

STUDY OF FORESTS BELONGING TO THE *FESTUCO DRYMEJAE* - *FAGETUM* COMMUNITY PLANT VARIETY TIGHT INCLUDED IN THE NATURAL HABITAT OF COMMUNITY INTEREST 9110 *LUZULO-FAGETUM* TYPE BEECH FORESTS IN THE VLĂDEASA MOUNTAINS - WESTERN CARPATHIANS

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RESEARCH ARTICLE

Abstract

The purpose of this academic work is to conduct a phytosociological, ecological, cytogenetic study on the beech stands (*Fagus sylvatica*) with (*Festuca drymeja*) included in the natural habitat of community interest 9110 Luzulo-Fagetum beech forest, located in the geographical area of Vlădeasa Mountains, Western Carpathians.

To achieve this purpose, we set ourselves the objectives of identifying areas of forests with beech (*Fagus sylvatica*), fir (*Abies alba*), spruce (*Picea abies*) with *Festuca drymeja* that contain in the shrub and herbaceous layer rare, threatened, vulnerable, endemic, relict species, included on the Red Lists, considered to be high conservation value forests (HCVF). With regard to the working method, the research was planned over four successive stages of work: desktop scientific research (reviewing of scientific publications, forestry arrangements, stands maps) collection of information with reference to high conservation values forests (HCVF), preliminary evaluation of areas containing high conservation values forests, and a final evaluation of stands with selected forest areas included in the natural habitat 9110 Luzulo-Fagetum.

The results comprised the outcomes of 10 surveys carried out in the field on selected stands as high conservation values forests from the categories: HCVF 1.1, HCVF 1.2, HCVF 1.3, HCVF 3, HCVF 4.1, HCVF 4.2.

Based on the data from the association table, the species of the forest phytocoenosis *Festuco drymejae-Fagetum* were analysed from the standpoint of the type of bioform, phytogeographic element, valence of ecological indices (UTR) and the cytogenetic chromosomal karyotype.

We draw four conclusions summarising our research work.

Keywords: phytocoenoses, association, habitat, high conservation value forests

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INTRODUCTION

The focus of this research work is on conducting a phytosociological, ecological, eco-protective study of acidophilic mountain beech trees found in the Vlădeasa Mountains - Western Carpathians (Apuseni Mountains).

To achieve this goal, we set the following objectives:

(I) Finding the phytocoenoses exponentially dominated by *Fagus sylvatica* accompanied in the tree layer by *Acer pseudoplatanus*, *Abies alba*, *Picea abies*, *Sorbus aucuparia*, *Ulmus glabra*, in the shrub and herbaceous layers of rare, threatened, vulnerable, endangered species considered to be of high conservation value (HCV);

(II) Finding the forest ecosystem types and habitats encompassing High Conservation Value Forests (HCVFs);

(III) Analysis of the floristic composition and characterization from a phytosociological and ecological standpoint of the species of the *Festuco drymejae-Fagetum* association with reference to the type of bioform, phytogeographic element, cytogenetic element;

(IV) Establishing the relationship of phytocoenosis species with environmental factors: soil moisture, air temperature, soil chemical reaction in the context of global climate changes;

(V) Assessment of the conservation status of beech forests included in the Natura 2000 habitat: 9110 *Luzulo-Fagetum* type beech forests found in the Carpathian area of the Apuseni Mountains, and setting the related management plan.

Knowledge about the history and current state of play in the research and the types of habitats and ecosystems were extracted from the previous scientific works of the following

authors: Doniță et al. (2005), Schneider et Drăgulescu (2005), Drăgulescu et al. (2007), Lazăr et al. (2007), Alexiu et al. (2008), Gafta et al. (2008), Stăncioiu et al. (2008), Condrea et al. (2009).

We also took over references about high conservation value forests (HCVFs) from research works conducted by Jennings et al. (2003), Ioraș et Abrudan (2007), Stăncioiu (2008), Vlad et al. (2013), Burescu L.I.N. (2018).

We gathered information on forest biodiversity and protected species included in the Red Lists from the academic works of the following authors: Schulze et Money (1993), Angelstam et al. (2004), Boșcaiu et al. (1994). Oltean et al. (1994), Dihoru et Negrean (2009), Bilz et al. (2011), Danciu et al. (2007), Kliment et al. (2016).

We also collected scientific data on the coenotaxa structure of the association's phytocoenosis and the diversity of forest ecosystems have from the scientific works of the following authors: Coldea (1991), Coldea et al (2015), Sanda et al. (2007, 2008), Chifu et al (2014), Burescu L.I.N. (2021), Pop Iulia Florina (2024).

MATERIAL AND METHOD

We carried out our research work in beech and beech-fir forests within the Remeți forest district, Bihor county, in the management units, MU III Remeți, the settlements of Daica, Valea Gugii, Valea de Runc, MU IV Iadolina, the settlements of Dealul Mare, Valea Cârligate, Muntele Gruiu Ursului. We planned our research in four successive work stages as below:

(I) Reviewing forest management plans, stand maps, and scientific publications with reference to high conservation values forests (HCVF);

(II) Preliminary assessment of areas containing high conservation value forests (HCVFs) with an aged of 100-200 years, diversified structure and concentrated biodiversity;

(III) Field research of the structure of forests selected following the preliminary assessment, which could be presumed high conservation value forests (HCVF), through surveys and imputing scientific data in an association table;

(IV) Final assessment of stands in forest areas selected as HCVF 1.2, HCVF 1.3, HCVF 3, which are to be preserved in a percentage of 5% of the total forest area and which require

absolute protection for biodiversity preservation purposes.

RESULTS AND DISCUSSIONS

The research outcomes show that the beech (*Fagus sylvatica*) stands with fescue (*Festuca drymeja*) within the Vlădeasa Mountains are stratified secular forests included in the Natura 2000 Protected Areas Network, Natural habitat 9110 *Luzulo-Fagetum* beech forest, Habitats Directive 92/43/EEC having as corresponding species in Romania the types R4105 South-east Carpathian beech (*Fagus sylvatica*) and fir (*Abies alba*) forests with *Festuca drymeja*, correspondences: Emerald !41.1 Beech forests, Palaeartic habitats: 41.1D54 South Carpathian *Festuca drymeja* beech forests, Plant association: *Festuco drymejiae-Fagetum* Morariu et al. 1968, ecosystem type: 2436 Beech-fir forest with *Festuca drymeja*, R4110 South-eastern Carpathian beech forests (*Fagus sylvatica*) with *Festuca drymeja*, correspondences: Emerald !41.1 Beech forest, Palaeartic habitats: 41.1 D54 South Carpathians *Festuca drymeja* beech forests, Plant association: *Festuco drymejiae-Fagetum* Morariu et al. 1968, Ecosystem type: 4136 Beech forest with *Festuca drymeja* Doniță et al. (2005).

Festuco-drymejiae-Fagetum Association, Morariu et al. 1968

Phytocoenoses of the stands belonging to this association grow on a relief formed by moderate (18°) to strong (40°) steep slopes with different exposures, in mountain resorts with various rocks: crystalline schists, conglomerates, sandstones, eruptive rocks and acidic sediments, on superficial, semi-skeletal to medium-deep, mesobasic, moist districambosol (acid brown) types of soil. The phytocoenosis is three-layered, the beech (*Fagus sylvatica*) dominating in the upper canopy, having a general coverage of 75% ADm in the **tree layer**, a maximum constancy (K=V), crown density of 0.6-0.9, the height of the trees varying from 15 m to 29 m, the trunk diameters ranging between 20 cm - 100 cm, and being accompanied by *Acer pseudoplatanis* (K=IV), *Abies alba* (K=III), *Picea abies* (K=II), *Sorbus aucuparia* (K=II), *Carpinus betulus* (K=II) and rare specimens of *Ulmus glabra* (K=I), *Betula pendula* (K=I), *Prunus avium* (K=I). (see Table No. 1 below)

The **shrub layer** with a coverage of 1-6% is poorly developed due to the high density of the tree crown and the fact that it is located at the lowest level of the stand, and consisting of

Syringa josikaea, *Daphne mezereum*, *Sambucus racemosa*, *Corylus avellana*, *Cornus mas*, *Euonymus latifolius*, *Rubus idaeus*, and *Rubus hirtus*. (see Table No. 1 below)

In the Valea Iadului resort, the settlements of Dealul Mare, MU IV Iadolina, compartments: 93B, and 95B a the geographical space declared as protected area ROSC10262, it grows *Syringa josikaea*, a tertiary relict and endemic species belonging to East Carpathians-Apuseni Mountains and the Eastern Beschizi Mountains-Transcarpathianregion of Ukraine.

The **herbaceous layer** with an overall coverage of 74% is dominated by *Festuca drymeja* ADm=39.8%, maximum constancy (K=V) accompanied by a group of species characteristic of the **Symphyto cordati-Fagionalliance**, as follows: *Luzula luzuloides*, *Cardamine glanduligera*, *Calamagrostis*

arundinacea, *Polystichum aculeatum*, *Scilla bifolia*, for the **order Fagetalia sylvaticae**: *Galium odoratum*, *Mercurialis perennis*, *Oxalis acetosella*, *Salvia glutinosa*, *Lamium galeobdolon*, *Anemone nemorosa*, for the **class Querco-Fagetea**: *Athyrium filix-femina*, *Cardamine bulbifera*, *Carex digitata*, *Hepatica nobilis*, *Polygonatum odoratum*, *Hedera helix*, *Erythronium dens-cannis*, as well as the transgressive species from the **classes Vaccinio-Piceetea**: *Luzula sylvatica*, *Gentiana asclepiadea*, **Betulo-Adenostyletea**: *Doronicum columnae*, *Petasites albus*, *Ranunculus platanifolius*, **Molinio-Arrhenatheretea**: *Trollius europaeus*, *Cardamine pratensis* (see Table No. 1 below).

Table 1

Festuco drymejae-Fagetum association, Morariu et al., 1968

Bio	Fl. Elem.	M	T	R	2n	Survey No.	1	2	3	4	5	6	7	8	9	10	K	ADm	
						Altitude (m.s.l)	1100	700	720	588	1326	1334	775	640	840	750			
						Exposure	NV	N	V	N	SE	S	NE	E	SV	V			
						Slope (°)	20	22	28	34-40	12-20	20-30	18-20	33	40	40			
						Tree layer density (%)	0.8	0.8	0.8	0.6	0.6	0.7	0.8	0.8	0.7	0.9			
						Tree height (m)	22	20	20	29	20-26	24	22	19-25	15-27	16-18			
						Tree diameter (cm)	34	46	42	40	36-50	44	34	22-60	20-100	20-80			
						Shrub layer coverage (%)	1	1	1	1	5	1	1	6	6	6			
						Herbaceous layer coverage (%)	70	65	80	80	100	75	70	90	60	50			
						Surface (m ²)	400	400	400	400	800	800	800	400	400	400			
G(H)	Ec	4	2	3	D	<i>As. Festuca drymeja</i>	2	3	2	3	1	4	4	5	3	3	V	39.8	
MPh	E	3	3	0	D	<i>As. Fagus sylvatica</i>	5	4	4	4	4	4	5	5	5	5	V	75	
Symphyto-Fagenion																			
G	End	4	2.5	4	P	<i>Cardamine glanduligera</i>	+	+	+	.	+	+	.	.	.	.	III	0.25
H	Carp-B	3	0	0	D	<i>Hieracium transilvanicum</i>	.	.	.	.	.	.	+	.	.	.	I	0.05
H	Carp-B	3.5	2	3	D	<i>Pulmonaria rubra</i>	.	.	.	.	.	+	.	.	.	.	I	0.05
H(G)	End	3	2	3	D	<i>Symphytum cordatum</i>	.	.	.	.	.	+	.	.	.	.	I	0.05
Symphyto cordati-Fagion																			
MPh	Ec	3.5	3	3	P	<i>Acer pseudoplatanus</i>	+	+	+	+	.	.	+	+	+	+	IV	0.4	
H	E	2.5	2.5	2	DP	<i>Luzula luzuloides</i>	.	.	.	.	.	.	+	+	+	+	III	0.2
MPh	Ec	4	3	0	D	<i>Abies alba</i>	.	.	.	+	.	+	+	.	2	.	II	1.9	
mPh	End-Carp	3.5	2.5	4	D	<i>Syringa josikaea</i>	.	.	.	.	.	.	.	1	1	1	II	1.5
H	Eua	2.5	3	2	P	<i>Calamagrostis arundinacea</i>	1	+	.	.	.	+	.	.	.	.	II	0.6
H	Eua	3.5	3.5	3.5	P	<i>Polystichum aculeatum</i>	.	.	.	.	.	+	.	.	+	+	II	0.15
G	Ec	3.5	3	4	DP	<i>Scilla bifolia</i>	+	+	+	.	.	.	.	.	.	.	II	0.15
G	Ec	4	3	3	D	<i>Leucoujum vernum</i>	.	.	.	.	4	.	.	.	.	.	I	6.25
Th(TH)	Cosm	3.5	3	3	P	<i>Geranium robertianum</i>	.	+	.	.	.	.	+	.	.	.	I	0.1
MPh	Eua	4	3	3	P	<i>Ulmus glabra</i>	.	.	.	.	.	.	.	.	.	+	I	0.05
G	Cp	3	2.5	4.5	P	<i>Gymnocarpium dryopteris</i>	.	.	.	.	.	.	+	.	.	.	I	0.05
H	Carp-B-Ppn	2.5	3	4	P	<i>Helleborus purpurascens</i>	+	.	.	.	.	.	.	.	.	.	I	0.05
H	Eua	3	3	0	D	<i>Campanula persicifolia</i>	.	.	.	+	.	.	.	.	.	.	I	0.05
H	E	3	3	3	D	<i>Hypericum montanum</i>	.	.	.	.	.	.	.	.	.	+	I	0.05
H	End	4	2	3	D	<i>Leucanthemum waldsteinii</i>	.	.	+	.	.	.	.	.	.	.	I	0.05
Ch	Alp-E	3.5	2	0	D	<i>Saxifraga cuneifolia</i>	.	.	.	+	.	.	.	.	.	.	I	0.05

Table No. 1 Continuation

Bio	El.f.	U	T	R	2n	Survey No.	1	2	3	4	5	6	7	8	9	10	K	Adm	
Fagetalia sylvaticae																			
G	Eua	3	3	3	P	<i>Galium odoratum</i>	1	.	.	+	.	+	+	.	1	.	+	IV	1.25
H	E	3.5	3.5	4	D	<i>Mercurialis perennis</i>	1	1	3	+	.	.	.	+	+	.	.	III	4.9
G	Cp	3.5	4	0	P	<i>Anemone nemorosa</i>	1	1	1	.	1	1	+	.	.	.	.	III	2.55
H(Ch)	Eua	3.5	3	4	D	<i>Lamium galeobdolon</i>	+	.	.	+	.	.	+	.	1	+	+	III	0.7
nPh	E	3	2.5	2	P	<i>Rubus hirtus</i>	.	.	.	.	1	+	+	.	+	+	.	III	0.7
H	Eua	3.5	3	4	D	<i>Salvia glutinosa</i>	+	+	+	.	.	.	+	.	+	.	.	III	0.25
H	E	3.5	3	3	D	<i>Stellaria nemorum</i>	.	.	.	3	1	+	.	.	+	.	.	II	1.06
H	Eua	3.5	3	4	DP	<i>Asarum europaeum</i>	.	.	+	+	.	.	.	.	1	+	+	II	0.65
G	Eua	3	2.5	2.5	P	<i>Polygonatum verticillatum</i>	.	.	.	.	+	+	.	+	.	.	.	II	0.15
G	Eua	3	0	4	D	<i>Lilium martagon</i>	.	.	+	+	+	.	.	.	.	.	+	II	0.15
H	Cp	4	3	0	P	<i>Dryopteris filix-mas</i>	.	.	.	+	.	.	.	.	.	+	+	II	0.15
G	E	3	3	4	DP	<i>Corydalis solida</i>	+	+	+	.	.	.	.	.	.	.	.	II	0.15
Ch	Ec	3	3.5	4	DP	<i>Euphorbia amygdaloides</i>	+	+	.	.	.	.	+	.	.	.	.	II	0.15
H	Cp	3.5	3	4	P	<i>Carex sylvatica</i>	.	.	+	.	.	.	+	.	.	.	.	I	0.1
H	E	3.5	3	3	D	<i>Pulmonaria officinalis</i>	+	+	.	.	.	.	.	.	.	.	.	I	0.1
H	Ec	3	3	3	P	<i>Symphytum tuberosum</i> subsp. <i>nodosum</i>	+	.	.	.	.	.	.	.	.	.	+	I	0.1
H	Atl-M	3.5	3	4	D	<i>Sanicula europaea</i>	.	.	.	.	.	.	+	.	+	.	.	I	0.1
Quercio-Fagetalia																			
G	E	3.5	3	4	P	<i>Anemone ranunculoides</i>	1	.	.	.	.	.	.	.	.	.	.	I	0.5
G	Ec	3	3	0	D	<i>Corydalis cava</i>	1	.	.	.	.	.	.	.	.	.	.	I	0.5
G	E	3.5	3.5	4	D	<i>Allium ursinum</i>	.	.	.	.	.	+	.	.	.	.	.	I	0.05
H	Eua	3	0	2.5	P	<i>Epilobium montanum</i>	.	.	.	.	.	.	.	.	.	+	.	I	0.05
G	Ec	3	3.5	3	D	<i>Isopyrum thalictroides</i>	+	.	.	.	.	.	.	.	.	.	.	I	0.05
H	Eua	3	2	0	P	<i>Campanula rapunculoides</i>	+	.	.	.	.	.	.	.	.	.	.	I	0.05
G	Ec	3.5	3	2	P	<i>Carex brizoides</i>	.	.	.	.	.	.	.	.	.	.	+	I	0.05
G	Eua-M	3.5	3	4	D	<i>Circaea lutetiana</i>	.	.	.	.	.	.	+	.	.	.	.	I	0.05
H	Cp	3.5	2	3	P	<i>Dryopteris cristata</i>	.	.	.	.	.	.	.	.	.	.	+	I	0.05
nPh	Eua	3.5	3	3	D	<i>Daphne mezereum</i>	+	.	.	.	.	.	.	.	.	.	.	I	0.05
G	Ec	3.5	2	3	P	<i>Doronicum austriacum</i>	.	+	.	.	.	.	.	.	.	.	.	I	0.05
H	E	3.5	3	3	DP	<i>Myosotis sylvatica</i>	.	.	.	.	.	+	.	.	.	.	.	I	0.05
H	Eua	3	3	3	D	<i>Lathyrus vernus</i>	.	.	.	+	.	.	.	.	.	.	.	I	0.05
H	Eua	3.5	0	0	P	<i>Stachys sylvatica</i>	.	.	.	.	.	.	+	.	.	.	.	I	0.05
H	Eua	3.5	3	3	P	<i>Senecio nemorensis</i>	.	.	.	.	.	.	.	.	.	+	.	I	0.05
H	Eua	3.5	0	4	D	<i>Silene dioica</i>	.	.	.	.	.	.	.	.	.	+	.	I	0.05
Vaccinio-Piceetea																			
H	Cosm	4	2.5	0	P	<i>Athyrium filix-femina</i>	+	+	.	.	+	+	+	.	+	1	IV	0.8	
mPh	E	3	3	3	D	<i>Corylus avellana</i>	+	.	.	+	.	.	.	+	+	+	+	III	0.25
G	Ec	3	3	4	P	<i>Cardamine bulbifera</i>	2	1	2	.	+	+	+	.	.	.	.	III	4.15
MPh	E	3	3	3	P	<i>Carpinus betulus</i>	.	.	.	.	.	.	.	.	+	+	+	II	0.15
H	Eua	3	3	3	P	<i>Carex digitata</i>	+	1	.	3	.	.	.	.	.	.	.	II	4.3
H	Cp	3	3	4	D	<i>Hepatica nobilis</i>	+	+	+	.	.	.	.	.	.	.	.	II	0.15
l-nPh	Atl-M	3	3	3	P	<i>Hedera helix</i>	.	+	+	+	.	.	.	.	.	.	.	II	0.15
G	Eua	2	3	4	D	<i>Polygonatum odoratum</i>	.	.	.	.	+	.	.	.	+	.	+	II	0.15
G	Ec	3.5	3.5	4	D	<i>Erythronium dens-canis</i>	+	+	+	.	.	.	.	.	.	.	.	II	0.15
H	E	3	3	3	D	<i>Mycelis muralis</i>	.	.	.	+	.	.	+	.	+	.	.	II	0.15
H	E	4	3	4	P	<i>Lunaria rediviva</i>	+	.	.	.	.	.	.	.	.	+	.	I	0.1
G	Ec	2.5	3	3	P	<i>Carex pilosa</i>	.	+	.	.	.	.	.	.	.	.	.	I	0.05
MPh	E	3	3	3	DP	<i>Acer platanoides</i>	.	.	.	+	.	.	.	.	.	.	.	I	0.05
MPh	E	4	3	4	P	<i>Alnus incana</i>	.	.	.	.	.	.	.	+	.	.	.	I	0.05
mPh	MP	2	3.5	4	DP	<i>Cornus mas</i>	+	.	.	.	.	.	.	.	.	.	.	I	0.05
MPh	Eua	3	2	2	P	<i>Betula pendula</i>	.	.	.	.	.	.	+	.	.	.	.	I	0.05
MPh	E	3	3	3	DP	<i>Prunus avium</i>	.	.	.	.	.	.	+	.	.	.	.	I	0.05
H	Eua	3.5	3	3	P	<i>Ranunculus ficaria</i>	.	+	.	.	.	.	.	.	.	.	.	I	0.05
MPh	E	3	3	4	D	<i>Fraxinus excelsior</i>	.	.	.	.	.	.	.	.	.	.	+	I	0.05
H	Eua	4.5	2	0	DP	<i>Filipendula ulmaria</i>	.	.	.	.	.	.	.	.	.	.	+	I	0.05
H	Eua	3	3	3	D	<i>Stellaria holostea</i>	.	+	.	.	.	.	.	.	.	.	.	I	0.05
H	Ec	3	2.5	4	D	<i>Veronica urticifolia</i>	.	.	.	+	.	.	.	.	.	.	.	I	0.05
H	Cp	3	3	0	DP	<i>Poa nemoralis</i>	.	.	.	+	.	.	.	.	.	.	.	I	0.05
nPh	E	2	3	3	P	<i>Rosa canina</i>	.	+	.	.	.	.	.	.	.	.	.	I	0.05
H	Eua	2	3	4	P	<i>Sedum maximum</i>	.	.	.	+	.	.	.	.	.	.	.	I	0.05
Betulo-Adenostyletea																			
MPh	E	0	0	0	D	<i>Picea abies</i>	.	.	.	.	+	1	+	.	.	.	.	II	0.6
MPh	E	3	2.5	2	D	<i>Sorbus aucuparia</i>	.	.	.	.	+	+	.	+	.	.	.	II	0.15
H	Ec	3.5	2.5	2.5	P	<i>Luzula sylvatica</i>	.	.	.	+	1	+	.	.	.	.	.	II	0.6
H	Eua	4	3	3	D	<i>Hypericum maculatum</i>	.	.	.	.	.	.	+	+	.	.	.	I	0.1
H	Ec	4	2	4	P	<i>Gentiana asclepiadea</i>	.	.	.	+	.	.	.	.	.	.	+	I	0.1
Molinio-Arrhenatheretea																			
G	Alp-Carp-B	3.5	2	3.5	P	<i>Doronicum columnae</i>	.	.	.	+	.	.	.	.	.	+	+	II	0.15
nPh	Cp	3	3	3	DP	<i>Rubus idaeus</i>	.	.	.	.	.	+	.	.	.	.	.	I	0.05
H	E	3.5	2.5	0	D	<i>Ranunculus platanifolius</i>	.	.	.	.	.	+	.	.	.	.	.	I	0.05
G	Eua	4	0	0	P	<i>Petasites albus</i>	.	.	.	.	.	+	.	+	.	.	.	I	0.1
Variae syntaxa																			
mPh	Cp	3	2	3	P	<i>Sambucus racemosa</i>	.	.	.	.	.	.	.	+	.	.	.	I	0.05
Th	Eua	3	0	0	D	<i>Lamium purpureum</i>	.	.	.	.	.	.	+	.	.	.	.	I	0.05

Place and date of surveys: 1 Valea Gugii valley(04.09.2022); 2-3 Valea de Runc (12.07.2022); 4 Daica (19.09.2020) 46°49'785"N, 22°36'560"E; 5-6 Cărligat Mountain (27.05.2022) 46°43'166"N, 22°38'924"E; 46°43'126"N, 22°38'972"E; 7 Poiana Zâmbului (17.07.2022) 46°49'389"N, 22°40'659"E; 8-10 Valea Iadului-Dealul Mare (25.05.2022) 46°45'091"N, 22°33'391"E; 46°45'107"N, 22°33'408"E; 46°45'150"N, 22°33'414"E.

The bioforms spectrum (see Chart No.1 below) shows the dominance of hemicryptophytes (47.9%) followed by geophytes (25%) and phanerophytes (22.84%) as biological forms best adapted to the stationary pedoclimatic conditions of the habitat.

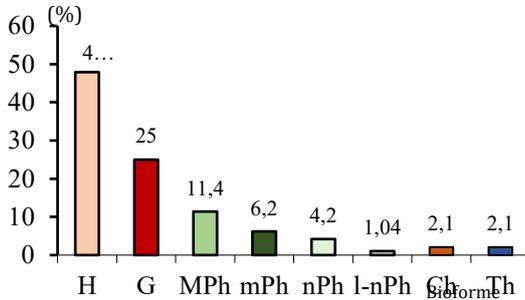


Chart 1 Spectrum of bioforms from *Festuco drymejae-Fagetum* association

Analysis of phytogeographic elements (see Chart No. 2 below) with regard to the territorial distribution by the origin of the geographical area indicates a diversified speciation process in which Eurasian species are dominant (29.2%), followed by European (25%), Central-European (18.7%), circumpolar (11.4%), endemic (4.2%), Carpatho-Balkan (1.04%), Carpatho-Balkan-Ponto-Pannonic (1.04%), Alpine-Carpatho-Balkan (1.04%), Alpine-European (1.04%), Atlantic-Mediterranean (2.1%), Mediterranean-Pontic (1.04%), and cosmopolitan (2.1%) species.

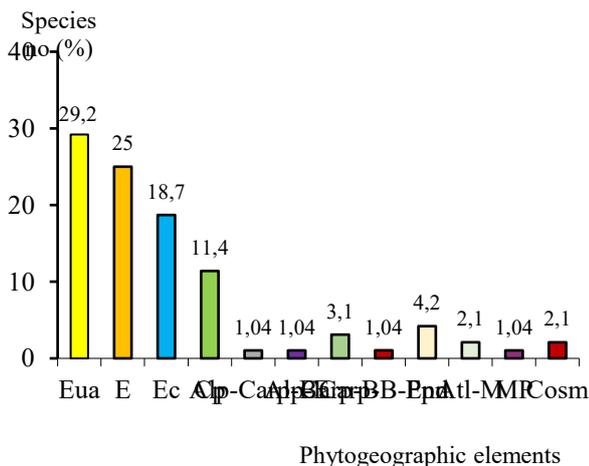


Chart No. 2 Spectrum of phytogeographic elements in the association *Festuco drymejae-Fagetum*

Analysis of environmental factors (see Chart no 3, Table No.2) with reference to soil moisture, air temperature, and soil chemical

reaction, indicates that the phytocoenoses of the association prefer the mesophilic (72.9%), micro-mesothermic (64.6%) and acido-neutrophilic (38.5%) topoclimate.

Table 2. Distribution of species by ecological categories of the association *Festuco drymejae-Fagetum*

Ecological indices	2	2.5	3	3.5	4	4.5	5	0	Total species
M Sp. No.	4	5	37	33	14	1	1	1	96
%	4.2	5.2	38.5	34.4	14.6	1.0	1.0	1.0	100
T Sp. No.	14	11	55	7	1	-	-	8	96
%	14.6	11.4	57.3	7.3	1.0	-	-	8.3	100
R Sp. No.	9		37		31		1	18	96
%	9.4		38.5		32.3		1.0	18.7	100
							4	7	

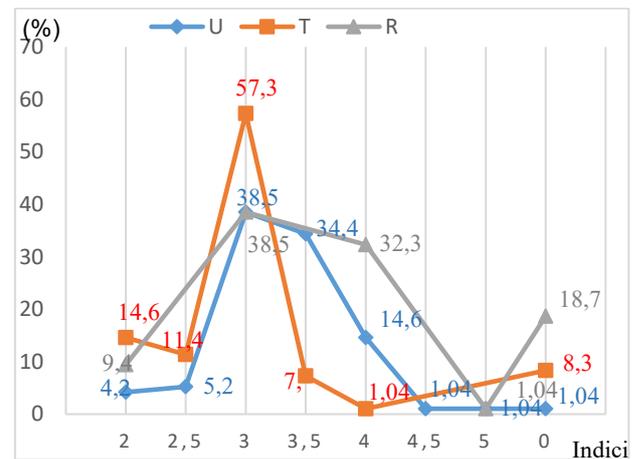


Chart No. 3 Ecological index diagram for the *Festuco drymejae-Fagetum* association

Analysis of the chromosomal complement of the genetic karyotype (see Chart No. 4) reveals the predominance of polyploid species (45.8%) closely followed by diploid ones (40.6%), favouring unhindered gene flow within the population during panmixia and the expression in the phenotype of the species best adapted to environmental conditions.

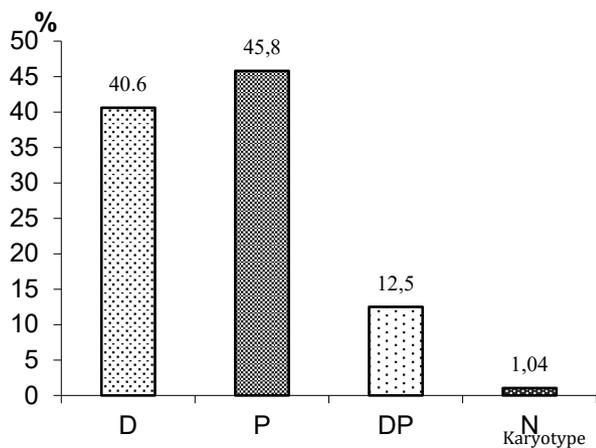


Chart 4 Karyological spectrum of the association *Festuco drymejae-Fagetum*

Forest categories found and classified according by high conservation values categories they contain

In the phytocoenoses of the natural habitat of community interest Natura 2000: 9110 *Luzulo-Fagetum* type beech forests within the Vlădeasa Mountains, in the compartments 92A, 93B, 95B, and the protected area ROSCI 0262, the management unit MU III Remeți and MU IV Iadolina were found five categories of high conservation value forests i.e. HCVF 1.2 - Forests that shelter rare, threatened and endangered species such as: *Lilium martagon* (forest relict), *Platanthera bifolia* (rare), *Erythronium dens-canis*, *Menyanthes trifoliata* (rare); HCVF 1.3 - Forests containing thickets of *Syringa josikaea*, a tertiary relict and endemic to the South-Eastern Carpathians area, the Apuseni Mountains and the Eastern Carpathians of Ukraine, *Trollius europaeus* (a protected species declared Monument of Nature); HCVF3 - Forests included in or containing rare forest ecosystems (2436, 4136) with some attributes of virgin forests; HCVF 4.1 - Forests that provide critical environmental services, hydrological, drinking water sources, water capture in reservoirs, the Cârligate dam discharged through an underground tunnel in Valea Drăganului valley and the Leș dam on Valea Iadului valley, Remeți; HCVF 4.2 Forests with a role

in the anti-erosion protection of the soil on steep slopes (30°-40°) with rocks and scree, degraded lands, and avalanche paths. The high conservation values found in these forests require sustainable management with the prohibition of forestry work of any kind, exploitation of by-products, grazing, hunting in HCVF 1.3 containing rare, threatened, relict, endemic species, and limited forestry work in HCVF 3, HCVF 4.1, HCVF 4.2.

Conservation status assessment, potential threats

High conservation value forests in the Vlădeasa Mountains, Apuseni Mountains could be affected by poor management leading to changes in the natural composition of the stands, and changes in their typical age structure. These forests could also be affected by the action of risk factors such as fires, wind-felling, damage caused by harmful insects, and last but not least by global climate change.

CONCLUSIONS

There have been found and described the natural habitat of community interest Ecological Network 2000: 9110 *Luzulo-Fagetum* beech forest, which corresponds in Romania to the types R4105 South-eastern Carpathian beech (*Fagus sylvatica*) and fir (*Abies alba*) forests with *Festuca drymeja* and R4110 South-eastern Carpathian beech (*Fagus sylvatica*) forests with *Festuca drymeja*. We found and described stands areas in six settlements: Valea Gugii, Valea de Runc, Daica, Valea Cârligate-Muntele Gruiu Ursului mountain, Poiana Zâmbrului, Valea Iadului-Dealul Mare all being included in the rare forest ecosystems 2436, 4136, which contain high conservation value forests in the following categories HCVF 1.1, HCVF 1.2, HCVF 1.3, HCVF 3, HCVF 4.1 and HCVF 4.2.

The high conservation value forest phytocoenoses we found belong to the *Festuco drymejae-Fagetum* association, but we studied them from a phytosociological and ecological standpoint, with reference to the percentage values obtained with regard to the types of bioforms and of phytogeographic element, the relationship of phytocoenosis species with environmental factors, the influence of moisture, air temperature and soil chemical reaction, as shown in tables and histograms.

We analysed the chromosomal complement of the population's genetic karyotype in relation to environmental factors,

which confer advantages to polyploid species in colonizing the territory and better adapting to the extreme living conditions of the habitat.

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