

CONSIDERATIONS REGARDING THE ASSOCIATION *Veratretum albi* PUȘCARU *et al.*, 1956

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Abstract. In this paper are presented the results of the study research that I performed in the Southern Carpathians in the period 2004-2009 regarding the association *Veratretum albi* PUȘCARU *et al.*, 1956. Although groups of *Veratrum album* LINNÉ were met in almost all the massifs of the Southern Carpathians, well united phytocoenosis were identified only in the Retezat Mountains. The variation of the rather big floristic composition of the phytocoenosis determined a lot of opinions regarding the syntaxonomic position. Although the field observation suggest to include the association among the megaforbs, in the Class Mulgedio-Aconitetea HADAČ & KLIKA in KLIKA 1948 because when the nitrates finish from the soil the characteristic species of the Order Adenostyletalia became predominant. The surveyings from the Hășmaș Mountains and Cibin Mountains described by other authors – besides of my own surveyings – have been presented in the phytosociological table of this association.

Keywords: megaforbs, *Veratretum albi*, Southern Carpathians.

Rezumat. Considerații privind asociația *Veratretum albi* PUȘCARU *et al.*, 1956. În această lucrare sunt prezentate rezultatele cercetărilor personale referitoare la asociația *Veratretum albi* PUȘCARU *et al.*, 1956 efectuate în Carpații Meridionali în perioada 2004-2009. Deși pălcuri de *Veratrum album* LINNÉ au fost întâlnite în aproape toate masivele muntoase din Carpații Meridionali, fitocenoză bine încheiate au fost identificate numai în Munții Retezat. Variația compoziției floristice destul de largi a fitocenozelor a determinat o multitudine de păreri în privința poziției sintaxonomice. Totuși, observațiile din teren pledează pentru încadrarea asociației printre megaforbiere, în clasa Mulgedio-Aconitetea HADAČ & KLIKA în KLIKA 1948 datorită faptului că odată cu epuizarea nitraților din sol devin predominante speciile caracteristice ordinului Adenostyletalia. În tabelul fitosociologic al acestei asociații sunt prezentate, alături de releveele proprii și releveele descrise de alți autori din Masivul Hășmaș și Munții Cibin.

Cuvinte cheie: megaforbiere, *Veratretum albi*, Carpații Meridionali.

INTRODUCTION

Physical and geographical setting

The Southern Carpathians are the highest area of our country. These mountains are situated in central Romania, south to the Transylvanian Depression. Prahova Valley (East), Timiș-Cerna Passage (West) and hilly regions (North & South) are framing these mountains. The following groups are forming the Southern Carpathians: Bucegi Group, Făgăraș Group, Parâng Group, Retezat-Godeanu Group.

The Eastern Carpathians lie from the northern border of the country up to Prahova Valley. They are formed by several mountainous groups: the northern group (Maramureș and Bucovina Carpathians), the central group (Moldo-Transylvanian Carpathians) and the southern group (the Curvature Carpathians) (POSEA, 2006).

Unlike in the Eastern Carpathians, in Southern Carpathians the metamorphic rocks and the magmatic ones are prevalent, which control the massiveness of these mountains, being more resistant to erosion (PELIN *et al.*, 1969).

The climate is a typically mountain one (1,000 and 1,800 – 2,000 m), even with alpine influences (over 1,800 - 2,000 m). The annual average temperature decreases as the height increases, from 6°C (at 1,000 m) and 2°C (1,800 m); the average temperature of the warmest and the coldest months decreases proportionally. The rainfalls increase from 800 mm to 1,200 mm-1,400 mm / year. The winds are on western domination, in Hațeg, Petroșani and Lovișteța depressions such phenomena of thermo inversion had been reported (CRISTEA & DIMITRIU, 1961; VELCEA & SAVU, 1982).

MATERIAL AND METHODS

For the study of the vegetal carpet we have used methods of phyto-sociologic research characteristic to the Central European phytosociologic School, which was based on the principles and methods elaborated by BRAUN-BLANQUET (1926).

The names of the species are conformable to Flora României (CIOCĂRLAN, 2009).

The syntaxonomic nomenclature was adopted according to the stipulations of the International Code of the Phytosociological Nomenclature elaborated by WEBER *et al.* (2000).

RESULTS AND DISCUSSIONS

The Association *Veratretum albi* PUȘCARU *et al.*, 1956 (Syn: *Poëto-Veratretum lobeliani* BORZA 1933 n.n.) was identified in the large area of the Southern Carpathians in the Parâng Mountains (SANDA, 2002), in the Sadu Valley Basin (DRĂGULESCU, 1995), in the Făgăraș Mountains (PUȘCARU *et al.*, 1981; POPESCU & SANDA, 1995), in the Lotru Mountains (NICULESCU *et al.*, 2008) and the area of the Eastern Carpathians (Hășmaș Mountain, NECHITA, 2003).

The correspondent of this association in Europe is *Poo chaixii-Veratretum lobeliani* KORNAŠ & MEDWECKA-KORNAŠ 1967. Like the Romanian association, it is included in the Alliance Rumicion alpini RUBEL ex KLIKA in KLIKA & HADAČ 1944 and the Rumicetalia alpini RUBEL ex KLIKA in KLIKA & HADAČ 1944 Order. Both associations present phytocoenosis which grow in similar climatic conditions (LÁNIKOVÁ, 2009).

Its phytocoenosis are not always clearly individualized, the only differential criteria being the abundance of the species *Veratrum album* (LINNÉ). The syntaxonomic position of the association is disputable; there are different opinions. Thus, some phytocoenologists include it together with the Association Rumicetum alpini BERGER 1922 in the Class Galio-Urticetea PASSARGE 1967 em. KOPECKÝ 1969 (SANDA *et al.*, 2008), while other include it in the Class Artemisietea vulgaris LOHMEYER *et al.* in R. TÜXEN 1950 (OBERDORFER 1978, COLDEA 1991) or Mulgedio-Aconitetea (MUCINA *et al.*, 1993). The field researches shown that the last variant is better, as long as after the nitrates (resulted from the animals' dejections) from the soil are finished, species of the Order Adenostyletalia become predominant and this justify the decision to include it in this order of the Aliance Rumicion alpini (SĂMĂRGIȚAN, 2005).

Because *V. album* appears in the edified meadows of *Festuca rubra* (LINNÉ) and *F. airoides* (LAMARCK), DRĂGULESCU (1995) consider that it is more appropriate to treat *V. album* coenosis as facieses of the association they grow up inside.

The phytocoenosis grow up very well on high altitudes, on northern slopes which are wetter, at the end of the meadow, and next to forests. In the floristic composition are included: *Veratrum album*, *Festuca rubra* (LINNÉ), *Nardus stricta* (LINNÉ), *Deschampsia caespitosa* (LINNÉ) BEAUV., *Trifolium repens* (LINNÉ), *Plantago media* (LINNÉ), *Stellaria graminea* (LINNÉ), *Urtica dioica* (LINNÉ) etc. (Table 1).

The spectre of the bioforms highlights a high percentage of the hemicyptophytes (77%), followed by the therophytes (13%) and chamephytes (4%), while the other cathegories of bioforms are less represented in these phytocoenosis (Fig. 1).

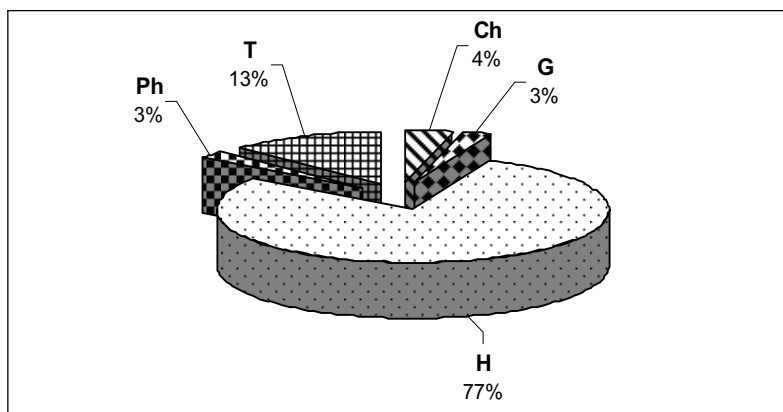


Figure 1. The spectrum of the bioforms (percentages) of the *Veratretum albi* association.
 Figura 1. Spectrul bioformelor (procente) asociației *V. albi*.

The floristic elements that form the basic substance of chormoflora are Eurasiatic (37.97%), European (25.31%) and Central-Europaen (6.32%). The presence of the Alps elements (8.86%) stresses the florogenetical links with the Alps' flora (Fig. 2).

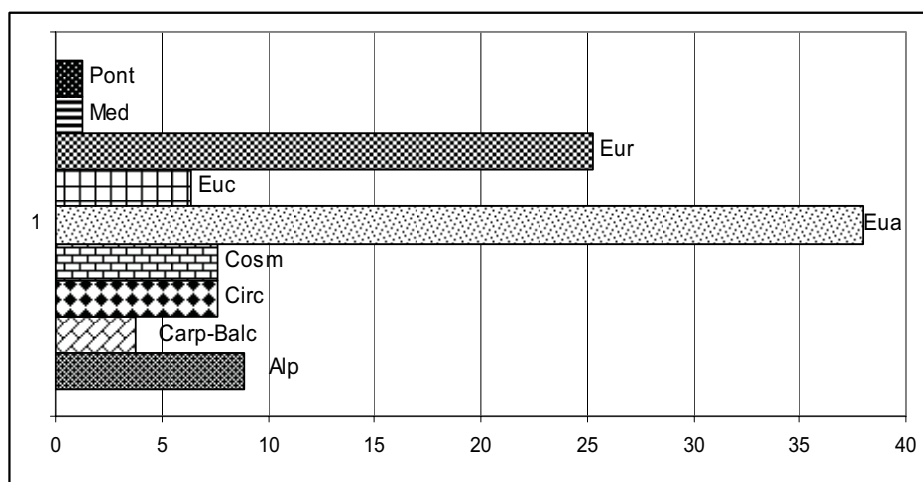


Figure 2. The spectrum of the floristics elements (percentages) of the *Veratretum albi* association.
 Figura 2. Spectrul elementelor floristice (procente) pentru asociația *V. albi*.

Table 1. *Veratretum albi* PUSCARU *et al.*, 1956. / Tabel 1. *V. albi* PUSCARU *et al.*, 1956.

Biof.	Geoelem.	Cyt.	The relevé Altitude (m x 10) Exposure Inclination (in grades) Area (m ²) Coverage (%)	1	2	3	4	5	6	7	8	K
				200 V	180 NV	170 -	160 NV	165 SV	150 SV	160 NE	160 NV	
				10	45	-	25	20	20	25	25	
				100	100	-	25	25	25	25	25	
				75	75	90	80	80	80	80	90	
			Ass.									
G	Eua	D	<i>Veratrum album</i>	4	4	4	4	4	4	4	4-5	V
			Rumicion et Rumicetalia									
H	Alp-Eur	D	<i>Rumex alpinus</i>	+	+	-	+	-	+	+	+	IV
TH-H	Eur (Mont)		<i>Senecio squalidus</i>	-	-	-	-	+	+	+	-	II
H	Circ (Arct-Alp)	D-P	<i>Poa alpina</i>	-	-	-	+	-	-	-	+	II
H	Eur	P	<i>Rumex obtusifolius</i>	-	+	-	-	+	+	-	-	II
H	Cosm	D	<i>Veronica serpyllifolia</i>	-	-	-	-	-	-	+	-	I
			Adenostyilion et Adenostyletalia									
H	Eua	P	<i>Senecio germanicus</i>	+	+	-	+	-	-	+	+	IV
H	Eur	P	<i>Valeriana sambucifolia</i>	-	-	-	-	+	+	-	+	II
H	Euc (Mont)	P	<i>Gentiana asclepiadea</i>	-	-	-	-	+	+	-	-	II
TH-H	Eua	D	<i>Angelica archangelica</i>	+	-	-	-	-	-	-	-	I
H	Eua	D	<i>Rumex arifolius</i>	1	1	-	-	-	-	-	-	II
			Mulgedio-Aconitetea									
H	Circ	D	<i>Viola biflora</i>	-	-	-	+	-	+	+	+	III
H	Alp-Carp	D	<i>Knautia longifolia</i>	-	-	-	+	+	+	-	-	II
mPh	Eur (Alp)	D	<i>Ribes petraeum</i>	-	-	-	-	+	-	+	-	II
H	Eur (Mont)	D	<i>Cicerbita alpina</i>	-	-	-	-	-	-	-	+	I
H	Eua (Mont)	P	<i>Geranium sylvaticum</i>	-	+	-	-	-	-	+	-	II
H	Eur (Mont)	D	<i>Ranunculus platanifolius</i>	+	-	-	-	-	-	-	+	II
H	Alp-Eur	P	<i>Gentiana punctata</i>	+	-	-	-	-	-	-	-	I
			Variae Syntaxa									
H	Circ	P	<i>Festuca rubra</i>	-	-	1	1	+	+	+	+	IV
H	Eur	D	<i>Anthyllis vulneraria</i>	-	-	-	+	+	+	-	+	III
H-G	Eua	P	<i>Euphorbia cyparissias</i>	-	-	-	+	-	+	+	+	III
H	Eua (Arct-Alp)	P	<i>Hieracium aurantiacum</i>	-	-	-	-	+	+	+	+	III
H	Eua	P	<i>Lotus corniculatus</i>	-	-	-	+	-	+	+	+	III
H-TH	Eua	D	<i>Trifolium pratense</i>	-	-	-	-	+	+	+	+	III
H (G)	Circ	P	<i>Agrostis capillaris</i>	-	-	+	+	+	+	-	-	III
H	Eur	P	<i>Alchemilla subcrenata</i>	-	-	-	+	-	-	+	+	II
H (Ch)	Eua	P	<i>Antennaria dioica</i>	-	+	-	+	+	+	-	-	III
TH	Eua	D	<i>Carum carvi</i>	-	-	-	+	-	+	+	-	I
TH	Eur	P	<i>Crepis biennis</i>	-	-	-	+	+	-	-	+	I
Th	Eur		<i>Euphrasia stricta</i>	-	-	+	-	-	+	+	+	III
TH	Alp-Carp-Balc	P	<i>Gentianella austriaca</i>	-	-	-	+	-	+	+	-	II
Ch	Euc (Mont)	D	<i>Helianthemum rupifragum</i>	-	-	-	+	+	-	+	-	II
Th-H	Eua	D-P	<i>Medicago lupulina</i>	-	-	-	-	-	-	+	+	II
H	Circ (Arct-Alp)	P	<i>Phleum alpinum</i>	-	-	-	+	-	+	-	+	II
H	Eua	P	<i>Taraxacum officinale</i>	-	-	-	-	+	+	-	+	II
Ch	Med-Euc	P	<i>Teucrium chamaedrys</i>	-	-	-	+	+	+	-	-	II
H	Eua	P	<i>Trifolium repens</i>	-	+	+	-	+	+	+	-	IV
H	Eua	D-P	<i>Briza media</i>	-	-	-	-	+	-	-	+	II
H	Eua (Med)	P	<i>Carex distans</i>	-	-	-	+	-	+	-	-	II
H	Eua	P	<i>Dactylis glomerata</i>	-	-	-	-	-	-	+	+	II
H	Eua		<i>Leucanthemum vulgare</i>	-	-	+	-	-	+	+	-	II
H	Eua (Circ)	D	<i>Nardus stricta</i>	-	+	1	+	-	+	-	-	III
H	Eur	D	<i>Pimpinella major</i>	-	-	-	-	+	-	+	-	II
H	Alp (Eur)	D	<i>Poa molinerii</i>	-	-	-	-	+	-	-	+	II
H	Alp-Eur	D-P	<i>Potentilla aurea</i>	-	-	-	-	-	-	+	+	II
H	Pont-Balc		<i>Potentilla chrysantha</i>	-	-	-	+	-	+	-	-	II
H	Eua (Med)	D	<i>Ranunculus acris</i>	-	-	-	+	-	-	-	+	II
H	Eur	D-P	<i>Trifolium alpestre</i>	-	-	-	-	+	-	+	-	II
H	Atl-Eur		<i>Trifolium hybridum</i>	-	-	-	-	-	+	+	-	II
H	Eua	P	<i>Achillea millefolium</i>	-	-	+	-	-	-	+	-	II
H	Eua	P	<i>Anthoxanthum odoratum</i>	-	-	+	-	-	-	-	+	II
H	Eur	D	<i>Bellis perennis</i>	-	-	-	-	-	-	+	-	I
G	Eur	D-P	<i>Dactylorhiza maculata</i>	-	-	-	-	+	-	-	-	I
TH-H	Eur	P	<i>Gentianella ciliata</i>	-	-	-	-	+	-	-	-	I
H	Cosm		<i>Juncus effusus</i>	-	-	-	-	-	+	-	-	I
H	Cosm	D	<i>Lolium perenne</i>	-	-	-	-	-	-	-	+	I
H	Eua	D-P	<i>Plantago media</i>	-	+	+	-	-	-	-	+	II
H	Cosm	P	<i>Prunella vulgaris</i>	-	+	-	-	-	-	-	+	II
H	Cosm	P	<i>Urtica dioica</i>	+	-	+	+	-	-	-	-	II
H	Cosm	D-P	<i>Deschampsia caespitosa</i>	+	+	1	-	-	-	-	-	II

MPh	Euc	D	<i>Pinus mugo</i>	+	-	-	-	-	-	-	-	I
H	Eua	D	<i>Silene vulgaris</i>	+	-	-	-	-	-	-	-	I
H	Eua	D	<i>Selinum carvifolium</i>	+	-	-	-	-	-	-	-	I
H	Euc	D	<i>Luzula sylvatica</i>	-	+	-	-	-	-	-	-	I
H	Eua	P	<i>Epilobium montanum</i>	-	+	-	-	-	-	-	-	I
H(Ch)	Eua	D	<i>Lamium maculatum</i>	-	+	-	-	-	-	-	-	I
H	Eur	D	<i>Cynosurus cristatus</i>	-	-	+	-	-	-	-	-	I
Th (TH)	Eur	P	<i>Trifolium dubium</i>	-	-	+	-	-	-	-	-	I
H	Euc	D	<i>Centaurea phrygia</i>	-	-	+	-	-	-	-	-	I
H	Eur	P	<i>Polygala vulgaris</i>	-	-	+	-	-	-	-	-	I
Ch	Eua	P	<i>Veronica officinalis</i>	-	-	+	-	-	-	-	-	I
H	Eua	D	<i>Stellaria graminea</i>	-	+	+	-	-	-	-	-	II
H	Eua	P	<i>Potentilla erecta</i>	-	-	+	-	-	-	-	-	I
H	Carp-Balc		<i>Potentilla ternata</i>	-	-	+	-	-	-	-	-	I
H	Eur	P	<i>Geum montanum</i>	-	-	+	-	-	-	-	-	I
H	Eur	P	<i>Alchemilla vulgaris</i>	-	-	+	-	-	-	-	-	I
TH	Carp-Balc	P	<i>Campanula* abietina</i>	-	-	+	-	-	-	-	-	I
H	Carp-Balc	D-P	<i>Viola declinata</i>	-	-	+	-	-	-	-	-	I
H	Circ	D-P	<i>Carex ovalis</i>	-	-	+	-	-	-	-	-	I

Data and place of relevés:

1 – Retezat Mountain, Tăul Negru (11.08.2005); 2 – Retezat Mountain, Tăul Negru (11.08.2005); 3 – Cibin Mountain, Oncești (17.07.1979), ap. DRĂGULESCU, 1995; 4 – Hășmaș Mountain, Poiana Albă (6.08.1993), ap. NECHITA, 2003; 5 – Hășmaș Mountain, Poiana Albă (6.08.1993), ap. NECHITA, 2003; 6 – Hășmaș Mountain, Poiana Albă (6.08.1993), ap. NECHITA, 2003; 7 – Hășmaș Mountain, Curmătura Hășmașului (1.08.1996), ap. NECHITA, 2003; 8 – Hășmaș Mountain, Curmătura Hășmașului (1.08.1996), ap. NECHITA, 2003.

By analyzing the ecologic indexes we found out that regarding the humidity (U), the majority of the studied megaforbs are mesophytes ($U_{3-3.5}=54.54\%$). Regarding the temperature factor (T): the microthermic ($T_{2-2.5}=37.66\%$) and micro-mesothermic ($T_{3-3.5}=23.37\%$) are the best represented, that indicating a cold climate specific for the superior mountain and subalpine floors. The criophytes species ($T_{1-1.5}=9.09\%$) and the moderate-thermophytes ($T_{4-4.5}=2.59\%$) are poorly represented, while the thermophytes ($T_{5-5.5}$) are not present. The index that regards the soil reaction (R), highlights the presence of the acid-neutrophilous ($R_{3-3.5}=18.18\%$) and low-acid-neutrophilous ($R_{4-4.5}=25.97\%$), joined by the euriionic species ($R_0=40.25\%$). The acidophilous species are found in big percentage ($R_{2-2.5}=2.59\%$), to the edification of the mountain high weed, while the neutro-basiphilous ($R_{5-5.5}=1.29\%$) and the strong-acidophilous ones ($R_{1-1.5}=2.59\%$) are poorly represented (Fig. 3).

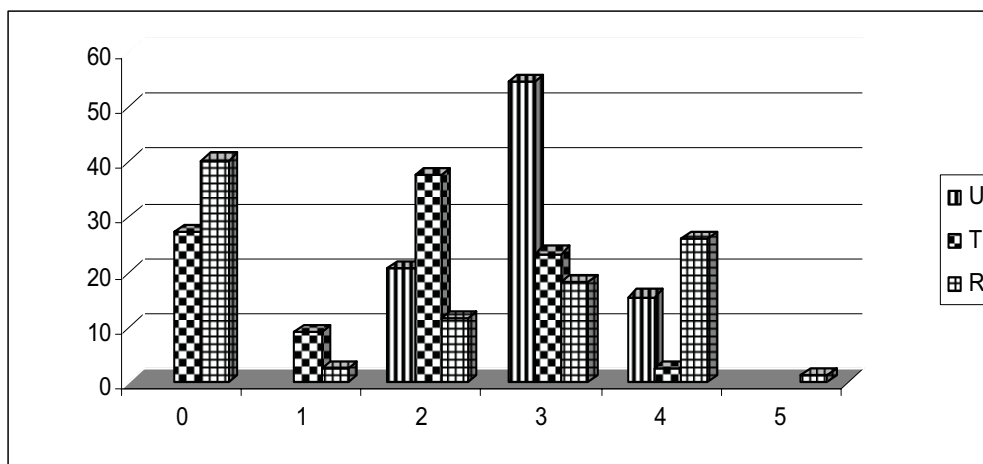


Figure 3. The spectrum of the ecological indexes (percentages) of the *Veratrum albi* association.
 Figura 3. Spectrul indicilor ecologici (procente) pentru asociația *V. albi*.

The polyploides species (43.03%) dominate the floristic composition of this coenosis, while the diploid represent only 35.44% from the total amount of the species (Fig. 4).

We found it in the Retezat Mountains (August 08, 2005), while groups of *Veratrum album* which did not form well united phytocoenosis, we also identified in the Făgăraș & Bucegi Massifs, in the ex sheep breeding places.

The coenosis from the Retezat Mountains of this association have been found by us too on the old places of a sheepfold near Tăul Negru at a 2000 m altitude, Western exposure, 10^0 inclination.

Depending on the intensity of the shepards activity, the floristic composition of the coenosis in which the white veratrum is predominant varies between distant values, fact that explains the diversity of opinions regarding the syntaxonomic wage-class. Despite this the groups from the Retezat Mountains which were related to this association show a certain belonging to the Class Mulgedio-Aconitetea (*Ranunculus platanifolius* (LINNÉ), *Geranium sylvaticum* (LINNÉ), *Gentiana punctata* (LINNÉ), *Viola biflora* (LINNÉ), *Cicerbita alpina* (LINNÉ) WALLR.).

The personal surveyings made in Retezat Mountains (rel. 1, 2) together with the described surveyings from Cibin Mountains (rel. 3, DRĂGULESCU, 1995) and Hășmaș Mountains (rel. 4-8, NECHITA, 2003) will be presented in table 1.

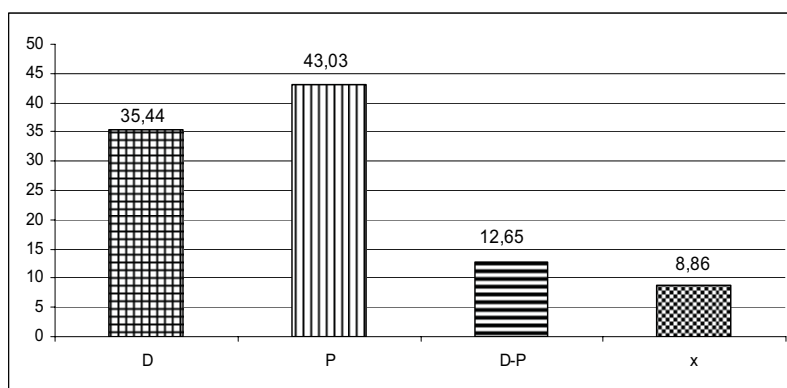


Figure 4. The spectrum of the karyological index (percentages) of the *Veratretum albi* association.
Figura 4. Spectrul cariologic (procente) al asociației *V. albi*.

CONCLUSIONS

Veratretum albi association was reported to Rumicetalia alpini order and integrated in different phytosociological classes by some authors.

From the floristic analysis it can be recorded that the species that form the floristic composition of the association are mainly Eurasian and European hemicryptophyte.

From the point of view of the ecological factors there are mesophytes, microtherme, micro-mesotherme, acido-neutrophilous and low-acido-neutrophilous.

All these data obtained after the research are in concordance with the features of the other associations of megaforbs and this thing is a proof for the correct recording of the *Veratretum albi* association in Mulgedio-Aconitetea class.

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