

Plant Communities of the *Trifolio - Geranietea sanguinei* TH. MÜLLER 1961 in East Slovakia

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MOCHNACKÝ S. et MAGLOCKÝ Š. (1993): Plant Communities of the *Trifolio - Geranietea sanguinei* TH. MÜLLER 1961 in East Slovakia - *Thaiszia, Košice*, 3:101 - 110. - ISSN 1210-0420.

ABSTRACT: The communities of the *Trifolio-Geranietea* as ecotonic phytocoenoses are present on various substrata (such as Tertiary igneous rocks, limestones, loess clays and sands), and more frequently in the areas where the parent rock mounts the surface on the shallow or profound soils. We studied the communities of the *Trifolion medii* TH. MÜLLER 1961 and *Geranion sanguinei* TX. in MÜLLER 1961.

KEYWORDS: East Slovakia, *Geranion sanguinei*, *Trifolion medii*, *Trifolio-Geranietea*, phytocoenology.

Fringe communities are composed predominantly of broad-leaved plant species that form patches (*Brachypodium pinnatum*, *Polygonatum odoratum*). In these communities, parasitic and hemiparasitic plants (*Orobanche*, *Melampyrum*) are present as well. In addition, many sciophilic species and those which are xerothermic in their aerial part but do not tolerate too high warming of the soil (*Clematis*) are present.

These ecotonic communities use the access of light and, in addition, the shelter effect of the ecoclimate and pedosphere of the forest margins.

From the point of view of the genesis of fringe communities, the natural fringes are important especially on those places where the habitat originally provided the conditions for the sequence: community on rocks - xerothermic community - fringe community - covering community - xerothermic oak forests, for example the margins of the karst plato above the Zádiel Canyon in the Slovak Karst.

Methods

The fringe vegetation was analyzed according to the modified Braun - Blanquet approach (BRAUN - BLANQUET 1964) with coverage abundance scale according to van der MAAREL (1979). Individual relevés were evaluated by the computer program for geobotanical data processing BIOSYS (JAROLÍMEK and SCHLOSSER 1991). Names of higher plant taxa are presented according to ČERVENKA et al., 1986. The names of syntaxa are in accordance with the proposal of MUCINA and MAGLOCKÝ (1985).

Rosetum gallicae KAISER 1926

The community belongs to *Geranion sanguinei*. The dominant species is *Rosa gallica* (Table 1, relevé 9-15) frequently forming patches. Xerothermic species are regularly present in the community: *Pseudolysimachion incanum*, *Vincetoxicum hirundinaria*, *Vicia pisiformis*, *Cyanus triumfettii*, *Elytrigia intermedia*, *Peucedanum cervaria*. The characteristic species of the association is *Rosa gallica*. Permanent species are *Pseudolysimachion incanum*, *Stachys recta*, and companion species are those of the *Agropyreteea intermedii - repentis* and *Festuco - Brometea*.

This community occurs in the southern part of Slovakia. Frequently, it forms fringes of vineyards and xerothermic oak forests in the Tokaj region of the East Slovakia lowland or is present on the vineyard margins.

On the territory of Slovakia, as well as on the territory of surrounding states, there is little phytocoenological literature dealing with fringe communities. The exception is Slovak Karst (JAROŠOVÁ and MUCINA 1988). Indicatory species suggest, that communities of *Trifolium - Geranietea* occur in mountain ranges of East Slovakia. In phytocoenological system, as a phytocenoses of "younger" class, they were included in xerothermous communities to which they are phytosociologically and ecologically closest (DIRSCHKE 1974). MICHALKO (1957) gives *Peucedanum cervaria* in all three relevés in the association *Caricetum humilis viorlatense*, in five relevés *Polygonatum officinale* occurs (1, 2, 4, 5, 7), *Geranium sanguineum* in three relevés (2, 4, 6). In the association *Festuca pseudodalmatica - Potentilla arenaria*, the following species are often present: *Geranium sanguineum* (2, 6, 7, 8, 9, 11), *Rosa gallica* (2, 4, 10, 12), *Trifolium alpestre* (7). SIMON (1977) gives various species as e.g. *Geranium sanguineum* (36), *Trifolium alpestre* (2, 16, 36), *Trifolium rubens* (5, 6) in the association *Minuartio - Festucetum pseudodalmaticae* and similarly, in the *Spireetum mediae*, *Trifolium rubens* (5, 6), *Geranium sanguineum* (1), *Origanum vulgare* (1) occur. In other works they are mentioned as various succession stages.

Numerous phytosociological data can be found in MÜLLER (1961, 1962), OBERDORFER (1978), PASSARGE (1967), TURK and MEIEROTT (1992).

Community with *Trifolium sarosiense*

The characteristic species of the community is *Trifolium sarosiense* (Tab. 1, relevé 1-8). The following species belong to the xerothermic taxa: *Melampyrum arvense*, *Stachys recta*, *Muscari comosum*, *Chamaecytisus triflorus*. The differential species are *Arrhenatherum elatius*, *Antoxanthum odoratum*, *Trifolium rubens*. The community belongs to the *Geranion sanguinei*. The following species are characterized by a high constancy: *Galium verum*, *Vicia tenuifolia*, *Hypericum perforatum*. Among the class and order characteristic species we have found *Fragaria vesca*, *F. viridis*, *Origanum vulgare*, *Veronica chamaedrys*, *Conyza squarrosa*. The presence of species forming the cover stands of the forest margins of xerothermic oak forests is as follows: *Rosa canina*, *Prunus spinosa*, *Crataegus monogyna*, *Swida sanguinea*. The presence of species from the contact communities is predominantly from the *Quercion pubescenti - petraeae* as well as from non-forest communities of the *Festuco - Brometea*. The most close community on basic substrates is that of *Geranio - Dictamnenum* WENDELBERGER ex TH. MÜLLER 1961. On the acidic substrata it is close to community *Geranio - Trifolietum alpestris* TH. MÜLLER 1961. The community is found on warm and dry habitats. It is localized in the southern and east-southern part of East Slovakia.

Trifolio medii - Agrimonietum eupatoriae TH. MÜLLER 1961

Syn.: *Trifolietum medii* TH. MÜLLER 1961
Agrimonietum eupatorii GRABNER et POLATSCHKE 1986.

On the basis of the floristic analysis and a comparison with the literature data, the community belongs to the *Trifolion medii* (Tab. 1, relevé 16 - 31). The characteristic species are *Trifolium medium* and *Agrimonia eupatoria*. Their occurrence amounts only to 19%. It shows that the community is very impoverished. The differential species are *Melampyrum nemorosum*, *Pilosella officinarum*, *Astragalus glycyphyllos*, *Betonica officinalis*, *Helianthemum nummularium*. As the dominant species and edificators of the community we have found *Clinopodium vulgare*, *Viola hirta*, *Hypericum perforatum*, *Galium verum*. The occurrence of companion species of *Festuco - Brometea* (*Tithymalus cyparissias*, *Teucrium chamaedrys*, *Pimpinella saxifraga*, *Brachypodium pinnatum*) was abundant. The community is present on the acidic to neutral soils in areas with mild xerothermic to cold climate. It belongs to the most common communities within the *Trifolion medii*. It is distributed predominantly in the north and northwest part of East Slovakia.

Tab. 1. - Communities of class *Trifolio-Geranieae sanguinei* TH. MÜLLER

Serial No.	12345678	9111111	111122222222233
		012345	6789012345678901
Relevé No.	12913422	5678233	1111212222212111
	5 2 6	801	0134961403792587
Number of species	32323211	4214111	322232233111223
	04492165	2841317	0503776333822491

Rosetum gallicae Kaiser 1926

<i>Rosa gallica</i>	.....	0%	..5+343	71%	+5	.....+	6%	+	19%	+5
<i>Pseudolysimachion incanum</i>	.....	0%	. +311+..	71%	+3	.....+	6%	+	16%	+3
<i>Vincetoxicum hirundinaria</i>	.....	0%	. +.+....	29%	+	.....	0%	.	6%	+
<i>Vicia pisiformis</i>	0%	. +.+....	29%	+	0%	.	6%	+

Differential species of association

<i>Viola hirta</i>	...+....	13%	+	0%	. ++....++11.++...	50%	+1	29%	+1
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Community with *Trifolium sarosiense*

<i>Trifolium sarosiense</i>	...3++1	50%	+3	0%	0%		50%	+3
<i>Lathyrus sylvestris</i>	....++..	25%	+	.....	0%	. .....	0%	.	6%	+

Geranium sanguinei R. Tx. in Th. Müller 1961

<i>Hypericum perforatum</i>	..+....	25%	+	+++..+	71%	+. +.3+.+++++....+	63%	+3	55%	+3	
<i>Galium verum</i>	+1+11...	63%	+1	..A1...	29%	1A ++1+.1+++1...+. .	63%	+1	55%	+A	
<i>Vicia tenuifolia</i>	+AA3....	50%	+3	....++.	29%	+	.....++.....	19%	+	38%	+3
<i>Geranium sanguineum</i>	1.....	13%	1	4.....1	29%	14	....A+.....1	19%	+A	19%	+4
<i>Stachys recta</i>	.....	0%	.	+++..+	71%	+	....+. ....	6%	+	19%	+
<i>Trifolium alpestre</i>	.....1.	13%	1	...+..	14%	+	.....11.....	13%	1	13%	+1
<i>Inula hirta</i>	..A.....	13%	A	.....	0%	.	.....1.A.....	13%	1A	10%	1A
<i>Campanula rapunculoides</i>	...+....	13%	+	...+..	14%	+	....+. ....	6%	+	10%	+
<i>Melampyrum arvense</i>	..A.....	13%	A	..A..	14%	A	.....	0%	.	6%	A
<i>Trifolium rubens</i>	.....	0%	.	.....+	14%	+	.....+. .	6%	+	6%	+
<i>Verbascum lychnitis</i>	.....	0%	.	.....	0%	.	.....+. .R	13%	R+	6%	R+
<i>Cyanus triumfetti</i>	.....	0%	.	.....	14%	+	.....	0%	.	3%	+
<i>Chamaecytisus ratisbonensis</i>	.....	0%	.	.....	0%	.	.....+. .	6%	+	3%	+

Tab. 1 - continued

Relevé No.	12913422	5678233	1111212222212111
	5 2 6	801	0134961403792587

Trifolio medii- Agrimonietum Th. Müller 1962

Trifolium medium agg.	.....	0%	.....	0%	.....3.1..3.....	19%	13	23%	+3
Agrimonia eupatoria	..+.....	13%	+	0%	..1.....+.....	19%	+1	13%	+1

Trifolion medii Th. Müller 1961

Pilosella officinarum	.....	0%	.....	0%	..+..A..1+.....1..	38%	+A	19%	+A
Libanotis pyrenaica	....Al..	25%	1A ..+...	14%	+	0%	.	10%	+A
Verbascum austriacum	+...+...	25%	+ +.....	14%	+	0%	.	10%	+
Melampyrum nemorosum	.....	0%	.....	0%	.....43.....+	19%	+4	10%	+4

Trifolio - Geranietea Th. Müller 1961,

Origanetalia vulgaris Th. Müller 1961

Clinopodium vulgare	1....+.	38%	+1 ++.....	29%	+ ++..11+++.....	50%	+1	42%	+1
Origanum vulgare	A..1++..	50%	+A 1.....	14%	1 11..1...+1..+1.	44%	+1	39%	+A
Fragaria vesca	..1A..11	50%	1A	0%	.....+++.....	31%	+	29%	+A
Fragaria viridis	1....1..	25%	1 1.....	14%	1 1141+.....	31%	+4	26%	+4
Coronilla varia	..+..+...	25%	+ ..+..+.	29%	+	19%	+	23%	+
Medicago falcata	.....	0%	..+..A..	29%	+A	31%	+1	23%	+A
Veronica chamaedrys	..+..11	38%	+1 ..+..	14%	+ ++...+.....	19%	+	23%	+1
Trifolium montanum	..+.....	13%	+	0%	. 33.....1A+...1.	38%	+3	23%	+3
Vicia cracca	+.....	13%	+	0%	.....+..+++...1.	31%	+1	19%	+1
Sedum maximum	..+...+	25%	+	29%	+	6%	+	16%	+
Astragalus glycyphyllos	.....	0%	.....	0%	.....Al..1+.....	31%	+A	16%	+A
Betonica officinalis	.....	0%	.....	0%	.....+..+++.....	31%	+	16%	+
Dactylis polygama	.....	0%	.....	0%	.....++.....+.....	19%	+	10%	+
Achillea pannonica	..+.....	13%	+	0%	.....+.....+.....	13%	+	10%	+
Helianthemum nummularium	.....	0%	.....	0%	.....11.....+	19%	+1	10%	+1
Peucedanum cervaria	.....	0%	...1..	14%	1	6%	1	6%	1
Conyza squarrosa	+.....	13%	+	0%	.....+.....	6%	+	6%	+
Knautia arvensis	.....	0%	.....	0%	.....+.....	13%	+	6%	+
Prunella grandiflora	.....	0%	.....	0%	.....+.....	6%	+	3%	+
Anthericum ramosum	.....	0%	.....	0%	.....1	6%	1	3%	1
Anemone sylvestris	.....	0%	.....	0%	.....+.....	6%	+	3%	+
Dictamnus albus	.....	0%	.....	0%	.....+.....	6%	+	3%	+

Tab. 1 - continued

Relevé No.	12913422	5678233	1111212222212111
	5 2 6	801	0134961403792587
Festuco - Brometea			
<i>Tithymalus cyparissias</i>	..+.... 25%	+ +1+..+.	71% +1 11+1..+..+++++++ 88% +1 68% +1
<i>Teucrium chamaedrys</i>	1.11.1.. 50%	1 +1..+1.1	71% +1 ..1+..+.....++ 38% +1 45% +1
<i>Asperula cynanchica</i>	..11+..+ 50%	+1 1+....	43% +1 ++++..+.....1.. 38% +1 42% +1
<i>Pimpinella saxifraga</i>	..1+... 38%	+1	0%+..++++.+++.. 56% + 39% +1
<i>Poa angustifolia</i>	11..... 25%	1 ...A+1	43% +A 11+A...+..... 38% +A 35% +A
<i>Achillea millefolium</i>	..++++.. 50%	+ ...+...	14% + +...+..+..+.... 31% + 32% +
<i>Thymus marschallianus</i>	..... 0%	. ++1....	43% +1 ++1A..+..... 31% +A 26% +A
<i>Eryngium campestre</i>	..+.... 25%	+ ++.1....	43% +1 ..+.....+. 19% + 26% +1
<i>Seseli elatum</i>	..... 0%	. +...+.	43% + ...+.....1+1 25% +1 23% +1
<i>Brachypodium pinnatum</i>	..A..... 13%	A	0% . ....AA3AA..A. 38% A3 23% A3
<i>Koeleria macrantha</i>	.1..... 13%	1	0% . ++...+..1....+. 31% +1 19% +1
<i>Elytrigia intermedia</i>	.A...4.. 25%	A4 +.34A1.	71% +4 0% . 19% +4
<i>Potentilla arenaria</i>	..... 0%	. .1.....	14% 1 ...3.....311 25% 13 16% 13
<i>Festuca pseudodalmatica</i>	...+.... 13%	+ .3+...+	43% +3 ...1..... 6% 1 16% +3
<i>Acinos arvensis</i>	..... 0%	. .+..+...	29% ++...1+ 19% +1 16% +1
<i>Festuca valesiaca</i>	...+.... 13%	+	0% . 1..3..+..... 19% +3 13% +3
<i>Carex humilis</i>	..... 0%	. .....	0% . ....3...3.3 19% 3 10% 3
<i>Salvia pratensis</i>	..+..... 13%	+	0%+..+..... 13% + 10% +
<i>Inula ensifolia</i>	..... 0%	. .....	0% . .....+1+ 19% +1 10% +1
<i>Festuca sulcata</i>	..A..... 13%	A	0% . ....+..1.... 13% +1 10% +A
<i>Scabiosa ochroleuca</i>	+..... 13%	+ ...+...	14% ++. 6% + 10% +
<i>Sanguisorba minor</i>	..... 0%	. .....	0%++ 13% + 6% +
<i>Dichanthium ischaemum</i>	..... 0%	. +.....	14% +3.. 6% 3 6% +3
<i>Leontodon hispidus</i>	...R.... 13%	R	0% 0% . 3% R
<i>Linum flavum</i>	..... 0%	. .....	0%+. 6% + 3% +
<i>Chamyecytisus albus</i>	..... 0%	. .....	0% . .....1 6% 1 3% 1
<i>Anthyllis vulneraria</i>	..... 0%	. .....	0%+. 6% + 3% +
<i>Polygala major</i>	..... 0%	. .....	0% . .....1. 6% 1 3% +
<i>Linum tenuifolium</i>	..... 0%	. .....	0% . .....1.. 6% 1 3% 1
<i>Linaria genistifolia</i>	..... 0%	. .+.....	14% + 0% . 3% +
<i>Crinitaria linosyris</i>	..... 0%	. ...A... 14%	A 0% . 3% A

Tab. 1 - continued

Relevé No.	12913422	5678233	1111212222212111
	5 2 6	801	0134961403792587
Companion species			
<i>Rosa canina</i>	+++AR+..	75% RA +.....	14% + RR.....+.+.+.+. 25% R+ 35% RA
<i>Elytrigia repens</i>	111.111.	75% 1 1..+.+.+	43% +1 0% . 29% +1
<i>Galium verum</i>	+..+....	25% + 1.....+	29% +1 11..+.+.+.+.+.+.+. 31% +1 29% +1
<i>Elymus caninus</i>	.....++	25% +	0% . +1..1.1.+..... 38% +1 26% +1
<i>Potentilla argentea</i>	...+.+.+	38% + .+.1+.	57% +1 .+.+.+.+.+.+.+. 6% + 26% +1
<i>Ligustrum vulgare</i>	+++3..++	75% +3 +.....	14% + 0% . 23% +3
<i>Calamagrostis epigejos</i>	+1.+.+.+	63% +1 ..1..	14% 1+.+.+.+.+. 6% + 23% +1
<i>Swida sanguinea</i>	....+1.	38% +1 +.....	14% +R..... 6% R 16% RI
<i>Achillea nobilis</i>	.+.+.+.+	25% +1.+	29% +1 ...1..... 6% 1 16% +1
<i>Koeleria macrantha</i>	...+.+.+	13% + ++.....	29% + .+.+.+.+.+.+.+. 13% + 16% +
<i>Melica transylvanica</i>	.....1..	13% 1 +.+.+.+	29% +3... 6% 3 13% +3

Arrhenatherum elatius (+,1 - 13,29,16,21,24,20,23), *Antoxanthum odoratum* (+,A-10,11,13,14,21,24)
Prunus spinosa (R;1 - 1,25,9,3,5,), *Carex precox* (+,A - 1,25,9,5,6,10,14), *Pilosella bauhini*
(+ - 1,25,10,14,29), *Galium album* (+,1 - 21,24,27,19,18), *Poa pratensis* (+,1 - 3,4,5,7,8),
Crataegus monogyna (+ - 1,25,9,12,8), *Poa nemoralis* (+,1 - 2,26,16,24,22), *Achillea ptarmica*
(+ - 1,5,6,13), *Artemisia vulgaris* (+,1 - 3,4,8,16), *Ranunculus acris* (+,A - 2,26,16,18), *Steris*
viscaria (R,+ - 12,10,11,13), *Dactylis glomerata* (+ - 3,23,27,18), *Genista tinctoria*
(+ - 12,10,11,16), *Lotus corniculatus* (+,1 - 14,20,23,18), *Allium flavum* (+,1 - 5,6,8,31),
Stellaria holostea (+,1 - 2,26,10,11), *Acetosella vulgaris* (+,1 - 5,6,28), *Plantago lanceolata*
(+ - 5,13,22), *Festuca rubra* (+ - 14,21,24), *Campanula trachelium* (+ - 8,21,24), *Luzula*
campestris (+,1 - 21,20,23), *Colymbada scabiosa* (+,A - 1,9,8), *Picris hieracioides* (+,1
- 1,3,4), *Ranunculus polyanthemos* (+,1 - 20,23,27), *Fallopia convolvulus* (R,+ - 12,31,10,11),
Poa compressa (+,1 - 1,12,3), *Salvia verticillata* (R,3 - 27,19,22), *Trisetum flavescens*
(+ - 16,21,24), *Silene vulgaris* (+ - 16,20,23), *Galium glaucum* (+,A - 30,22,17), *Vicia*
tetrasperma (+ - 6,29,16), *Geum urbanum* (+,1 - 2,26,16), *Campanula patula* (+ - 10,11), *Rorippa*
austriaca (+ - 2,26), *Carlina vulgaris* (+ - 15,18), *Lysimachia punctata* (A - 2,26), *Lavatera*
thuringiaca (+,1 - 5,8), *Lembotropsis nigricans* (+,1 - 29,15,17), *Melissa officinalis* (+,1
- 9,3), *Prunus domestica* (+,1 - 9,5), *Carex caryophylla* (+ - 9,10), *Campanula persicifolia*
(+ - 29,16), *Dorycnium herbaceum* (+,1 - 9,29), *Hypericum perforatum* (+ - 28,30), *Rubus spec.*
(+,1 - 1,2), *Sedum sexangulare* (+ - 5,6), *Allium oleraceum* (+ - 1,8), *Convolvulus arvensis*
(+ - 25,15), *Thymus kosteleckyanus* (+ - 25,29), *Artemisia absinthium* (+ - 3,7), *Dianthus*
pontederacae (+,1 - 25,29), *Campanula sibirica* (+,1 - 15,17), *Falcaria vulgaris* (+,1 - 25,8),
Taraxacum officinale agg. (+ - 3,16), *Medicago lupulina* (+ - 1,18), *Acosta rhenana* (+ - 6,17),
Trifolium pratense (+ - 21,24), *Bromus erectus* (+ - 20,23), *Potentilla recta* (+ - 3,5),
Leucanthemum vulgare (+ - 20,23), *Arabis hirsuta* (+ - 6,7), *Trifolium ochroleucon* (+ - 13,29),
Stellaria graminea (+ - 13,16), *Galeopsis speciosa* (+ - 2,26), *Anagallis arvensis* (R - 10,11),

Quercus dalechampii (+ - 10,11), *Cruciata pedemontana* (+ - 31), *Alyssum alyssoides* (+ - 31), *Bromus sterilis* (+ - 31), *Lactuca viminea* (1 - 31), *Achillea collina* (+ - 30), *Anthemis tinctoria* (+ - 29), *Erysimum diffusum* (+ - 29), *Vicia lathyroides* (+ - 29), *Campanula moravica* (+ - 29), *Otites cuneifolia* (+ - 28), *Poa bulbosa* (1 - 28), *Laserpitium latifolium* (+ - 27), *Tragopogon pratensis* (+ - 27), *Calamagrostis varia* (A - 27), *Rubus fruticosus* (+ - 26), *Muscari comosum* (R - 25), *Potentilla neglecta* (+ - 25), *Daucus carota* (+ - 25), *Vicia dumetorum* (3 - 25), *Aster amelus* (+ - 18), *Gymnadenia conopsea* (+ - 18), *Geranium pratense* (R - 21), *Aegopodium podagraria* (+ - 21), *Potentilla heptaphylla* (+ - 29), *Carex montana* (+ - 18), *Melica ciliata* (+ - 17), *Lactuca perennis* (+ - 17), *Artemisia campestris* (+ - 17), *Thymus praecox* (+ - 17), *Veronica austriaca* (+ - 17), *Scorzonera austriaca* (+ - 17), *Teucrium pannonicum* (1 - 17), *Pulsatilla slavica* (+ - 17), *Festuca pallens* (1 - 17), *Stipa pulcherrima* (A - 17), *Quercus petraea* (+ - 16), *Carpinus betulus* (+ - 16), *Acer campestre* (+ - 16), *Festuca heterophylla* (1 - 16), *Vicia sepium* (+ - 16), *Trifolium hybridum* (+ - 16), *Anthriscus sylvestris* (+ - 16), *Ranunculus auricomus* (+ - 16), *Symphytum tuberosum* (+ - 16), *Echium vulgare* (+ - 15), *Alyssum montanum* (1 - 15), *Veronica prostrata* (+ - 14), *Silene dichotoma* (+ - 14), *Thlaspi arvense* (+ - 14), *Ajuga reptans* (+ - 12), *Dianthus armeria* (R - 11), *Thymus pulegioides* (1 - 20), *Prunella laciniata* (+ - 29), *Pseuclimachion spicatum* (+ - 29), *Carex nichelli* (A - 9), *Chamaecytisus triflorus* (1 - 9), *Filipendula vulgaris* (1 - 9), *Cerastium spec.* (+ - 8), *Salvia nemorosa* (+ - 8), *Seseli annuum* (+ - 8), *Asparagus officinalis* (+ - 8), *Minuartia hirsuta* (+ - 6), *Medicago prostrata* (1 - 6), *Trifolium arvense* (+ - 6), *Iris pumila* (A - 6), *Orphantha lutea* (+ - 5), *Stipa capillata* (+ - 5), *Acer tataricum* (+ - 5), *Chamaecytisus supinus* (+ - 5), *Chondrila juncea* (+ - 4), *Thymus serpyllum* (+ - 4), *Galium boreale* (+ - 3), *Lathyrus pratensis* (+ - 3), *Melandrium album* (+ - 3), *Ballota nigra* (+ - 3), *Allium scorodoprasum* (+ - 3), *Carduus acanthoides* (+ - 3), *Cirsium arvense* (+ - 3), *Aristolochia clematidis* (3 - 3), *Robinia pseudoacacia* (+ - 1), *Chaerophyllum bulbosum* (+ - 1), *Stenactis annua* (+ - 1).

Taxonomic remark

In the group of *Trifolium medium* agg. in Slovakia, *Trifolium sarosiense* HAZSLINSKY (2n=48) and *Trifolium flexuosum* JACQ. (2n=64) are found. Within the aggregate, only these taxa were determined by morphological and karyological features (MÁJOVSKÝ and MURÍN 1988). *Trifolium sarosiense* grows in warm oak - hornbeam forests. *Trifolium flexuosum* grows in Slovakia anywhere.

Localities of relevés

1. Brehová village, SW, in the direction of Sírník village, margin near vineyard, slope 10°, 1x3 m, coverage 90%, 8.7.1986.
2. Veľká Trňa village, SW, in the direction of Malá Trňa, road margin, 1.5x3 m, coverage 100%, 9.7.1986.

3. Viničky village, SE, in the direction of Borsuk village, vineyard margin, slope 10°, 5x5 m, coverage 100%, 11.7.1986.
4. Viničky village, SE, direction of Borsuk village, 20 m of the locality 3., slope near road, slope 25°- 30°, 5x5 m, coverage 90%, 11.7.1986.
5. Borsuk village, SE, direction of Viničky, vineyard margin, slope 5°, 1.5x6 m, coverage 80%, 11.7.1986.
6. Borsuk, SW, direction of Viničky, near quarry, slope 15°, 5x5 m, coverage 90%, 11.7.1986.
7. Borsuk, SW, direction of Viničky, margin near shrubs, 50 m of the locality 6, slope 10°, 3x6 m, coverage 100%, 11.7.1986.
8. Malý Kamenec village, SW, direction of the town Streda n. Bodrogom waste land between the road and the vineyard, slope 10°, 3x6 m, coverage 90%, 11.7.1986.
9. Svinica village, SE, direction of Sečovce village, margin near shrubs, slope 10°, 3x2 m, coverage 100%, 29.6.1992.
10. Svinica, SE, direction of Sečovce, 30 m of locality 9, shrub margin, slope 10°, 5x5 m, coverage 90%, 29.6.1992.
11. Veľká Tŕňa, SW, above the village, margin near forest, slope 10°, 3x2 m, coverage 90%, 29.6.1992.
12. Veľká Tŕňa, SW, 200 m of the locality 11, margin near forest, slope 10°, 3x2 m, coverage 90%, 29.6.1992.
13. Veľká Tŕňa, SSE, direction of the village, about 300 m of the locality 12, slope 10°, 5x5 m, coverage 90%, 29.6.1992.
14. Černochoch village, SE, direction of Borša village, xerothermous pasture land, slope 10°, 5x5 m, coverage 100%, 29.6.1992.
15. Ladmovce village, direction of Hatfa village, road margin, slope 10°, 5x5 m, coverage 80%, 29.6.1992.
16. Kavečany village, E, forest margin, 10x1.5 m, coverage 100%, 30.6.1992.
17. Trebejov village, S, direction of Kysak village, forest margin, 40 m above the railway track, slope 50°, 5x5 m, coverage 80%, 30.6.1992.
18. Záhradné village, SW, direction of Vranov, shrub margin, slope 10°, 5x5 m, coverage 100%, 1.7.1992.
19. Podhorany village, NE, behind the out-buildings of agricultural farm, slope 15°, 5x5 m, coverage 90%, 1.7.1992.
20. Radvanovce village, NE, locality Skalky, shrub margin, slope 10°, 1.5x2 m, coverage 25%, 1.7.1992.
21. Radvanovce, SE, locality Skalky, shrub margin, slope 10°, 3x5 m, coverage 100%, 1.7.1992.
22. Gerlachov village, S, direction of Maľčov village, margin on the left side in the slope near the main road, slope 60°, 3x5 m, coverage 80%, 2.7.1992.
23. Bardejov, SSW, Vinbark, above the sports area, forest margin, slope 45°, 3x5 m, coverage 100%, 2.7.1992.
24. Bardejov town, SSE, Vinbark, forest margin, about 50 m of the locality 27, slope 20°, 3x10 m, coverage 100%, 2.7.1992.
25. Malý Kamenec, S, rune margin, slope 10°, 1x2 m, coverage 100%, 24.6.1982.
26. Veľká Tŕňa, S, vineyard margin, slope 15°, 1.5x3 m, coverage 100%, 9.7.1986.
27. Veľký Lipník village, S, beech margin, slope 30°, 1x2.5 m, 9.7.1991.
28. Malý Kamenec, S, vineyard margin, slope 10°, 1x2 m, coverage 100%, 12.6.1979.
29. Zemplínske Jastrabie, SE, forest margin, slope 20°, 2x5 m, coverage 80%, 7.7.1978.
30. Kráľovský Chlmec, W, rune near vineyard, slope 3°, 1x2 m, coverage 100%, 8.7.1978.
31. Veľký Kamenec village, rune at the end of vineyard, above Tarbucka, slope 30°, 2x2 m, coverage 80%, 8.7.1987.

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Received: 23 July 1993

Revised: 18 August 1993

Accepted: 25 August 1993