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PLANT COMMUNITIES IN ARABLE FIELDS OF THE SKIERBIESZÓW LANDSCAPE PARK

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A b s t r a c t

Floristic research on segetal communities was carried out in 2000 on arable fields in the Skierbieszów Landscape Park and its protected zone. Three communities of segetal weeds in cereal crops, and two communities of segetal weeds in root crops were separated in the arable fields of the Skierbieszów Landscape Park. The community *Vicietum tetraspermae typicum* commonly occurred in cereal crops on brown soils developed from loess soils. The community *Echinochloo-Setarietum,* which belongs to root crops, was noted in the same habitat. The greatest richness of species was found in *Consolido-Brometum* and *Lamio Veronicetum politae,* with the average of 25 species in one record. Both communities were abundant in rare segetal species which are considered to be endangered in our country: *Adonis aestivalis, Euphorbia exigua, Lathyrus tuberosus, Muscari comosum, Thlaspi perfoliatum, Veronica polita, Agrostemma githago.*

Key words: segetal communities, arable fields, Skierbieszów Landscape Park

INTRODUCTION

The common use of herbicides and high doses of fertilizers trigger the disappearance of many segetal communities. This concerns especially the communities growing in very poor and acid, or calcerous soil. Species distinctive for these environments disappear, and nitrophilous species thrive. Impoverished communities are formed with one or two species clearly dominating (A n i o ł - K w i a t k o w s k a , 1990; T r ą b a and Z i e m i ń s k a , 2006). For a long time, naturalists have been paying attention to the necessity to retain diversity of species in segetal communities (S i c i ń s k i , 2001). M e d w e c k a - K o r n a ś (1986) notes that rare species and protected species can survive only if their habitats and environments within plant communities are protected. Protection of biodiversity is easier in protected areas, such as landscape parks. Agricultural management is limited there, which gives a better opportunity to counteract the threats. The aim of this study is to characterise the diversity of species of segetal communities in cereal crops and root crops in the Skierbieszów Landscape Park and its protected zone.

The aim of the study is to separate and describe weed species in cereal crops and root crops in brown soils and rendzinas of the Skierbieszów Landscape Park and its protected zone. The research that was carried out allows to distinguish endangered and rare species of segetal flora in the investigated area. Detailed studies of segetal communities were not conducted in this area. Fragmentary studies on the plants of the Skierbieszów Landscape Park were made by F i j a ł k o w s k i and A d a m c z y k (1990).

MATERIALS AND METHODS

Floristic research on segetal communities was carried out in 2000 on arable fields in the Skierbieszów Landscape Park and its protected zone (Fig. 2) on brown soils and rendzinas. Moreover, in May 2001 the list of segetal flora species was supplemented with typically spring species. The type and kind of soil and its agricultural usability were determined on the basis of soil-agricultural maps at a scale of 1:5000. In cereal and root crops, 110 phytosociological records were taken using the Braun-Blanquet method (1964). Species nomenclature followed M i r e k et al. (2002) and the classification of communities was based on the system proposed by M a t u s z k i e w i c z (2002). The records were grouped into communities of weeds, which were subsequently put into floristic tables (Tabs 1-2). In the tables, the degree of constancy (S) and the cover coefficient (D) were calculated for specific taxons; only these species were included which reached at

Fig. 1. Muscari comosum in cereals – rare calciphilous species.

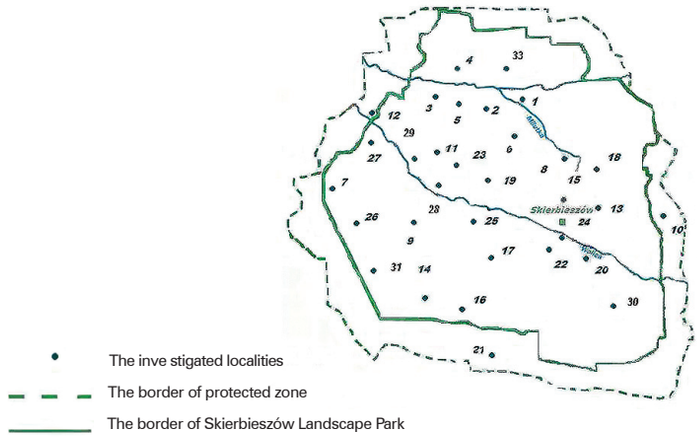

Fig. 2. 1. The list of the investigated localites:
1 – Krasniczyn, 2 – Majdan Surhowski, 3 – Surhów, 4 – Łukaszówka, 5 – Franciszków, 6 – Anielpol, 7 – Zalesie, 8 – Drewniki, 9 – Majdan Sitaniecki, 10 – Osiczyna, 11 – Orłów Murowany, 12 – Wólka Orłowska, 13 – Nowa Lipina, 14 – Chomęciska Małe, 15 – Kolonia Zrąb, 16 – Borowina Starozamojska, 17 – Pańska Dolina, 18 – Podwysokie, 19 – Sulmice, 20 – Szorcówka, 21 – Udrycze, 22 – Suchodębie, 23 – Kryniczki, 24 – Skierbieszów, 25 – Kalinówka, 26 – Krasne, 27 – Orłów Drewniany, 28 – Zabytów, 29 – Stryjów, 30 – Cieszyn, 31 – Wierzba, 32 – Stara Wieś, 33 – Czajki.

Table 1
Floristic diversity and species richness in cereal communities in Skierbieszów Landscape Park.

Alliance	*Aperion*		*spicae – venti*				*Caucalidion lappulae*	
Association	*Vicietum tetraspermae typicum*		*V.t. typicum variant with Apera spica-venti*		*Consolido-Brometum*		*Avena fatua*	
Number of records	18		13		10		10	
Number of species	82		71		85		66	
Mean number of species in one record	22.9		19.8		25.9		18.8	
Soil unit	1,2,3 Bwl*		2,3 Bwl		3R		3Bwl, 3R	
Soil pH	5.5		5.4		6.8		5.9	
Constancy S, Density of coverage – D	S	D	S	D	S	D	S	D
Ch. Aperion spicae-venti								
Apera spica-venti	V	1368	V	3750	IV	1170	III	195
Vicia hirsuta	IV	419	III	131	IV	295	III	235
Consolida regalis	II	37	II	19	V	1020	II	10
Vicia tetrasperma	IV	253	III	58	III	17		
Bromus secalinus	II	161	II	15	I	10		
Seleranthus annuus	II	136	I	5				
Veronica hederifolia					II	15		
Ch. D. Caucalidion lappulae								
Avena fatua					I	6	V	1975
Melandrium noctiflorum					II	16	I	5
Euphorbia exigua					II	6	I	5
Aethusa cynapium					I	6		
Ch.Centauretalia cyani								
Centaurea cyanus	IV	347	IV	462	II	15	V	85
Vicia sativa	IV	58	II	15	III	66	II	10
Papaver rhoeas	II	217	II	300	V	305	II	10
Anthemis arvensis	II	11	II	300	II	60	I	5
Vicia villosa	IV	131	II	18	III	62		
Ch. Polygono-Chenopodietalia								
Setaria pumila	III	219	III	158	II	190	V	1280
Echinochloa crus-galli	III	20	I	173	I	6	III	30
Setaria viridis	I	103	I	8	I	6	II	15
Veronica persica	II	11	II	12	II	15	III	20
Polygonum aviculare	II	17	I	5	II	11	I	5
Capsella bursa-pastoris	II	111	I	8	I	6	II	10
Galinsoga parviflora	I	30	I	8	II	15		
Sonchus arvensis	II	11	I	139	I	180		

cd. Table 1

Alliance	*Aperion*		*spicae – venti*				*Caucalidion lappulae*	
Association	*Vicietum tetraspermae typicum*		*V.t. typicum variant with Apera spica-venti*		*Consolido-Brometum*		*Avena fatua*	
Sonchus asper			II	19	I	6		
Ch.Stelarietea mediae								
Matricaria maritima ssp. inodora	V	1319	IV	369	III	30	III	235
Myosotis arvensis	IV	183	IV	627	IV	225	III	25
Fallopia convolvulus	II	16	III	158	III	30	III	285
Viola arvensis	IV	64	IV	69	III	30	III	25
Stellaria media	II	19	II	19	III	25	II	230
Galeopsis tetrahit	II	16	II	15	I	55	II	10
Anagallis arvensis	III	25	II	19	IV	85	III	65
Lapsana communis	I	5	II	19	I	16		
Sinapis arvensis	II	14			I	5	II	15
Veronica arvensis	II	14	II	12			I	5
Sonchus asper	II	11					II	15
Other								
Equisetum arvense	IV	219	IV	269	II	11	II	10
Cirsium arvense	III	47	III	62	IV	205	III	60
Convolvulus arvensis	II	67	II	219	IV	455	III	480
Agropyron repens	II	319	III	58	II	60	I	5
Chenopodium album	I	8	I	8	II	60	III	190
Polygonum persicaria	I	5	I	138	I	10	II	10
Stachys palustris	II	14	II	308	II	20	I	50
Arenaria serpyllifolia	I	3	I	5	III	25	I	5
Galium aparine	IV	150	III	23	IV	255	II	250
Taraxacum officinale	IV	272	II	185	IV	125	II	15
Artemisia vulgaris	III	50	I	42	III	25	II	10
Medicago lupulina	I	3	I	8	III	25	I	15
Plantago pauciflora	II	19	III	308	II	15	II	10
Daucus carota	I	8			III	25	II	10
Conyza canadensis	III	22	II	46	I	10		
Achillea millefolium	II	39	III	23	III	25		
Gnaphalium uliginosum	II	11	II	12				
Agrostis stolonifera	I	103	II	142			II	189
Gypsophila muralis	II	14	II	19			II	10
Campanula rapunculoides					II	15		

Explanation:* Bwl-brown soil formed from loess, R – rendzinas, 1– very good wheat complex, 2 – good wheat complex, 3 – defective wheat complex, Ch – characteristic species.

least once constancy II in one community. Soil samples were collected from the patches of plant communities in order to determine the pH of the surface layer of the soil. The results of this analysis were put in the headings of the tables (Tabs 1, 2). The investigated areas are shown in Fig. 2.

Characterisation of the investigated area

The Skierbieszów Landscape Park is located in the Lublin province and occupies the eastern part of the province, called Wierzchowina Grabowiecka or 'działy Grabowieckie', which apart from Roztocze belongs to the most interesting subregions of Eastern Poland, as far as nature and landscapes are concerned. The park was set up in 1995 and includes the whole area of Skierbieszów commune and parts of the following communes: Stary Zamość, Izbica, Sitno, Grabowiec, Miączyn, Kraśniczyn, and Krasnystaw, with a total area of 35 488 ha, including the protected zone 47 967 ha (Fijałkowski, 1996). According to geobotanical division of the Lublin region, the area of the Skierbieszów Landscape Park belongs to the Lowland-Highland Province, Central European, Baltic Division, Central Highlands Division, Land: Lublin Highland (Szafer, 1959).

The areas surrounding Skierbieszów are known in geobotanical literature for beech forests on the north-east boundaries (Fijałkowski and Adamczyk, 1990). Another characteristic feature of the area is the occurrence of swards and xerothermal thickets. The arable sites of the park consisted of 145 weed species, including 40 protected species. The main branch of human activity in the investigated area is agriculture. Therefore, arable lands account for the greatest part of the Park and its protected zone. Arable lands cover almost 80% of the area (Census of Agriculture 2003) and can be found mainly in the following communes: Grabowiec, Sitno, Miączyn, whereas in the communes: Stary Zamość, Skierbieszów, Izbica, arable lands cover a smaller part of the area. The greatest area in the structure of arable lands is covered with arable soils. There are small areas of meadows and pastures. The high quality of the area for agricultural production in the landscape park (Fijałkowski, 1990) provides great opportunities to cultivate high demand crops, such as wheat and root crops; the former takes up 66% of the cultivated area; potatoes and beet cover slightly smaller areas (Census of Agriculture 2003).

RESULTS AND DISCUSSION

In the area of the Skierbieszów Landscape Park and its protected zone, three communities of cereal crops and two communities of root crops were distinguished. The community *Vicietum tetraspermae* is the most common in the investigated area. It occurred on loess soils that belong to good wheat and defective wheat complex. The pH of the surface layer of the soil ranged from pH 4.1 to 7.0 (Tab. 1). The reaction of most of the analysed soil samples was acidic or slightly acidic (Obojski and Strączyński, 1995).

Vicia tetrasperma occurred most frequently in the community, another species – Bromus secalinus – was found very rarely (Tab. 1).

The *Vicietum tetraspermae typicum* community developed mainly in winter wheat, less frequently in rye canopy. The community consisted of 82 weed species. An average of 22.9 taxons was noted in one record. Much greater floristic richness was found in an analogical community in the protected zone of Roztocze National Park (Ziemińska-Smyk, 2006), where about 30 species were noted in one record. The same community that was distinguished by Skrzyczyńska in the area of 'Wysoczyzna Kaluszyńska' consisted of a smaller number of species (Skrzyczyńska and Skrajna 2004), with an average of 18 species in one record.

The analyzed community was found in the following places: Skierbieszów, Wólka Orłowska, Majdan Sitaniecki, Udrycze, Krasne, Osiczyna, Majdan Żukowski, Sulmice, Franciszków. *Apera spica-venti* from the group *Aperion spicae-venti* occurred most commonly there. Other weeds of this group *(Vicia hirsuta, Vicia sativa, and Scleranthus annuus*) were found rather frequently (Tab. 1). Centaurea cyanus occurred most commonly in the suborder *Centauretalia* cyani. There were also many weeds of the *Stellarietea* order (*Matricaria maritima, Myosottis arvensis, Viola arvensis and Anagallis arvensis*).

The *Vicietum tetraspermae typicum* community frequently occurs in the Lublin region (Fijałkowski, 1996; Kucharczyk, 1999; Ziemińska-Smyk, 2006), and in the whole country (Anioł-Kwiatkowska, 1990; Skrzyczyńska, 1994). It is replaced with the community Echinochloo-Setarietum in root crops (Anioł-Kwiatkowska, 1990; Kucharczyk, 1999).

Within the typical *Vicia tetrasperma* community, a variant was separated that occurred very frequently – *Apera spica-venti,* which developed in environments similar to a typical community. However, this community was very poor floristically because on the average 19.8 taxons were observed. It occurred most frequently in Majdan Skierbieszowski, Drewniki, Osiczyna, Udrycze, Pańska Dolina, Nowa Lipina and Drewniki. The species characteristic for the community had low cover coefficients and degrees of constancy (Tab. 1). The physiognomy of the community was mainly built by *Apera spica-venti,* with the cover coefficient of over 3800. Other perennial species that

Table 2
Floristic diversity and species richness in root-crops communities in Skierbieszów Landscape Park.

Alliance	*Panico-Setarion*				*Polygono-Chenopodion*	
Association	*Echinochloo-Setarietum typicum*		*Echinochloo-Setarietum typicum variant with Galinsoga parviflora*		*Lamio-Veronicetum politae typicum*	
Number of records	9		7		5	
Number of species	65		49		50	
Mean number in one record	22.4		18.6		25.3	
Soil unit	2.3 Bw l		2.3 Bw l		3 R	
Soil pH	5.4		5.6		6.8	
Constancy – S, Density of coverage D	S	D	S	D	S	D
Ch.D Panico-Setarion						
Setaria pumila	V	508	V	28	III	40
Echinochloa crus galli	V	1079	V	1228		
Spergula arvensis	II	11				
Scleranthus annuus	II	11				
Ch. D. Polygono-Chenopodion						
Galinsoga parviflora	II	11	V	2250	V	50
Sonchus asper	III	211	III	29	III	37
Veronica persica	II	11	III	21	III	462
Lamium amplexicaule	I	5	II	14	III	27
Veronica polita					V	600
Euphorbia helioscopia					I	12
Ch. Polygono-Chenopodietalia						
Chenopodium album	V	333	V	1121	V	812
Stellaria media	III	29	IV	639	II	25
Polygonum lapathifolium ssp.pallidum	III	11	I	7	II	25
Solanum nigrum					II	140
Ch. Centauretalia cyani						
Anthemis arvensis	IV	39	II	14	II	25
Centaurea cyanus	IV	33	I	7	II	15
Vicia hirsuta	II	11	II	14	I	12
Vicia sativa	II	17				
Papaver rhoeas	II	17				
Vicia villosa	II	17				
Avena fatua					III	140

cd. Table 2

Alliance	*Panico-Setarion*				*Polygono-Chenopodion*	
Association	*Echinochloo-Setarietum typicum*		*Echinochloo-Setarietum typicum variant with Galinsoga parviflora*		*Lamio-Veronicetum politae typicum*	
Melandrium nociflorum					II	12
Ch.Stellarietea mediae						
Myosotis arvensis	IV	39	III	21	V	50
Fallopia convolvulus	III	22	V	43	II	137
Matricaria maritima ssp.inodora	V	944	III	21	V	560
Veronica arvensis	III	28	I	7	III	12
Galeopsis tetrahit	III	18	II	7	II	25
Sinapis arvensis	II	200	III	21	III	25
Lapsana communis					III	37
Anagallis arvensis					II	25
Viola arvensis						
Other						
Amaranthus retroflexus	II	11	III	264	I	800
Capsella bursa-pastoris	V	33	III	29	III	400
Cirsium arvense	II	527	III	557	II	570
Convolvulus arvensis	III	28	III	271	II	25
Equisetum arvense	III	128	III	86	I	12
Agropyron repens	II	11	III	336	I	140
Plantago maior	III	28	III	264	I	12
Galium aparine	III	30	III	80	II	25
Taraxacum officinale	II	17	II	7	II	25
Polygonum persicaria	III	22	III	29		
Poa annua	II	11	I	5		
Gnaphalium uliginosum	IV	22	III	507		
Gypspohila muralis	II	21	III	21		
Achillea millefolium	III	22				

occurred frequently were *Equisetum arvense, Cirsium arvense*, and *Agropyron repens.* This community was botanically similar to an impoverished community described in Wał Trzebnicki (Anioł-Kwiatkowska, 1990).

The *Consolido-Brometum* community that belongs, like *Vicietum tetraspermae*, to the *Aperion* community developed in the investigated area in rendzinas of the defective wheat complex. The pH of the surface layer of the soil was neutral – within 6.7-7.0. The community was found mainly in winter wheat canopy and was represented by 85 weed species. It was floristically rich, with an average number of 25.9 taxons in one record. The community was observed in Kryniczki, Chomęciska Małe, Borowina Starozamojska and Orłów Murowany. Among the most characteristic species, Consolida regalis was the one that was found most frequently (Tab. 1), but *Bromus secalinus* occurred very rarely. From the *Aperion* community, the following taxons were noticed: *Apera spica-venti, Vicia hirsuta*, and less frequently *V. sativa.* In the calciphilous *Caucalidion* community, attention should be paid to *Melandrium noctiflorum*, *Agrostemma githago*, *Avena fatua*, *Euphorbia exigua*, Lathyrus tuberosus, and from the remaining group – *Muscari comosum*. They belong to rare calciphilous species in segetal flora of our country (Fijałkowski, 1996; Siciński, 2001; Warcholińska, 1998). Over a dozen plants of this species were found in the area of Skierbieszów Landscape Park (fallow land and adjacent arable fields in Borowina Starozamojska).

The *Avena fatua* community infested mainly spring crops (mixture, oats, barley) in rendzina and brown loess soils with a slightly acidic soil pH (Tab. 1). This community was floristically poor, with an average of 18.8 species in one record (66 species on average). The community was observed in the following places: Orłów Murowany, Chomęciska Małe, Kryniczki, Suchodębie, Pańska Dolina. The community had features that place it between the Caucalidion and Aperion communities. This community was dominated by *Avena fatua,* from the calciphilous *Caucalidion* community, and reached high constancy (V) and the cover coefficient of about 1980. From the acidophilous *Aperion* community, *Apera spica-venti* and *Vicia hirsuta* occurred quite frequently. From the *Polygono-Chenopodietalia* suborder, *Setaria pumila* was the most common. The community with similar floristic contents, described as an impoverished community from the *Caucalidion* community, is known from a study of Wnuk et al. (1989). The association of *Avena fatua* in spring crops was described by Hołdyński (1991) in Żuławy Wiślane.

The *Echinochloo-Setarietum* community was found in similar environments as *Vicietum tetraspermae typicum*. It occurred commonly in the area where sugar beet, beetroot, and potato were cultivated. 74 species of weeds were noticed in the community, with the average of 22.4 taxons in one record. The community was found in the following places of the Park: Zabytów, Sulmice, Udrycze, Stryjów, Cieszyn, Wierzba and Majdan Sitaniecki. The most characteristic species in the community were: *Echinochloa crus-galli* and *Setaria pumila* (Tab. 2). From the *Polygono-Chenopodietali*a suborder, a very important role in crop infestation was played by *Chenopodium album*. and *Matricaria maritima ssp. indora* as well as *Myosotis arvensis* from *Stellarietea mediae*.

The *Echinochloo-Setarietum* community commonly occurs in root crops in the Lublin region (Fijałkowski, 1996; Kucharczyk, 1999; Trąba and Ziemińska, 2006) and in the whole country (Anioł-Kwiatkowska, 1990, Hołdyński, 1991, Rzymowska and Skrzyczyńska, 2007).

The variant *Echinochloo-Setraietum* with *Galinsoga parviflor*a had a high contribution of *Galinsoga parviflora* and *Echinochloa crus-galli* (Tab. 2). This variant differed from a typical community in the high contribution of species such as *Chenopodium album* and *Stellaria media* (Tab. 2). Phytocoenoses of this type were observed in Stara Wieś, Stryjów, Zabytów, and Czajki in potato and sugar beet canopy. There was significantly lower richness of species in the community than in a typical variant, in one phytosociological record 18.6 species of weeds were observed, with a total number of 49 species.

A community with similar floristic contents was observed by Towpasz and Barabasz-Krasny in the area of Czarnorzęki-Strzyżów Landscape Park (2006) and Skrzyczyńska and Marciniuk from Siedlce (2003).

The *Lamio-Veronicetum* politae community is a representative of eutrophilous alliance *Polygono-Chenopodion*. In the area of the Park it occurred mainly in rendzinas of the defective wheat complex with neutral reaction (Tab. 2). The community occupied small areas in Kryniczki, Borowina Starozamojska and Chomęciska Małe. The total number of 49 weed species was observed in the community, with the average number of species in the relevé – 25.2 taxons. A characteristic species in the community – *Veronica polita* – occurred often and grew thickly (V degree of constancy); the second taxon – *Lamium amplexicaule* – was more rarely encountered. In the community, numerous rare calciphilous species were observed such as: *Euphorbia exigua*, *Aethusa cynapium, Melandrium noctiflorum*. The physiognomy of the community was determined by *Matricaria maritima ssp. indora*, *Chenopodium album*, and *Cirisium arvense*

(Tab. 2). *Lamio-Veronicetum politae* was described by Hołdyński (1991), Kucharczyk (1999) as well as Trąba and Ziemińska (1994). This community undergoes significant changes caused by anthropopression, which result in the elimination of species with narrow ecological amplitude, such as the species characteristic for this community (Fijałkowski, 1996; Siciński 2001; Warcholińska, 1998).

CONCLUSIONS

1. Three segetal communities were separated in cereal crops, in rendzinas and loess soils of the Skierbieszów Landscape Park. Two segetal communities were separated in root crops, in rendzinas and loess soils of the Skierbieszów Landscape Park.
2. *Vicietum tetrsperma typicum* was the most frequently found community in cereal crops in loess soils in the investigated area. The *Echinochloo-Setarietum* community was found in root crops on the same soils.
3. The greatest richness of species was found in *Consolido-Brometum* and *Lamio Veronicetum politae*, 25 species on the average. Both communities were abundant in rare segetal species which are considered to be endangered in our country; they were as follows: *Adonis aestivalis, Veronica polita, Thlaspi perfoliatum, Euphorbia exigua, Lathyrus tuberosus,* and *Muscari comosum.* These phytocoenoses and their habitats should be protected.

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Zbiorowiska roślinne pól uprawnych Skierbieszowskiego Parku Krajobrazowego

Streszczenie

Badania florystyczne nad zbiorowiskami segetalnymi przeprowadzono w roku 2000 na polach uprawnych Skierbieszowskiego Parku Krajobrazowego. Na polach uprawnych Skierbieszowskiego Parku Krajobrazowego wyodrębniono 3 zespoły chwastów segetalnych w zbożach i 2 zespoły upraw okopowych. Na glebach brunatnych wytworzonych z lessów w zbożach występował powszechnie zespół *Vicietum tetraspermae typicum.* W tych samych warunkach siedliskowych wyróżniono w uprawach okopowych zespół *Echinochloo-Setarietum.* Największym bogactwem gatunkowym charakteryzowały się *Consolido-Brometum* oraz *Lamio-Veronicetum politae,* liczące średnio po około 25 gatunków w jednym zdjęciu. Fitocenozy te zajmowały niewielkie powierzchnie gleb rędzinowych badanego obszaru. Obydwa zespoły obfitowały w rzadkie gatunki segetalne, uważane za zagrożone w naszym kraju takie jak: *Adonis aestivalis, Euphorbia exigua, Lathyrus tuberosus, Muscari comosum, Thlaspi perfoliatum, Veronica polita, Agrostemma githago.*