EUROPEAN BEECH STANDS (FESTUCO DRYMEJAE-FAGETUM) FROM MESES MOUNTAINS

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Abstract

Acidophilus beech stands species with Festuca drymeja in the Meses Mountains colonize medium to steep slopes with a predominantly northern exposition, at altitudes ranging between 650-720 m. They present a high biodiversity, the floral inventory counting 45 species of cormopohytes. The phytocoenoses of the Festuco drymejae-Fagetum association by the type of bioforms consist predominantly of plant species of geophytes (34.8%), hemicryptophytes (32.6%), and phanerophytes (23.9%). In terms of phytogeographical characteristics the dominant species are as follows: European (41.3%), Eurasian (26.1%), Central European (21.7%), followed by Carpathian (4.3%), Atlantic – Mediterranean and cosmopolitan ones, each sharing the same percentage (i.e. 2.2%). As regards ecological factors requirements (i.e. moisture, temperature, chemical reaction of soil) acidophilous beech stands with Festuca drymeja presents a mesophilic-like character (47.8%), meso-hygrophilc (32.6%), micro-mesothermic (80%) moderate thermophilic (4.3%), weak acid neutrophilic (43.5%), acid-neutrophilic (41.3%), and amphitolerant-eurionic (15.2%). The phytocenoses of the association have a rich floral composition of 45 species, of which 36 species of cormophytes included in the herb layer. Festuco drymejae-Fagetum association is economically important due to the fact that the Fagus-sylvatica beech stands give a high quality wood used in the furniture industry. Fagus sylvatica (Festuca drimeja) forests provide soil protection against erosion, regulate the flows of the valleys and streams, purify and ozonize the air.

Key words: beech stands, association, bioforms, floristic elements, ecological indices.

INTRODUCTION

Extensive research endeavours on the flora and vegetation of the Meses Mountains have not been conducted so far. The first information on the flora comes from the work of Fodor (1910), which drew up a floral index of the plants in Satu Mare County, including plant species from Salaj County. Borza (1929) published a synthesis study on the vegetation and flora of Transylvania with some references to the plants present in the Meses Mountains. A more in-depth research in the Meses Mountains was carried out by Balazs (1943) who developed a floral index of identified plant species and made a brief analysis of the structure of the living soil cover.

In the neighbouring areas of the Meses Mountains, floral research were carried out by Mathe (1947), Prodan (1956-1957), E. Pop, member of the Romanian Academy (1960), and Karacsonyi (2011).

MATERIAL AND METHOD

The study material consists by the beech forests (*Fagus sylvatica* - *Festuca drimeja*) surveyed within the following settlements: Buciumi-Pria-Magura, Tresnea, Cizer, Paraul Hotarul located in Salaj County.

In the study of *Festuca drymeja* beech stands, we selected some sampling surfaces containing the most representative floral and physiognomic phytocenoses totalling 400 square meters, situated on slopes with predominantly northern exposition and altitudes between 650-720 m.

The finding and description of phytocenoses of the association *Festuco drymejae-fagetum* was made on the basis of the floristic criterion using the characteristic species for the association surveyed and differentials for the sub-alliance coenotaxa (*Symphyto-fagenion*), alliance (*Symphyto cordati-Fagion*), order (*Fagetalia sylvaticae*), and class (*Querco-Fageteea*) The classification of the species that make up the floristic inventory in the table of associations, corresponding to the coenotaxa they are subordinated to was made in accordance with the ecological and floristic systems of the European school, Mucina (1997), Pott (1995), Oberdorfer (1992), Rothmaler (1994, 2000), Rodwell et. al. (2002), Borhidi (1996, 2003), Soo (1964-1980,) Borza, Boscaiu (1965), Sanda et al. (1963-2008), Coldea (1991), Coldea et al. (1997-2012), Chifu et al. (2014).

The quantitative participation in the structure the structure of the living soil cover of each species according to the dominance and/ or abundance values was calculated using the Braun-Blanquet & Pavillard scale (1928).

Graphical representations were developed in the form of the bioforms' spectrum, the floristic elements spectrum, the ecological indices chart within the ecological analysis of the association' phytocoenoses, included in the Results and Discussions title below.

RESULTS AND DISCUSSION

The specific relief on which the phytocoenoses of the association surveyed developed consist of medium to steep slopes (i.e. 8º-28º), at altitudes ranging between 650-720 m, on shady, humid, northern, north-western and north-eastern expositions. The lithological substrate consists of crystalline shale, conglomerates, sandstone and volcanic rocks. The soils on which the coenosis is located are districambosols, luvisols, weak-semi-skeletal soils, medium deep soils, moderately acidic and slightly most soils.

The Festuca drimeja phytocoenoses have a high biodiversity of 45 species of cormopohytes and vegetates mainly in sites with plenty of moisture (precipitation = 700-1000 mm), temperate climate (T = 5-8°C). The layer of trees is well-grown (consistency 0.8) and is dominated by *Fagus sylvatica* with a 75% coverage, along with some disseminated species such as *Acer pseudoplatanus*, *Acer platanoides*, *Prunus avium* (Fig 1). The crowning is 0.7-0.8, trunk diameters ranges between 60-80 cm and the height of the trees varies from 22-28 m.

Fig 1. Magura Buciumi settlement (Salaj County)

The layer of shrubs has an insignificant coverage, and it is directly marked by the shading generated by the rich crowning of the tree layer. Among the shrub species that are highlighted in the floristic structure of the association we mention: *Sambucus nigra*, *Cornus mas*, *Corylus avellana*.

The herbaceous layer is dominated by *Festuca drymeja* with a 30-35% overall coverage, spread in clusters of different sizes and it is a characteristic, differential and subdominant species for this association.

The herb layer includes a number of 36 species of cormopohytes subordinated to the suballiance ***Symphyto-Fagenion***, the alliance ***Symphyto cordati-Fagion***, as follows *Dentaria glandulosa, Helleborus purpurascens, Primula elatior*, ordinului ***Fagetalia sylvaticae***: *Mercurialis perennis, Pulmonaria officinalis, Galium odoratum, Lamium galeobdolon, Arum maculatum, Corydalis solida, Euphorbia amygdaloides, Aposeris foetida, Isopyrum thalictroides, Anemone ranunculoides*, etc., class ***Querco-Fagetea***: *Dentaria bulbifera, Anemone nemorosa, Erythronium dens-canis, Carex digitata, Scilla bifolia, Hepatica nobilis, Carex pilosa, Hedera helix*, etc. (Table 1).

Table 1

Floristic inventory of the herb layer

Bio.	E.f.	U.	T.	R.	Survey no.	1	2	3	4	5	K
					Altitude (m.s.m.)	680	700	720	650	680	
					Exposition	N	NE	V	NV	N	
					Consistency	0.9	0.8	0.8	0.8	0.8	
					Tree height (m)	22	26	22	26	36	
					Tree diameter (cm)	70	100	38	80	60	
					Herbal layer coverage (%)	60	70	70	40	80	
					Slope (°)	12	8	18	28	20	
					Surface (m²)	400	400	400	400	400	
G	Carp	4	2	3	As. *Festuca drymeja*	2	3	2	3	3	V
MPh	E	3	3	0	As. *Fagus sylvatica*	5	4	4	4	4	V
					Symphyto-Fagenion, Symphyto cordati-Fagion						
MPh	Ec	3.5	3	3	*Acer pseudoplatanus*	+	+	+	+	·	IV
MPh	Ec	4	3	0	*Prunus avium*	+	·	+	·	·	II
H	Carp	2.5	3	4	*Helleborus purpurascens*	+	·	·	·	·	I
G	End Carp	4	2.5	4	*Dentaria glandulosa*	·	·	·	·	2	I
H	Eua	3	3	4	*Primula elatior*	+	·	·	·	·	I
					Fagetalia sylvaticae						
H	E	3.5	3	4	*Mercurialis perennis*	1	1	3	+	+	V
H	E	3.5	3	3	*Pulmonaria officinalis*	+	+	·	+	+	IV
G	E	3.5	3	4	*Anemone ranunculoides*	1	·	·	·	+	II
G	Eua	3	3	3	*Galium odoratum*	1	·	·	·	+	II
H	Ec	3	0	4	*Lamium galeobdolon*	+	·	·	·	+	II
G	Ec	3.5	3.5	4	*Arum maculatum*	+	·	·	·	+	II
G	E	3	3	0	*Corydalis solida*	·	·	·	+	1	II
Ch	E	3	3.5	4	*Euphorbia amygdaloides*	+	+	·	·	·	II
G	E	3.5	3	4	*Aposeris foetida*	·	+	·	1	·	II
G	Ec	3	3.5	3	*Isopyrum thalictroides*	+	·	·	·	+	II
H	E	3.5	3	4	*Carex sylvatica*	·	·	+	·	·	I
H	Eua	3.5	3	4	*Salvia glutinosa*	·	·	·	·	+	I
nPh	Eua	3.5	3	3	*Daphne mezereum*	+	·	·	·	·	I
G	E	3.5	3.5	4	*Asarum europaeum*	·	·	+	·	·	I
H	Eua	3	2	0	*Campanula rapunculoides*	+	·	·	·	·	I
H	Eua	3	3	3	*Lathyrus vernus*	+	·	·	·	·	I
G	Eua	3	0	4	*Lilium martagon*	·	·	+	·	·	I
H	Ec	3	3	3	*Symphytum tuberosum* ssp. *nodosum*	+	·	·	·	·	I
					Querco-Fagetea						
G	Ec	3	3	4	*Dentaria bulbifera*	2	1	2	+	+	V
G	E	3.5	4	0	*Anemone nemorosa*	1	1	1	1	2	V
G	Eua	3.5	3.5	4	*Erythronium dens-canis*	+	+	+	+	·	IV
H	E	3	3	3	*Carex digitata*	+	1	·	+	·	III

G	E	3.5	3	4	*Scilla bifolia*	+	+	+	·	·	III
G	E	3	3	4	*Hepatica nobilis*	+	+	+	·	·	III
H	Eua	2.5	3	3	*Carex pilosa*	·	+	·	1	·	II
G	Ec	3	3	0	*Corydalis cava*	1	·	·	·	2	II
Ch	E	3	4	3	*Ranunculus ficaria*	·	+	·	+	·	II
Th	Eua	3	3	4	*Alliaria petiolata*	·	+	·	·	+	II
l-nPh	Atl-M	3	3	3	*Hedera helix*	·	+	+	·	·	II
MPh	Eua	3	3	3	*Acer platanoides*	·	·	+	·	·	I
Th	Cosm	3.5	3	3	*Geranium robertianum*	·	+	·	·	·	I
H	Eua	3	3	0	*Stellaria holostea*	·	+	·	·	·	I
					Rhamno-Prunetea						
mPh	E	3	3	3	*Sambucus nigra*	·	+	+	1	+	IV
mPh	E	3	3	3	*Corylus avellana*	+	·	·	·	·	I
mPh	E	2.5	3	4	*Cornus mas*	+	·	·	·	·	I
nPh	E	2	3	3	*Rosa canina*	·	+	·	·	·	I
nPh	E	2	3	3	*Crataegus monogyna*	+	·	·	·	·	I
					Variae syntaxa						
H	Ec	3.5	2	3	*Doronicum austriacum*	·	+	·	·	·	I
H	Ec	4	2	4	*Gentiana asclepiadea*	·	·	+	·	·	I

Site and date of surveying: 1 - 2 Magura Buciumi (19.04.2013); 3 - Tresnea (19.04.2013); 4 - Cizer (19.04.2013); 5 - Paraul Notarului (19.04.2013).
Festuco drymejae-Fagetum (Source: Morariu et al., 1968)

In terms of categories of bioforms, in the floristic composition of the phytocenoses of the association, geophytes (34.8%) are dominant, followed by hemicryptophytes (32.6%), and phanerophytes (MPh + mPh + nPh + l-nPh = 23.9%), (Fig 2).

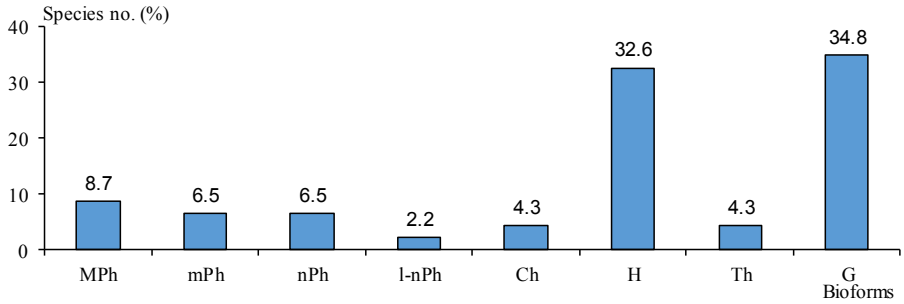

Fig 2. The spectre of bioforms of the association *Festuco drymejae-Fagetum*

The floristic elements spectrum (Fig. 3) shows that European species (41.4%) have the largest share, followed by the Eurasian species (26.1%), Central European ones (21.7%), while the other species i.e. Carpathian,

endemic types of species, Atlantic – Mediterranean and cosmopolitan ones have in a lower percentage (2.2%).

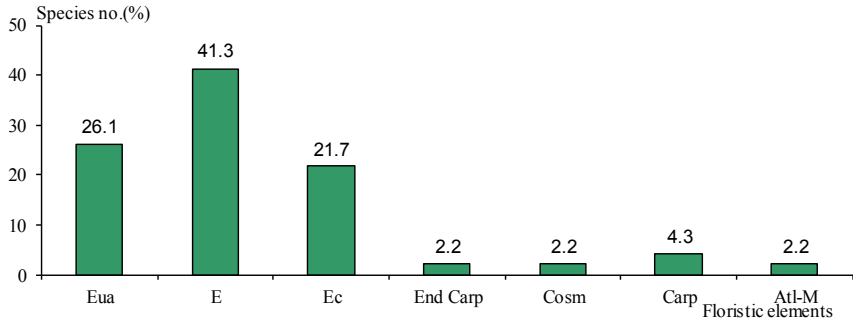

Fig. 3. The spectre of floristic elements of the association *Festuco drymejae-Fagetum*

The chart of ecological indices (Fig. 4) highlights the high share of mesophilic species (80.4%), followed by a lower percentage of xero-mesophiles (10.8%) and meso-hygrophiles (8.7%). From the temperature point of view, micro-mesotherm species (80.5%) are dominant, followed by microtherms species (10.9%). Soil chemical reaction favours the development of weak-acid neutrophils (43.5%), acid-neutrophils (41.3%) followed by amphytolerant eurionic species (15.2%)

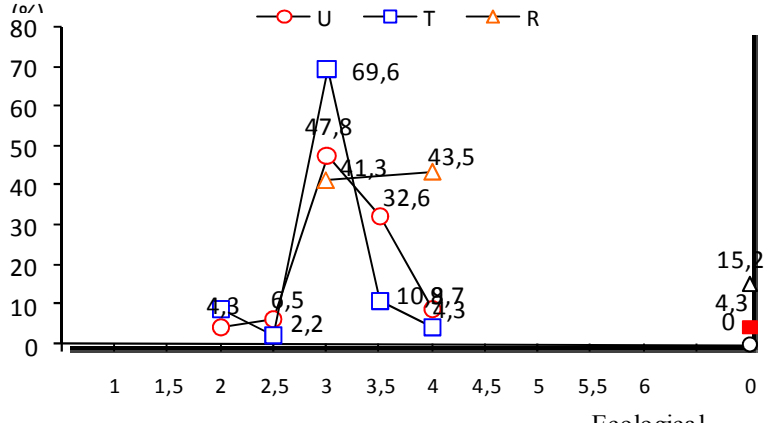

Fig 4. Diagram of ecological indices for the association *Festuco drymejae-Fagetum*

ECONOMIC RELEVANCE

Fagus sylvatica beech stands provide high quality wood used in the furniture industry. Beech-nut is the main source of winter food for game species (i.e. wild boar, deer, etc.) and even for domestic animals (pigs,

sheep, goats). Beech forests through their very consistent litter provide soil protection against erosion, the aquifer of springs, the regulation of streams flow and mountain valleys during the melting of snow, purification and ozonisation of the air.

In the structure of the living soil layer, at the level of herbaceous layer, there is a significant number of medicinal plants, as well as other plants living in the layer of shrubs and trees, but used in the local industry (tools accessories, braids, handicrafts, wood sculptures).

CONCLUSIONS

1. *Festuca drymeja* beech stands in Meses Mountains present a relatively high biodiversity, the floristic composition thereof reaching 45 species of cormopohytes.
2. The percentage analysis of the species on the spectrum of bioforms reveals the dominance of geophyte plants (34.8%), closely followed by hemicryptophytes (32.6%) and phanerophytes.
3. The phytocoenoses of this association in terms of the type of floristic elements are dominated by European species (41.3%) followed by Eurasian (26.1%) and Central European (21.7%).
4. The behaviour towards the main ecological factors (moisture, temperature, chemical reaction of the soil) reveals the mesophilic (80.4%), micro-mesothermic (80.5%), weak acid neutrophils (43.5%) and acid-neutrophils (41.3%) of the beech forests (*Fagus sylvatica - Festuca driymeja*).

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