

# NEW ASSOCIATION OF SMALL-LEAVED LIME IN EASTERN SLOVENIA

(*VIBURNO OPULI-TILIIETUM CORDATAE* ASS. NOVA)

NOVA ZDRUŽBA LIPOVCA V VZHODNI SLOVENIJI  
(*VIBURNO OPULI-TILIIETUM CORDATAE* ASS. NOVA)

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## ABSTRACT

UDC 581.9:582.685.24(497.43)

### New association of small-leaved lime in eastern Slovenia

(*Viburno opuli-Tilietum cordatae* ass. nova)

On a steep slope in Posotelje on Rudnica near Podčetrtek, we recorded probably a new association *Viburno opuli-Tilietum cordatae* ass. nova. We originally envisaged that it was a new initial stage of the already known association *Tilio cordatae-Aceretum platanoidis* Ž. Košir 1953. However, Jaccard's and Sørensen's indexes showed very low coefficients of similarity ( $\sigma_j = 23.4$ ,  $\sigma_s = 37.9$ ), which made us consider the existence of a new, previously named association. We consider the association *Viburno-Tilietum* to be a vicariant phytocenosis of the edge of the subpannonian region of Slovenia, of the subalpine-alpine association *Tilio-Aceretum*.

**Key words:** phytocenology, *Tilio-Aceretum*, *Viburno-Tilietum*, *Tilia cordata*, *Acer platanoides*, *Quercus cerris*, *Q. petraea*, *Acer campestre*, *Sorbus torminalis*, edge of subpannonian Slovenia.

## IZVLEČEK

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### Nova združba lipovca v vzhodni Sloveniji

(*Viburno opuli-Tilietum cordatae* ass. nova)

V Posotelju na Rudnici pri Podčetrtku je na strmem pobočju zabeležena verjetno nova asociacija *Viburno opuli-Tilietum cordatae* ass. nova. Prvotno smo predvidevali, da gre za nov inicialni stadij že znane asociacije *Tilio cordatae-Aceretum platanoidis* Ž. Košir 1953. Vendar sta Jaccardov indeks in indeks Sørensenove pokazala zelo nizke količnike ( $\sigma_j = 23,4$ ,  $\sigma_s = 37,9$ ) podobnosti, kar je dalo misliti na obstoj nove, prej imenovane asociacije. Asociacijo *Viburno-Tilietum* štejemo za vikariantno fitocenozo obrobne predpanonskega območja Slovenije predalpsko-alpske asociacije *Tilio-Aceretum*.

**Ključne besede:** fitocenologija, *Tilio-Aceretum*, *Viburno-Tilietum*, *Tilia cordata*, *Acer platanoides*, *Quercus cerris*, *Q. petraea*, *Acer campestre*, *Sorbus torminalis*, obrobje subpanonske Slovenije.

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P. KOŠIR and L. MARINČEK (1999: 53–55) wrote about research into noble broadleaves in Europe and especially in Slovenia. We will restrict ourselves in this paper to phytocenoses of noble broadleaves that, in our opinion, are developmental or related or, on an objective judgement, are connected with the question of our phytocenosis of noble broadleaves on Rudnica near Podčetrtek.

In order to confirm the independence of our association, we made a comparison with the associations *Tilio cordatae-Aceretum platanoidis* Ž. Košir 1953 (synonyms *Ostrya-Tilietum cordatae*, *Tilio-Ostryetum*), *Corydalido ochroleucae-Aceretum* Accetto 1991, *Saxifrago petraeae-Tilietum platyphylli* Dakskobler 1999 and *Acero-Tilietum platyphylli* Faber 1936 (Ž. Košir 1953, ACCETTO 1991, DAKSKOBLER 1999, OBERDORFER 1957). In a wider sense, we additionally made a partial comparison with the phytocenoses *Omphalodo verna-Aceretum pseudoplatani* P. Košir & Marinček 1999, *Lamio orvalae-Aceretum pseudoplatani* P. Košir & Marinček 1999, *Dentario polyphyllae-Aceretum* P. Košir & Marinček 1999, *Dryopterido affini-Aceretum* P. Košir 2005 (P. KOŠIR & MARINČEK 1999, P. KOŠIR 2002, 2005 a, 2005 b, 2005 c), *Veratro nigri-Fraxinetum* Dakskobler 2007, *Carici albae-Tilietum cordatae* Müller & Görs 1958 var. geogr. *Anemone trifolia* Dakskobler 2007, *Ornithogalo-Fraxinetum* Čušin & Dakskobler ex Dakskobler 2007, *Hacquetio-Fraxinetum* Marinček in Wallnöfer et al. 1993 (DAKSKOBLER 1999, 2007 a, 2007 b); *Corydalido cavae-Aceretum* Moor 1938 var. geogr. *Dentaria enneaphyllos* Zupančič 1996, *Arunco-Aceretum* Moor 1952 var. geogr. *Dentaria enneaphyllos* Zupančič & Žagar (1997) 1999, *Arunco-Aceretum* Moor 1952 var. geogr. *Dentaria pinnata* Zupančič & Žagar 1999 (ZUPANČIČ 1996, ZUPANČIČ & ŽAGAR 1999).

We were initially convinced that this was a case of an initial stage of Ž. Košir's association *Tilio cordatae-Aceretum platanoidis* and, subsequently, in particular its geographic variant on the edge of the subpannonian phytogeographic region. We were led to this thinking by a comparison that showed that of the six characteristic species that Ž. Košir determined for the association *Tilio cordatae-Aceretum platanoidis*, our phytocenosis has four or five (*Ostrya carpinifolia* 2<sup>1-3</sup>, *Tilia cordata* 2<sup>1-3</sup>, *Tamus communis* 1<sup>1</sup>, *Euonymus latifolia* 2<sup>+</sup> and in the shrub layer *Acer platanoides* 1<sup>+</sup>). Comparison showed that the characteristic species *Ostrya carpinifolia*, *Euonymus latifolia* and *Tamus communis* frequently appear, with higher levels of abundance value, in other phytocenoses of noble broadleaves and are not only diagnostic species for the association *Tilio cordatae-Aceretum platanoidis*. Instead of them, we propose *Epipactis helleborine* (L.) Crantz s. lat. (= *E. latifolia* (L.)

All.) as the diagnostic species. We do now know very much about it and its ecological characteristics. OBERDORFER (1979) characterises it as a common species in damp, herb-rich oak and beech forests, as well as in mixed scrub and water meadows or in associations of flood forests. It grows on fresh, nutrient and base rich, medium deep, clayey, composted soil, with moderately mild, acid, friable humus. It is an indicator of clayey soil. It grows in associations of the alliances *Fagion*, *Carpinion*, *Alno-Ulmion* or the order *Fagetalia*; it more rarely appears in associations of the alliance *Quercion pubescentis*. It is classified among Euro-Asian (suboceanic)-sub-Mediterranean species. In Austria it grows up to an altitude of 1350 (1400) m.

In Slovenia, the species *Epipactis helleborine* s. lat. grows in associations of the class *Quercio-Fagetea*. It grows on carbonate ground, usually at lower altitudes. It prefers warm exposures on fresh habitats. It tolerates thermophilous, damp habitats very well so it is common in the association of small-leaved lime and Norway maple. It is not found in damp forests of maple, European ash or similar forests of noble broadleaves and beech. A review or comparison from relevant phytocenological tables of ACCETTO (1991), DAKSKOBLER (1999, 2007 a, 2007 b), Peter KOŠIR (2005 a, 2005 b, 2005 c) confirms this statement. Because of its ecological properties, we have classified it among characteristic species of the association *Tilio cordatae-Aceretum platanoidis*. It has a more than half median level of presence in this association, which ranks it among diagnostic species of the association. We also find that it is not found in similar associations of noble broadleaves, or is very rare in them. The selection of characteristic species of the association *Tilio cordatae-Aceretum platanoidis* would be: *Tilia cordata*, *Acer platanoides*, *Rhamnus fallax* and *Epipactis helleborine* s. lat.

The above combination of characteristic species of the association *Tilio cordatae-Aceretum platanoidis* more or less corresponds to our phytocenosis, although ours is only presented with two phytocenological relevés. In relation to the similarity between the phytocenoses, we therefore calculated the coefficient of similarity according to Sørensen and Jaccard. The coefficients are very low ( $\sigma_s = 37.9$  and  $\sigma_j = 23.4$ ), which means that the phytocenoses are very different and independent. From the comparison tables (Tables 2 and 3), we established that the species *Cardamine pentaphyllos* (L.) Crantz, *Aconitum napellus* L. em. Skalkicky s. lat. (*A. napellus* subsp. *lobelii*, or even a cross?), *Cirsium erisithales* (Jacq.) Scop. and *Carex alba* Scop. distinguish the association from other similar phytocenoses of noble broadleaves, including ours, so we chose them as the distinguishing species of the asso-

ciation *Tilio cordatae-Aceretum platanoidis*. The distinguishing species *Cardamine pentaphyllos* and *Aconitum napellus* s. lat. indicate damp and cold habitats, *Cirsium erisithales* prefers fresh, relatively warm habitats and *Carex alba* is a species that grows on more or less initial soils. All the enumerated distinguishing species correspond to the ecological conditions in which the association *Tilio cordatae-Aceretum platanoidis* thrives.

Ž. KOŠIR (1953) compared his phytocenosis with surrounding related phytocenoses of Kamniška Bistrica and the Swiss association *Tilio-Asperuletum taurinae* Trepp (1944) 1947, from which he »obtained the necessary synthetic signs, which distinguish (his) association from other forest types«. He found that the Swiss association shows a great deal of relatedness to his phytocenosis but there are some essential floristic differences. The species *Tilia platyphyllos*, *Staphylea pinnata*, *Asperula taurina*, *Acer campestre* are not found in the association *Tilio cordatae-Aceretum platanoidis*, it is more impoverished with species of the order *Prunetalia spinosae* and richer in fagetal species, especially Southeast-European-Illyrian species. He thoroughly describes in detail the ecological conditions that are important for the existence of the association *Tilio cordatae-Aceretum platanoidis*, the geological basis (limestone, dolomite and marl gravel, with a thickness of gravel of 2–6, 6–12 cm), amount of precipitation (2200–2400 mm), air temperature (8.5–9 °C), he draws attention to the micro-climate, air humidity, insulation, evaporation, wind, period of snow cover, inclination, exposure and altitude of the terrain. He deals in detail with the soils, which are skeletal, young, undeveloped, gravel with an admixture of dark-brown-black humus and he classifies them among rendzinas and »humo-carbonate« soils. The terrain is unstable due to landslip, rock fall and rolling gravel, which is released by game. He draws attention in this to damage to the thickness and the dubious human exploitation of such an ecologically sensitive structure. In view of the described ecological conditions and floristic composition, Ž. Košir distinguished three types of succession, namely on dry (crest), damp (wide trenches) and parched habitats. From the phytocological table, on a floristic basis there is a clearly expressed initial stage, represented by the first ten of twenty relevés in the table. It must be stressed above all that the species *Tilia platyphyllos* is not found in the association *Tilio cordatae-Aceretum platanoidis*.

Ž. Košir's association should be properly evaluated syntaxonically as follows:

*Tilio cordatae-Aceretum platanoidis* Košir 1953  
nom. nov. hoc loco

Basionom: *Ostryo-Tilietum* Košir 1953 (Art. 34)

Nomenclature type (Neotypus hoc loco): Slovenia, Kamniška Bistrica, 850 a.s.l., exposure WSW, inclination 35–40 °, 15 October 1953, Ž. Košir:

E<sub>3</sub>: *Acer platanoides* 2.1, *Tilia cordata* 1.1, *Ostrya carpinifolia* 1.2, *Acer pseudoplatanus* +1, *Fagus sylvatica* 2.2, *Fraxinus excelsior* 1.2, *Ulmus glabra* +1, *Fraxinus ornus* (r), *Sorbus aria* (+1)

E<sub>2</sub>: *Acer platanoides* 1.1, *Tilia cordata* 1.1, *Ostrya carpinifolia* +1, *Rhamnus fallax* (+1), *Euonymus latifolia* 2.2, *Acer pseudoplatanus* +1, *Fagus sylvatica* +1, *Daphne mezereum* 1.1, *Corylus avellana* 1.3, *Clematis vitalba* +1, *Ulmus glabra* 1.1, *Lonicera xylosteum* (+1), *Laburnum alpinum* +1, *Rosa alpina* +1, *Sambucus racemosa* +1

E<sub>1</sub>: *Acer platanoides* +1, *Tilia cordata* +1, *Ostrya carpinifolia* +1, *Acer pseudoplatanus* +1, *Fagus sylvatica* +1, *Fraxinus excelsior* +1, *Carpinus betulus* +1, *Tamus communis* 1.1, *Galeobdolon flavidum* 1.1, *Polygonatum multiflorum* +1, *Dryopteris filix-mas* 1.1, *Paris quadrifolia* +1, *Viola reichenbachiana* +1, *Phyteuma spicatum* +1, *Epipactis helleborine* s. lat. +1, *Cyclamen purpurascens* 1.1, *Mercurialis perennis* 1.2, *Galium laevigatum* +1, *Carex digitata* 1.3, *Actaea spicata* 2.1, *Asarum europaeum* 1.1, *Carex digitata* 1.3, *Actaea spicata* 2.1, *Asarum europaeum* 1.1, *Cardamine pentaphyllos* 1.2, *Hepatica nobilis* +1, *Lilium martagon* +1, *Mycelis muralis* +1, *Cephalanthera longifolia* +1, *Lamium orvala* 2.1, *Campanula trachelium* 1.1, *Platanthera bifolia* +1, *Hacquetia epipactis* 1.1, *Pulmonaria officinalis* 1.2, *Symphytum tuberosum* +1, *Veronica urticifolia* +1, *Salvia glutinosa* 1.2, *Senecio fuchsii* +1<sup>0</sup>, *Gentiana asclepiadea* +1, *Carex alba* +2, *Calamagrostis varia* +1, *Prenanthes purpurea* 1.2<sup>0</sup>, *Solidago virgaurea* +1, *Cirsium erisithales* +1, *Aconitum napellus* s. lat. +1, *Cardamine trifolia* +1, *Melittis melisophyllum* +1, *Hypericum hirsutum* +1, *Helleborus niger* ssp. *niger* +1, *Primula vulgaris* +1, *Aposeris foetida* +1, *Arabis (gerardii?)*\* +3, *Veratrum album* +1. \*Not in Slovenia!

E<sub>0</sub>: *Ctenidium molluscum* +2, *Neckera* sp. +2, *Hylocomium triquetrum* +2, *Thuidium abietinum* +2, *Camptothecium lutescens* +2.

Despite the similarity in characteristic species between Ž. Košir's phytocenosis and ours, the floristic and ecological conditions are different. We determined the soil conditions of our phytocenosis as rendzina or shallow skeletal carbonate soil, but other abiotic and biotic influences are essentially different, especially in relation to climate and the (non)dynamic terrain. Our phytocenosis is located in a region of continental dry subpannonian climate (800 mm precipitation annually and average temperature 9.2–10.3

°C) and on terrain which is more or less stable, with a limestone geological base. This is followed by a difference in the number of fresh and moisture-loving species, of which there are ten fewer in our phytocenosis (20 : 30).

We decided in addition to make a comparison with the associations *Corydalis-Aceretum* Accetto 1991, *Saxifraga-Tilietum* Dakskobler 1999 and *Acer-Tilietum* Faber 1936 (ACCETTO 1991, DAKSKOBLER 1999, OBERDORFER 1957). Despite the fact that large-leaved lime *Tilia platyphyllos* is leading in the mentioned associations, we were interested in a possible link with Ž. Košir's and with our phytocenoses, especially because in Accetto's and Dakskobler's associations the species *Tilia cordata* is in low abundance, and the species *Acer platanoides* in Dakskobler's and Faber's (Oberdorfer's) associations has at least a fifty per cent or more level of presence. Above all, we were interested in a comparison with our phytocenosis, whether it is possible to include it in any of them, when we found that it could not be classified in Ž. Košir's *Tilio cordatae-Aceretum platanoidis*. Comparison between our phytocenosis and Accetto's association *Corydalis ochroleuca-Aceretum* showed very low coefficients of similarity –  $\sigma_s = 26.7$  and  $\sigma_j = 15.4$ . There was a slightly higher coefficient of similarity, although still low ( $\sigma_s = 35.6$  and  $\sigma_j = 21.6$ ), between our phytocenosis and Dakskobler's association *Saxifraga petraeae-Tilietum*. The similarity between our phytocenosis and Faber's (Oberdorfer's) association is  $\sigma_s = 37.6$  and  $\sigma_j = 23.4$ , which means that there is little similarity between them. The conclusion is that our phytocenosis cannot

be classified into Accetto's, Dakskobler's or Faber's (Oberdorfer's) associations.

The provisional decision is that our two relevés represent a new phytocenosis-association, which we have designated

**Viburno opuli-Tilietum cordatae ass. nova**

Nomenclature type: Zupančič & Žagar (2013: Tabela 1, popis 2) Neotypus hoc loco.

Characteristic species: **Viburnum opulus, Ligustrum vulgare, Pyrus pyraeaster, Brachypodium rupestre.**

Distinguishing species: **Acer campestre, Quercus cerris, Q. petraea, Sorbus torminalis.**

The association was inventoried on southeast and southwest exposures of a steep slope of Rudnica near Podčetrtek, with an inclination of 40 to 45° on a limestone base at altitudes of 280 and 310 m. The climate is continental, with average annual precipitation between 800 and 900 mm and average annual temperature between 9 and 10 °C. The soils are rendzinas or shallow skeletal carbonate soils, fresh to damp. Because of the specific ecological conditions of a warm-damp habitat, thermophilous and fresh-loving or even moisture-loving plant species appear in it – these are in a ratio of 1 : 2 in favour of thermophilous species. Fagetal species predominate, species of the orders *Prunetalia spinosae* and *Quercetalia pubescentis* and the class *Trifolio-Geranietea* were noted, which corresponds with the finding of predominately thermophilous species, to which can be added species of the classes *Festuco-Brometea* and *Molinio-Arrhenatheretea*.

Table 1

Synsystematic units	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	no.	%	no.	%
<i>Carpinion</i> s. lat.	3	2.8	5	5.0
<i>Prunetalia spinosae</i>	3	2.8	12	11.9
<i>Quercetalia pubescentis-petraeae</i>	6	5.6	9	8.9
<i>Quercetalia roboris-petraeae</i>	0	0.0	3	2.9
<i>Querco-Fagetea</i> s. str.	52	48.6	33	32.7
<i>Querco-Fagetea</i> s. lat.	64	59.8	63	61.3
<i>Vaccinio-Piceetea</i>	19	17.9	4	4.0
<i>Erico-Pinetea</i>	3	2.8	2	2.0
<i>Betulo-Adenostyletea (Mulgedio-Aconitetea)</i>	5	4.7	1	1.0
<i>Epilobietea angustifolii</i>	3	2.8	2	2.0
<i>Trifolio-Geranietea</i>	1	0.9	11	10.9
<i>Festuco-Brometea</i>	1	0.9	6	5.9
<i>Molinio-Arrhenatheretea</i>	0	0.0	4	4.0
<i>Artemisietea</i>	1	0.9	1	1.0
<i>Asplenietea trichomanis</i>	3	2.8	3	2.9
Other species	7	6.5	5	5.0
Total	107	100.0	101	100.0



There is a more exact presentation of individual taxa in Table 1, in which there is also a comparison with the association *Tilio cordatae-Aceretum platanoidis*. There is a clear difference in the higher share of species of the classes *Vaccinio-Piceetea* and *Betulo-Adenostyletea* in the association *Tilio cordatae-Aceretum platanoidis* and in the share of already mentioned (thermophilous) synsystematic units in the association *Viburno-Tilietum cordatae*. The share of picetal species of high stemmed plants ranks the association *Tilio cordatae-Aceretum platanoides* in the subalpine phytogeographic region, and thermophilous species places the association *Viburno-Tilietum cordatae* in the subpannonian region. We find that only three southeast-European-Illyrian species that are characteristic of the Illyrian floral province have been recorded so far in the association *Viburno-Tilietum cordatae*, while there are nine in the association *Tilio cordatae-Aceretum platanoidis*.

The phytogeographic affiliation and ecological differentiation of the associations is confirmed by the distribution of geoelements (Table 2), whereby there are more thermophilous species in the association *Viburno-Tilietum cordatae*, such as Pontic, Mediterranean-Atlantic, Mediterranean-Pontic and even one Eumediterranean geoelement. In the association *Tilio cordatae-Aceretum platanoidis* there are three times more Mediterranean-montane species than in the association *Viburno-Tilietum cordatae*. These species stress the warm-damp conditions of habitats of the association *Tilio cordatae-Aceretum platanoidis* in the subalpine/alpine world (*Cyclamen purpurascens*, *Sanicula europaea*, *Sambucus racemosa*, *Laburnum alpinum*, *Abies alba*, *Saxifraga cuneifolia*, *Valeriana tripteris*, *Adenostyles glabra*, *Larix decidua*, *Cirsium eristhates*, *Bupthalmum salicifolium*, *Aposeris foetida*, *Calamintha nepeta*).

Table 2

Geoelements (accord. to POLDINI 1991)	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	no.	%	no.	%
European	25	23.4	<b>30</b>	<b>29.6</b>
European-Asian	15	14	15	14.9
Circumboreal	9	8.4	8	7.9
European-Siberian	7	6.5	7	6.9
Paleotemperate	6	5.6	6	5.9
Eastalpine	1	0.9	0	0.0
Alpine-Carpathian	1	0.9	0	0.0
Arctic-Alpine	1	0.9	0	0.0
Mediterranean-montane	<b>13</b>	<b>12.1</b>	4	4.0
Southernillyrian	3	2.8	0	0.0
Northernillyrian	3	2.8	2	2.0
Pontic	3	2.8	<b>6</b>	<b>5.9</b>
Southeasteuropean	2	2.0	2	2.0
Mediterranean-Atlantic	1	0.9	<b>3</b>	<b>3.0</b>
European-Mediterranean	1	0.9	<b>3</b>	<b>3.0</b>
Mediterranean-pontic	2	2.0	<b>3</b>	<b>3.0</b>
Eumediterranean	0	0.0	<b>1</b>	<b>1.0</b>
Cosmopolitan	3	2.8	3	3.0
Adventive	0	0.0	1	1.0
Other species	11	10.3	7	6.9
Total	107	100.0	101	100.0

The results of the analysis of the biological forms of species (Table 3) correspond with the above findings. The association *Viburno-Tilietum cordatae* thrives in relatively less favourable ecological conditions, in which there are slightly more phanerophytes and hemicryptophytes and half as many geophytes as in the association *Tilio cordatae-Aceretum platanoidis*. According to I. HORVAT (1949), these would be similar

to the ecological conditions that prevail in habitats of oak and hop (*Quercu-Ostryetum*). For comparison, we should highlight that ecological conditions in the association *Tilio cordatae-Aceretum platanoidis* more approximate to beech habitats of the temperate zone (according to I. HORVAT 1949), except that there are more phanerophytes in them.

Table 3

Biological form	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	no.	%	no.	%
PHANEROPHYTES	28	26.2	33	<b>32.8</b>
P caesp – tufted	13	12.2	<b>15</b>	<b>14.9</b>
P scap – stemmed	11	10.3	12	11.9
P lian – liana	1	0.9	2	2.
NP – Nano ph.	3	2.8	4	4.
CHAMAEPHYTES	11	10.2	9	9.0
Ch sufr – shrubby	1	0.9	2	2.0
B Ch – mossy	<b>10</b>	<b>9.3</b>	7	7.0
HEMICRYPTOPHYTES	43	40.2	48	<b>47.4</b>
H scap – stalked	23	21.5	<b>31</b>	30.7
H casp – tufted	6	5.6	6	5.9
H ros – rosette	<b>11</b>	<b>10.3</b>	5	5.0
H rep – climbing	2	1.9	3	2.9
H bien – biennial	1	0.9	<b>3</b>	<b>2.9</b>
GEOPHYTES	25	<b>23.4</b>	11	10.8
G bulb – G. with bulb	<b>3</b>	<b>2.8</b>	1	0.9
G rhiz – G. with rhizome	<b>21</b>	<b>19.7</b>	9	9.0
G rad – G. with root tuber	1	0.9	1	0.9
Total	107	100.0	101	100.0

It can be said in general that both life spectra according to Raunkiaer (I. HORVAT 1949) are classified more or less in the temperate zone.

On the basis of the aforementioned analyses, we decided on designating characteristic and distinguishing species of the association *Viburno-Tilietum cordatae*. Their ecological properties are fairly similar, which the selection confirms. The characteristic species *Viburnum opulus*, *Ligustrum vulgare*, *Pyrus pyraister* and *Brachypodium rupestre* thrive on fresh to damp, but also dry, nutrient and base rich soils with neutral to moderate acidity, light to composted humus. In relation to light, they are classified in semi-shade to light-loving species. In terms of character, they are thermophilous and, for the most part, pioneer species (OBERDORFER 1979). The first three are classified in the order *Prunetalia spinosae*, and the last in the class *Festuco-Brometea*, some people even in the alliance *Geranion*. With their fairly similar ecological conditions they suitably represent the association *Viburno-Tilietum cordatae*.

The distinguishing species *Acer campestre*, *Quercus cerris*, *Q. petraea* and *Sorbus torminalis* very well distinguish the association *Viburno-Tilietum cordatae* from similar associations (Table 3). In relation to ecological conditions, they correspond to the characteristic species of the association. They grow on dry to fresh, for the most part base rich and only in one case (*Quercus petraea*) base poor, more or less rich soils with moderately acid humus. All the distinguishing species are thermophilous and semi-shade to light-loving species (OBERDORFER 1957). Their general ecological determination is in their thermophilous nature, which characterises the summer warmer region of subpannonian Slovenia.

Finally, we made a further comparison of similarity with and between other associations dealt with in Table 3, *Corydalido-Aceretum*, *Saxifrago-Tilietum* and *Aceri-Tilietum*. As expected, it showed that there are floristic and consequently ecological differences among them, as Sørensen's ( $\sigma_s$ ) and Jaccard's ( $\sigma_j$ ) indexes show.

Table 4

Compared phytocenoses	1	2	3	4	5	6	7
Sørensen	37.9	26.7	35.6	37.9	41.3	44.8	44.9
Jaccard	23.4	15.4	21.6	23.4	26.0	28.9	29.0

- 1 *Viburno-Tilietum* : *Tilio-Aceretum*
- 2 *Viburno-Tilietum* : *Corydalido-Aceretum*
- 3 *Viburno-Tilietum* : *Saxifrago-Tilietum*
- 4 *Viburno-Tilietum* : *Aceri-Tilietum*
- 5 *Tilio-Aceretum* : *Corydalido-Aceretum*
- 6 *Tilio-Aceretum* : *Saxifrago-Tilietum*
- 7 *Corydalido-Aceretum* : *Saxifrago-Tilietum*

We made the comparison with selected phytocenoses of noble broadleaves due to the caution dictated by some more or less general ecological similarities that they have, e.g., in the geological base, soils, steep warmer exposures, fresh to damp habitats, sometimes even in the presence of some leading, diagnostically important tree species of one phytocenosis or another (*Tilia cordata*, *T. platyphyllos*, *Acer platanoides*, *A. pseudoplatanus*) and other trees in the chosen phytocenoses, which appear more or less constantly because of similar ecological conditions, e.g., *Ostrya carpinifolia*, *Fraxinus ornus*, *F. excelsior*, *Ulmus scabra*.

On the basis of the cited findings, despite there being only two relevés, we can consider the association *Viburno-Tilietum cordatae* to be an independent phytocenosis with clearly recognisable characteristic and distinguishing species.

In classifying the association *Viburno-Tilietum cordatae* into higher syntaxonomic units, it is clearly in

the class *Quercio-Fagetea* Br.-Bl. & Vlieger 1937 and order *Fagetalia sylvaticae* Pawl. 1928. Because of the two more widely distributed southeast-European-Illyrian species, *Cyclamen purpurascens* and *Knautia drymeia* subsp. *drymeia* of the association, we cannot classify it into the Illyrian alliance *Aremonio-Fagion* (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989. We must consider the more or less suitable central-European alliance *Tilio-Acerion* Klika 1955 with its relative (disputed) species. These are the following in our association: *Acer platanoides*, *A. pseudoplatanus*, *Actaea spicata*, *Euonymus latifolia*, *Geranium robertianum*, *Geum urbanum* and perhaps also the characteristic species of the association *Viburnum opulus*, which is considered to be more or less characteristic of the alliance *Alno-Ulmion* Br.-Bl. & R. Tx. 1943. Perhaps further research into the association *Viburno-Tilietum cordatae* will bring a clearer specification into any of the already known or even perhaps new alliances, or suballiances eg *Ostryo-Tilienion platyphylli* P. Košir, Čarni & Di Pietro 2008.

The association *Viburno-Tilietum cordatae* does not have great economic value but it is important as protective forest or perhaps in some less extreme conditions as economic forest with limitations. In addition to the nature protection function, it has importance in the mosaic of our proverbially rich biological diversity.

## POVZETEK

O raziskovanih fitocenoz plemenitih listavcev v Evropi in še posebej v Sloveniji sta pisala P. KOŠIR in L. MARINČEK (1999: 53–55). V našem prispevku se bomo omejili na tiste fitocenoze plemenitih listavcev, ki so po našem mnenju razvojno ali sorodstveno ali zaradi objektivne presoje povezani s problematiko naše fitocenoze plemenitih listavcev na Rudnici pri Podčetrtku.

Za potrditev o samostojnosti naše asociacije smo naredili primerjave z asociacijami *Tilio cordatae-Aceretum platanoidis* Ž. Košir 1953 (sinonima *Ostryo-Tilietum cordatae*, *Tilio-Ostryetum*), *Corydalido ochroleucae-Aceretum* Accetto 1991, *Saxifrago petraeae-Tilietum platyphylli* Dakskobler 1999 in *Acer-Tilietum platyphylli* Faber 1936 (Ž. KOŠIR 1953, ACCETTO 1991, DAKSKOBLER 1999, OBERDORFER 1957). V širšem smislu pa smo delne (parcialne) primerjave naredili še s fitocenozami: *Omphalodo verna-Aceretum pseudoplatani* P. Košir & Marinček 1999, *Lamio orvalae-Aceretum pseudoplatani* P. Košir & Marinček 1999, *Dentario polyphyllae-Aceretum* P. Košir & Marinček 1999, *Dryopterido affini-Aceretum* P. Košir 2005 (P. KOŠIR & MARINČEK 1999, P.

KOŠIR 2002, 2005 a, 2005 b, 2005 c), *Veratro nigri-Fraxinetum* Dakskobler 2007, *Carici albae-Tilietum cordatae* Müller & Görs 1958 var. geogr. *Anemone trifolia* Dakskobler 2007, *Ornithogalo-Fraxinetum* Čušin & Dakskobler ex Dakskobler 2007, *Hacquetio-Fraxinetum* Marinček in Wallnöfer et al. 1993 (DAKSKOBLER 1999, 2007 a, 2007 b); *Corydalido cavae-Aceretum* Moor 1938 var. geogr. *Dentaria enneaphyllos* Zupančič 1996, *Arunco-Aceretum* Moor 1952 var. geogr. *Dentaria enneaphyllos* Zupančič & Žagar (1997) 1999, *Arunco-Aceretum* Moor 1952 var. geogr. *Dentaria pinnata* Zupančič & Žagar 1999 (ZUPANČIČ 1996, ZUPANČIČ & ŽAGAR 1999).

V začetku smo bili prepričani, da gre v našem primeru za inicialni stadij Ž. Koširja asociacije *Tilio cordatae-Aceretum platanoidis* zlasti, kasneje za njeno geografsko varianto na obrobju subpanonskega fitogeografskega območja. K temu razmišljanju nas je vodila primerjava, ki je pokazala, da ima naša fitocenoza od šestih značilnic, ki jih je Ž. Košir določil za asociacijo *Tilio cordatae-Aceretum platanoidis*, kar štiri oziroma pet (*Ostrya carpinifolia* 2<sup>1-3</sup>, *Tilia cordata* 2<sup>1-3</sup>, *Tamus*

*communis* 1<sup>1</sup>, *Euonymus latifolia* 2<sup>+</sup> in v grmovni plasti *Acer platanoides* 1<sup>+</sup>). V primerjavi se je pokazalo, da se značilnice *Ostrya carpinifolia*, *Euonymus latifolia* in *Tamus communis* pogosto pojavljajo, z višjimi stopnjami vrednot abundance, v drugih fitocenozah plemenitih listavcev in niso samo diagnostične vrste za asociacijo *Tilio cordatae-Aceretum platanoidis*. Namesto njih predlagamo za značilnico *Epipactis helleborine* (L.) Crantz s. lat. (= *E. latifolia* (L.) All.). O njej in o njenih ekoloških značilnostih ne vemo kaj dosti. OBERDORFER (1979) jo označuje kot pogostno vrsto v vlažnih zeliščno bogatih hrastovih in bukovih gozdovih, tudi v mešanih grmiščih in lokah oziroma v združbah poplavnih gozdov. Porašča sveža, s hranili in bazami bogata, srednje globoka, ilovnato sprsteninasta tla, z zmerno blagim, kislim, rahlim humusom. Je kazalka glinastih tal. Uspeva v združbah zvez *Fagion*, *Carpinion*, *Alno-Ulmion* oziroma reda *Fagetalia*, redkeje se pojavlja v združbah zveze *Quercion pubescentis*. Uvrščamo jo med evroazijsko (suboceansko)-submediteranske vrste. V Avstriji uspeva do 1350 (1400) m nadmorske višine.

Pri nas vrsta *Epipactis helleborine* s. lat. raste v združbah razreda *Quercio-Fagetea*. Porašča karbonatna tla, najpogosteje na nižjih nadmorskih višinah. Prednost daje toplejšim legam na svežih rastiščih. Zelo dobro prenaša toploljubna, vlažna rastišča, zato je pogosta v združbi lipovca in ostrolistnega javorja. Ni je v vlažnih gozdovih javorjev, velikega jesena in podobnih gozdovih plemenitih listavcev in bukve. Pregled oziroma primerjava iz ustreznih fitocenoloških tabel ACCETTA (1991), DAKSKOBLERJA (1999, 2007 a, 2007 b), Petre KOŠIR (2005 a, 2005 b, 2005 c) potrjuje to trditev. Zaradi njenih ekoloških lastnosti smo jo uvrstili med značilnice asociacije *Tilio cordatae-Aceretum platanoidis*. V tej asociaciji ima nadpolovično srednjo stopnjo navzočnosti, kar jo uvršča med diagnostične vrste asociacije. Ugotovljamo pa tudi, da je v podobnih združbah plemenitih listavcev ni, ali je zelo redka. Izbor značilnic asociacije *Tilio cordatae-Aceretum platanoidis* bi bil: *Tilia cordata*, *Acer platanoides*, *Rhamnus fallax* in *Epipactis helleborine* s. lat.

Zgornja kombinacija značilnic asociacije *Tilio cordatae-Aceretum platanoidis* bolj ali manj ustreza naši fitocenozi, sicer predstavljeni le z dvema fitocenološkima popisoma. Zato smo glede podobnosti med fitocenozama izračunali količnik podobnosti po Sørensenovi in Jaccardu. Količnika sta zelo nizka ( $\sigma_s = 37,9$  in  $\sigma_j = 23,4$ ) kar pomeni, da sta si fitocenozi zelo različni in samostojni. Iz primerjalnih tabel (Tabeli 2 in 3) smo ugotovili, da vrste *Cardamine pentaphyllos* (L.) Crantz, *Aconitum napellus* L. em. Skalicky s. lat. (*A. napellus* subsp. *lobelii*, ali celo križanci?), *Cirsium erisithales* (Jacq.) Scop. in *Carex alba* Scop. razlikujejo

asociacijo od drugih podobnih fitocenoz plemenitih listavcev, tudi naše, zato smo jih izbrali kot razlikovalnice asociacije *Tilio cordatae-Aceretum platanoidis*. Razlikovalnici *Cardamine pentaphyllos* in *Aconitum napellus* s. lat. kažeta na vlažno in hladno rastišče, *Cirsium erisithales* daje predanost svežim, razmeroma toplim rastiščem in *Carex alba* je vrsta, ki porašča bolj ali manj inicialna tla. Vse našete razlikovalnice ustrezajo ekološkim razmeram, kjer uspeva asociacija *Tilio cordatae-Aceretum platanoidis*.

Ž. KOŠIR (1953) je svojo fitocenozo primerjal z okolnimi sorodnimi fitocenozami Kamniške Bistrice in švicarsko asociacijo *Tilio-Asperuletum taurinae* Trepp (1944) 1947, da je »dobil potrebne sintetične znake, ki (njegovo) združbo ločijo od ostalih gozdnih tipov«. Ugotovil je, da švicarska asociacija v primerjavi z njegovo fitocenozo kaže veliko sorodnost, vendar so bistvene nekatere floristične razlike. V asociaciji *Tilio cordatae-Aceretum platanoidis* ni vrst *Tilia platyphyllos*, *Staphylea pinnata*, *Asperula taurina*, *Acer campestre*, siromašnejša je z vrstami reda *Prunetalia spinosae* in bogatejša s fagetalnimi, zlasti z jugovzhodnoevropsko-ilirskimi vrstami. Zelo podrobno in utemeljeno opisuje ekološke razmere, ki so pomembne za obstoj asociacije *Tilio cordatae-Aceretum platanoidis*, geološko podlago (apneni, dolomitni in lapornati grušč, debelina grušča 2–6, 6–12 cm), količino padavin (2200–2400 mm), temperaturo zraka (8,5–9 °C), opozarja na mikroklimo, zračno vlago, insolacijo, evaporacijo, veter, čas ležanja snega, nagib, ekspozicijo in nadmorsko višino terena. Podrobno obravnava tla, ki so skeletna, mlada, nerazvita, grušč s primesjo temnorjavo-črnega humusa, in jih uvršča med rendzine in »humo-karbonatna« (humusno-karbonatna) tla. Teren je neustaljen, plazi, pada kamenje, kotali se grušč, ki ga sproža divjad. Pri tem opozarja na poškodbo debel in na sporno človekovo izkoriščanje tako ekološko občutljivega sestoja. Glede na opisane ekološke razmere in floristično sestavo je Ž. Košir ločil tri vrste sukcesij, in sicer na sušnih (grebenskih), vlažnih (široko jarkastih) in izsušenih rastiščih. Iz fitocenološke tabele pa je na floristični osnovi jasno izražen inicialni stadij, ki ga predstavlja prvih deset od dvajsetih popisov v tabeli. Predvsem pa moramo poudariti, da vrsta *Tilia platyphyllos* v asociacijo *Tilio cordatae-Aceretum platanoidis* ne prihaja.

Asociacijo Ž. Koširja moramo pravilno sintaksonomsko ovrednotiti takole:

*Tilio cordatae-Aceretum platanoidis* Košir 1953 nom. nov. hoc loco

Basionom: *Ostryo-Tilietum* Košir 1953 (Art. 34)

Nomenklaturni tip (Neotypus hoc loco): Slovenija, Kamniška Bistrica, 850 m. n. v., ekspozicija WSW, nagib 35–40 °, 15. oktober 1953, Ž. Košir:



E<sub>3</sub>: *Acer platanoides* 2.1, *Tilia cordata* 1.1, *Ostrya carpinifolia* 1.2, *Acer pseudoplatanus* +.1, *Fagus sylvatica* 2.2, *Fraxinus excelsior* 1.2, *Ulmus glabra* +.1, *Fraxinus ornus* (r), *Sorbus aria* (+.1)

E<sub>2</sub>: *Acer platanoides* 1.1, *Tilia cordata* 1.1, *Ostrya carpinifolia* +.1, *Rhamnus fallax* (+.1), *Euonymus latifolia* 2.2, *Acer pseudoplatanus* +.1, *Fagus sylvatica* +.1, *Daphne mezereum* 1.1, *Corylus avellana* 1.3, *Clematis vitalba* +.1, *Ulmus glabra* 1.1, *Lonicera xylosteum* (+.1), *Laburnum alpinum* +.1, *Rosa alpina* +.1, *Sambucus racemosa* +.1

E<sub>1</sub>: *Acer platanoides* +.1, *Tilia cordata* +.1, *Ostrya carpinifolia* +.1, *Acer pseudoplatanus* +.1, *Fagus sylvatica* +.1, *Fraxinus excelsior* +.1, *Carpinus betulus* +.1, *Tamus communis* 1.1, *Galeobdolon flavidum* 1.1, *Polygonatum multiflorum* +.1, *Dryopteris filix-mas* 1.1, *Paris quadrifolia* +.1, *Viola reichenbachiana* +.1, *Phyteuma spicatum* +.1, *Epipactis helleborine* s. lat. +.1, *Cyclamen purpurascens* 1.1, *Mercurialis perennis* 1.2, *Galium laevigatum* +.1, *Carex digitata* 1.3, *Actaea spicata* 2.1, *Asarum europaeum* 1.1, *Carex digitata* 1.3, *Actaea spicata* 2.1, *Asarum europaeum* 1.1, *Cardamine pentaphyllos* 1.2, *Hepatica nobilis* +.1, *Lilium martagon* +.1, *Mycelis muralis* +.1, *Cephalanthera longifolia* +.1, *Lamium orvala* 2.1, *Campanula trachelium* 1.1, *Platanthera bifolia* +.1, *Hacquetia epipactis* 1.1, *Pulmonaria officinalis* 1.2, *Symphytum tuberosum* +.1, *Veronica urticifolia* +.1, *Salvia glutinosa* 1.2, *Senecio fuchsii* +.1<sup>0</sup>, *Gentiana asclepiadea* +.1, *Carex alba* +.2, *Calamagrostis varia* +.1, *Prenanthes purpurea* 1.2<sup>0</sup>, *Solidago virgaurea* +.1, *Cirsium erisithales* +.1, *Aconitum napellus* s. lat. +.1, *Cardamine trifolia* +.1, *Melittis melisophyllum* +.1, *Hypericum hirsutum* +.1, *Helleborus niger* ssp. *niger* +.1, *Primula vulgaris* +.1, *Aposeris foetida* +.1, *Arabis (gerardii)?* +.3, *Veratrum album* +.1. \*Ni v Sloveniji!

E<sub>0</sub>: *Ctenidium molluscum* +.2, *Neckera* sp. +.2, *Hylocomium triquetrum* +.2, *Thuidium abietinum* +.2, *Camptothecium lutescens* +.2.

Kljub podobnostim z značilnicami med fitocenozo Ž. Koširja in našo so floristične in ekološke razmere različne. Talne razmere smo za našo fitocenozo določili kot rendzine oziroma plutva skeletna karbonatna tla, vendar so drugi abiotični in biotični vplivi bistveno drugačni, zlasti glede klime in (ne)dinamike terena. Naša fitocenozoza se nahaja na območju kontinentalnega sušnega subpanonskega podnebja (800 mm padavin letno in povprečno temperaturo 9,2–10,3 °C) in na terenu, ki je bolj ali manj stabilen z apnenno geološko podlago. Temu sledi tudi razlika v številu sveže in vlagoljubnih vrst, teh je v naši fitocenozni za deset manj (20 : 30).

Odločili smo se še za primerjavo z asociacijami *Corydalis-Aceretum* Accetto 1991, *Saxifraga-Tilie-*

*tum* Dakskobler 1999 in *Acero-Tilietum* Faber 1936 (ACCETTO 1991, DAKSKOBLER 1999, OBERDORFER 1957). Ne glede na dejstvo, da je v omenjenih asociacijah vodilna navadna lipa *Tilia platyphyllos*, nas je zanimala mogoča povezava s fitocenozo Ž. Koširja in našo fitocenozo, posebno zato, ker se v Accetovi in Dakskoblerjevi asociaciji z majhno abundanco pojavlja vrsta *Tilia cordata*, ter vrsta *Acer platanoides* v Dakskoblerjevi in Fabrovi (Oberdorferjevi) asociaciji z vsaj petdeset ali več odstotno stopnjo navzočnosti. Predvsem nas je zanimala primerjava z našo fitocenozo, ali jo je mogoče vključiti v eno izmed njih, ko smo ugotovili, da je ne moremo uvrstiti v asociacijo Ž. Koširja *Tilio cordatae-Aceretum platanoidis*. Primerjava med našo fitocenozo in Accetovo asociacijo *Corydalis ochroleucae-Aceretum* je pokazala zelo nizek količnik podobnosti –  $\sigma_s = 26,7$  in  $\sigma_j = 15,4$ . Nekoliko višji količnik podobnosti, vendar še vedno nizek ( $\sigma_s = 35,6$  in  $\sigma_j = 21,6$ ), je med našo fitocenozo in Dakskoblerjevo asociacijo *Saxifraga petraeae-Tilietum*. Podobnost med našo fitocenozo in Fabrovo (Oberdorferjevo) je  $\sigma_s = 37,6$  in  $\sigma_j = 23,4$ , kar pomeni, da je med njima majhna podobnost. Zaključek je, da našo fitocenozo ne moremo uvrstiti v Accetovo, Dakskoblerjevo ali Fabrovo (Oberdorferjevo) asociacijo.

Začasna odločitev je, da naša dva popisa predstavljata novo fitocenozo – asociacijo, ki smo jo poimenovali

#### **Viburno opuli-Tilietum cordatae ass. nova**

Nomenklturni tip: Zupančič & Žagar (2013: Tabela 1, popis 2) Neotypus hoc loco.

Značilnice: *Viburnum opulus*, *Ligustrum vulgare*, *Pyrus pyraeaster*, *Brachypodium rupestre*.

Razlikovalnice: *Acer campestre*, *Quercus cerris*, *Q. petraea*, *Sorbus torminalis*.

Asociacija je popisana na jugovzhodni in jugozahodni legi strmega pobočja Rudnice pri Podčetrtku z naklonom 40 do 45° na apnenčasti podlagi na nadmorskih višinah 280 in 310 m. Podnebje je kontinentalno, s povprečnimi letnimi padavinami med 800 in 900 mm in povprečno letno temperaturo med 9 in 10 °C. Tla so rendzine ali plutva skeletna karbonatna tla, sveža do vlažna. Zaradi posebnih ekoloških razmer toplo-vlažnega rastišča se v fitocenozni pojavljajo toploljubne in sveželjubne ali celo vlagoljubne rastlinske vrste – te so v razmerju 1 : 2 v korist toploljubnih. Prevladujejo fagetalne vrste, zaznavne so vrste redov *Prunetalia spinosae* in *Quercetalia pubescentis* ter razreda *Trifolio-Geranietaea*, kar se ujema z ugotovitvijo prevlade toploljubnih vrst, h katerim lahko prištejemo še vrste razredov *Festuco-Brometea* in *Molinio-Arrhenatheretea*.

Preglednica 1

Sinsistematske enote	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	št.	%	št.	%
<i>Carpinion</i> s. lat.	3	2,8	5	5,0
<i>Prunetalia spinosae</i>	3	2,8	12	11,9
<i>Quercetalia pubescentis-petraeae</i>	6	5,6	9	8,9
<i>Quercetalia roboris-petraeae</i>	0	0,0	3	2,9
<i>Quercu-Fagetea</i> s. str.	52	48,6	33	32,7
<i>Quercu-Fagetea</i> s. lat.	64	59,8	63	61,3
<i>Vaccinio-Piceetea</i>	19	17,9	4	4,0
<i>Erico-Pinetea</i>	3	2,8	2	2,0
<i>Betulo-Adenostyletea (Mulgedio-Aconitetea)</i>	5	4,7	1	1,0
<i>Epilobietea angustifolii</i>	3	2,8	2	2,0
<i>Trifolio-Geranietea</i>	1	0,9	11	10,9
<i>Festuco-Brometea</i>	1	0,9	6	5,9
<i>Molinio-Arrhenatheretea</i>	0	0,0	4	4,0
<i>Artemisietea</i>	1	0,9	1	1,0
<i>Asplenietea trichomanis</i>	3	2,8	3	2,9
Ostale vrste (Other species)	7	6,5	5	5,0
Skupaj (Total)	107	100,0	101	100,0

Natančnejša predstavitev posameznih sintaksonov je v Preglednici 1, kjer je hkrati še primerjava z asociacijo *Tilio cordatae-Aceretum platanoidis*. Očitna je razlika v višjem deležu vrst razredov *Vaccinio-Piceetea* in *Betulo-Adenostyletea* v asociaciji *Tilio cordatae-Aceretum platanoidis* ter v deležu že prej imenovanih (toplih) sinsistematskih enot v asociaciji *Viburno-Tilietum cordatae*. Delež piceetalnih vrst in vrst visokih steblik uvršča asociacijo *Tilio cordatae-Aceretum platanoides* v predalpsko fitogeografsko območje, asociacijo *Viburno-Tilietum cordatae* pa toploljubne vrste uvrščajo v subpanonsko območje. Ugotavljamo, da so v asociaciji *Viburno-Tilietum cordatae* do zdaj zabeležene le tri jugovzhodnoevropsko-ilirske vrste, ki so značilne za ilirsko florno provinco, v asociaciji *Tilio cordatae-Aceretum platanoidis* jih je devet.

Fitogeografsko pripadnost in ekološko raznolikost asociacij potrjuje razdelitev geoelementov (Preglednica 2), kjer je več toploljubnih vrst v asociaciji *Viburno-Tilietum cordatae*, kot so pontski, mediteransko-atlantski, mediteransko-pontski in celo en eumediteranski geoelement. V asociaciji *Tilio cordatae-Aceretum platanoidis* pa je prisotnih trikrat več mediteransko-montanskih vrst kot v asociaciji *Viburno-Tilietum cordatae*. Te vrste poudarjajo toplo-vlažne razmere rastišča asociacije *Tilio cordatae-Aceretum platanoidis* v predalpsko/alpskem svetu (*Cyclamen purpurascens*, *Sanicula europaea*, *Sambucus racemosa*, *Laburnum alpinum*, *Abies alba*, *Saxifraga cuneifolia*, *Valeriana tripteris*, *Adenostyles glabra*, *Larix decidua*, *Cirsium eristhates*, *Buphthalmum salicifolium*, *Aposeris foetida*, *Calamintha nepeta*).

Preglednica 2

Geoelementi (po POLDINIJU 1991)	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	št.	%	št.	%
Evropski	25	23,4	30	29,6
Evropsko-azijski	15	14	15	14,9
Cirkumborealni	9	8,4	8	7,9
Evropsko-sibirski	7	6,5	7	6,9
Paleotemperatni	6	5,6	6	5,9
Vzhodnoalpski	1	0,9	0	0,0
Alpsko-karpatski	1	0,9	0	0,0
Arktično-alpski	1	0,9	0	0,0
Mediteransko-montanski	13	12,1	4	4,0
Južnoilirski	3	2,8	0	0,0

Severnoilirski	3	2,8	2	2,0
Pontski	3	2,8	<b>6</b>	<b>5,9</b>
Jugovzhodnoevropski	2	2,0	2	2,0
Mediteransko-atlantski	1	0,9	<b>3</b>	<b>3,0</b>
Evropsko-mediteranski	1	0,9	<b>3</b>	<b>3,0</b>
Mediteransko-pontski	2	2,0	<b>3</b>	<b>3,0</b>
Eumediteranski	0	0,0	<b>1</b>	<b>1,0</b>
Kozmopolitski	3	2,8	3	3,0
Adventivni	0	0,0	1	1,0
Ostale vrste	11	10,3	7	6,9
Skupaj	107	100,0	101	100,0

Rezultati analize bioloških oblik vrst (Preglednica 3) se ujema z gornjimi ugotovitvami. Asociacija *Viburno-Tilietum cordatae* uspeva v relativno manj ugodnih ekoloških razmerah, kjer je nekoliko več fanerofitov in hemikriptofitov in polovico manj geofitov kot v asociaciji *Tilio cordatae-Aceretum platanoidis*. Po I. HORVATU (1949) bi bile te podobne ekološkim

razmeram, ki vladajo na rastiščih hrastov in črnega gabra (*Quercus-Ostryetum*). Za primerjavo naj opozorimo, da se ekološke razmere v asociaciji *Tilio cordatae-Aceretum platanoidis* bolj približujejo bukovim rastiščem zmernega pasu (po I. HORVATU 1949), le, da je v njej več fanerofitov.

Preglednica 3

Biološka oblika	<i>Tilio-Aceretum</i>		<i>Viburno-Tilietum</i>	
	št.	%	št.	%
FANEROFITI	28	26,2	33	<b>32,8</b>
P caesp – Šopasti	13	12,2	<b>15</b>	<b>14,9</b>
P scap – Steblasti	11	10,3	12	11,9
P lian – Lijane	1	0,9	2	2,
NP – Nano f.	3	2,8	4	4,
HAMEFITI	11	10,2	9	9,0
Ch sufr – Grmičasti	1	0,9	2	2,0
B Ch – Mahovni	<b>10</b>	<b>9,3</b>	7	7,0
HEMOKRIPTOFITI	43	40,2	48	<b>47,4</b>
H scap – Steblasti	23	21,5	<b>31</b>	30,7
H casp – Šopasti	6	5,6	6	5,9
H ros – Rozetni	<b>11</b>	<b>10,3</b>	5	5,0
H rep – Plazeči	2	1,9	3	2,9
H bien – Dvoletni	1	0,9	<b>3</b>	<b>2,9</b>
GEOFITI	25	<b>23,4</b>	11	10,8
G bulb – G. z gomolji	<b>3</b>	<b>2,8</b>	1	0,9
G rhiz – G. s koreniko	<b>21</b>	<b>19,7</b>	9	9,0
G rad – G. s koreninskimi brsti	1	0,9	1	0,9
Skupaj	107	100,0	101	100,0

Na splošno lahko rečemo, da oba življenjska spektra po Raunkiaerju (I. HORVAT 1949) uvrščamo bolj ali manj v zmerni pas.

Na osnovi navedenih analiz smo se odločili za postavitev značilnic in razlikovalnic asociacije *Viburno-Tilietum cordatae*. Njihove ekološke lastnosti so si

precej podobne, kar potrjuje izbiro. Značilnice *Viburnum opulus*, *Ligustrum vulgare*, *Pyrus pyraeaster* in *Brachypodium rupestre* uspevajo na svežih do vlažnih, tudi suhih, s hranili in bazami bogatih tleh z nevtralnimi do zmerno kislimi, rahlim do prsteninanim humusom. Glede svetlobe jih uvrščamo med polsenčne do

svetloljubne vrste. Po svojem značaju so toploljubne in večinoma pionirske vrste (OBERDORFER 1979). Prve tri uvrščamo v red *Prunetalia spinosae*, zadnje pa v razred *Festuco-Brometea*, nekateri celo v zvezo *Geranion*. S svojimi precej podobnimi ekološkimi razmerami ustrezno predstavljajo asociacijo *Viburno-Tilietum cordatae*.

Razlikovalnice *Acer campestre*, *Quercus cerris*, *Q. petraea* in *Sorbus torminalis* zelo dobro razlikujejo asociacijo *Viburno-Tilietum cordatae* od podobnih asociacij (Tabela 3). Glede ekoloških razmer se približujejo značilnicam asociacije. Poraščajo sušna do sveža, večinoma z bazami bogata in le v enem primeru (*Quer-*

*cus petraea*) z bazami revna, bolj ali manj bogata tla z zmerno kislim humusom. Vse razlikovalnice so toploljubne in polsenčne do svetloljubne vrste (OBERDORFER 1957). Njihova splošna ekološka določitev je v njihovi toploljubnosti, ki označuje poletno toplejše območje predpanonske Slovenije.

Na koncu smo naredili še primerjavo podobnosti z drugimi asociacijami, obravnavanimi v Tabeli 3 in med njimi, *Corydalido-Aceretum*, *Saxifrago-Tilietum* in *Aceri-Tilietum*. Po pričakovanju se je izkazalo, da so med njimi floristične in posledično ekološke razlike, kar kažeta indeks Sørensenove ( $\sigma_s$ ) in Jaccardov ( $\sigma_j$ ) indeks.

Preglednica 4

Primerjane fitocenozе	1	2	3	4	5	6	7
Sørensen	37,9	26,7	35,6	37,9	41,3	44,8	44,9
Jaccard	23,4	15,4	21,6	23,4	26,0	28,9	29,0

- 1 *Viburno-Tilietum* : *Tilio-Aceretum*
- 2 *Viburno-Tilietum* : *Corydalido-Aceretum*
- 3 *Viburno-Tilietum* : *Saxifrago-Tilietum*
- 4 *Viburno-Tilietum* : *Aceri-Tilietum*
- 5 *Tilio-Aceretum* : *Corydalido-Aceretum*
- 6 *Tilio-Aceretum* : *Saxifrago-Tilietum*
- 7 *Corydalido-Aceretum* : *Saxifrago-Tilietum*

Primerjanje z izbranimi fitocenozi plemenitih listavcev smo naredili iz previdnosti, ki nam jo narakuje njihove nekatere bolj ali manj splošne ekološke podobnosti, npr. v geološki podlagi, tleh, strmih toplejših legah, sveželjubnih do vlažnih rastiščih, včasih celo v prisotnosti nekaterih vodilnih, diagnostično pomembnih drevesnih vrst te ali one fitocenoze (*Tilia cordata*, *T. platyphyllos*, *Acer platanooides*, *A. pseudoplatanus*) ter drugih drevnin v izbranih fitocenozah, ki se pojavljajo bolj ali manj stalno zaradi podobnih ekoloških razmer, npr. *Ostrya carpinifolia*, *Fraxinus ornus*, *F. excelsior*, *Ulmus scabra*.

Na osnovi navedenih ugotovitev lahko, kljub le dvema popisoma, štejemo asociacijo *Viburno-Tilietum cordatae* za samostojno fitocenozo z jasno prepoznavnimi značilnicami in razlikovalnicami.

Uvrstitev asociacije *Viburno-Tilietum cordatae* v

višje sintaksonomske enote je jasna v razredu *Querco-Fagetea* Br.-Bl. & Vlieger 1937 in redu *Fagetalia sylvaticae* Pawl. 1928. Zaradi dveh bolj razširjenih jugovzhodnoevropsko-ilirskih vrst *Cyclamen purpurascens* in *Knautia drymeia* subsp. *drymeia* asociacije ne moremo uvrščati v ilirsko zvezo *Aremonio-Fagion* (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989. Upoštevati moramo bolj ali manj primerno srednjeevropsko zvezo *Tilio-Acerion* Klika 1955 z njenimi relativnimi (spornimi) vrstami. Te so v naši asociaciji naslednje: *Acer platanooides*, *A. pseudoplatanus*, *Actaea spicata*, *Euonymus latifolia*, *Geranium robertianum*, *Geum urbanum* in morda še značilnica asociacije *Viburnum opulus*, ki naj bi bila bolj ali manj značilna za zvezo *Alno-Ulmion* Br.-Bl. & R. Tx. 1943. Morda bodo nadaljnje raziskave asociacije *Viburno-Tilietum cordatae* prinesle jasnejše določitve v katero od že znanih ali celo morda novih zvez, oziroma podzvez npr. *Ostryo-Tilienion platyphylli* P. Košir, Čarni & Di Pietro 2008.

Asociacija *Viburno-Tilietum cordatae* nima velike gospodarske vrednosti, je pa pomembna kot varovalni gozd ali morda v nekaterih manj ekstremnih razmerah kot gospodarski gozd z omejitvami. Poleg naravovarstvene funkcije pa ima pomen v mozaiku naše pregovno bogate biološke raznovrstnosti.

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## PHYTOCOENOLOGICAL TABLE (Fitocenološka tabela) 1:

## VIBURNO OPULI-TILIETUM CORDATAE ass. nova

Sinsistematska characteristic (Sinsistematska prilpadnost)	Number of relevé (Zaporedna številka popisa)		1	2	
	Altitude in m (Nadmorska višina v m)		280	310	
	Aspect (Nebesna lega)		SE	SW	
	Slope in degrees (Nagib v stopinjah)		40	45	
	Bedrock (Geološka podlaga)		limestone (apnec)		
	Cover (Pokrovnost) %: Tree layer (drevesna plast)	I	80-90	70	
	Shrub layer (grmovna plast)	II	70-80	40	
	Herb layer (zeliščna plast)	III	20	80	
	Moss layer (mahovna plast)	IV	0	0	
	Relevé (Velikost popisne ploskve) m <sup>2</sup>		400	400	Presence (Prezenca)
	Location (Kraj popisov)		Rudnica, Podčetrtek		

## VIBURNO OPULI-TILIETUM CORDATAE ass. nova

CHARACTERISTIC SPECIES (Značilnice)			1	2	
FB	Brachypodium rupestre	III	+	2.3	2
P	Viburnum opulus	II	+	1.1	2
P	Ligustrum vulgare		+	+	2
P	Pyrus pyraster		+	+	2
DISTINGUISHING SPECIES (Razlikovalnice)			1	2	
OO	Quercus cerris	I	3.2	2.1	2
		II	-	+	1
F <sub>3</sub>	Quercus petraea	I	+	2.1	2
		II	-	+	1
C	Acer campestre	I	+	+	2
		II	1.1	1.1	2
Q <sub>2</sub>	Sorbus torminalis		+	.	1
F <sub>1</sub>	AREMONIO-FAGION (Ht. 1938) Török, Podani & Borhidi in Borhidi 1989		1	2	
	Cyclamen purpurascens	III	1.2	.	1
	Knautia drymeia subsp. drymeia		.	+	1
	Lamium orvala		+	.	1
C	CARPINION Issler 1931 em. Oberd. 1953		1	2	
	Tilia cordata	I	3.2	1.1	2
		I	1.1	+	2
	Carpinus betulus	II	+	.	1
		I	+	+	2
	Acer campestre	II	1.1	1.1	2
	Rosa arvensis		+	+	2
	Malus sylvestris		.	+	1
F <sub>2</sub>	FAGETALIA SYLVATICAE Pawl. 1928 s. lat.		1	2	
	Primula vulgaris	III	+	1.2	2
	Epipactis helleborine (subsp. orbicularis ?) s. lat.		+	1.1	2
	Galium laevigatum		+	1.1	2
	Campanula trachelium		+	+	2
	Euonymus latifolia	II	+	+	2
	Phyllitis scolopendrium	III	2.2	.	1
	Digitalis grandiflora		.	1.1	1
	Heracleum sphondylium		1.1	.	1
	Ranunculus lanuginosus		1.1	.	1
	Salvia glutinosa		.	1.1	1
	Tamus communis		.	1.1	1
	Acer pseudoplatanus	I	+	-	1
		II	1.1	+	2
		I	+	-	1
	Fagus sylvatica	II	+	+	2
	Geranium robertianum	III	+2	.	1
	Asarum europaeum		+	.	1
	Carex sylvatica		+	.	1
	Cephalanthera rubra		.	+	1
	Daphne mezereum	II	.	+	1
	Galeobdolon flavidum (=Lamium galeobdolon)	III	+	.	1

	<i>Galium odoratum</i>		+	.		1
	<i>Mycelis muralis</i>		+	.		1
	<i>Pulmonaria officinalis</i>		+	.		1
	<i>Viola reichenbachiana</i>		+	.		1
P	PRUNETALIA SPINOSAE R. Tx. 1952 s. lat.					
				1	2	
	<i>Cornus sanguinea</i>	II	2.2	2.2		2
	<i>Viburnum lantana</i>		+	1.1		2
	<i>Clematis vitalba</i>		+	+		2
	<i>Crataegus monogyna</i>		+	+		2
	<i>Ligustrum vulgare</i>		+	+		2
	<i>Pyrus pyraeaster</i>		+	+		2
	<i>Viburnum opulus</i>		+	+		2
	<i>Berberis vulgaris</i>		.	+		1
	<i>Cornus mas</i>		.	+		1
	<i>Juniperus communis</i>		.	+		1
	<i>Prunus spinosa</i>		.	+		1
	<i>Rhamnus catharticus</i>		.	+		1
Q <sub>2</sub>	QUERCETALIA PUBESCENTIS Br.-Bl. 1931					
				1	2	
OO	<i>Ostrya carpinifolia</i>	I	2.1	3.2		2
OO	<i>Quercus cerris</i>	I	3.2	2.1	2	2
OO	<i>Fraxinus ornus</i>	II	-	+	1	
		I	-	+	1	2
		II	1.1	2.2	2	
	<i>Camptothecium lutescens</i>	IV	.	+3		1
	<i>Buglossoides purpureoacerulea</i>	III	.	+		1
	<i>Hypericum montanum</i>		.	+		1
	<i>Melittis melissophyllum</i>		.	+		1
	<i>Sorbus aria</i>	II	.	+		1
	<i>Sorbus torminalis</i>		+	.		1
RP <sub>2</sub>	QUERCETALIA ROBORIS-PETRAEAE R. Tx. (1931) 1937 s. lat.					
				1	2	
	<i>Festuca heterophylla</i>	III	+	1.2		2
	<i>Hieracium racemosum</i>		+	1.1		2
	<i>Galium lucidum</i>		.	+		1
F <sub>3</sub>	QUERCO-FAGETEA Br.-Bl. et Vlieger 1937 s. lat.					
				1	2	
	<i>Hedera helix</i>	II	2.2	2.2		2
	<i>Quercus petraea</i>	I	+	2.1	2	2
		II	-	+	1	
	<i>Carex digitata</i>	III	+2	+		2
	<i>Corylus avellana</i>	II	2.2	.		1
	<i>Acer platanoides</i>		+	.		1
	<i>Lonicera xylosteum</i>		+	.		1
	<i>Prunus avium</i>		+	.		1
VP <sub>3</sub>	VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. et al. 1939 em. Zupančič (1976) 2000 s. lat.					
				1	2	
	<i>Plagiothecium neglectum</i>	IV	+2	+3		2
	<i>Solidago virgaurea</i>	III	+	+		2
	<i>Hieracium murorum</i>		.	+		1
	<i>Hypnum cupressiforme</i>	IV	.	+		1
EP <sub>3</sub>	ERICO-PINETEA Ht. 1959 s. lat.					
				1	2	
	<i>Buphthalmum salicifolium</i>	III	.	1.1		1
	<i>Chamaecytisus hirsutus</i>		.	+		1
E	EPILOBIETEA ANGUSTIFOLII R. Tx. & Prsg. in R. Tx. 1950 s. lat.					
				1	2	
	<i>Bromopsis ramosa</i> (= <i>Bromus ramosus</i> )	III	.	+		1
	<i>Fragaria vesca</i>		.	+		1
TG	TRIFOLIO-GERANIETEA SANGUINEI T. Müller 1961 s. lat.					
				1	2	
	<i>Clinopodium vulgare</i>	III	+	+		2

Vincetoxicum hirundinaria	.	1,2	1
Coronilla varia	.	+2	1
Anthericum ramosum	.	+	1
Campanula persicifolia	.	+	1
Geranium sanguineum	.	+	1
Inula conyza	.	+	1
Peucedanum cervaria	.	+	1
Polygonatum odoratum	.	+	1
Veronica chamaedrys	.	+	1
Viola hirta	.	+	1
FB FESTUCO-BROMETEA Br.-Bl. & R. Tx. 1943 s. lat.			
Brachypodium rupestre	III	1 +	2 2,3
Silene viridiflora (=S. cucubalus)	.	+	2
Arabis hirsuta (?)	.	+	1
Euphorbia cyparissias	.	+	1
Galium verum	.	+	1
Teucrium chamaedrys	.	+	1
MA MOLINIO-ARRHENATHERETEA R. Tx. 1937 s. lat.			
Iris sibirica	III	1 .	2 +2
Ajuga reptans	.	+	1
Carex flacca	.	+	1
Centaurea jacea	.	+	1
AS ASPLENIETEA TRICHOMANIS Br.-Bl. in Meier & Br.-Bl. 1934 corr. Oberd. 1977 s. lat.			
Asplenium trichomanes	III	1 +2	2 +
Asplenium ruta-muraria	.	+	1
Calamintha nepeta	.	+	1
O OTHER SPECIES (Ostale vrste)			
TH Sedum maximum	III	1 +	2 +2
A <sub>3</sub> Dryopteris filix-mas	.	+	1
AR <sub>1</sub> Geum urbanum	.	+	1
Juglans regia	II	.	+
M MOSSES (Mahovi)			
Anomodon sp.	IV	1 +5	2 +3
Leucodon sciuroides	.	+3	1
Eurhynchium sp.	.	+2	1
Fissidens taxifolius	.	+2	1

**LEGEND (Legenda)**
**Sinsistematical characteristic (Sinsistematska pripadnost)**

OO Fraxino orni-Ostryion Tomažič 1940

 A<sub>3</sub> Betulo-Adenostyletea Br.-Bl. et R. Tx. 1943 s. lat. (=Mulgedio-Aconitetea Hadač & Klika in Klika & Hadač 1944)

 AR<sub>1</sub> Alliarion Oberdorfer (1957) 1962

TH Thlaspietea rotundifolii Br.-Bl. Et al 1947



PHYTOCOENOLOGICAL TABLE (Fitocenološka tabela) 2:  
**TILIO CORDATAE-ACERETUM PLATANOIDIS Ž. Košir (1953) 1954**  
 (Tilio-Ostryetum Ž. Košir 1953=Ostryo-Tilietum Ž. Košir 1954)  
**VIBURNO OPULI-TILIIETUM CORDATAE ass. nova**

Sinsistematska karakteristik (Sinsistematska pripadnost)	Number of anal. table (Zaporedna številka tabele)	1	2
	Author of anal. Table (Avtor anal. tabele)	ŽK	ZŽ
	Altitude in m (Nadmorska višina v m)	650-980	260-390
	Aspect (Nebesna lega)	N-W-S	SE-SW
	Slope in degrees (Nagib v stopinjah)	25-45	40-45
	Bedrock (Geološka podlaga)	apn, gru	apn
	Stoniness in % (Kamnitost v %)		0
	Location (Kraj popisov)	Kamniška Bistrica	Rudnica, Podčetrtek
	Number of relevé (Število popisov)	20	2

TILIO CORDATAE-ACERETUM PLATANOIDIS Ž. Košir (1953) 1954

CHARACTERISTIC SPECIES (Značilnice)

		1	2	
C	Tilia cordata	I	677 V	2 <sup>1-2</sup>
		II	156 V	-
		III	8 IV	-
		IV	565 V	-
F <sub>2</sub>	Acer platanoides	II	131 V	1 <sup>+</sup>
		III	10 V	-
		IV	170 V	-
F <sub>1</sub>	Rhamnus fallax	II	170 V	.
F <sub>2</sub>	Epipactis helleborine s. lat.	III	4 III	2 <sup>+1</sup>
	DISTINGUISHING SPECIES (Razlikovalnice)		1	2
F <sub>2</sub>	Cardamine pentaphyllos	III	465 V	.
EP <sub>3</sub>	Carex alba		31 V	.
EP <sub>3</sub>	Cirsium erisithales		6 IV	.
F <sub>2</sub>	Aconitum napellus		103 III	.

VIBURNO OPULI-TILIIETUM CORDATAE ass. nova

CHARACTERISTIC SPECIES (Značilnice)

		1	2	
FB	Brachypodium rupestre	.	2 <sup>+2</sup>	
P	Ligustrum vulgare	.	2 <sup>+</sup>	
P	Pyrus pyraeaster	.	2 <sup>+</sup>	
P	Viburnum opulus	.	2 <sup>+</sup>	
	DISTINGUISHING SPECIES (Razlikovalnice)	1	2	
OO	Quercus cerris	I	.	2 <sup>2-3</sup>
		II	.	1 <sup>+</sup>
F <sub>3</sub>	Quercus petraea	I	.	2 <sup>+2</sup>
		II	.	1 <sup>+</sup>
C	Acer campestre	I	.	2 <sup>+</sup>
		II	.	1 <sup>+</sup>
Q <sub>2</sub>	Sorbus torminalis	.	1 <sup>+</sup>	

F<sub>1</sub> AREMONIO-FAGION (Ht. 1938) Török, Podani & Borhidi in Borhidi 1989

		1	2	
	Cyclamen purpurascens	III	476 V	1 <sup>+</sup>
	Rhamnus fallax	II	170 V	.
	Cardamine trifolia	III	105 IV	.
	Lamium orvala		386 III	1 <sup>+</sup>
	Cardamine enneaphyllos		54 III	.
	Hacquetia epipactis		115 II	.
	Helleborus niger subsp. niger		3 II	.
	Knautia drymeia subsp. drymeia		.	1 <sup>+</sup>

C CARPINION Issler 1931 em. Oberd. 1953

		1	2	
Tilia cordata	Tilia cordata	I	677 V	2 <sup>1-3</sup>
		II	156 V	-
		III	8 IV	-
		IV	53 II	2 <sup>+1</sup>
Carpinus betulus	Carpinus betulus	II	2 I	1 <sup>+</sup>
		III	3 II	-
		IV	2 II	.
Listera ovata	Listera ovata		.	2 <sup>+</sup>
Acer campestre	Acer campestre	I	.	2 <sup>1</sup>
		II	.	

<i>Rosa arvensis</i>		.	2 <sup>+</sup>
<i>Malus sylvestris</i>		.	1 <sup>+</sup>
F <sub>2</sub> FAGETALIA SYLVATICAE Pawl. 1928 s. lat.			
		1	2
<i>Mercurialis perennis</i>	III	750 V	.
<i>Actaea spicata</i>		727 V	.
	I	590 V	1 <sup>+</sup>
<i>Fagus sylvatica</i>	II	108 V	2 <sup>+</sup>
	III	5 III	-
<i>Lonicera alpigena</i>	II	528 V	.
<i>Cardamine pentaphyllos</i>	III	465 V	.
<i>Galeobdolon flavidum</i> (= <i>Lamium galeobdolon</i> )		415 V	1 <sup>+</sup>
<i>Galium laevigatum</i>		402 V	2 <sup>+1</sup>
<i>Daphne mezereum</i>	II	353 V	1 <sup>+</sup>
<i>Polygonatum multiflorum</i>	III	279 V	.
<i>Salvia glutinosa</i>		255 V	1 <sup>1</sup>
	I	156 V	1 <sup>+</sup>
<i>Acer pseudoplatanus</i>	II	7 V	2 <sup>+1</sup>
	III	8 V	.
<i>Paris quadrifolia</i>		9 V	.
<i>Asarum europaeum</i>		601 IV	1 <sup>+</sup>
<i>Prenanthes purpurea</i>		179 IV	.
<i>Viola reichenbachiana</i>		80 IV	1 <sup>+</sup>
<i>Cardamine bulbifera</i>		151 III	.
<i>Tamus communis</i>		127 III	1 <sup>+</sup>
<i>Lilium martagon</i>		104 III	.
<i>Aconitum napellus</i>		103 III	.
<i>Sanicula europaea</i>		103 III	.
<i>Pulmonaria officinalis</i>		101 III	1 <sup>+1</sup>
<i>Campanula trachelium</i>		54 III	1 <sup>+</sup>
<i>Phyteuma spicatum</i>		29 III	.
<i>Polystichum aculeatum</i>		5 III	.
<i>Epipactis helleborine</i> (subsp. <i>orbicularis</i> ?) s. lat.		4 III	1 <sup>+1</sup>
<i>Euonymus latifolia</i>	II	139 II	2 <sup>+</sup>
<i>Mycelis muralis</i>	III	53 II	1 <sup>+</sup>
<i>Euphorbia amygdaloides</i>		52 II	.
<i>Symphytum tuberosum</i>		28 II	.
<i>Primula vulgaris</i>		3 II	1 <sup>+1</sup>
<i>Sambucus racemosa</i>	II	2 II	.
<i>Phyllitis scolopendrium</i>	III	1 II	1 <sup>2</sup>
<i>Cephalanthera longifolia</i>		1 I	.
<i>Neottia nidus-avis</i>		1 I	.
<i>Digitalis grandiflora</i>		.	1 <sup>1</sup>
<i>Heracleum sphondylium</i>		.	1 <sup>1</sup>
<i>Ranunculus lanuginosus</i>		.	1 <sup>1</sup>
<i>Carex sylvatica</i>		.	1 <sup>+</sup>
<i>Cephalanthera rubra</i>		.	1 <sup>+</sup>
<i>Galium odoratum</i>		.	1 <sup>+</sup>
<i>Geranium robertianum</i>		.	1 <sup>+</sup>
P PRUNETALIA SPINOSAE R. Tx. 1952 s. lat.			
		1	2
<i>Clematis vitalba</i>	II	28 II	2 <sup>+</sup>
<i>Rhamnus catharticus</i>		2 I	1 <sup>+</sup>
<i>Berberis vulgaris</i>		1 I	1 <sup>+</sup>
<i>Cornus sanguinea</i>		.	2 <sup>2</sup>
<i>Viburnum lantana</i>		.	2 <sup>+1</sup>
<i>Crataegus monogyna</i>		.	2 <sup>+</sup>
<i>Ligustrum vulgare</i>		.	2 <sup>+</sup>
<i>Pyrus pyraeaster</i>		.	2 <sup>+</sup>
<i>Viburnum opulus</i>		.	2 <sup>+</sup>
<i>Cornus mas</i>		.	1 <sup>+</sup>
<i>Juniperus communis</i>		.	1 <sup>+</sup>
<i>Prunus spinosa</i>		.	1 <sup>+</sup>
Q <sub>2</sub> QUERCETALIA PUBESCENTIS Br.-Bl. 1931 s. lat.			
		1	2
	I	2152 V	2 <sup>2-3</sup>
OO <i>Ostrya carpinifolia</i>	II	5 III	-
	III	1 I	-

OO	<i>Fraxinus ornus</i>	I	52 III	1 <sup>+</sup>		
		II	78 III	2 <sup>1-2</sup>		
		III	54 III	-		
	<i>Camptothecium lutescens</i>	IV	5 III	1 <sup>+</sup>		
	<i>Melittis melissophyllum</i>	III	3 II	1 <sup>+</sup>		
OO	<i>Euonymus verrucosa</i>	II	2 I	.		
		I	1 I	1 <sup>+</sup>		
		II	27 II	-		
	<i>Sorbus aria</i>	III	3 II	-		
OO	<i>Quercus cerris</i>	I	.	2 <sup>2-3</sup>		
		II	.	1 <sup>+</sup>		
		III	.	1 <sup>+</sup>		
			<i>Buglossoides purpureocaerulea</i>	III	.	1 <sup>+</sup>
			<i>Hypericum montanum</i>		.	1 <sup>+</sup>
	<i>Sorbus torminalis</i>	II	.	1 <sup>+</sup>		
RP <sub>2</sub> QUERCETALIA ROBORIS-PETRAEAE R. Tx. (1931) 1937 s. lat.						
			1	2		
	<i>Festuca heterophylla</i>	III	.	2 <sup>+1</sup>		
	<i>Hieracium racemosum</i>		.	2 <sup>+1</sup>		
	<i>Galium lucidum</i>		.	1 <sup>+</sup>		
F <sub>3</sub> QUERCO-FAGETEA Br.-Bl. et Vlieger 1937 s. lat.						
			1	2		
	<i>Acer platanoides</i>	I	565 V	-		
		II	131 V	1 <sup>+</sup>		
		III	10 V	-		
	<i>Lonicera xylosteum</i>	II	490 V	1 <sup>+</sup>		
	<i>Carex digitata</i>	III	464 V	2 <sup>+</sup>		
	<i>Ctenidium molluscum</i>	IV	405 V	.		
	<i>Hepatica nobilis</i>	III	277 IV	.		
	<i>Corylus avellana</i>	II	129 IV	1 <sup>2</sup>		
	<i>Laburnum alpinum</i>		7 IV	.		
		I	153 III	.		
	<i>Fraxinus excelsior</i>	II	241 IV	.		
		III	30 III	.		
		I	53 II	.		
	<i>Ulmus glabra</i>	II	54 III	.		
		III	3 II	.		
	<i>Festuca gigantea</i>		51 II	.		
	<i>Platanthera bifolia</i>		3 II	.		
	<i>Hedera helix</i>	II	.	2 <sup>2</sup>		
	<i>Quercus petraea</i>	I	.	2 <sup>+2</sup>		
		II	.	1 <sup>+</sup>		
	<i>Convallaria majalis</i>	III	.	1 <sup>+</sup>		
	<i>Prunus avium</i>	II	.	1 <sup>+</sup>		
VP <sub>3</sub> VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. et al. 1939 em. Zupančič (1976) 2000 s. lat.						
			1	2		
	<i>Gentiana asclepiadea</i>	III	180 V	.		
	<i>Solidago virgaurea</i>		7 IV	2 <sup>+</sup>		
		I	6 IV	.		
	<i>Abies alba</i>	II	1 I	.		
		III	4 II	.		
	<i>Homogyne sylvestris</i>		288 III	.		
	<i>Gymnocarpium dryopteris</i>		226 III	.		
	<i>Clematis alpina</i>	II	176 III	.		
	<i>Oxalis acetosella</i>	III	54 III	.		
		I	6 III	.		
	<i>Picea abies</i>	II	5 III	.		
		III	1 I	.		
	<i>Hylocomium triquetrum</i>	IV	5 III	.		
	<i>Veronica urticifolia</i>	III	4 III	.		
	<i>Rosa pendulina</i>	II	3 III	.		
	<i>Saxifraga cuneifolia</i>	III	126 II	.		
	<i>Valeriana tripteris</i>		77 II	.		
	<i>Rubus saxatilis</i>	II	52 II	.		
	<i>Aposeris foetida</i>	III	27 II	.		
	<i>Pleurozium schreberi</i>	IV	3 II	.		
	<i>Polystichum lonchitis</i>	III	3 II	.		
	<i>Adenostyles glabra</i>		2 II	.		

<i>Larix decidua</i>	I	1 I	.
<i>Plagiothecium neglectum</i>	IV	.	2 <sup>+</sup>
<i>Hieracium murorum</i>	III	.	1 <sup>+</sup>
<i>Hypnum cupressiforme</i>	IV	.	1 <sup>+</sup>
EP <sub>3</sub> ERICO-PINETEA Ht. 1959 s. lat.			
<i>Calamagrostis varia</i>	III	1 33 V	2 .
<i>Carex alba</i>		31 V	.
<i>Cirsium erisithales</i>		6 IV	.
<i>Bupthalmum salicifolium</i>		.	1 <sup>+</sup>
<i>Chamaecytisus hirsutus</i>		.	1 <sup>+</sup>
A <sub>3</sub> BETULO-ADENOSTYLETEA Br.-Bl. et R. Tx. 1943 s. lat. (=MULGEDIO-ACONITETEA Hadač & Klika in Klika & Hadač 1944 s. lat.)			
<i>Dryopteris filix-mas</i>	III	1 205 V	2 1 <sup>+</sup>
<i>Senecio fuchsii</i>		34 V	.
<i>Athyrium filix-femina</i>		52 II	.
<i>Aruncus dioicus</i>		1 I	.
<i>Veratrum album</i>		1 I	.
E EPILOBIETEA ANGUSTIFOLII R. Tx. & Prsg. in R. Tx. 1950 s. lat.			
<i>Fragaria vesca</i>	III	1 3 II	2 1+
<i>Bromopsis ramosa</i> (=Bromus ramosus)		2 II	1+
<i>Hypericum hirsutum</i>		2 II	.
TG TRIFOLIO-GERANIETEA SANGUINEI Th. Müller 1961 s. lat.			
<i>Vincetoxicum hirundinaria</i>	III	1 3 II	2 1 <sup>1</sup>
<i>Clinopodium vulgare</i>		.	2 <sup>+</sup>
<i>Anthericum ramosum</i>		.	1 <sup>+</sup>
<i>Campanula persicifolia</i>		.	1 <sup>+</sup>
<i>Coronilla varia</i>		.	1 <sup>+</sup>
<i>Geranium sanguineum</i>		.	1 <sup>+</sup>
<i>Inula conyza</i>		.	1 <sup>+</sup>
<i>Peucedanum cervaria</i>		.	1 <sup>+</sup>
<i>Polygonatum odoratum</i>		.	1 <sup>+</sup>
<i>Veronica chamaedrys</i>		.	1 <sup>+</sup>
<i>Viola hirta</i>		.	1 <sup>+</sup>
FB FESTUCO-BROMETEA Br.-Bl. & R. Tx. 1943 s. lat.			
<i>Arabis hirsuta</i> (?)	III	1 1 I	2 1 <sup>+</sup>
<i>Brachypodium rupestre</i>		.	2 <sup>+-2</sup>
<i>Silene viridiflora</i> (=S. cucubalus)		.	2 <sup>+</sup>
<i>Euphorbia cyparissias</i>		.	1 <sup>+</sup>
<i>Galium verum</i>		.	1 <sup>+</sup>
<i>Teucrium chamaedrys</i>		.	1 <sup>+</sup>
MA MOLINIO-ARRHENATHERETEA R. Tx. 1937 s. lat.			
<i>Ajuga reptans</i>	III	1 .	2 1 <sup>+</sup>
<i>Carex flacca</i>		.	1 <sup>+</sup>
<i>Centaurea jacea</i>		.	1 <sup>+</sup>
<i>Iris sibirica</i>		.	1 <sup>+</sup>
ART ARTEMISIETEA Lohm., Prsg. & R. Tx. ex von Rochov 1951 s. lat.			
<i>Tussilago farfara</i>	III	1 101 II	2 .
<i>Geum urbanum</i>		.	1 <sup>+</sup>
AS ASPLENIETEA TRICHOMANIS Br.-Bl. in Meier & Br.-Bl. 1934 em. Oberdorfer 1977 s. lat.			
<i>Asplenium viride</i>	III	1 28 II	2 .
<i>Asplenium trichomanes</i>		2 II	2 <sup>+</sup>
<i>Asplenium ruta-muraria</i>		1 I	1 <sup>+</sup>
<i>Calamintha nepeta</i>		.	1 <sup>+</sup>
O OTHER SPECIES (Ostale vrste)			



		1	2
Sorbus aucuparia	II	3 II	.
Sedum maximum	III	.	2 <sup>+</sup>
Juglans regia	II	.	1 <sup>+</sup>
M	MOSSES (Mahovi)		
		1	2
Neckera sp.		57 V	.
Fissidens taxifolius		5 III	1 <sup>+</sup>
Plagiochila asplenioides		5 III	.
Thuidium abietinum		4 III	.
Polytrichum sp.		3 II	.
Ulotia sp.		1 I	.
Anomodon sp.		.	2 <sup>+</sup>
Eurhynchium sp.		.	1 <sup>+</sup>
Leucodon sciuroides		.	1 <sup>+</sup>

**LEGEND (Legenda)****Author of analytical table (avtor analitične tabele)**

ŽK Živko Košir

ZŽ Zupančič &amp; Žagar

**Bedrock (Geološka podlaga)**

apn limestone (apnec)

gru rubble, breccia (gručč)

**Sinsistematical characteristic (Sinsistematska pripadnost)**

OO Fraxino orni-Ostryion Tomažič 1940

TH Thlaspietea rotundifolii Br.-Bl. 1948

PHYTOCOENOLOGICAL TABLE (Fitocenološka tabela) 3:  
**SINTHETIC TABLE OF SOME ASSOCIATIONS OF NOBLE BROADLEAVES**  
 (Sintezna tabela nekaterih združb plemenitih listavcev)

Sinsistematska characteristic (Sinsistematska pripadnost)	Number of anal. table (Številka anal. tabele)	1	2	3	4	5	
	Author of anal. table (Avtor anal. tabele)	ŽK	ZŽ	AC	DA	OB	
	Altitude in m (Nadmorska višina v m)	700-1000	260-310	630-800	190-400	600-700	
	Aspect (Nebesna lega)	S SW SE	SE-SW	N-NE	N-NE		
	Slope in degrees (Nagib v stopinjah)	30-40	40-45	0-40	30-45		
	Bedrock (Geološka podlaga)	apn	apn	apn	apn	gna	
	Stoniness in % (Kamnitost v %)		0	60-90	50-100		
	Location (Kraj popisov)	Kamniška Bistrica	Rudnica pri Podčetrtku	Čičarija, Slavnik, juž. Notranjska	Zeleni potok, Dolina Idrije	Jura	
	Country (Država)	S l o w e n i a ( S l o v e n i j a )				Deutschland	
	Number of relevé (Številka popisov)	20	2	27	13	12	
TILIO CORDATAE-ACERETUM PLATANOIDIS Ž. Košir (1953) 1954							
CHARACTERISTIC SPECIES (Značilnice)							
		1	2	3	4	5	
C	Tilia cordata	I	V	2	I	I	.
		II	V	-	-	-	.
		III	IV	-	-	-	.
		Ia	V	-	.	II	III
		Ib	-	-	.	II	-
F <sub>2</sub>	Acer platanoides	IIa	V	1	.	III	-
		IIb	-	-	.	II	-
		III	V	-	-	-	-
F <sub>1</sub>	Rhamnus fallax	II	V	.	IV	.	
F <sub>2</sub>	Epipactis helleborine s. lat.	III	III	2	.	.	
DISTINGUISHING SPECIES (Razlikovalnice)							
F <sub>2</sub>	Cardamine pentaphyllos	III	V	.	.	.	
EP <sub>3</sub>	Carex alba		V	.	.	.	
EP <sub>3</sub>	Cirsium erisithales		IV	.	.	.	
F <sub>2</sub>	Aconitum napellus		III	.	.	.	
VIBURNUM OPULI-TILIIETUM CORDATAE ass. nova							
CHARACTERISTIC SPECIES (Značilnice)							
		1	2	3	4	5	
P	Viburnum opulus	II	.	2	.	.	
P	Ligustrum vulgare	.	.	2	I	I	
P	Pyrus pyraeaster	.	.	2	.	.	
FB	Brachypodium rupestre	III	.	2	.	.	
DISTINGUISHING SPECIES (Razlikovalnice)							
C	Acer campestre	I	.	2	I	IV	
		II	.	1	I	.	
OO	Quercus cerris	I	.	2	.	.	
		II	.	1	.	.	
F <sub>3</sub>	Quercus petraea	I	.	2	.	.	
		II	.	1	.	.	
Q <sub>2</sub>	Sorbus torminalis	.	.	1	.	.	
CORYDALIDO-ACERETUM Accetto 1991							
		1	2	3	4	5	
TH	Corydalis ochroleuca	III	.	V	.	.	
PAR	Cymbalaria muralis	.	.	V	.	.	
FB	Festuca carniolica	.	.	III	.	.	
	Normandina pulchella	IV	.	III	.	.	
TH	Dryopteris villarii	III	.	II	.	.	
SAXIFRAGO-TILIIETUM Dakskobler 1999							
		1	2	3	4	5	
		Ia	.	V	V	V	
		Ib	.	-	IV	-	
F <sub>3</sub>	Tilia platyphyllos	IIa	.	V	V	-	
		IIb	.	-	I	-	
		III	.	II	V	-	
F <sub>3</sub>	Veratrum nigrum	.	.	.	V	.	
VP <sub>3</sub>	Saxifraga cuneifolia	.	.	.	V	.	
AS	Saxifraga petraea	.	.	.	V	.	
Q <sub>2</sub>	Sesleria autumnalis	.	.	I	V	.	

Q <sub>2</sub>	<i>Ruscus aculeatus</i>	.	.	.	V	.
Q <sub>2</sub>	<i>Cnidium silaifolium</i>	.	.	.	IV	.
F <sub>3</sub>	<i>Laburnum alpinum</i>	IIa	.	.	IV	.
		IIb	.	.	II	.
	<i>Molopospermum peloponnesiacum</i> subsp. <i>bauhinii</i>	III	.	.	III	.
F <sub>1</sub>	<i>Anemone trifolia</i>	.	.	.	II	.
ACERI-TILIETUM Faber 1936						
		1	2	3	4	5
TG	<i>Vicia dumetorum</i>	.	.	.	.	III
TG	<i>Vicia sylvatica</i>	.	.	.	.	I
S	<i>Centaurea montana</i>	.	.	.	.	V
Q <sub>2</sub>	<i>Viola mirabilis</i>	.	.	.	.	V
F <sub>1</sub>	AREMONIO-FAGION (Ht. 1938) Török, Podani & Borhidi in Borhidi 1989					
		1	2	3	4	5
	<i>Cyclamen purpurascens</i>	III	V	1	V	.
	<i>Rhamnus fallax</i>	II	V	.	IV	.
	<i>Cardamine trifolia</i>	III	IV	.	I	.
PA	<i>Lamium orvala</i>		III	.	III	II
	<i>Cardamine enneaphyllos</i>		III	.	IV	V
	<i>Hacquetia epipactis</i>		II	.	.	.
	<i>Helleborus niger</i> subsp. <i>niger</i>		II	.	.	.
	<i>Knautia drymeia</i> subsp. <i>drymeia</i>		.	1	.	.
	<i>Calamintha grandiflora</i>		.	.	V	.
	<i>Aremonia agrimonoides</i>		.	.	I	.
	<i>Geranium nodosum</i>		.	.	I	.
	<i>Polystichum setiferum</i>		.	.	.	V
	<i>Anemone trifolia</i>		.	.	.	II
	<i>Euphorbia carniolica</i>		.	.	.	I
	<i>Ruscus hypoglossum</i>		.	.	.	I
F2	FAGETALIA SYLVATICAE Pawl. 1928					
		1	2	3	4	5
	<i>Mercurialis perennis</i>	III	V	.	I	IV
TA	<i>Actaea spicata</i>		V	.	V	I
		Ia	V	1	IV	II
	<i>Fagus sylvatica</i>		Ib	-	-	I
		II	V	2	I	-
		III	III	.	-	-
	<i>Lonicera alpigena</i>	II	V	.	IV	.
	<i>Cardamine pentaphyllos</i>	III	V	.	.	.
	<i>Galeobdolon flavidum</i> (= <i>Lamium galeobdolon</i> )		V	1	.	IV
	<i>Galium laevigatum</i>		V	2	.	V
	<i>Daphne mezereum</i>	II	V	1	V	III
	<i>Polygonatum multiflorum</i>	III	V	.	I	IV
	<i>Salvia glutinosa</i>		V	1	IV	II
		Ia	V	1	V	II
		Ib	-	-	-	II
TA	<i>Acer pseudoplatanus</i>		IIa	V	-	III
			IIb	-	-	II
			III	V	-	IV
	<i>Paris quadrifolia</i>		V	.	II	I
	<i>Asarum europaeum</i>		IV	1	V	.
	<i>Prenanthes purpurea</i>		IV	.	II	III
	<i>Viola reichenbachiana</i>		IV	1	.	.
	<i>Cardamine bulbifera</i>		III	.	I	II
	<i>Tamus communis</i>		III	1	.	II
	<i>Lilium martagon</i>		III	.	.	.
	<i>Aconitum napellus</i>		III	.	.	.
	<i>Sanicula europaea</i>		III	.	.	.
	<i>Pulmonaria officinalis</i>		III	1	V	II
	<i>Campanula trachelium</i>		III	1	I	I
	<i>Phyteuma spicatum</i>		III	.	.	.
TA	<i>Polystichum aculeatum</i>		III	.	IV	.
	<i>Epipactis helleborine</i> s. lat.		III	1	.	.
TA	<i>Euonymus latifolia</i>		IIa	II	2	II
			IIb	.	-	II
	<i>Mycelis muralis</i>		II	1	V	IV
						I

Euphorbia amygdaloides		II	.	.	I	.
Symphytum tuberosum		II	.	.	I	.
Primula vulgaris		II	1	.	I	.
Sambucus racemosa	II	II	.	II	.	.
Phyllitis scolopendrium	III	II	1	V	IV	.
Cephalanthera longifolia		I	.	.	I	.
Neottia nidus-avis		I	.	.	.	.
Digitalis grandiflora		.	1	.	.	I
Heracleum sphondylium		.	1	.	.	I
Ranunculus lanuginosus		.	1	.	.	.
Carex sylvatica		.	1	.	.	.
Cephalanthera rubra		.	1	.	.	.
Galium odoratum		.	1	.	.	III
TA Geranium robertianum		.	1	V	III	III
Eurhynchium striatum	IV	.	.	V	III	.
Galeobdolon montanum	III	.	.	V	.	IV
Sambucus nigra	IIa	.	.	-	II	.
	IIb	.	.	IV	III	.
TA Adoxa moschatellina	III	.	.	II	.	.
Cardamine impatiens		.	.	II	.	.
Lathyrus vernus		.	.	II	II	V
Poa nemoralis		.	.	I	.	III
Scrophularia nodosa		.	.	I	.	.
Epilobium montanum		.	.	I	.	I
TA Arum maculatum		.	.	I	I	I
Brachypodium sylvaticum		.	.	I	.	V
Melica nutans		.	.	I	II	V
Daphne laureola	II	.	.	.	V	.
Galanthus nivalis	III	.	.	.	IV	.
Helleborus odorus		.	.	.	IV	.
Asarum europaeum subsp. caucasicum		.	.	.	II	.
Lilium martagon		.	.	.	II	V
Festuca altissima		.	.	.	II	.
Euphorbia dulcis		.	.	.	I	IV
Allium ursinum		.	.	.	I	.
Galium sylvaticum		.	.	.	.	IV
Phyteuma spicatum		.	.	.	.	IV
Aquilegia vulgaris		.	.	.	.	I
Pulmonaria obscura		.	.	.	.	I
C CARPINION Issl. 1931 em. Oberd. 1953		1	2	3	4	5
	I	V	2	I	I	.
Tilia cordata	II	V	-	-	-	.
	III	IV	-	-	-	.
	I	II	.	II	II	I
Carpinus betulus	II	I	.	-	-	-
	III	II	.	-	-	-
Listera ovata		II	.	.	.	.
Acer campestre	I	.	2	.	I	IV
	II	.	1	.	I	.
Rosa arvensis		.	2	III	III	III
Malus sylvestris		.	1	.	.	.
Vincetoxicum minor	III	.	.	III	.	.
Dactylis polygama		.	.	.	I	.
P PRUNETALIA SPINOSAE R. Tx. 1952 s. lat.		1	2	3	4	5
Clematis vitalba	II	II	2	.	II	.
Rhamnus catharticus	IIa	-	-	.	I	.
	IIb	I	1	.	I	.
Berberis vulgaris	II	I	1	.	I	.
Cornus sanguinea	IIa	.	-	.	II	-
	IIb	.	2	.	I	IV
Viburnum lantana	IIa	.	-	.	I	-
	IIb	.	2	.	II	IV
Crataegus monogyna	II	.	2	I	I	III
Ligustrum vulgare		.	2	.	I	I
Pyrus pyraeaster		.	2	.	.	.
AU Viburnum opulus		.	2	.	.	.

Cornus mas	IIa	.	1	I	V	.
	IIb	.	-	-	I	.
Juniperus communis	II	.	1	.	I	.
Prunus spinosa	.	.	1	.	.	II
Staphylea pinnata	IIa	.	.	.	IV	.
	IIb	.	.	.	IV	.
Euonymus europaea	IIa	.	.	.	II	IV
	IIb	.	.	.	III	-
Rubus fruticosus agg.	II	.	.	.	II	.
Rubus montanus (?)	.	.	.	.	II	.
Rosa corymbifera	.	.	.	.	II	.
Crataegus oxyacantha	.	.	.	.	.	IV
Rosa glauca	.	.	.	.	.	II
Helleborus foetidus	III	.	.	.	.	I
Ribes uva-crispa	.	.	.	.	.	I
Q <sub>2</sub> QUERCETALIA PUBESCENTIS-PETRAEAE Br.-Bl. 1931 s. lat.						
		I	2	3	4	5
OO Ostrya carpinifolia	Ia	V	2	V	V	.
	Ib	-	-	-	III	.
	II	III	-	-	I	.
	III	I	-	-	-	.
	Ia	III	1	II	IV	.
	Ib	-	-	-	V	.
OO Fraxinus ornus	IIa	III	2	II	IV	.
	IIb	-	-	-	II	.
	III	III	-	-	-	.
Camptothecium lutescens	IV	III	1	IV	III	.
Melittis melissophyllum	III	II	1	.	IV	III
OO Euonymus verrucosa	II	I	.	I	I	.
	Ia	I	1	II	II	I
	Ib	-	-	-	III	-
Sorbus aria	IIa	II	-	I	II	-
	IIb	-	-	-	II	-
	III	II	-	-	-	-
OO Quercus cerris	I	.	2	.	.	.
	II	.	1	.	.	.
Buglossoides purpureocaerulea	III	.	1	.	.	III
Hypericum montanum	.	.	1	.	.	I
Sorbus torminalis	II	.	1	.	.	.
Sesleria autumnalis	III	.	.	II	V	.
Homalothecium sericeum	IV	.	.	II	.	.
Arabis turrata	III	.	.	I	III	.
Campanula pyramidalis	.	.	.	I	.	.
Epipactis atrorubens	.	.	.	I	.	.
Lathyrus venetus	.	.	.	I	.	.
Valeriana officinalis	.	.	.	I	.	.
Ruscus aculeatus	.	.	.	.	V	.
Cnidium silaifolium	.	.	.	.	IV	.
Asparagus tenuifolius	.	.	.	.	III	.
	Ia	.	.	.	II	.
Quercus pubescens	Ib	.	.	.	II	.
	II	.	.	.	I	.
Aristolochia lutea	III	.	.	.	II	.
Viola mirabilis	.	.	.	.	.	V
Chrysanthemum corymbosum	.	.	.	.	.	IV
RP <sub>2</sub> QUERCETALIA ROBORIS-PETRAEAE R. Tx. (1931) 1937 s. lat.						
		I	2	3	4	5
Festuca heterophylla	III	.	2	.	.	.
Hieracium racemosum	.	.	2	I	I	.
Galium lucidum	.	.	1	.	.	.
Hieracium sabaudum	.	.	.	I	.	.
Castanea sativa	II	.	.	.	I	.
Quercus robur	I	.	.	.	.	IV
Carex montana	III	.	.	.	.	II
Veronica officinalis	.	.	.	.	.	II

F <sub>3</sub> QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937 s. lat.						
		1	2	3	4	5
	Ia	V	-	.	II	III
	Ib	-	-	.	II	-
TA	Acer platanoides	IIa	V	1	.	III
		IIb	-	-	.	II
		III	V	-	-	-
	Lonicera xylosteum	II	V	.	IV	IV
	Carex digitata	III	V	.	IV	IV
	Ctenidium molluscum	IV	V	.	V	V
	Hepatica nobilis	III	IV	.	II	III
	Corylus avellana	IIa	IV	.	V	II
		IIb	-	.	I	-
		Ia	-	.	I	.
	Laburnum alpinum	Ib	-	.	.	III
		II	IV	.	.	II
		Ia	III	.	.	IV
		Ib	-	.	.	I
	Fraxinus excelsior	IIa	IV	.	.	I
		IIb	-	.	.	III
		III	III	.	.	-
		Ia	II	.	III	-
		Ib	-	.	.	I
	Ulmus scabra	IIa	III	.	II	I
		IIb	-	.	.	I
		III	II	.	I	-
	Festuca gigantea		II	.	.	.
	Platanthera bifolia		II	.	.	.
		I	.	-	I	II
	Hedera helix	II	.	2	III	II
		III	.	-	I	II
	Quercus petraea	I	.	2	.	.
		II	.	1	.	.
	Convallaria majalis	III	.	1	.	.
	Prunus avium	II	.	1	.	.
		Ia	.	.	V	V
		Ib	.	.	-	IV
	Tilia platyphyllos	IIa	.	.	V	V
		IIb	.	.	-	I
		III	.	.	II	V
	Isothecium alopecuroides	IV	.	.	IV	V
	Platanthera bifolia	III	.	.	III	.
	Acer campestre	I	.	2	.	I
		II	.	1	.	I
	Anemone nemorosa		.	.	II	.
		I	.	.	II	.
	Clematis vitalba	II	.	.	-	.
		III	.	.	I	.
	Melica uniflora		.	.	I	I
	Veratrum nigrum		.	.	.	V
	Taxus baccata	IIa	.	.	.	I
		IIb	.	.	.	I
	Moehringia trinervia	III	.	.	.	I
	Spiraea chamaedryfolia	II	.	.	.	I
	Listera ovata		.	.	.	I
	Primula elatior	III	.	.	.	.
			.	.	.	II
VP <sub>3</sub> VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. Et al. 1939 em. Zupančič (1976) 1980 s. lat.						
		1	2	3	4	5
	Gentiana asclepiadea	III	V	.	.	.
	Solidago virgaurea		IV	2	IV	I
		I	IV	.	.	II
	Abies alba	II	I	.	.	-
		III	II	.	.	-
	Homogyne sylvestris		III	.	.	.
	Gymnocarpium dryopteris		III	.	.	.
	Clematis alpina		III	.	.	.
	Oxalis acetosella		III	.	III	.
		I	III	.	.	IV
	Picea abies	II	III	.	.	-
		III	I	.	.	-



Hylocomium triquetrum	IV	III	.	.	.	.
Veronica urticifolia	III	III	.	.	II	.
Rosa pendulina	II	III	.	.	I	.
Saxifraga cuneifolia	III	II	.	.	V	.
Valeriana tripteris		II	.	.	I	.
Rubus saxatilis	II	II	.	.	.	V
Aposeris foetida	III	II	.	.	.	.
Pleurozium schreberi	IV	II	.	.	.	.
Polystichum lonchitis	III	II	.	.	.	.
Adenostyles glabra		II	.	.	.	.
Larix decidua	I	I	.	.	.	.
Plagiothecium neglectum	IV	.	2	.	.	.
Hieracium murorum	III	.	1	I	II	IV
Hypnum cupressiforme	IV	.	1	V	II	.
Scapania nemorea		.	.	III	.	.
Rhytidiadelphus triquetrus		.	.	III	.	.
Thuidium tamariscinum		.	.	III	.	.
Dicranum scoparium		.	.	II	.	.
Rubus hirtus	II	.	.	II	I	.
Hylocomium brevirostre	IV	.	.	II	.	.
Rhizomnium punctatum		.	.	I	.	.
Polytrichum formosum		.	.	I	.	.
Mnium hornum		.	.	I	.	.
Hylocomium splendens		.	.	I	.	.
Atrichum undulatum		.	.	I	.	.
Polystichum lonchitis	III	.	.	I	.	.
Ribes alpinum	II	.	.	.	III	.
Maianthemum bifolium	III	.	.	.	I	.
EP <sub>3</sub> ERICO-PINETEA Ht. 1959 s. lat.						
Calamagrostis varia	III	V	.	II	IV	.
Carex alba		V	.	.	.	.
Cirsium erisithales		IV	.	.	.	.
Buphthalmum salicifolium		.	1	.	.	.
Chamaecytisus hirsutus		.	1	.	.	.
Sesleria albicans subsp. angustifolia		.	.	.	I	.
Amelanchier ovalis		.	.	.	.	I
Carex ornithopoda		.	.	.	.	I
A <sub>3</sub> BETULO-ADENOSTYLETEA Br.-Bl. & R. Tx. 1943 s. lat. (=MULGEDIO-ACONITETEA Hadač & Klika in Klika & Hadač 1944 s. lat.)						
Dryopteris filix-mas	III	V	1	V	III	I
Senecio fuchsii		V	.	II	II	IV
Athyrium filix-femina		II	.	.	.	.
TA Aruncus dioicus		I	.	.	.	.
Veratrum album		I	.	.	.	.
Rubus idaeus	II	.	.	III	I	II
Saxifraga rotundifolia	III	.	.	III	.	.
AU Chrysosplenium alternifolium		.	.	II	.	.
Dryopteris affinis		.	.	I	.	.
Milium effusum		.	.	I	.	.
Doronicum austriacum		.	.	.	I	.
Polygonatum verticillatum		.	.	.	.	I
E EPILOBIETEA ANGUSTIFOLII R. Tx. & Prsg. in R. Tx. 1950 s. lat.						
Fragaria vesca	III	II	1	I	I	IV
Bromopsis ramosa (=Bromus ramosus)		II	1	.	.	IV
Hypericum hirsutum		II	.	.	.	.
TG TRIFOLIO-GERANIETEA SANGUINEI Th. Müller 1961 s. lat.						
Vincetoxicum hirundinaria	III	II	1	.	II	.
Clinopodium vulgare		.	2	.	.	I
Anthericum ramosum		.	1	.	.	.
Campanula persicifolia		.	1	.	.	I
Coronilla varia		.	1	.	.	.
Geranium sanguineum		.	1	.	.	.

<i>Inula conyza</i>	.	1	.	.	.		
<i>Peucedanum cervaria</i>	.	1	.	.	.		
<i>Polygonatum odoratum</i>	.	1	.	.	.		
<i>Veronica chamaedrys</i>	.	1	.	.	.		
<i>Viola hirta</i>	.	1	.	.	IV		
<i>Campanula rapunculoides</i>	.	.	.	IV	V		
<i>Verbascum lanatum</i>	.	.	.	I	.		
<i>Origanum vulgare</i>	.	.	.	.	III		
<i>Vicia dumetorum</i>	.	.	.	.	III		
<i>Astragalus glycyphyllos</i>	.	.	.	.	I		
<i>Silene nutans</i>	.	.	.	.	I		
<i>Vicia sylvatica</i>	.	.	.	.	I		
FB FESTUCO-BROMETEA Br.-Bl. & R. Tx. 1943 s. lat.							
	III	I	2	3	4	5	
<i>Arabis hirsuta</i> (?)	III	I	1	.	.	.	
<i>Brachypodium rupestre</i>	.	.	2	.	.	.	
<i>Silene viridiflora</i> (=S. cucubalus)	.	.	2	.	.	.	
<i>Euphorbia cyparissias</i>	.	.	1	.	.	.	
<i>Galium verum</i>	.	.	1	.	.	.	
<i>Teucrium chamaedrys</i>	.	.	1	.	.	.	
<i>Festuca carniolica</i>	.	.	.	III	.	.	
<i>Brachypodium pinnatum</i>	.	.	.	.	.	III	
<i>Primula veris</i> subsp. ?	.	.	.	.	.	III	
<i>Ranunculus nemorosus</i>	.	.	.	.	.	I	
MA MOLINIO-ARRHENATHERETEA Tx. 1937 s. lat.							
	III	I	2	3	4	5	
<i>Ajuga reptans</i>	III	.	1	.	.	.	
<i>Carex flacca</i>	.	.	1	.	.	IV	
<i>Centaurea jacea</i>	.	.	1	.	.	.	
<i>Iris sibirica</i>	.	.	1	.	.	.	
<i>Taraxacum officinale</i> agg.	.	.	.	.	I	.	
<i>Cardamine pratensis</i>	.	.	.	.	.	IV	
AU Galium mollugo							
<i>Galium mollugo</i>	.	.	.	.	.	IV	
<i>Angelica sylvestris</i>	.	.	.	.	.	III	
<i>Knautia sylvatica</i>	.	.	.	.	.	III	
<i>Vicia sepium</i>	.	.	.	.	.	II	
ART ARTEMISIETEA Lohm., Prsg. & R. Tx. ex von Rochov 1951 s. lat.							
	III	II	1	2	3	4	5
<i>Tussilago farfara</i>	III	II	.	.	.	.	.
TA Geum urbanum							
<i>Geum urbanum</i>	.	.	1	.	.	.	I
<i>Solanum dulcamara</i>	.	.	.	.	IV	.	.
<i>Urtica dioica</i>	.	.	.	.	II	.	.
TH THLASPIETEA ROTUNDIFOLII Br.-Bl. Et al 1947 s. lat.							
	I	2	3	4	5		
<i>Corydalis ochroleuca</i>	.	.	V	.	.		
<i>Dryopteris villarii</i>	.	.	II	.	.		
AS ASPLENIETEA TRICHOMANIS Br.-Bl. in Meier & Br.-Bl. 1934 corr. Oberd. 1977 s. lat.							
	III	II	1	2	3	4	5
<i>Asplenium viride</i>	III	II	.	.	.	.	.
<i>Asplenium trichomanes</i>	.	II	2	.	V	V	.
<i>Asplenium ruta-muraria</i>	.	I	1	.	III	IV	.
<i>Sedum maximum</i>	.	.	2	.	.	I	.
<i>Calamintha nepeta</i>	.	.	1	.	.	.	.
<i>Polypodium vulgare</i>	.	.	.	.	V	V	.
<i>Moehringia muscosa</i>	.	.	.	.	V	V	.
<i>Cystopteris fragilis</i>	.	.	.	.	III	.	.
<i>Polystichum illyricum</i>	.	.	.	.	II	.	.
<i>Gymnocarpium robertianum</i>	.	.	.	.	II	.	.
<i>Saxifraga petraea</i>	.	.	.	.	.	V	.
<i>Ceterach officinarum</i> agg.	.	.	.	.	.	IV	.
<i>Polypodium interjectum</i> (incl. P. australe ?)	.	.	.	.	.	II	.
<i>Cardaminopsis arenosa</i>	.	.	.	.	.	I	.
O OTHER SPECIES (Ostale vrste)							

		1	2	3	4	5
	I	-	.	IV	.	I
Sorbus aucuparia	II	II	.	III	.	-
	III	-	.	I	.	-
Juglans regia	II	.	1	.	I	.
PAR Cymbalaria muralis	.	.	.	V	.	.
Molopospermum peloponnesiacum subsp. bauhinii	III	.	.	.	III	.
Rubus caesius	II	.	.	.	I	.
Hieracium sp.	III	.	.	.	I	.
S Centaurea montana	.	.	.	.	.	V
M MOSES AND LICHENS (Mahovi in lišaji)						
		1	2	3	4	5
Neckera sp.	IV	V	.	.	.	.
Fissidens taxifolius		III	1	.	.	.
Plagiochila asplenioides		III	.	IV	.	.
Thuidium abietinum		III	.	.	.	.
Polytrichum sp.		II	.	.	.	.
Ulota sp.		I	.	.	.	.
Anomodon sp.		.	2	.	.	.
Eurhynchium sp.		.	1	.	.	.
Leucodon sciuroides		.	1	.	.	.
Normandina pulchella		.	.	III	.	.
Neckera crispa		.	.	.	V	.
Grimmia pulvinata		.	.	.	IV	.
Fissidens cristatus (=F. dubius)		.	.	.	III	.
Thamnobryum alopecurum		.	.	.	III	.
Anomodon viticulosus		.	.	.	III	.
Neckera complanata		.	.	.	III	.
Homalothecium philippeanum		.	.	.	II	.
Homalothecium sericeum		.	.	.	II	.
Metzgeria furcata		.	.	.	II	.
Madotheca platyphylla (=Porella p.)		.	.	.	II	.
Plagiochila porelloides		.	.	.	II	.
Bryum capillare		.	.	.	I	.
Peltigera canina		.	.	.	I	.
Tortella tortuosa		.	.	.	I	.
Mnium marginatum		.	.	.	I	.
Mnium sp.		.	.	.	I	.
Collema cristatum		.	.	.	I	.
Plagiomnium undulatum		.	.	.	I	.
Brachythecium rutabulum		.	.	.	I	.
Thuidium sp.		.	.	.	I	.
Bryum sp.		.	.	.	I	.
Encalypta sp.		.	.	.	I	.
Cladonia pyxidata		.	.	.	I	.

## LEGEND (Legenda)

Autor of analytical table (avtor analitične tabele)

AC Marko Accetto

DA Igor Dakskobler

OB Erich Oberdorfer

ZŽ Mitja Zupančič &amp; Vinko Žagar

ŽK Živko Košir

Bedrock (Geološka podlaga)

apn limestone (apnenec)

gna gneiss (gnajs)

Sinsistematical characteristic (Sinsistematska pripadnost)

AU Alno-Ulmion Br.-Bl. &amp; R. Tx. 1943

OO Fraxino orni-Ostryion Tomažič 1940

PA Polysticho setiferi-Acerenion

PAR Parietarientalia (Rivaz-Martinez 1960) Rivas Goday 1964

S Seslerietea Br.-Bl. 1948 em. Oberdorfer 1978

TA Tilio-Acerion Klika 1955