Thaiszia - J. Bot., Košice, 15: 63-83, 2005
http://www.upjs.sk/bz/thaiszia/index.html

THAISZIA
JOURNAL OF
BOTANY

Galeopsido-Galinsogetum POLDINI et al. 1998 in NW Slovenia

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Šilc U. & Čušin B. (2005): *Galeopsido-Galinsogetum* POLDINI et al. 1998 in NW Slovenia. – Thaiszia – J. Bot. 15: 63-83. – ISSN 1210-0420.

Abstract: The weed vegetation of hoe-fields in the western part of the Julian Alps was studied. Relevé material was compared to relevés from Slovenia and Friuli Venezia Giulia (Italy). The stands are classified into the association *Galeopsido-Galinsogetum parviflorae* (*Stellarietea mediae*).

Keywords: weeds, *Stellarietea mediae*, Julian Alps, Slovenia, phytosociology.

Introduction

Weed vegetation of the Alpine phytogeographical region in Slovenia (WRABER 1969) and the neighbouring Friuli Venezia Giulia has only recently become the subject of research studies. POLDINI et al. (1998) provided a regional synthesis of studies of this type of vegetation, while ČUŠIN & ŠILC (2002) studied the association *Echinochloo-Setarietum* in the Breginjski kot.

Methods

The vegetation was researched applying the standard Central-European, Zürich-Montpellier method (BRAUN-BLANQUET 1964; WESTHOFF & VAN DER MAAREL 1973). Numerical analyses were made with CANOCO 4.5 (TER BRAAK & ŠMILAUER 2002), PC-ORD (MCCUNE & MEFFFORD 1999) and TWINSPAN (in JUICE programme (TICHÝ 2002)). Ellenberg (ELLENBERG et al. 1992) indicatior

values were calculated in JUICE programme (TICHÝ 2002) based on species presence, i.e. unweighted by their cover-abundance values.

Syntaxonomical nomenclature is congruent with the work of JAROLÍMEK et al. (1997) and MOCHNACKÝ (2000), while the nomenclature of pteridophyta and spermatophyta follows EHRENDORFER et al. (1973), except for species *Setaria pumila* (POIR.) ROEM. & SCHULT. and *Panicum miliaceum* L. For selection of C4 plants a checklist by COLLINS & JONES (1985) was used.

Study area

Our research was conducted in the mountainous region of western Slovenia which is a part of the Julian Alps. The Julian Alps are the southeastern end of the south limestone Alps. They are mostly composed of carbonate rocks (limestone and dolomite), while in the lower altitude they contain a rather large proportion of marl and flysch. Glaciers, which deposited moraine material at rather high altitudes (today at about 1000 m a.s.l.), had an important role in forming the surface. A variegated geomorphology is characteristic for the region, since the relative difference in height can be as much as 2000 m even at very short distances. Inclinations in this part of Slovenia are therefore 30 degrees and more. Nevertheless, the fields are on naturally flat surfaces of hills, where the incline is minimum (1°).

According to OGRIN (1998), at altitudes above 1000 m the mountain climate prevails, so that the region of our research is classified into the moderate continental climate type. Characteristic for this type is the sub-Mediterranean rainfall regime – its peak rainfall is in October and November, and although the maximum rainfall is in autumn, the crops do not endure drought (as they are not on permeable soil). The region is classified among the wettest in Europe, as the average annual rainfall is between 2500 and 3000 mm. Isothermic average annual temperatures are between 6° and 8° C, and th e average temperature in January is between –2° and 0° C, which is about 2° higher than at the same altitude in central Slovenia (Mediterranean impact in the Soča Valley).

The study area is classified in the Alpine phytogeographical region (WRABER 1969). Potential vegetation on moraines and on slope rubble is *Anemone-Fagetum*, and on flysch *Luzulo-Fagetum*.

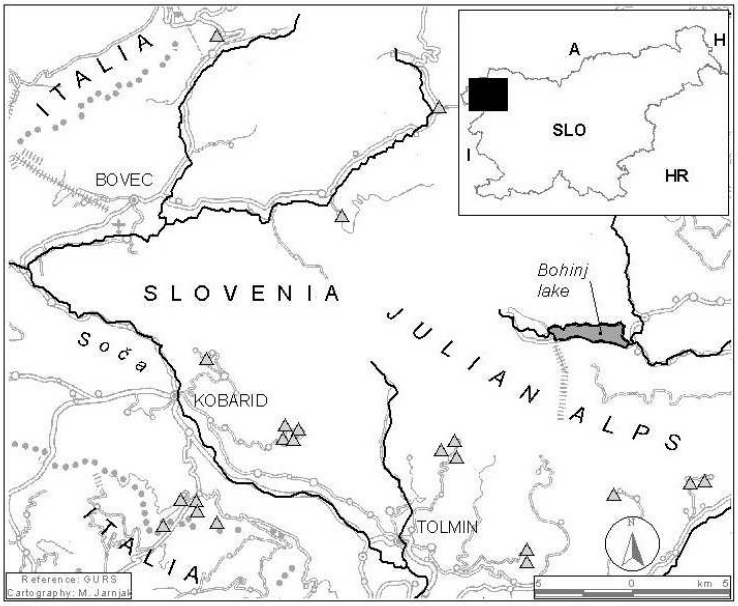

Fig. 1. Study area and relevé locations.

Characteristics of the association

Synmorphology

Stands of the association *Galeopsido-Galinsogetum* are dense, with the coverage of between 80 and 100 %. They are dominated by *Galinsoga parviflora*, which can be completely replaced by *Galinsoga ciliata*.

The stands are two-layered. The upper layer consists of the following species: *Galeopsis tetrahit*, *Chenopodium album* and *Sonchus arvensis*. The lower layer is dominated by *Mentha arvensis*, *Stellaria media*, *Lamium purpureum* and *Fallopia convolvulus*.

Synecology

The stands are found on small fields and gardens in the vicinity of settlements in the montane belt. The fields are situated on saddles, graduated slopes, level and wide ridges and on level terrain in the mountains (the fields in pre-Alpine valleys are situated on steeper slopes). It is these regions that are composed of rocks, less characteristic for the high-mountain belt. Most fields are on brown soil on marls (brown marl soil), or on skeletal rendzinas (those on glacier moraines). They are situated between 600 and 1050 m a.s.l.

Although the soil on flysch and marl is more fertile than on limestone, people have improved the structure of the soil even on less favourable skeletal

rendzinas by the means of cultivation (fertilization with stable manure) and thus obtained anthropogenous soil with similar features. The principle factor forming the site conditions is therefore the cold and wet “mountain” climate.

Above all, potatoes, beans and cabbage are grown in the fields. Often the cultures on the same surface are mixed. The fields are cultivated manually. They are hoed in the spring and sometimes weeded during the season. Mechanized cultivation is scarce. Potato is usually harvested in September.

Syntaxonomy

Two studies of weed vegetation have been conducted in the study area and its vicinity. So far, in Friuli Venezia Giulia POLDINI et al. (1998) have described the associations *Echinochloo-Setarietum* and *Galeopsido-Galinsogetum parviflorae.* Weed stands on hoe-fields on lower altitudes in the Breginjski kot were described by ČUŠIN & ŠILC (2002). They classified them as the association *Echinochloo-Setarietum* and within it into the altitudinal form *Galeopsis tetrahit*, since grasses: *Echinochloa crus-galli*, *Setaria pumila*, *Digitaria sanguinalis* also occur within them.

There exist numerous examples of weed syntaxa on higher altitudes mentioned in the literature. The associations are classified into the alliance *Scleranthion annui* (*Holco-Galeopsietum* HILBIG 1967, *Galeopsio-Matricarietum* OBERDORFER 1957, *Aegopodio-Campanuletum rapunculoidis* KUTSCHERA 1966 em. MUCINA 1993), into the alliance *Spergulo-Oxalidion* (*Galeopsietum speciosae* KRUSEM. & VLIEGER 1939 em PASSARGE 1959) or into the alliance *Panico-Setarion* (*Galeopsido-Galinsogetum parviflorae* POLDINI et al. 1998).

Altitudinal gradient

For syntaxonomical classification of researched stands the weed vegetation of border area of Slovenia and Italy was compared. In the synoptic table (Tab. 2) relevés of the associations *Echinochloo-Setarietum* (SELJAK 1989, POLDINI et al. 1998, ČUŠIN & ŠILC 2002) and *Galeopsido-Galinsogetum* (POLDINI et al. 1998; ŠILC & ČUŠIN hoc loco) were arranged according to altitudinal gradient (in 100 metre altitudinal interval classes). Altitude (with associated parameters of temperature and percipitation) is the most important gradient in determining the floristic composition of weed vegetation (LOSOSOVÁ et al. 2004).

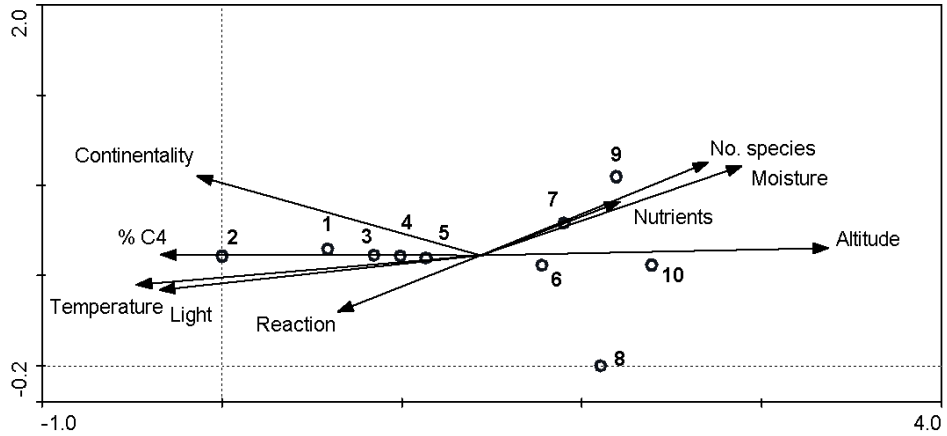

Fig. 2. DCA with supplementary evironmental data (Ellenberg indicator values) passively projected on the ordination plot. Numbers correspond to columns in Table 2.

Numerical analysis (Fig. 2) shows agglomeration of relevé material up to an altitude of 500 m (columns 1-5). Stands differentiate due to the altitudinal gradient and associated temperature and moisture, as indicated by Ellenberg values.

In the second group stands that thrive above 500 metres (columns 6-10) are merged. The number of C4 plants, that are losing competitive strength in mountain climate (COLLINS & JONES 1985, POLDINI et al. 1998), is well correlated with the horizontal axe. Weed stands above 500 m (column 5 in Tab. 2) are characterised by lower abundance of C4 plants, while above 600 m (column 6 in Tab. 2) they appear only individually with low cover.

C4 plants are the major differential species between both syntaxa (POLDINI et al. 1998). MUCINA (1993) cites numerous C4 plants as transgressive character species of the alliance *Panico-Setarion* and the association *Echinochloo-Setarietum.* The latter is not defined by character species, only by diagnostic species combination.

C4 plants have a competitive advantage in areas with high light intensity, high ambient temperature and low moisture availability. These parameters are associated with altitude and are the dominant factor of division between stands. There is a need for caution in interpreting the distribution and abundance of C4 plants. Topography, structure of vegetation, differences in soil and nutrients availability are to be considered as well (COLLINS & JONES 1985).

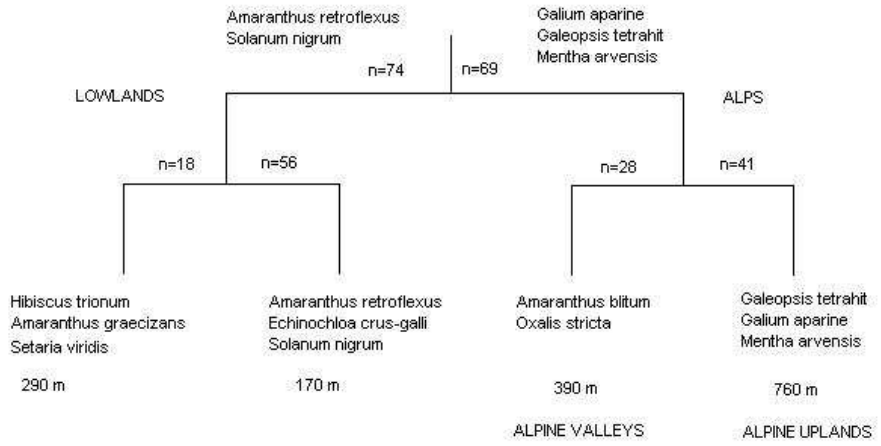

Fig. 3. TWINSPAN classification. Mean altitude of cluster in the second division is shown.

The first level of TWINSPAN classification (eigenvalue 0.34) divides relevés into lowland and alpine stands. They are characteristically differentiated by C4 plants appearance, specially *Amaranthus retroflexus.* At the second level of division, alpine relevés separate into stands from alpine valleys and uplands. Stands that thrive in valleys are similar to ones from uplands due to the mountain climate, but C4 plants are still present. In upper sites they are not found, except for species *Setaria pumila* and *S. viridis.* Clusters are separated according to altitude. Relevés from lowland clusters are distributed up to 490 m.

Syntaxonomical classification

Comparison of relevés (Tab. 3) arranged according to syntaxonomical classification shows the separation of extreme parts of altitudinal transect and the transitional character of stands from alpine valley (Breginjski kot). Even more transitional is the character of altitudinal form, which includes hygrophilous species that thrive at higher altitudes and C4 plants, that are characteristic for warmer stands at lower altitude.

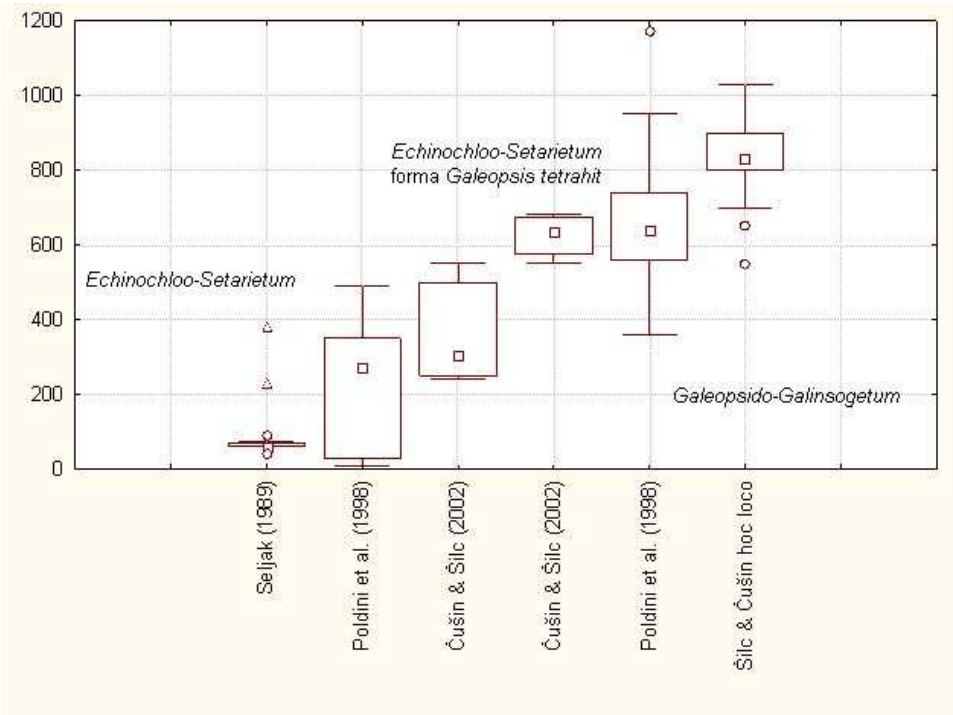

Fig. 4. Altitudinal range of relevés arranged according to syntaxonomical classification of authors.

Division of both syntaxa (*Echinochloo-Setarietum* and *Galeopsido-Galinsogetum*) is difficult because of the continuity of site parameters that are changing with altitude. POLDINI et al. (1998) stated that the delimitation between syntaxa is at 400 metres, but stands of associations *Echinochloo-Setarietum* in *Galeopsido-Galinsogetum* interwine within a range of 100 m. ČUŠIN & ŠILC (2002) stated delimitation at 500 m; up to 650 m there appear stands of altitudinal form of association *Echinochloo-Setarietum,* where C4 plants - above all grasses (*Panicoideae*) - are still found. A similarity with the typical form is indicated by the presence of character species of the alliance *Panico-Setarion* (Tab. 2).

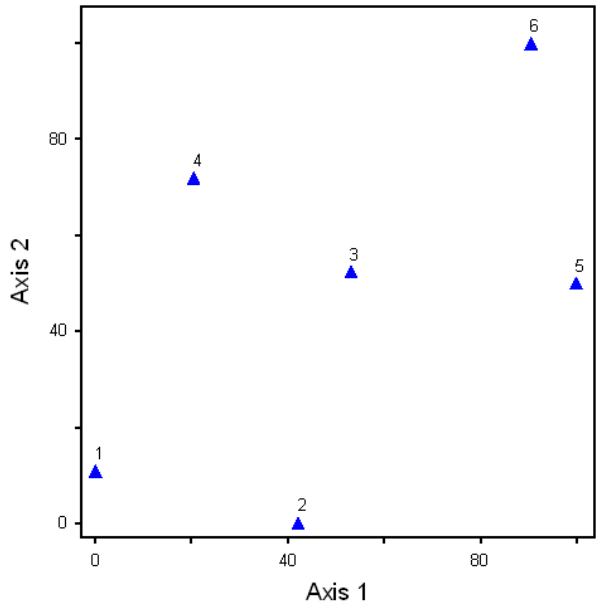

Fig. 5: NMS ordination of Table 3 (numbers correspond to columns).

In the Non-metric scaling ordination diagram a transitional character of alpine valley stands is indicated, and the similarity with stands of the association *Galeopsido-Galinsogetum* from Carnian Alps (column 5 in Tab. 3), due to wider altitudinal range of stands from Carnia is shown (Fig. 4).

Equally problematic is the classification of the studied stands on the level of alliance. In their survey of weed vegetation, POLDINI et al. (1998) consider that the alliance *Spergulo-Oxalidion* does not appear in the area and classify the association into the alliance *Panico-Setarion.* Due to the absence of C4 grasses (*Echinochloa crus-galli, Setaria pumila*) and termophilic elements (*Mercurialis annua*, *Diplotaxis muralis*), it is our opinion that these stands cannot be classified into the alliance *Panico-Setarion*, but instead into the more humid alliance *Spergulo-Oxalidion*. It is linked to this alliance by the species: *Galinsoga ciliata*, *Bidens tripartita*, *Chenopodium polyspermum*.

Syntaxonomical classification is as follows:

Stellarietea mediae R. TX., LOHMEYER et PREISING in R. TX. ex VON ROCHOW 1951

Violenea arvensis HÜPPE et HOFMEISTER ex JAROLÍMEK et al. 1997

Atriplici-Chenopodietalia albi R. TX. (1937) NORDHAGEN 1940

Spergulo-Oxalidion GÖRS in OBERD. et al. 1946

Galeopsido-Galinsogetum POLDINI et al. 1998

Synphenology

Due to the montane perhumid climate the stands develop late. In May, most of the plants are still as seedlings. They reach their optimum development at the end of July and August, when the above ground parts of potato decay.

As the vegetation period is shorter, particular aspects or spring associations do not develop on these sites. MUCINA (1993) came to the same conclusions regarding *Aegopodio-Campanuletum rapunculoidis,* the highest thriving weed association in Austria.

Synchorology

The association has so far only been described in the Carnic Alps in Italy and in the Julian Alps in Slovenia.

Acknowledgements

We would like to thank Prof. Dr. L. Poldini and Dr. A. Čarni for their commentary and suggestions. Furthermore, we would like to express our gratitude to the anonymous reviewer for useful suggestions.

Appendix

Species present in only one relevé:

Euphorbia helioscopia 1: +; *Medicago lupulina* 3: +; *Achillea millefolium* 4: +; *Equisetum arvense* 7: +; *Rumex acetosa* 7: +; *Hordeum vulgare* 8: r; *Dactylis glomerata* 9: r; *Poa trivialis* 9: r; *Silene alba* ssp. *alba* 10: +; *Veronica arvensis* 13: +; *Calendula officinalis* 14: r; *Fumaria vaillantii* 15: +; *Chelidonium majus* 15: +; *Valerianella dentata* 15: r; *Anthemis arvensis* 16: 1; *Pimpinella major* 16: +; *Campanula rapunculoides* 16: +; *Anthemis* sp. 17: 1; *Symphytum officinale* 18: +. *Geranium columbinum* 21: +.

Date, location, latitude, longitude:

1: 2002/07/23, Krn, under a haymow, potatoes, 397427, 5121982; 2: 2002/07/23, Krn, above a haymow, potatoes, 397450, 5122009; 3: 2002/07/23, Krn, the last two houses under Mt. Krn, potatoes, 396990, 5122413; 4: 2002/07/23, Krn, the outset of the village, potatoes, 397400, 5121656; 5: 2002/07/23, Drežniške ravne, potatoes and beans, skeletal rendzina, 392958, 5125801; 6: 2002/07/23, Livek, potatoes, 392458, 5118557; 7: 2002/07/23, Livek, potatoes, 392454, 5118496; 8: 2002/07/23, Livške ravne, potatoes, 393519, 5117444; 9: 2002/07/23, Avsa, on the path to Matajur, potatoes, 391647, 5118626; 10: 2002/07/23, Jevšček, 50 m before the village, potatoes, 390765, 5117302; 11: 2002/07/24, Tolminske ravne, potatoes and cabbage, 405553, 5121443; 12: 2002/07/24, Tolminske ravne, potatoes, 405602, 5121521; 13: 2002/07/24, Tolminske ravne, potatoes, 405482, 5121427; 14: 2002/07/24, Sela nad Podmelcem, potatoes, marl, skeletal soil, 409371, 5115602; 15: 2002/07/24, Grant, potatoes, 413800, 5118889; 16: 2002/07/24, Kal, east of Stržišče, potatoes, 418481, 5119582; 17: 2002/07/24, Stržišče, above the road, potatoes, 417715, 5119461; 18: 2002/07/25, Strmec, Predel, potatoes and beans, 393479, 5142318; 19: 2002/07/25, the village of Soča, Vrsnik, moraine, rendzina, potatoes, 399887, 5133101; 20: 2002/07/25, Trenta, Na Logu, potatoes and beans, 404888, 5138663; 21: 2002/07/24, Sela nad Podmelcem, potatoes, 409374, 5115385.

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Tab. 1. *Galeopsido-Galinsogetum* POLDINI et al. 1997 in NW Slovenia.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Relevé area	100	100	100	80	100	80	80	60	120	100	100	80	80	100	60	100	100	50	50	100	50	
Altitude (m)	881	900	910	830	550	710	700	1030	840	820	912	920	916	818	800	821	802	900	900	650	810	
Cover (%)	80	80	90	90	100	80	80	70	70	60	90	90	80	80	40	80	60	90	70	100	70	
Number of species	24	20	23	21	16	20	22	19	18	18	17	16	18	22	21	28	26	20	12	22	20	%
Diagnostic combination of the association																						
Galeopsis tetrahit	2	2	2	1	.	1	1	2	1	.	1	2	1	2	.	2	.	2	1	1	1	81
Galium aparine	+	+	1	2	.	.	2	2	.	.	1	1	1	+	+	+	+	3	3	2	1	81
Galinsoga ciliata	3	+	1	3	4	2	2	2	1	+	.	.	1	.	2	.	2	2	1	5	.	76
Mentha arvensis	+	+	1	+	.	2	+	+	2	1	+	+	2	2	.	+	+	1	.	.	.	76
Stachys palustris	2	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+	1	.	.	2	2	29
Galeopsis speciosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.	14
Aethusa cynapium	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	10
Characteristic and differential species of the *Panico-Setarion*, *Atriplici-Chenopodietalia*, *Violenea arvensis* and *Stellarietea mediae*																						
Stellaria media	2	1	+	1	+	3	2	2	2	1	1	2	2	2	2	3	2	1	1	+	2	100
Galinsoga parviflora	.	2	3	1	2	2	2	2	2	3	4	4	3	4	+	.	2	2	3	.	3	86
Polygonum persicaria	1	.	+	1	1	1	1	2	2	+	2	2	1	2	+	.	.	+	.	+	1	81

Capsella bursa-pastoris	+	+	+	+	+	.	.	+	+	+	+	+	+	+	+	+	+	.	.	+	+	81
Chenopodium album	+	+	1	+	+	+	1	1	.	1	+	2	.	1	+	+	+	.	.	+	+	81
Lamium purpureum	+	+	+	.	+	+	+	.	+	+	+	.	.	+	1	.	+	+	+	.	+	71
Fallopia convolvulus	1	.	+	+	1	1	1	1	1	1	1	1	1	1	.	+	+	.	.	1	.	76
Veronica persica	+	+	+	+	+	.	.	.	.	.	.	1	1	1	.	.	+	.	+	+	+	57
Sonchus asper	+	+	.	+	.	+	+	+	.	+	.	.	+	+	1	+	+	.	.	.	.	57
Chenopodium polyspermum	+	.	.	+	.	.	+	.	.	+	.	.	.	+	.	+	+	.	.	+	.	38
Sonchus arvensis	1	1	1	1	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	29
Myosotis arvensis	.	.	.	.	.	+	.	.	.	.	+	.	+	.	+	+	+	.	.	.	.	29
Viola arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	+	.	.	24
Sonchus oleraceus	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	+	+	19
Matricaria chamomilla	+	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	14
Geranium molle	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	14
Vicia sativa	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10
Polygonum lapathifolium	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10
Other																					
Taraxacum officinale agg.	.	+	+	.	.	+	+	+	+	.	.	+	+	+	1	+	+	+	.	+	+	71
Cirsium arvense	+	+	.	+	.	+	+	1	.	+	1	.	+	+	+	+	+	+	.	.	+	71
Agropyron repens	+	+	+	+	+	+	+	.	.	+	+	.	+	+	.	+	+	.	.	.	.	62
Ranunculus repens	.	+	+	.	.	+	1	.	+	+	+	+	.	1	.	.	.	+	.	+	2	57
Rumex obtusifolius	+	+	+	.	+	+	+	+	2	.	.	.	.	.	+	+	.	.	.	+	+	57

Convolvulus arvensis	.	.	1	.	.	+	.	.	.	2	.	.	.	.	1	1	+	+	1	+	1	48
Calystegia sepium	.	.	.	+	+	.	1	.	3	.	.	.	.	.	1	2	+	.	.	+	.	38
Trifolium repens	.	.	.	+	.	.	+	+	.	.	+	+	.	+	.	.	.	.	.	+	+	38
Vicia cracca	+	+	+	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	.	+	.	33
Aegopodium podagraria	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	19
Polygonum aviculare	+	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	+	.	.	.	+	24
Silene dioica	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	r	+	.	.	19
Lamium album	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.	.	19
Galeopsis pubescens	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	19
Plantago lanceolata	.	.	.	.	.	r	.	.	r	.	.	.	.	.	.	+	.	.	.	.	+	19
Daucus carota	.	.	.	.	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	10
Geranium pyrenaicum	.	.	.	.	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	14
Armoracia rusticana	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	14
Lapsana communis	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	+	.	.	.	.	14
Heracleum sphondylium	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	10
Trifolium pratense	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10
Poa annua	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	10

Tab. 2. Synoptic table corresponding to the altitudinal gradient.

	1	2	3	4	5	6	7	8	9	10
No. of releves	33	4	20	22	14	11	11	7	10	11
Light	7,0	7,1	7,0	6,9	6,9	6,8	6,9	6,9	6,8	6,8
Temperature	6,4	6,3	6,3	6,2	6,1	5,9	5,9	5,9	5,7	5,7
Continantality	3,9	3,8	3,8	3,9	3,8	3,7	3,7	3,4	3,6	3,6
Moisture	4,9	4,9	4,8	4,9	4,8	5,2	5,2	4,9	5,2	5,2
Reaction	6,7	6,7	6,6	6,6	6,8	6,5	6,6	6,7	6,6	6,6
Nutrients	7,0	7,1	7,0	6,9	7,0	7,2	7,1	7,0	7,1	7,1
No. of species	16,8	16,0	18,2	20,2	19,1	21,4	20,3	18,1	21,6	18,6
No. of C4 species	11,0	8,0	10,0	11,0	8,0	5,0	2,0	0,0	0,0	0,0
% C4	0,8	0,6	0,7	0,8	0,6	0,4	0,1	0,0	0,0	0,0
Altitude (mean)	39	137	253	333	436	532	639	723	824	948
Altitude (up to)	100	200	300	400	500	600	700	800	900	1000
Echinochloo-Setarietum										
Amaranthus retroflexus	82	100	80	86	71	.	.	.	.	.
Echinochloa crus-galli	76	25	65	68	29	55	45	.	.	.
Setaria pumila	61	75	65	91	64	64	45	14	.	.
Galinsoga parviflora	70	25	70	64	64	91	82	71	80	91
Chenopodium album	94	75	95	95	93	100	100	100	90	73
Fallopia convolvulus	9	.	15	55	79	64	73	86	80	64
Cirsium arvense	24	25	25	27	57	36	36	57	90	55
Galeopsido-Galinsogetum										
Galinsoga ciliata	.	.	25	18	7	36	18	57	70	55
Aethusa cynapium	.	.	.	5	7	55	27	14	10	9
Galium aparine	.	.	.	9	7	64	64	57	80	91
Stachys palustris	9	.	.	5	36	55	45	14	50	.
Mentha arvensis	6	.	.	9	.	64	36	57	80	91
Galeopsis tetrahit	.	.	.	.	7	36	64	86	70	100
Matricaria chamomilla	.	.	.	.	14	27	36	.	.	45
Panico-Setarion										
Mercurialis annua	30	25	15	18	21	.	.	14	.	.
Diplotaxis muralis	18	25	30	14	14	.	.	.	.	.
Datura stramonium	12	25	10	.	.	.	.	.	.	.
C4 plants										
Amaranthus cruentus	12	.	.	.	.	.	.	.	.	.
Cynodon dactylon	12	.	15	9	.	.	.	.	.	.

Amaranthus hybridus	33	.	.	5	.	.	.	.	.	.
Amaranthus lividus	.	.	10	.	.	18	18	.	.	.
Sorghum halepense	30	75	25	18	.	.	.	.	.	.
Amaranthus graecizans	6	25	15	5	36	.	.	.	.	.
Portulaca oleracea	30	25	15	5	7	.	.	.	.	.
Panicum miliaceum	.	.	.	9	7	.	.	.	.	.
Digitaria sanguinalis	61	100	75	50	36	55	.	.	.	.
Setaria viridis	12	50	15	18	21	27	27	29	.	.
Atriplex tatarica	.	.	.	.	.	.	9	.	.	.
Spergulo-Oxalidion										
Calystegia sepium	58	100	75	77	57	100	82	43	60	9
Chenopodium polyspermum	12	.	20	41	57	55	36	43	60	.
Bidens tripartita	21	25	.	14	14	27	27	.	10	.
Oxalis stricta	6	.	20	14	7	36	.	.	.	.
Euphorbia peplus	3	.	.	.	.	.	.	.	.	.
Symphytum officinale	.	.	.	.	.	.	.	.	.	9
Stellarietea mediae										
Persicaria maculosa	67	75	80	73	93	100	100	100	80	73
Euphorbia helioscopia	39	75	55	73	79	45	55	43	20	18
Stellaria media	39	.	50	50	86	100	91	100	100	100
Capsella bursa-pastoris	39	.	65	64	86	91	82	29	100	82
Sonchus oleraceus	30	.	45	68	57	45	55	57	30	27
Lamium purpureum	18	.	30	32	36	64	64	86	70	73
Sonchus asper	24	.	25	23	29	27	9	29	70	27
Vicia sativa agg.	3	25	.	5	14	.	.	14	10	9
Geranium molle	3	.	5	5	7	9	18	.	20	.
Sonchus arvensis	9	.	5	9	29	.	18	.	30	36
Persicaria lapathifolia	27	25	5	9	.	.	.	.	10	9
Solanum nigrum	45	100	65	32	50	.	.	.	.	.
Hibiscus trionum	12	25	20	9	7	.	.	.	.	.
Sinapis arvensis	3	25	.	14	21	.	.	.	.	9
Geranium columbinum	.	.	.	5	.	9	18	29	10	.
Matricaria chamomilla	.	.	.	.	.	27	9	14	10	18
Senecio vulgaris	30	.	20	9	29	.	.	.	.	.
Anagallis arvensis	9	.	5	5	7	.	.	.	.	.
Erodium cicutarium	3	.	10	5	7	.	.	.	.	.
Brassica napus	3	.	.	.	7	.	9	.	.	9
Myosotis arvensis	.	.	.	.	.	.	9	29	40	45

Geranium pusillum	.	.	5	5	14	.	.	.	.	.
Other										
Convolvulus arvensis	30	25	60	55	79	73	45	86	60	45
Veronica persica	64	25	60	36	50	45	45	14	50	55
Taraxacum officinale agg.	39	50	45	82	43	45	64	29	60	64
Agropyron repens	15	25	40	23	36	27	.	29	60	45
Ranunculus repens	6	.	40	41	29	36	45	29	40	45
Rumex obtusifolius	12	.	10	5	14	45	36	29	50	36
Trifolium pratense	6	.	20	27	21	9	18	29	10	9
Polygonum aviculare	15	50	20	36	29	.	9	14	50	.
Trifolium repens	9	.	20	23	.	18	55	29	30	27
Equisetum arvense	39	.	20	23	21	18	9	29	.	9
Erigeron annuus	27	25	20	27	.	9	27	14	.	.
Medicago lupulina	6	.	10	27	7	18	9	.	.	9
Poa annua	18	.	.	9	.	18	27	14	10	18
Daucus carota	9	.	5	14	.	.	27	.	10	9
Armoracia rusticana	.	.	15	14	.	9	.	14	10	9
Artemisia vulgaris	*12*	25	10	9	7	.	.	.	.	.
Plantago lanceolata	3	25	.	9	.	.	.	14	30	.
Glechoma hederacea	3	.	5	14	7	9	.	.	.	.
Silene alba ssp. *alba*	.	.	5	.	7	9	.	.	10	9
Lamium album	.	.	10	.	.	18	9	.	10	27
Aegopodium podagraria	.	.	.	5	.	9	18	.	20	27
Vicia cracca	.	.	.	9	.	.	9	14	20	27
Rumex crispus	6	.	25	5	7	.	.	.	.	.
Mentha spicata	6	50	5	5	.	.	.	.	.	.
Potentilla reptans	9	25	.	5	.	9	.	.	.	.
Myosoton aquaticum	.	.	10	.	7	18	27	.	.	.
Geranium pyrenaicum	.	.	.	.	.	9	.	14	10	9
Diplotaxis tenuifolia	9	.	10	5	.	.	.	.	.	.
Plantago major	3	.	5	18	.	.	.	.	.	.
Vicia sepium	6	.	.	9	.	.	.	.	.	9
Agrostis stolonifera	3	.	5	9	.	.	.	.	.	.
Cardamine hirsuta	3	.	.	5	.	.	9	.	.	.
Trifolium incarnatum ssp. *molineri*	.	25	5	.	14	.	.	.	.	.
Silene dioica	.	.	10	.	.	.	.	.	20	18
Leucanthemum vulgare	.	.	.	5	.	.	.	14	.	9

Silene vulgaris	.	.	.	9	7	.	.	.	.	9
Galeopsis pubescens	.	.	.	.	.	9	9	.	.	18

Tab. 3. Synoptic table according to syntaxonomic classification.

		1	2	3	4	5	6
	No. of releves	17	63	18	4	23	21
	Echinochloo-Setarietum						
	Chenopodium album	100	90	94	100	100	81
	Galinsoga parviflora	100	54	89	100	74	86
	Fallopia convolvulus	6	32	39	50	83	76
C4	*Setaria pumila*	53	70	83	50	48	.
C4	*Amaranthus retroflexus*	71	92	44	.	.	.
C4	*Echinochloa crus-galli*	76	59	72	100	13	.
	Cirsium arvense	41	27	22	50	43	71
	Galeopsido-Galinsogetum						
	Galium aparine	.	.	28	25	70	81
	Galeopsis tetrahit	.	.	.	100	65	81
	Mentha arvensis	12	.	44	75	39	76
	Galinsoga ciliata	.	5	56	.	26	76
	Stachys palustris	18	5	22	25	39	29
	Aethusa cynapium	.	.	22	25	30	10
	Galeopsis speciosa	.	.	.	.	48	14
	Panico-Setarion						
	Mercurialis annua	41	22	.	.	4	.
	Diplotaxis muralis	41	17	.	.	.	.
	Datura stramonium	.	11	.	.	.	.
	C4 plants						
	Digitaria sanguinalis	41	67	72	25	4	.
	Setaria viridis	18	19	11	25	26	.
	Sorghum halepense	12	30	6	.	.	.
	Portulaca oleracea	24	19	.	.	.	.
	Amaranthus graecizans	6	17	.	.	.	.
	Cynodon dactylon	6	13	.	.	.	.
	Amaranthus hybridus	71	.	.	.	.	.
	Amaranthus cruentus	24	.	.	.	.	.
	Panicum miliaceum	.	3	.	.	4	.
	Amaranthus lividus	.	.	33	50	.	.
	Atriplex tatarica	.	.	.	.	4	.
	Spergulo-Oxalidion						
	Calystegia sepium	41	71	89	100	65	38

Chenopodium polyspermum	12	32	44	50	30	38
Bidens tripartita	18	11	6	.	39	.
Oxalis stricta	.	6	56	25	4	.
Symphytum officinale	.	.	.	.	.	5
Stellarietea mediae						
Stellaria media	88	35	72	100	96	100
Persicaria maculosa	59	75	100	100	96	81
Capsella bursa-pastoris	65	52	72	100	74	81
Convolvulus arvensis	35	48	78	25	74	48
Veronica persica	100	41	44	75	26	57
Euphorbia helioscopia	35	65	39	50	65	5
Lamium purpureum	29	21	67	75	57	71
Sonchus asper	29	24	28	50	.	57
Sonchus oleraceus	35	49	33	.	74	19
Sonchus arvensis	18	11	.	.	13	29
Geranium molle	.	6	6	.	4	14
Geranium columbinum	.	.	11	50	13	5
Solanum nigrum	24	63	11	.	.	.
Armoracia rusticana	.	2	33	.	.	14
Vicia sativa agg.	.	8	.	.	4	10
Lamium album	.	.	17	.	9	19
Matricaria chamomilla	.	.	17	.	9	14
Senecio vulgaris	29	24	.	.	.	.
Anagallis arvensis	12	6	.	.	.	.
Erodium cicutarium	6	6	.	.	.	.
Lamium amplexicaule	6	2	.	.	.	.
Heliotropium europaeum	6	3	.	.	.	.
Sinapis arvensis	.	11	.	.	9	.
Geranium pusillum	.	5	.	.	4	.
Brassica napus	.	3	.	.	9	.
Oxalis corniculata	.	3	.	.	4	.
Viola arvensis	.	3	.	.	.	24
Myosotis arvensis	.	.	.	.	26	29
Other						
Taraxacum officinale agg.	41	51	78	100	26	71
Ranunculus repens	12	24	44	75	22	57
Rumex obtusifolius	18	6	39	100	4	57
Trifolium repens	12	11	28	50	17	38

Poa annua	29	3	11	50	17	10
Erigeron annuus	18	25	6	25	17	.
Medicago lupulina	6	14	11	50	.	5
Agropyron repens	12	35	17	.	4	62
Equisetum arvense	35	22	28	.	22	5
Trifolium pratense	6	17	28	.	17	10
Daucus carota	6	10	11	.	13	10
Polygonum aviculare agg.	24	30	.	25	9	24
Aegopodium podagraria	.	2	11	.	13	19
Persicaria lapathifolia	29	13	.	.	.	10
Artemisia vulgaris	6	13	.	.	4	.
Glechoma hederacea	.	3	17	.	9	.
Lolium multiflorum	.	2	6	.	4	.
Achillea millefolium agg.	.	2	11	.	.	5
Vicia cracca	.	2	6	.	.	33
Myosoton aquaticum	.	.	33	50	9	.
Urtica dioica	.	.	17	50	9	.
Silene alba ssp. *alba*	.	.	28	.	9	5
Rorippa sylvestris	24	3	.	.	.	.
Rumex crispus	12	11	.	.	.	.
Agrostis stolonifera	6	5	.	.	.	.
Mentha longifolia	6	2	.	.	.	.
Chaenarrhinum minus	6	2	.	.	.	.
Hypericum perforatum	6	2	.	.	.	.
Poa trivialis	12	.	.	.	.	5
Conyza canadensis	.	8	6	.	.	.
Potentilla reptans	.	8	.	25	.	.
Vicia sepium	.	6	.	.	4	.
Plantago lanceolata	.	6	.	.	.	19
Cardamine hirsuta	.	3	.	.	4	.
Galium mollugo	.	2	.	.	4	.
Prunella vulgaris	.	2	.	.	4	.
Leucanthemum vulgare	.	2	.	.	9	.
Polygonum mite	.	2	6	.	.	.
Silene dioica	.	.	11	.	.	19
Ranunculus acris	.	.	6	.	4	.
Geranium pyrenaicum	.	.	.	.	4	14
Dactylis glomerata	.	.	.	.	4	5

1. *Echinochloo-Setarietum*- SELJAK 1989
2. *Echinochloo-Setarietum*- POLDINI et al. 1998
3. *Echinochloo-Setarietum*- ŠILC & ČUŠIN 2002
4. *Echinochloo-Setarietum* forma *Galeopsis tetrahit*- ŠILC & ČUŠIN 2002
5. *Galeopsido-Galinsogetum*- POLDINI et al. 1998
6. *Galeopsido-Galinsogetum*- ŠILC & ČUŠIN hoc loco

Received: 12 June 2003
Revised: 2 Ddecember 2004
Accepted: 2 Ddecember 2004