1%, E – 23,7%, Med – 2,3%, DB – 2,3% etc.

Quercus petraeae-Fagetum silvaticae Resmeriță 1974, 1975 (Table 3)

The phytocoenoses of this association are generally spread in the west side of the massif, but they can also be found in its central and southern part. They grow more frequently in lower zones, between 400 and 500 m, but also at 700 m in some places. They prefer sunny mountain sides with slopes between 7 and 30 degrees. The ratio between the two co-dominating species is determined by more factors, the most important of them being the altitude and anthropic impact. The flora of the association includes 88 cormophyte species.

The formation of the top crowning is of 65-90%. The dimensions of tree trunks are of 20-32 cm, and their heights vary between 15 and 26 m. The coverage of the grassy layer is variable in a range between 2-3% and 80%.

On the basis of the analysis of the main ecological factors, in the common oak-hornbeam forests considered, the mesophytes represent half of the number of species (57,3%), followed by the xero-mesophytes (33,7%).

Considering the thermic factor, the micro-mesothermic species (78,6%) are clearly predominant compared to the microthermic species (12,3%) and the moderate-thermophilous species (3,3%).

The species requirement for a certain soil chemical reaction shows the prevalence of the acido-neutrophilous and weakly acido-neutrophilous species (R_3 – 37%; R_4 – 26,9%). But from the quantitative viewpoint, the xero-mesophilous, micro-mesothermic and euryionic species are more numerous as compared to the mesophilous and micro-thermic ones.

The biomorphic analysis shows a percentage of 13% of megaphanerophytes among the woody species and of 43% of hemicryptophytes in the grassy layer.

The spectrum of the floristic elements shows the European species are dominant (E + Ec – 51%), followed by the Euro-Asiatic ones (36%); the other elements are to be found in small percentages, still significant for the floristic structure of these forests.

Table 3

		No. of survey																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
U	Altitude (×10 m)	40	75	45	48	50	45	45	45	42	44	40	40	68	50	57	58	70	70	40	40	40	42	40	40
	Looking	E	V	SE	SE	E	V	NV	-	NV	E	E	SE	NE	V	E	E	S	S	E	E	V	E	NV	
	Slope inclination in degrees	30	18	22	20	15	20	12	-	7-8	20	25	20	12	40	15	10	18	30	30	15	10	8	13	
	Formation of top	75	85	85	85	90	80	75	55	75	65	75	65	85	70	75	80	60	75	75	65	65	80	80	
Geo- element	growing (%)	2-3	8	1	3-4	10	30	10	80	5-6	10	15	6-8	12	20	5	2-3	5-6	15	50	15	4-5	4-5	8-9	7-8
T	Surface (× 10 m ²)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
R		4-5	5	5	5	3-4	2	+1	+	+	+	+	+	5	3	+	3-4	2-3	4-5	4-5	+	+	+	+	
Biof	<i>Fagus silvatica</i>	+	+	+	+	-1	3	4	4-5	3-4	4-5	4	4-5	4	5	3	+	4-5	2-3	4-5	4-5	3-4	3-4	4	
	<i>Quercus petraea</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Quercus silvatica</i> (reg.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Quercus petraea</i> (reg.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Symphyto-Fagion																									
	<i>Sorbus torminalis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Carpinus betulus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Corylus avellana</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Cardamine bulbifera</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Carex silvatica</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Mercurialis perennis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Festuca drynaria</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Sanicula europaea</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Galeobdolon luteum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Apospiza foetida</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Asperula odorata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Althium ursinum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Euphorbia amygdaloides</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Gentiana asclepiadea</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Cardamine glandulifera</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Carpinion																									
	<i>Tilia cordata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Crocus banaticus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Actaea spicata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Galium schultesii</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Polystichum setiferum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Veronica urticifolia</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Digitalis grandiflora</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Fagetalia																									
	<i>Leucojum vernum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Heracium maculatum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Dryopteris filix-mas</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Daphne mezereum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Salvia glutinosa</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Ulmus glabra</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Pulmonaria officinalis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Geranium robertianum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Scrophularia nodosa</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Brodiaea benckem</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Siphium tuberosum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Neofitia nigris-avis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Stachys silvatica</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Cnicus lucetiana</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Hedera helix</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Quercion pubescenti-petraeae et cerris																									
	<i>Quercus cerris</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
U		3	2	0	PhM	Ec																			
T		2,5	3	0	PhM	E																			
R		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Biof		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
sm		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

Table 3 continued

Cornus mas				Quercetalia robori-petraeae											
2,5	3	4	Phm sM												
3	3	2	PhM Eua												I 0,04
3	3	0	PhM Ec												I 0,08
3	2,5	2	Phm E												III 0,06
3	3	3	PhM E												I 0,08
3	3	0	G Cosm												I 0,04
3	2,5	3	H E												II 0,22
2,5	3	4	H Med												I 0,10
2,5	3	3	H Ec												I 0,18
3,5	3	3	PhM Ec (Med)												I 0,06
2,5	3	2	H Ec												I 0,02
2,5	3	4	G Eua												III 0,39
2,5	3	3	Phm Eua												I 0,04
2,5	3	3	PhL Ec												I 0,06
2,5	3	4	Phm E (Med)												I 0,04
2,5	3	4	H Eua (Med)												I 0,02
3	3	3	H E												I 0,02
3	3	3	H Eua												I 0,06
3,5	0	3	G Eua												I 0,02
3	3	3	H-G Eua												I 0,02
2,5	3	0	H Ec (med)												I 0,04
3,5	3	2	Phm Eua												I 0,02
3	3	0	H Euc-Atl												I 0,02
3	3	0	H E												I 0,06
				Quercetalia pubescenti-petraeae											
2,5	4	4	H Eua												I 1,16
2,5	3	2	Ch E (Med)												I 0,08
2,5	3	4	Phm Ec												I 0,06
2,5	3	0	H Ec (Med)												I 0,06
2,5	3	0	H Eua												I 0,02
2,5	3	5	H E												I 0,04
3	3,5	4	G Atl-Med												I 0,02
				Accompanying											
2,5	3	3	H Cp												I 0,08
3	0	0	H Eua												I 0,06
3	3	0	H Eua												I 0,04
2	3	3	Phn E												I 0,02
4	0	2	Th Eua												I 0,02
4	3	4	H E												I 0,02
2	2	2	PhM Eua												I 0,02
3	2	2	Ch E												I 0,02
2	3	2	H E												I 0,06
3,5	3,5	3	H Camp (End)												I 0,02
3	3	0	H-Ch Eua												I 0,06
2,5	3	3	Ch-Phn Ec												I 0,06
2,5	3	3	H-G Eua												I 0,04
2,5	0	1	H Cp												I 0,72
2,5	3	3	Th Eua (Med)												I 0,02

Place and time of the surveys: 1 – Semnelor Valley, 9.06.1992; 2 – Culmea Poienii, 9.06.1992; 3, 4, 12 – Mişid Valley, 5.06.1992; 5 – between Vărciorog and Dobreşti, 6.07.1992; 6 – V. Urzicarului, 9.06.1992; 7, 8 – Culmea Bulzului, 7.07.1992; 9, 11 – Şuncuiuş, Dumbrava Hill, 6.06.1992; 10, 13 – Bălnaca Groşi, near mine, 7.06.1992; 14 – Surducel, Berendei Valley, 13.07.1991; 15, 16 – Meziad hut, 16.08.1994; 17, 18 – between Meziad hut and Leşu Lake, Dumbrăviţa Hill, 16.08.1994; 19 – 21 – between Vărciorog and Corbeşti, on Vasului Hill, 30.08.1996; 22 – between Vărciorog and Dobreşti, 31.08.1996; 23 – Luncasprie, 31.08.1996; 24 – Luncasprie, near Sclavu Pleş, 1.09.1996.

No. of survey

[illegible]

[illegible]

Place and time of the surveys: 1, 4 – Bucuroaia, Pietroasa Valley, 8.06.1992; 2 – Bucuroaia, Seaca Valley, 8.06.1992; 3 – between Vârciorog and Surducel, 11.06.1992; 5, 6 – Peștera, Secătura Hill, 14.07.1990; 7, 8 – between Vârciorog and Bucuroaia, Pietroasa Valley, 30.08.1996; 9 – between Corbești and Șerghiș, 30.08.1996; 10 – Aștileu, Șerbota Hill, 15.07.1997.

Quercus cerris-Carpinetum Boşcaiu et al. 1966 (Table 4)

It is a hill association, propagated only in the western side of the massif, where it goes down to the limit of the western hills. The slopes altitude is no higher than 400m, always exposed to the sun, and the inclination varies in wide limits, between 4-5° and 40°. The formation of the top crowning is generally between 65% and 75%, the size of the trees varies from 15 to 20m height and from 21 to 26cm thickness of the trunk. The flora of the analyzed phytocoenosis has 87 species of cormophytes.

The diagram of ecological parameters shows the mesophilous character (51,7%) to xero-mesophilous (42,5%), micro-mesothermic (74,7%) and acid-neutrophilous to low acid-neutrophilous ($R_3 - 39\%$; $R_4 - 26,4\%$) of these forests. And in these forests there is a great number of euriionic species ($R_0 - 23\%$).

Quantitatively, the great majority is made, in a net superior percentage, of xero-mesophilous elements, micro-mesothermic, with the mesophilous-micro-mesothermic element weakly represented.

The bioforms analysis shows the predominance of the megaphanerophytes in the upper layer (PhM – 8%), and that of the hemicryptophytes (43%), followed by geophytes (10%), in the grassy layer.

The spectrum of the floristic elements is dominated by the European element (33%), Eur-Asian one (28,6 %) and the Central European one (16%). The presence of the Submediterranean element is significant (9,1%), which shows the presence of a warmer microclimate of the stations where we can find this association.

Quercetum petraeae-cerris Soó 1957 (Table 5)

This association is part of the leafy woods xero-mezo-thermophilous. The phytocoenosis of the association are spread on the slopes of the western sides of the massif up to an altitude of 400m, but goes up to 720m on the southern slopes (Table , rel. 4), where beech is still present, forming a combination that we have temporary included in a new subassociation – fagetosum silvaticae. A more extensive study of these coenosis will certainly establish the affiliation of this group of oak-cerris with beech. The flora of the analyzed phytocoenosis has 63 species of cormophytes.

The analysis of the main ecological parameters shows the preponderance of the mesophytes (62,5%), followed by the xero-mesophytes (29,6%). Related to the temperature element we can see the clear dominance of micro-mesothermic (70,3%). The microthermic plants (18,7%) can be found in the phytocoenosis from a higher altitude.

The graphic of bioforms underlines the percentage of megaphanerophytes in the superior layer (10,9 %), the hemicryptophytes predominance in the grassy layer (43,7%), and a small percent of geophytes (9,3%).

Table 5

No. of survey						1	2	3	4	5
Altitude (×10 m)						38	47	48	72	40
Looking						E	-	E	S	S
Slope inclination in degrees						4-5	-	25	15	25-28
Formation of top crowning (%)						60	75	60	75	50
Grassy layer covering (%)						10	5-6	10	5	15
Surface (× 10 m ²)						100	100	100	100	100
U	T	R	Biof	Geoelement	Car. as.					
2,5	3	0	PhM	E	<i>Quercus petraea</i>	2-3	3	3-4	+	+
2,5	3,5	3	PhM	sM	<i>Quercus cerris</i>	+	1-2	1-2	3-4	3
					<i>Quercetalia pubescenti-petraeae</i>					
3,5	3	4	PhM	E	<i>Malus sylvestris</i>	.	+	.	.	.
2,5	3	2	Ch	E-Med	<i>Genista tinctoria</i>	.	.	+	.	.
3	3	4	H	E	<i>Campanula persicifolia</i>	.	.	.	.	+
2,5	3,5	3	H	sM	<i>Potentilla plicrantha</i>	.	.	+	.	.
3	0	3	H	Alp-Carp-Balc	<i>Silene italica</i>	.	.	.	.	+
					<i>Quercetalia roborj-petraeae et Carpinion</i>					
3	3	0	PhM	Ec	<i>Carpinus betulus</i>	2-3	3	+	.	.
2,5	3	0	PhM	Ec	<i>Prunus avium</i>	+	+	+	.	.
3	3	4	Phm	E	<i>Sorbus torminalis</i>	.	.	+	.	.
3	3	4	H	Eua (Med)	<i>Brachypodium silvaticum</i>	+	.	+	.	.
					<i>Symphytio-Fagion</i>					
3	2,5	0	PhM	Ec	<i>Fagus sylvatica</i>	.	.	.	2-3	.
					<i>Fagus sylvatica (reg.)</i>	.	.	+	+1	.
3	3	3	PhM	E	<i>Tilia cordata</i>	.	.	+	.	.
3	3	4	G	Ec	<i>Cardamine bulbifera</i>	+	+1	.	.	.
1,5	3,5	4	H	E	<i>Carex sylvatica</i>	+	.	+	.	.
1,5	3,5	4	Ch	Ec	<i>Euphorbia amygdaloides</i>	+	.	+	.	.
1,5	2,5	3	H	Ec	<i>Aposotis foetida</i>	+	.	+	.	.
1,5	2,5	4	H	E	<i>Veronica urticifolia</i>	+	.	.	.	.
4	2	0	G	E	<i>Crocus banaticus</i>	.	+	.	.	.
4	2	3	H-G	Med	<i>Festuca drymeia</i>	.	.	+	.	.
					<i>Fagetalia</i>					
2,5	2,5	2	H	Ec	<i>Luzula luzuloides</i>	.	.	+	+1	+1
2,5	3	2	H	E	<i>Hieracium maculatum</i>	+	.	+	.	+
1,5	3	3	Th	Eua (Med)	<i>Geranium robertianum</i>	+	.	.	.	.
1,5	3	3	H	Eua (Med)	<i>Sanicula europaea</i>	+	.	.	.	.
1,5	3	4	H-G	Eua	<i>Asarum europaeum</i>	+	.	.	.	.
1,5	3	3	G	Eua	<i>Asperula odorata</i>	+	.	.	.	.
1,5	3	3	H-Ch	Ec	<i>Lamium galeobdolon</i>	+	.	+	.	.
1,5	3	3	H	Eua	<i>Lathyrus vernus</i>	+	.	+	.	.
1,5	2,5	0	H-Ch	Ec	<i>Apula reptans</i>	+	.	.	.	.
					<i>Quercio-Fagetea</i>					
3,5	0	3	G	Eua	<i>Plantanthera bifolia</i>	.	.	+	.	.
2,5	3	3	H	Eua	<i>Fragaria vesca</i>	+	.	+	.	+
2,5	3,5	3	H	E	<i>Viola reichenbachiana</i>	+	.	+	.	.
2,5	0	3	H	Eua	<i>Hieracium murorum</i>	.	.	.	.	+
2,5	3	3	Th-TH	Eua	<i>Moehringia trinervia</i>	.	+	.	.	+
2,5	3	4	H	Med	<i>Melica uniflora</i>	.	.	+	.	.
2,5	3	3	H	Eua	<i>Crucata glabra</i>	.	.	+	.	.
2,5	3	3	H	E	<i>Lathyrus niger</i>	.	.	+	.	.
2,5	3	0	H	Eua	<i>Poa nemoralis</i>	.	.	.	+	.
2,5	3	3	Phn	Eua	<i>Crataegus monogyna</i>	.	.	.	+	.
2,5	2,5	2	Phn	E	<i>Rubus hirtus</i>	.	.	.	+	.
1,5	3	4	G	Ec (Med)	<i>Cephalanthera longifolia</i>	+	.	.	.	.
2	3	0	H-Ch	Eua	<i>Glechoma hirsuta</i>	+	.	.	.	.
2	3	3	H	E	<i>Symphytum tuberosum</i>	.	.	.	+	.
					<i>Calamintha vulgaris</i>	.	.	.	+	.
					<i>Accompanying</i>					
3	3	0	H-Ch	Eua	<i>Veronica chamaedrys</i>	.	.	+	.	.
3,5	3	3	Ch	E	<i>Lysimachia nummularia</i>	+	.	.	.	.
3	0	0	Th	Cosm	<i>Stellaria media</i>	.	.	.	+	.
0	0	2	H	Cp	<i>Agrostis tenuis</i>	.	.	.	.	+1
2	2	2	Ch	Eua	<i>Veronica officinalis</i>	.	.	.	.	+
2	2	0	Th-TH	Eua (Med)	<i>Trifolium strepens</i>	.	.	.	.	+
2	0	0	H	Eua	<i>Leontodon autumnalis</i>	.	.	.	.	+
2,5	0	2	Th	Eua	<i>Hypericum humifusum</i>	.	.	.	.	+
2	3	2	H	E	<i>Hieracium pilosella</i>	.	.	.	.	+
2	3	0	G	Cosm	<i>Pteridium aquilinum</i>	.	.	.	+	.
2,5	3,5	0	Phn	E	<i>Rosa canina</i>	.	.	.	+	.
2,5	3	0	Ch-Phn	sM	<i>Rubus procerus</i>	.	.	+	.	.
2,5	3	0	H-G	Eua	<i>Carex panicea</i>	+	.	.	.	.
2,5	3	4	H	Eua	<i>Astragalus glycyphyllos</i>	+	.	.	.	.
2,5	3	4	Th-TH	Cp	<i>Geum urbanum</i>	+	.	.	.	.
2,5	3	3	H	Eua	<i>Lapsana communis</i>	+	.	.	.	.
3	3	0	H	Eua	<i>Prunella vulgaris</i>	.	.	+	.	.
3	3	4	H	Eua	<i>Dactylis glomerata</i>	.	.	.	.	.
1,5	3	0	H	E	<i>Poa compressa</i>	.	.	.	+	.

Place and time of the surveys: 1 – Vida Valley, 16.07.1990; 2, 3 – Vârciorog, between Urzicarului Valley Peștiș Valley; (2), Culmea Poienilor (3), 10.06.1992; 4 – Bălnaca Groși, Hapatag Hill, 5.06.1992; 5 – Luncasprrie, 30.08.1996.

The spectrum of floristic elements is dominated by the Eur-Asian element (39 %), followed by the European one (29,6%) and the Central-European one (14%).

Economically speaking, the oak-cerris has a medium quality wood, because of the cerris, which is the weakest essence among the quercetum.

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(REZUMAT)

PĂDURILE DE AMESTEC DIN MUNŢII PĂDUREA CRAIULUI

O mare parte din pădurile Munţilor Pădurea Craiului sunt făgete. Celelalte sunt păduri de amestec de fag, gorun, carpen şi cer. În acest articol sunt analizate din punct de vedere fitosociologic pădurile de fag în amestec cu gorunul şi carpenul, precum şi pădurile de gorun şi cer în diferite amestecuri. Dispoziţia acestor păduri este influenţată de factori naturali precum altitudinea şi expoziţia versanţilor, dar şi de factorul antropic.