COENOTAXONOMY AND CHOROLOGY OF THE STANDS DEVELOPED BY *THE PULMONARIO RUBRAE-FAGETUM, SYRINGETOSUM JOSIKAEAE* COMMUNITY

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RESEARCH ARTICLE

Abstract

The tree stands with Syringa josikaea from the Apuseni Mountains were studied from the perspective of the floristic composition of the phytocenosis Pulmonario rubrae-Fagetum Täuber 1987-syringetosum josikaeae, Burescu L., 2018, which brings together a total of 91 cormophyte species in the synthetic association table.

The analysis of ecological categories by lifeforms highlights the share of hemicryptophyte elements (49.4%) followed by phanerophytes (22.8%), and geophytes (17.5%).

The analysis of the ecological categories by the genetic center of origin and the geographical area shows the dominance of Eurasian species (32.9%) followed by Circumpolar-Boreal (15.3%), European (15.3%), Central-European (10.9 %), Carpathian, and Carpatho-Balkan (7.5%) species.

The tree stands with Syringa josikaea included in the Pulmonario rubrae-Fagetum – syringetosum josikaeae association have a high conservation value, bringing together rare, endangered, endemic, relict species, characteristic of an endemic habitat found only in the Apuseni Mountains.

Keywords: spruce-beech-fir forest, phytocenoses, ecological classification.
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INTRODUCTION

Among the 30 species of the *Syringa* genus spread today across Iran, Afghanistan, the Himalayas, China, Japan, and Eastern Europe, the tertiary relict *Syringa josikaea* an endemic species for the Western Carpathians in Romania and the Northern Carpathians in Ukraine is of interest.

The shrub *Syringa josikaea* J.Jack. ex Rchb.fil. also known as the Hungarian lilac, forms distinct thickets at the border of beech, and spruce-beech-fir forest stands on the upper course of the narrow mountain valleys in the Apuseni Mountains, Iadului Valley, Crișul Negru Valley, and Aries Valley. From the literature (Vlad et al. (2013)) the species could still be found either cultivated or spontaneous in the Crișul Repede river basin Ciucea, Negreni, Sacuieu Cluj County, Metaliferi Mountains (on Vulcan Mountain), which in fact was not confirmed in the field, the plant basic habitat consisting of Iadului Valley, Crișul Negru Valley, and Aries Valley.

In-depth research on the ecology, coenotaxonomy and chorology of the beech, and spruce-beech stands including and sheltering the *Syringa josikaea* thickets has not been done before except for flora and vegetation (Rațiu et al. 1984), to find and describe rare, endangered forest ecosystems of high conservation values (Burescu L. 2015, 2018, 2021).

The goal of our research work is to carry out an integrated study of the forest areas in the Apuseni Mountains sheltering *Syringa josikaea* - a tertiary relict and endemic Carpathian species from a coenotaxonomic, ecological, eco-protective and chorological standpoint within the territory.

In order to achieve the proposed research goal, we set ourselves to attain the following objectives:

- Floristic inventory of forest areas – management units that include and protect the *Syringa josikaea* species,
- Study of the structure of the phytocenoses of *Syringa josikaea* stands and thickets with the inclusion of the species in the *Pulmonario rubrae-Fagetum* association *Syringetosum josikaeae* subassociation by their belonging to the coenotaxa suballiance, alliance, order and vegetation class,
- Ecological characterization of the species found in terms of their distribution by the type of lifeform, and phytogeographical elements

- Sustainable management of *Syringa josikaea* shrublet forests by adopting appropriate forest management.

MATERIAL AND METHOD

The research material consists of the phytocoenoses of the association *Pulmonario rubrae-Fagetum*, Täuber 1987 – *syringetosum josikaeae* Burescu L. 2018, which gathers the beech, and spruce-beech-fir forest stands with *Syringa josikaea* from the Iadului Valley river basin, Remeti forest district, Bihor County, Management unit IV Iadolina technically on the right bank of Forest compartment 93B Dealul Mare, area: 7.7 ha, altitude: 750m; Forest compartment 95A Iadolina Waterfall, area: 5.4 ha, altitude: 850m; Forest compartment 95B Dealul Mare Gorge, area: 13.9 ha, altitude: 860m; Forest compartment 96A Iadolina Waterfall, are: 1.3 ha, altitude: 880m; Forest compartment 108A Calea Laii, area: 22.7 ha, altitude: 900m; Forest compartment V Iadului Valley technically on the left bank; parcels of Forest compartment 66A Iadolina Waterfall; area: 8.7 ha, altitude: 750m; Forest compartment 70A Iadolina Waterfall, area: 3.0 ha, altitude: 710m; Forest compartment 74 Dealul Mare Hill opposite to the Rustic House Tourist Lodge, area: 37 ha, altitude: 640m; Forest compartment 78B Savoi, area: 4.0 ha, altitude: 610m; Forest compartment 82A Vâlcei sub Cruce, area: 8.8 ha, altitude: 590m.

Moreover, the biological material subjected to research consisted in the arboretum included in the *Pulmonario rubrae-Fagetum* Täuber 1987 cenosis, the sub-association *syringetosum josikaeae* Burescu L. 2018, on the upper course of the Crisul Negru river, Sudrigiu Forest district, Bihor county, Management unit VI Poiana, Forest compartment 91A, area: 13.8 ha, altitude: 644m; Forest compartment 91B, area: 2.2ha, altitude: 684m; Forest compartment 95C, area: 27.2 ha, altitude: 626m; as well as the arboretum within the Aries Valley, Garda Forest district, Alba county, Management unit I Magura, Forest compartment 259A, area: 27.2 ha, altitude: 756m; Horea Apuseni Forest district, Management unit I Neagra, Forest compartment 370, area: 0.2 ha, altitude: 794m.

Phytocenological surveys were carried out in the forest compartments subjected to research, and the plant species found were inputted in a synthetic table of the association with the assessment of abundance-dominance by coefficients according to the Braun-Blanquet scale (1964) which expresses the degree of soil cover and consistency coefficients (K) expressing the frequency of species throughout the territory (see Table 1).

According to the scientific data from the synthetic table of association, the tree stands (beech, beech-spruce, spruce-beech-beech stands) with *Syringa josikaea* were analysed ecologically, cenotaxonomically, bioeconomically and ecoprotectively, while highlighting the distribution of phytocenosis species by life forms, the type of geoelement with the presentation of the results in the form of spectra in histograms. The classification of species by the type of life forms was done according to the system developed by Raunkiaer (1937) and subsequently improved by Braun-Blanquet (1964) and with regard the types of geoelements according to the classification adopted by Meusel et Jäger (1992).

RESULTS AND DISCUSSIONS

Tree stands with *Syringa josikaea* thickets grow on various rocks, conglomerates, crystalline schists, especially flysch, on phreatic-moist meso-eubasic soils with a Ph ranging between 5.8-7.5.

They colonize limited areas of forests, in sites at altitudes of 626-684m, on Crisul Negru Valley, at 756-794m on Aries Valley, at 750-900m on Iadului Valley, being characterized by a temperate-montane climate (average annual temperatures of 7°C in Crisul Negru Valley, 6°C in Aries Valley, and 5.5° in Iadului Valley), and average annual precipitation of 800-1,000mm.

The floristic inventory of *Syringa josikaea* stands totals 91 cormophyte species, which means a high biodiversity considering the environmental conditions present in the sites of the mountain-boreal floor of the Western Carpathians.

With regard the coenotaxonomic classification of the species in the stands with *Syringa josikaea* in the community *Pulmonario rubrae-Fagetum* Täuber 1987 – *syringetosum josikaeae* Burescu L. 2018, the author of the sub-association reviewed the scientific works published in Romania by the authors Boşcaiu et al. 1982, Coldea 1991, Sanda et al. 1999, Donita et al. 2005, Sanda et al. 2007, 2008, Chifu et al. 2014, which he compared with those published in Europe by Klika 1936, Tüxen 1955, Jurko 1964, Mayer 1974, Oberdorfer 1992, Mucina et al. 1993, Pott 1995, Mucina 1997, Rodwell et al.

2002, Borhidi 2003 and came to the conclusion that the phytocoenoses of the association from the Carpathians of Romania cannot be included in similar phytocoenoses from the Western Carpathians of Europe, due to the differences in terms of structure and floristic composition, as is the case with the species characteristic of the South-east Carpathian spruce, beech and fir forests with *Syringa josikaea* growing in Romania.

The characteristic species of *Syringa josikaea* tree stands such as *Pulmonaria rubra*, *Symphytum cordatum*, *Dentaria glandulosa*, *Hieracium transsylvanicum*, Leucanthemum waldsteinii, *Euphorbia carniolica*, *Campanula abietina* led the author to describe the Carpathian association *Pulmonario rubrae-Fagetum* Täuber 1987, the regional sub-association *syringetosum josikaeae* Burescu L. 2018 which is specific to the Western Carpathians. The *syringetosum josikaeae* sub-association has in its floristic composition a strong core made of 14 species (i.e. *Syringa josikaea*, *Fagus sylvatica*, *Abies alba*, *Picea abies*, *Acer pseudoplatanus*, *Pulmonaria rubra*, *Hieracium transsylvanicum*, *Leucanthemum waldsteinii*, *Silene heuffelii*, *Symphytum cordatum*, *Dentaria glandulosa*) characteristic and differentiated for coenotaxa ***Symphyto-Fagenion***, ***Symphyto cordati-Fagion*** (see Table 1). Along these latter species, the floristic composition of the association includes 22 species characteristic to the order ***Fagetalia sylvaticae*** (i.e. *Rubus hirtus*, *Asarum europaeum*, *Oxalis acetosella*, *Lamium galeobdolon*, *Galium odoratum*, *Calamagrostis arundinacea*), 18 species characteristic to the class ***Querco-Fagetea*** (i.e. *Athyrium filix-femina*, *Dryopteris filix-mas*, *Corylus avellana*, *Ulmus glabra*, *Carpinus betulus*, *Spiraea chamaedryfolia*, *Betula pendula*, *Salix capraea*, *Poa nemoralis*, *Galium schultesii*, *Doronicum austriacum*, *Filipendula ulmaria*) as well as transgressive species belonging to other vegetation classes i.e. ***Betulo-Adenostyletea*** (10 species), ***Vaccinio-Piceetea*** (nine species), ***Epilobietea angustifolii***, ***Asplenietea trichomanis***.

The layer of trees with a general coverage of 64% is dominated by *Fagus sylvatica*, *Picea abies*, *Abies alba* in which *Acer pseudoplatanus*, *Ulmus glabra*, *Carpinus betulus*, in which *Sorbus aucup*aria also participate. The compaction degree of the tree crown ranges between 0.6-0.7, the diameters of the tree trunks between 30-80 cm, and the height between 18-24m

The bush layer is dominated by *Syringa josikaea* with an overall coverage of 5.6%, accompanied by *Corylus avellana*, *Spiraea chamaedryfolia*, *Salix capraea*, *Sambucus nigra*, *Sambucus racemosa*, *Lonicera nigra*, *Lonicera xylosteum*, *Rosa pendulina*, *Daphne mezereum*, and *Clematis alpina*.

The grass layer with a general coverage of 26% consists of 69 species among which we mention *Pulmonaria rubra*, *Rubus hirtus*, *Asarum europaeum*, *Athyrium filix-femina*, *Polystichum aculeatum*, *Festuca drymeja*, *Oxalis acetosella*, *Galium odoratum*, *Lamium galeobdolon*, *Dryopteris filix-mas*, *Luzula luzuloides*, *Gentiana asclepiadea*, *Galeopsis tetrarhit* (see Table 1).

Analysis of the phytocenosis of *Syringa josikaea* stands shows us that in the spectrum of eco-diversity of life forms hemicryptophytes are dominant (49.4%) followed by phanerophytes (23.8%) of which (MPh=10.9%, mPh=7 .6%, nPh=4.3%, l-nPh=1%), geophytes (17.5%), camaephytes (3.2%) as ecological categories best adapted to a temperate-continental excessively mountainous climate (see Figure 1).

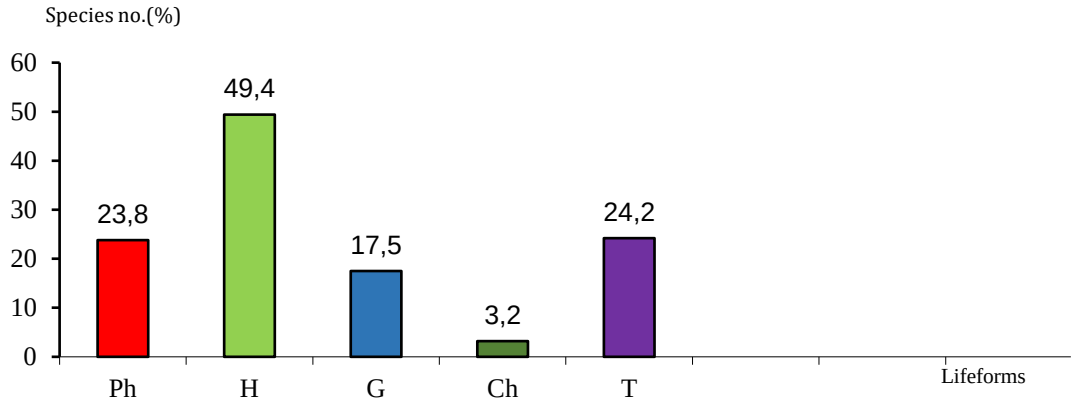

Figure 1. **The spectrum of lifeforms from the association *Pulmonario rubrae-Fagetum* Täuber 1987- *syringetosum josikaeae* Burescu, L. 2018**

Table 1

Coenotaxonomic diversity and ecology of forests developed by *Pulmonario rubrae-Fagetum* Täuber 1987-*syringetosum josikaeae* Burescu L., 2018, in Apuseni Mountains

Bio	E.f.	Survey no.	1	2	3	4	5	6	7	8	9	10	11	12	13
		Compartments	93B	95A	95B	96A	108A	66A	70A	74	78B	82A	91A	91B	95C
		Management units	Management unit. IV Iadolina					Management unit V Iadului Valley					Management unit VI Poiana		
		Altitude (mamsl)	750	850	860	880	900	750	710	640	610	590	644	684	626
		Exposure	V	V	SV	V	V	E	E	E	NE	E	N	N	N
		Slope (°)	38	45	40	45	46	45	45	33	41	40	28	45	45
		Tree height (m)	18	25	24	25	26	28	18	25	18	18	18	20	22
		Tree diameter (m)	60	80	80	60	80	50	60	60	80	100	30	34	42
		Canopy density degree	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.8	0.7	0.6	0.9	0.8	0.7
		Grass layer (%)	35	20	40	20	40	30	40	50	40	35	20	40	45
		Area (ha)	7.7	5.4	13.9	1.3	22.7	8.7	3.0	37	4.0	8.8	13.8	2.2	27.2
MPh	E	As. *Fagus sylvatica*	4	2	3	3	3	3	2	5	4	3	3	3	4
MPh	Ec	As. *Abies alba*	+	3	2	1	2	+	2	.	.	.	+	.	+
H	Carp-B	As. *Pulmonaria rubra*	.	+	+	+	+	+	+	.	.	+	+	+	+
mPh	End	Subas. *Syringa josikaea*	+	1	1	+	1	1	1	+	+	2	1	2	1
		Symphyto-Fagenion, Symphyto cordati-Fagion													
MPh	Ec	*Acer psedoplatanus*	+	+	+	+	+	+	+	+	+	+	1	1	+
G(H)	E-M	*Festuca drymeja*	2	+	2	.	2	.	.	+	+	+	+	+	2
H	E	*Polystichum aculeatum*	+	+	+	+	+	+	1	.	.	.	+	+	+
H	Carp-B	*Hieracium transsylvanicum*	.	.	.	+	.	+	.	+	.	.	.	.	.
G	End	*Dentaria glanduligera*	.	.	+	.	+	.	.	.	.	.	.	.	.
H(G)	End	*Symphytum cordatum*	.	.	+	.	+	.	.	.	.	.	.	.	.
H	Carp	*Leucanthemum waldsteinii*	.	+	.	.	+	.	+	.	.	.	.	.	.
H	Ec	*Veronica urticifolia*	.	.	.	.	.	.	.	.	+	+	.	.	+
Ch	Alp-E	*Saxifraga cuneifolia*	.	.	.	.	.	.	.	.	+	1	+	.	+
H	Ec	*Aconitum vulparia ssp. lasianthum*	.	+	.	+	.	.	+	.	.	.	.	.	.
H	Alp-Carp-B	*Euphorbia carniolica*	.	.	.	.	.	.	.	.	.	.	.	+	+
TH	Carp-B	*Silene heuffelii*	.	.	+	.	+	.	.	.	.	.	.	.	.
G	Cp	*Phyllitis scolopendrium*	.	.	.	.	.	.	.	.	.	.	+	+	.
		Fagetalia sylvaticae													
nPh	Eua	*Rubus hirtus*	+	+	+	+	1	1	3	.	+	+	+	+	+
H(G)	Eua	*Asarum europaeum*	+	+	1	+	.	+	+	.	+	+	+	+	+
H(G)	Cp	*Oxalis acetosella*	+	+	+	+	+	+	.	+	.	.	+	+	+
G(H)	E	*Mercurialis perennis*	+	+	+	.	.	.	+	+	+	.	.	.	.
H(Ch)	Ec	*Lamium galeobdolon*	+	+	1	1	+	+	.	.	.	+	+	+	+
H	Eua	*Senecio germanicus*	.	+	+	+	+	+	.	.	.	+	.	.	.
G	Eua	*Galium odoratum*	+	+	+	.	+	.	.	+	+	+	+	.	.
Th-TH	Cosm	*Geranium robertianum*	+	+	+	.	.	.	+	.	.	+	.	+	+
H	E	*Stellaria nemorum*	+	+	+	.	.	.	.	.	.	.	.	.	.
H	Eua(C)	*Calamagrostis arundinacea*	.	+	+	.	+	1	+	.	.	2	+	.	1
Th	E	*Galeopsis tetrahit*	.	+	+	.	+	.	+	.	.	.	.	+	+
G	Ec	*Symphytum tuberosum*	+	.	.	.	+	.	.	.	.	.	.	.	.
H	Eua	*Sanicula europaea*	.	+	+	.	.	.	.	.	.	.	.	.	.

Table 1 - Continuation

Bio	E.f.	Survey no.	1	2	3	4	5	6	7	8	9	10	11	12	13
H	Eua	*Epilobium montanum*	.	+	+	.	.	.	.	.	.	.	.	.	.
H	Eua	*Salvia glutinosa*	.	+	+	.	.	.	.	.	.	.	.	.	.
H	Eua	*Fragaria vesca*	.	+	+	.	.	.	+	.	.	.	.	.	.
Th	Eua	*Impatiens noli-tangere*	.	.	.	.	.	.	.	.	+	+	.	.	.
H	Cp	*Milium effusum*	.	.	.	.	.	.	.	.	.	.	+	.	+
G	Eua	*Lilium martagon*	+	.	.	.	.	.	.	.	.	.	.	.	.
G	Cp	*Gymnocarpium dryopteris*	.	.	.	+	+	.	.	.	.	.	.	.	.
G	Eua	*Polygonatum verticillatum*	.	.	.	+	+	.	.	.	.	.	.	.	.
nPh	Eua	*Daphne mezereum*	+	.	.	.	.	.	.	.	.	.	.	.	.
		Querco-Fagetea													
H	Cosm	*Dryopteris filix-mas*	+	+	+	+	+	+	+	.	+	+	.	.	.
mPh	Balc	*Corylus avellana*	+	+	+	.	+	.	+	+	1	1	+	+	+
H	Cosm	*Athyrium filix-femina*	1	+	+	1	1	+	+	.	.	+	+	+	+
MPh	Eua	*Ulmus glabra*	+	+	+	+	+	+	+	.	.	.	1	.	+
mPh	Eua	*Spiraea chamaedrifolia*	.	+	.	+	.	+	+	.	2	1	.	.	.
MPh	E	*Carpinus betulus*	+	.	+	.	.	.	.	+	1	+	2	2	+
MPh	Eua	*Betula pendula*	.	+	.	+	.	+	+	.	.	.	.	.	.
nPh	Ec	*Rosa pendulina*	+	.	.	+	.	.	.	.	+	+	.	+	.
mPh	Eua	*Salix capraea*	.	+	.	.	.	.	+	.	+	.	.	.	.
H	Cp	*Poa nemoralis*	.	+	.	.	.	.	+	.	1	1	+	.	+
H(G)	Eua	*Melica nutans*	+	+	.	.	.	.	+	.	.	.	.	.	.
H	Eua	*Campanula persicifolia*	.	+	.	.	.	.	+	.	+	.	.	.	.
G	Ec	*Galium schultesii*	.	+	.	.	.	.	+	.	+	.	.	.	.
H	Eua	*Filipendula ulmaria*	+	.	.	.	+	.	.	.	.	+	.	.	.
G	E	*Doronicum austriacum*	.	.	.	.	+	+	+	.	.	.	.	.	.
mPh	Eua	*Lonicera xylosteum*	.	.	.	+	.	+	.	.	.	.	.	.	.
H	E	*Pulmonaria officinalis*	.	.	.	.	.	.	.	.	+	+	.	.	.
H	Eua(C)	*Sedum telephium ssp. maxima*	.	.	.	.	.	.	.	.	+	+	.	.	.
		Vaccinio-Piceetea													
MPh	E	*Picea abies*	.	1	+	2	1	+	1	.	1	+	1	+	2
H	E	*Luzula luzuloides*	+	+	+	.	+	.	+	+	+	.	.	.	2
MPh	E	*Sorbus aucuparia*	.	+	.	+	+	+	.	+	.	+	.	.	.
MPh	Eua	*Pinus sylvestris*	.	+	.	+	.	+	+	.	.	.	.	.	.
mPh	Alp(E)	*Lonicera nigra*	.	+	.	+	.	+	.	.	.	+	.	.	.
Ch	Cp	*Vaccinium myrtillus*	.	.	.	.	.	.	.	.	.	.	.	+	1
l-nPh	Act-Alp-E	*Clematis alpina*	.	.	.	+	.	+	.	.	.	.	.	.	.
H	Cp	*Dryopteris dilatata*	.	.	.	.	.	.	.	.	.	.	+	.	1
H	Cp	*Campanula abietina*	.	.	.	.	.	.	.	.	.	.	.	.	.
		Betulo-Adenostyletea													
G	Alp-Carp-B	*Doronicum columnae*	+	+	+	.	.	.	.	.	+	+	.	.	.
H	Ec	*Gentiana asclepiadea*	+	.	.	.	+	.	+	.	.	+	+	+	.
G	Eua	*Petasites hibridus*	.	+	+	.	+	.	.	.	.	.	.	.	.
H	Carp-B-Cauc-Anat	*Telekia speciosa*	.	+	+	.	+	.	.	.	.	.	+	+	+
H	Eua	*Heracleum sphondylium*	.	.	.	+	.	+	.	.	.	.	.	.	.
H	Ec	*Digitalis grandiflora*	.	+	.	.	.	.	+	.	.	.	.	.	.
TH-H	Eua(Bor)	*Angelica archangelica*	.	.	.	.	+	.	.	.	.	.	.	.	.
H	Carp-B	*Trollius europaeus*	+	.	.	.	.	.	.	.	.	.	.	.	.
H	Alp-Carp-B	*Achillea distans*	+	.	.	.	.	.	.	.	.	.	.	.	.
nPh	Cp	*Rubus idaeus*	.	.	.	.	+	.	.	.	+	+	+	.	+
		Asplenietea trichomanis													
H	Cosm	*Asplenium trichomanes*	.	+	.	.	.	.	+	.	+	.	.	.	.
H	Carp	*Campanula kladniana*	.	+	.	.	.	.	+	.	.	+	.	.	.
G	Cp	*Polypodium vulgare*	.	+	+	.	.	.	+	.	+	.	+	+	+
		Alnetea glutinosae													
H	Cp	*Dryopteris cristata*	+	.	.	.	.	.	+	.	.	+	.	+	.
Ch (nPh)	Eua	*Solanum dulcamara*	.	.	.	.	.	.	.	.	.	+	.	.	.
		Epilobietea angustifolii													
mPh	Cp	*Sambucus racemosa*	.	+	.	.	.	.	+	.	.	.	.	.	.
MPh	E	*Sambucus nigra*	.	.	.	.	.	.	.	.	1	+	+	+	.
H	Cp	*Solidago virgaurea*	.	+	.	.	.	.	+	.	+	.	.	.	.
H	Cosm	*Urtica dioica*	.	.	.	.	.	.	.	.	.	.	1	+	+
		Variae syntaxa													
G	Eua	*Polygonatum odoratum*	+	.	.	.	.	.	.	+	+	+	.	.	.
H	Eua	*Eupatorium cannabinum*	.	+	.	.	.	.	+	.	.	.	+	.	.
G	Cp	*Equisetum telmateia*	.	.	.	.	.	.	.	.	.	.	+	.	+
H	Eua	*Ranunculus repens*	.	.	.	.	.	.	.	.	.	.	.	+	+
H	E	*Lunaria rediviva*	.	.	+	.	.	.	.	.	.	.	.	+	.
H	End	*Phyteuma tetramerum*	.	+	.	.	.	.	.	.	.	.	.	.	.

The following were included in a single survey: Hypericum montanum (1, Compartment 93B), Aconitum callibotrion (1, Compartment 93B), Carex brizoides (1, Compartment 93B), Fraxinus excelsior (1, Compartment 93B), Angelica sylvestris (1, Compartment 93B), Lamium maculatum (1, Compartment 93B), Molinia caerulea (1, Compartment 93B), Mycelis muralis (3, Compartment 85B), Melittis melissophyllum (5, Compartment 108A), Senecio doria (6, Compartment 66A), Luzula sylvatica (10, Compartment 82A), Salix eleagnos (10, Compartment 82A), Lamium purpureum (11, Compartment 91A), Vaccinium vitis idaea (4, Compartment 259A).
Location and date of surveying: 1-5 Iadului Valley, right bank, Management unit IV Iadolina Remeți Forestry district, Bihor County (04.09.2022), 6-10 Iadului Valley, left bank, Management unit V Iadului Valley, Remeți Forest district, Bihor County (06.05.2021), 11-13 Crișul Negru Valley, upstream towards the springs, Management unit VI Poiana, Sudrigiu Forest district, Bihor County (27.10.2022), 14 – Aries Valley, Garda de Sus commune, Management unit I Magura, Garda Forest district , Alba County (28.10.2022), 15 –Ariesul Valley, Arieseni commune, Management unit I Neagra, Horea Apuseni Forest district, Alba County (31.10.2022).

The analysis by the genetic center of origin and the current geographical area (see Figure 2) shows that the spectrum of phytogeographical elements is dominated by *Eurasian species* (32.9%) followed by *circumpolar species* (15.3%), on a par with European ones (15.3%), followed by Central European species (10.9%), and Carpathian and Carpathian-Balkan (7.5%) species. Stenochore species are rare and occur in small percentages such as endemic (4.3%), Alpine-Carpatho-Balkan (3.2%), Alpine-European (2.1%), Arctic-Alpine (1%), and Balkan (1%).

Spruce (*Picea abies*), beech (*Fagus sylvatica*), fir (*Abies alba*) and *Pulmonaria rubra* forests with thickets of *Syringa josikaea* are rare in Romania, being included according to the Habitats' Directive 92/49/EEC in the natural habitat of community interest NATURA2000: 91V0 Dacian Beech forests (***Symphyto-Fagion***)

(Burescu L. 2018), according to Law 49 of April 7th, 2011 and the Emergency Ordinance of the Government of Romania no. 57 of 2007, regulating the regime of protected natural areas, any kind of felling is prohibited, the main objectives of the management plan being the conservation of biodiversity, and of the rare, endangered, endemic, relict species and ensuring the stability of rare or endangered forest ecosystems.

since it contains species at risk of extinction, which is why they must be protected in special protected areas.

The stands of *Syringa josikaea* from the Apuseni Mountains are centuries-old virgin forests included in Group I, Forest vegetation with special protective functions, subgroup 1-5 Forests with scientific importance for the protection of forest gene pool and ecological diversity 1.5c, 1.5f, 1.5i, 1.5e; sub-group 1-2 Soil protection forests from categories 1.2a Forests located on cliffs, gullies, lands with large slopes prone to erosion.

Although the forest species in the stands surveyed are relevant for the wood industry, in the forests with *Syringa josikaea* declared natural protected areas and containing high conservation values, VRC 1.1., VRC 1.2., VRC 1.3.

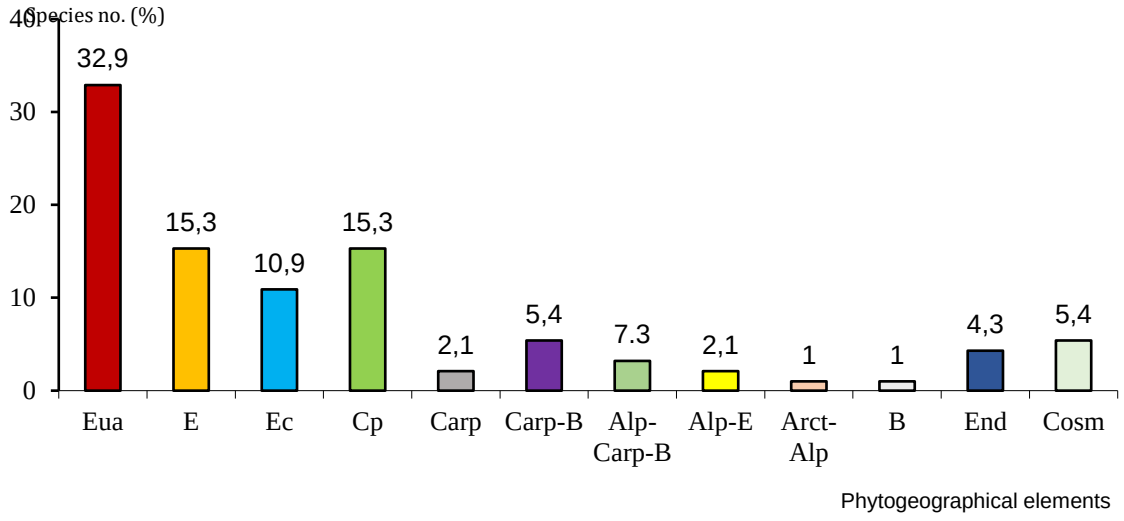

Figure 2. **The spectrum of phytogeographical elements of the association *Pulmonario rubrae-Fagetum* Täuber 1987- *syringetosum josikaeae* Burescu, L. 2018**

CONCLUSIONS

The floristic inventory of *Syringa josikaea* stands gathered in the association *Pulmonario rubrae-Fagetum* Täuber 1987 – *syringetosum josikaeae* Burescu L. 2018, totals 91 cormophyte species, which shows a high biodiversity.

Based on a strong nucleus consisting of 14 boreal, Carpathian species that grow alongside *Syringa josikaea* on narrow mountain valleys, in microthermal climate, on moist soils with a weakly acid-neutrophilic to slightly basic Ph, we differentiated the sub-association *syringetosum josikaeae* subordinated floristically, coenotaxonomically and ecologically at the *Pulmonario rubrae-Fagetum* base association.

The trees of the phytocenoses with *Syringa josikaea* are dominated by hemicryptophytes (49.4%) followed by phanerophytes (22.8%) and geophytes (17.5%), a consequence of the surveyed territory belonging to the temperate continental climate of the Apuseni Mountains.

Analysis of the distribution of species according to the occupied geographical area shows the predominance of Eurasian species (32.9%) followed by circumpolar boreal (15.3%) at par with European species (15.3%)

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