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ASSOCIATIONS AND COMMUNITIES OF CEREAL CROPS OF THE ŁUKÓW PLAIN PART I. LIGHT SOIL ASSOCIATIONS

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A b s t r a c t

The characteristics of phytocenoses developing on light soils in cereal crops of the Łuków Plain are presented in the paper. The studies were carried out between 2003 and 2006 in 182 localities. Cereal crops on light soils were frequently occupied by patches of *Arnoserido-Scleranthetum*. The association reaches the eastern limit of its geographic range in the mesoregion. The phytocenoses were noted under various moisture conditions and were the floristically poorest cereal communities in the studied area. The paper presents new data on the occurrence of *Arnoserido-Scleranthetum* on its eastern distributional limits. Quite frequently, the patches of *Vicietum tetraspermae scleranthetosum*, especially of its variant with *Juncus bufonius* and *Vicietum tetraspermae* typicum variant with *Rhinanthus serotinus*, were also frequently noted in the studied mesoregion. Small patches of *Papaveretum argemones* were recorded very seldom.

Key words: segetal vegetation, cereal communities, *Arnoserido-Scleranthetum*, *Papaveretum argemones*, *Vicietum tetraspermae*

INTRODUCTION

The floristic composition of segetal communities is evidently formed under the influence of numerous biotic and anthropogenic factors. The most important are these related to habitat characteristic, e.g. soil type, its reaction, and content of nutrient elements. These factors can be considerably modified by the intensity of applied agricultural technology, especially by widespread application of herbicides and nitrogen fertilizers. The use of certified seed material and new, more fertile cereal varieties, forming dense crop stands, also visibly affect the physiognomy of these communities.

The Łuków Plain is an interesting mesoregion, because in its area Atlantic species reach their eastern geographic range.

The aim of the work was to make a phytosociological classification and floristic analysis of communities developing in cereal crops of the Łuków Plain.

METHODS

Field studies on segetal communities were carried out between 2003 and 2006 in 186 localities situated in the agricultural areas of the Łuków Plain. In total, 304 phytosociological relevés according to the Braun-Blaquet method were made in cereal crops. The phytosociological material was divided into three parts: material related to light soil communities, compact soil communities as well as transitional and impoverished communities. The present work was concerned with light soil associations and was based on the analysis of 90 phytosociological relevés. The results were summarized in phytosociological tables, of which only one, a summary table of the analysed communities, is included in the present paper. Moreover, the phytosociological constancy and cover-abundance index were calculated for each species. The classification of communities was based on the system presented by Matuszkiewicz (2007). The species nomenclature follows Mirek et al. (2002). The studied region is shown in Fig. 1.

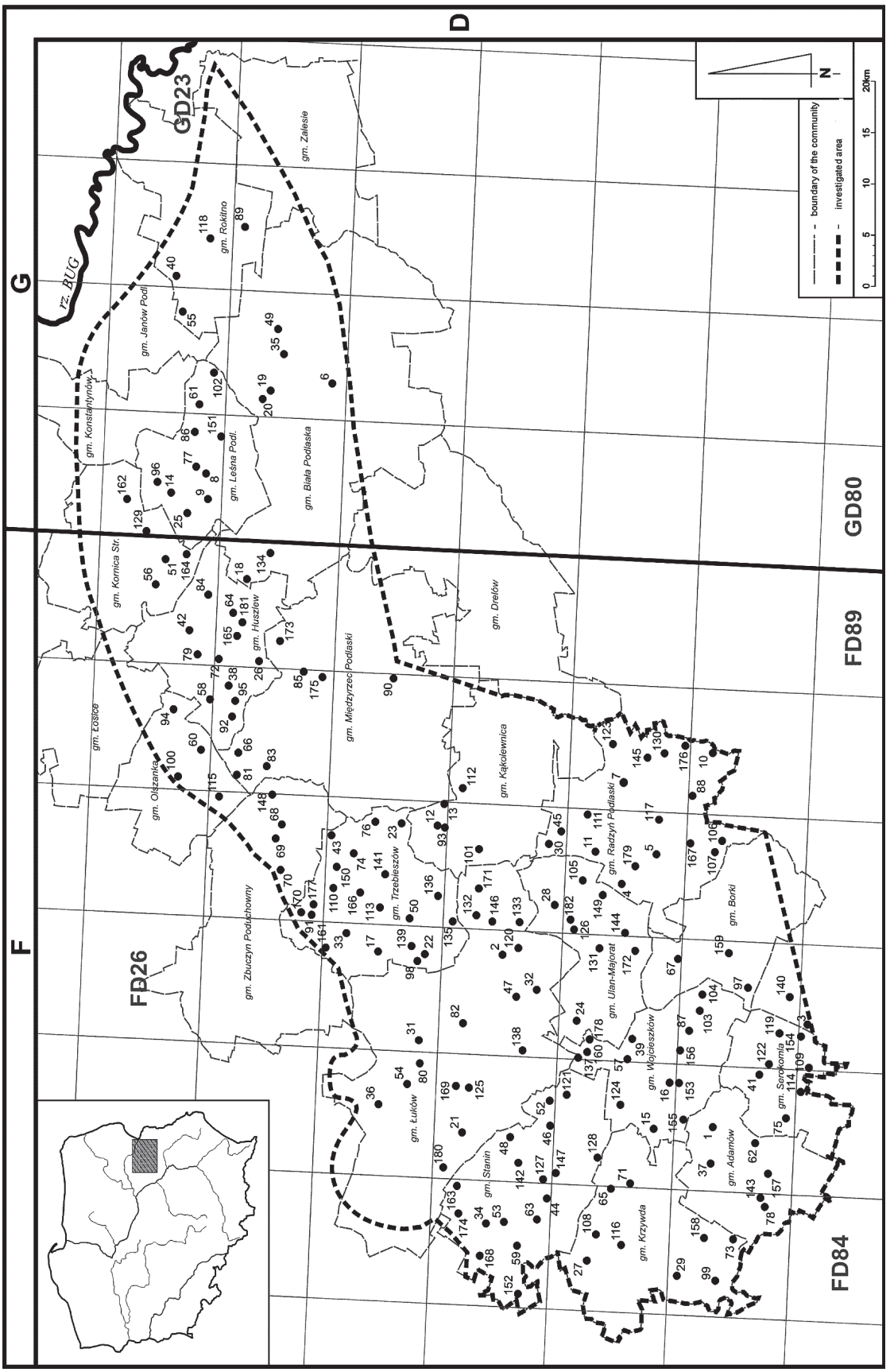

Fig. 1. Study area

List of locations:

1 – Adamów; 2 – Aleksandrów; 3 – Annopol; 4 – Bedlno; 5 – Biała; 6 – Biała Podlaska; 7 – Białka; 8 – Bordziłówka Nowa; 9 – Bordziłówka Stara; 10 – Branica Radzyńska; 11 – Brzostówiec; 12 – Brzozowica Duża; 13 – Brzozowica Mała; 14 – Bukowice; 15 – Burzec; 16 – Bystrzyca; 17 – Celiny; 18 – Celujki; 19 – Cicibór Duży; 20 – Cicibór Mały; 21 – Dąbie; 22 – Dębowica; 23 – Dębowierzchy; 24 – Domaszewnica; 25 – Droblin; 26 – Dziadkowskie; 27 – Fiukówka; 28 – Gąsiory; 29 – Gąszcze; 30 – Główne; 31 – Gołaszyn; 32 – Gołąbki; 33 – Gołowierzchy; 34 – Gózd; 35 – Grabanów; 36 – Gręzówka; 37 – Gułów; 38 – Harachwosty; 39 – Hermanów; 40 – Hołodnica; 41 – Hordzieżka; 42 – Huszlew; 43 – Jakusze; 44 – Jarczówek; 45 – Jaski; 46 – Jeleniec; 47 – Jeziory; 48 – Józefów; 49 – Julków; 50 – Karwów; 51 – Kiełbaski; 52- Kierzków; 53 – Kij; 54 – Klimki; 55 – Klonowica Duża; 56 – Kobylany; 57 – Kolonia Bystrzycka; 58 – Kopce; 59 – Kopina; 60 – Korczówka; 61 – Korczyska; 62 – Korzonatka; 63 – Kosuty; 64 – Kownaty; 65 – Kożuchówka; 66 – Kożuszki; 67 – Krasew; 68 – Krzesk Królowa Niwa; 69 – Krzesk Majątek; 70 – Krzesk Stary; 71 – Krzywda; 72 – Krzywośnity; 73 – Kubylczyk; 74 – Kurów; 75 – Leonardów; 76 – Leszczanka; 77 – Leśna Podlaska; 78 – Lipiny; 79 – Liwki; 80 – Ławki; 81 – Łuby; 82 – Łuków; 83 – Łuniew; 84 – Makarówka; 85 – Manie; 86 – Mariampol; 87 – Marianów; 88 – Marynin; 89 – Michałki; 90 – Międzyrzec Podlaski; 91 – Mikłusy; 92 – Mostów; 93 – Mościska; 94 – Mszanna; 95 – Nieznanki; 96 – Nosów; 97 – Nowiny; 98 – Nurzyna; 99 – Okrzeja; 100 – Olszanka; 101 – Olszewnica; 102 – Ossówka; 103 – Oszczepalin I; 104 – Oszczepalin II; 105 – Paskudy; 106 – Paszki Duże; 107 – Paszki Małe; 108 – Patok; 109 – Pieńki; 110 – Płudy (gm. Trzebieszów); 111 – Płudy (gm. Radzyń Podlaski); 112 – Polskowola; 113 – Popławy; 114 – Poznań; 115 – Próchenki; 116 – Radoryż Kościelny; 117 – Radzyń Podlaski; 118 – Rokitno; 119 – Ruda; 120 – Rzymy Las; 121 – Sarnów; 122 – Serokomla; 123 – Siedlanów; 124 – Siedliska; 125 – Sięciaszka; 126 – Skrzyszew; 127 – Stanin; 128 – Stara Gąska; 129 – Stara Kornica; 130 – Stasinów; 131 – Stok; 132 – Strzyżew; 133 – Sochocin; 134 – Swory; 135 – Szaniawy-Matysy; 136 – Szaniawy-Poniaty; 137 – Świderki; 138 – Świdry; 139 – Świerszcze; 140 – Talczyn; 141 – Trzebieszów; 142 – Tuchowicz; 143 – Turzystwo Drugie; 144 – Ulan Majorat; 145 – Ustrzesz; 146 – Wagram; 147 – Wesółka (gm. Stanin); 148 – Wesółka (gm. Zbuczyn); 149 – Wierzchowiny; 150 – Wierzejki; 151 – Witulin; 152 – Wnętrze; 153 – Wojcieszków; 154 – Wola Bukowska; 155 – Wola Burzecka; 156 – Wola Bystrzycka; 157 – Wola Gułowska; 158 – Wola Okrzejska; 159 – Wola Ossowińska; 160 – Wólka Domaszewska; 161 – Wólka Konopna; 162 – Wólka Nosowska; 163 – Wólka Zastawska; 164 – Wygnanki; 165 – Wygoda; 166 – Wylany; 167 – Zabiele; 168 – Zagóździe; 169 – Zalesie; 170 – Zaolszynie; 171 – Zarzecz Łukowski; 172 – Zarzecz Ulański; 173 – Zasiadki; 174 – Zastawie; 175 – Zaścianki; 176 – Zbulitów; 177 – Zembry; 178 – Zofibór; 179 – Żabików; 180 – Żdżary; 181 – Żurawlówka; 182 – Żyłki.

RESULTS AND DISCUSSION

Systematics of distinguished cereal associations

Class: *Stellarietea mediae* Tx., Lohm. et Prsg. 1950
Order: *Centauretalia cyani* R. Tx. 1950
Alliance: *Aperion spicae-venti* R. Tx. et J. Tx. 1960

1. Association: *Arnoserido-Scleranthetum* (Edouard 1925) R. Tx. 1937
   – typical variant
   – variant with *Polygonum hydropiper*
2. Association: *Papaveretum argemones* (Libb. 1032) Krusem. et Vlieg. 1939
3. Association: *Vicietum tetraspermae* (Krusem. et Vlieg. 1939) Kornaś 1950
   a. Subassociation: *Vicietum tetraspermae scleranthetosum*
      – typical variant
      – variant with *Juncus bufonius*
   b. Subassociation: *Vicietum tetraspermae typicum*
      – variant with *Rhinanthus serotinus*

Characteristics of distinguished associations

Arnoserido-Scleranthetum (Chouard 1925) Tx. 1937

Patches of *Arnoserido-Scleranthetum* were frequently found in the area of the Łuków Plain. They occupy large areas, especially in the south-western and western part of the mesoregion; this is a result of the Sub-Atlantic character of the community (Fijałkowski, 1991; Warcholińska, 1995). In the eastern part of the mesoregion (the eastern limit of its geographic range), patches of *Arnoserido-Scleranthetum* were observed quite rarely. Very seldom was the association noted in the area of the Podlaski Przełom Bugu mesoregion, bordering on the Łuków Plain (Skrzyczyńska and Rzymowska, 2005). In north-eastern Poland, the community has been observed in the regions of Pojezierze Iławskie and Pojezierze Olsztyńskie (Polakowski et al. 1989; Błocki, 2001). It has never been noted in the Polesie region (Fijałkowski et al. 2002).

The phytocenoses of *Arnoserido-Scleranthetum* develop in rye fields on light, acidic in reaction, pseudo-podzolic, brown leached and boggy soils, included in weak and very weak rye and weak cereal-fodder complexes (Table 1). Due to high floristic differentiation of the association (the effect of diverse moisture conditions), the typical and wet variants of the association were distinguished. Floristic differentiation of *Arnoserido-Scleranthetum* is rarely observed in Poland (Warcholińska, 1995). It has been reported by the following authors: Warcholińska (1997), Sobisz (2000), Ratuszniak and Sobisz (1999). A low degree cover-abundance of *Arnoseris minima* and *Scleranthus annuus* (species characteristic for the association) was observed in patches of the variant with *Polygonum hydropiper*. *Apera spica-venti* was noted more frequently and more abundantly. The

occurrence of a numerous group of hygrophilous species, e.g. *Polygonum hydropiper, Gnaphalium uliginosum, Mentha arvensis,* and *Spergularia rubra*, was also noted; however, their degree of cover was low. Differential species, e.g. *Veronica dillenii, Anthoxanthum aristatum, Teesdalea nudicaulis, Spergula morisonii* and *Holcus mollis,* were seldom recorded in the analyzed plots. Only an occasional occurrence of these Sub-Atlantic species can be a result of the process of impoverishment of the patches of the association, which was described by Bielska (1989) and Błocki (2001).

The occurrence of patches of the association with dominance of *Anthoxanthum aristatum* is especially noteworthy. That expansive plant is considered rare in the study area, however strongly degenerated patches of *Arnoserido-Scleranthetum* with mass occurrence of this species were observed. They were distinguishable by species poverty and low cover degree as well as vitality of other plants. Data on dominance of *Anthoxanthum aristatum* in field associations and on transformation of communities under the influence of the weed plant have also reported from the adjacent areas by Skrzyczyńska et al. (2004) and Skrzyczyńska et al. (2010). Similar observations from other regions of Poland have been published by Szmeja (1994, 1996), Warcholińska (1997), Błocki (2001), and Kozak (2002).

The analyzed association was the floristically poorest cereal phytocenosis in the Łuków Plain mesoregion. On average, 11 species were noted in one relevé in typical patches and 17 in patches with *Polygonum hydropiper*. In total, the occurrence of as much as 89 species was observed in 47 patches of the association, 55 in typical patches and 68 in patches with *Polygonum hydropiper*. A large number of species noted in the community is a result of the frequent occurrence of the association in the studied area (a large number of relevés) and the occurrence of numerous apophytes coming from adjacent psammophilous grasslands.

Papaveretum argemones (Libb. 1932) Krus. et Vlieg. 1939

It is a very rare association in cereal crops of the Łuków Plain mesoregion. Small areas of phytocenoses (8 patches) were observed exclusively on field margins (Table 1). The process of withdrawal of characteristic species from crop field margins and roadsides under the influence of anthropopressure seems to be observed. Dense stands of intensive crops limit their occurrence due to the worsening of light and thermal conditions. This rare association, similarly like in the Lublin Upland (Fijałkowski, 1991), develops on sandy pseudo-podzolic soils of slightly acidic and acidic reaction included in the weak rye complex. Only 52 species were noted on these soils, on average 17 species in one relevé. Apart from *Papaver argemone* and early spring differential species (*Arabidopsis thaliana* and *Veronica triphyllos*), such plants as *Erophila verna*, *Myosotis stricta,* and *Arenaria serpyllifolia* were also frequently noted (Table 1). A large proportion of acidophilus species, e.g. *Scleranthus annuus, Anthemis arvensis*, was also observed. Moreover, a few species characteristic for higher syntaxonomic units, e.g. *Apera spica-venti* and *Centaurea cyanus*, were noted with high cover. The phytocenoses of *Papaveretum argemones* were more frequently recorded in the adjacent mesoregions of the South Podlasie Lowland (Skrzyczyńska, 1994; Skrzyczyńska and Skrajna, 2004; Skrzyczyńska and Rzymowska, 2005). This association is common in the Wielkopolska region (Jackowiak et al. 1994) as well as in southern (Anioł-Kwiatkowska, 1990; Kozak, 2002; Węgrzynek, 2003) and central Poland (Warcholińska, 1974, 1997, 1998).

Vicietum tetraspermae Krus. et Vlieg 1939

Vicietum tetraspermae is the most common association in the studied area, similarly like in the other mesoregions of the South Podlasie Lowland (Skrzyczyńska, 1994; Skrzyczyńska and Skrajna, 2004; Skrzyczyńska and Rzymowska, 2005) and in whole Poland (Wójcik, 1965; Siciński, 1974, 2003; Warcholińska, 1974, 1997, 1999; Kozak, 2002; Węgrzynek, 2003). It is also the most internally differentiated cereal phytocenosis in the area of the Łuków Plain. The identified subassociations and variants reflect the mosaic of trophy-moisture conditions of the studied area and the level of agriculture.

Patches of *Vicietum teraspermae scleranthetosum* and the *typicum* variant with *Rhinanthus serotinus* developed on light soils (Table 1). *Vicietum tetraspermae scleranthetosum* was diversified internally as a result of different moisture condition of habitats. Two variants: the wet variant with *Juncus bufonius* and the typical one were distinguished. The wet variant developed on various soil types, usually on sandy soils, formed on clayey sand and light clay, included in cereal-fodder and good rye complexes. Typical patches were noted on pseudo-podzolic and brown leached soils of weak and good rye complexes. *Vicia tetrasperma* and other species distinguishing the association and subassociation reached a higher cover degree in the typical variant than in the patches with the participation of hygrophilous species (wet variant) *Bromus scalinus* was observed sporadically in both communities, however it reached a higher cover in the patches with *Juncus bufonius*. The largest proportions of *Juncus bufonius, Gnaphalium uliginosum, Polygonum hydropiper, Potentilla anserine,* and *Spergularia rubra* were noted among hygrophilous species. Patches with *Juncus*

bufonius were dominated by *Apera spica-venti*, typical patches – by *Vicia hirsuta*. In the analyzed subassociation, the occurrence of 92 species in total was noted, of which 48 in typical patches and 78 in wet ones. The number of species was respectively 14 (from 10 to 20) and 22 (from 17 to 29).

The *Vicietum tetraspermae typicum* variant with *Rhinanthus serotinus* was observed on various soil types included in good rye and week cereal--fodder complexes. These species-poor phytocenoses were dominated by *Rhinanthus serotinus* (Table 1). In total, 62 species were noted in them, on average 21 species in one relevé. *Vicia tetrasperma* and other species characteristic and differential for the association were frequently observed. *Bromus secalinus* was most frequently observed on light soils, however it never reached a high cover degree there. Among species characteristic for *Aperion spicae-venti* and *Centauretalia cyani*, a large share of *Apera spica-venti* was noted. Acidophilus species were noted seldom and not abundantly. On the other hand, hygrophilous species, e.g. *Juncus bufonius, Gnaphalium uliginosum, Polygonum hydropiper, Polygonum amphibium,* and *Sagina procumbens,* were noted frequently and with a large cover. The occurrence of similar phytocenoses of *Vicietum tetraspermae* has been reported by S k r z y c z y ń s k a and S k r a j n a (2004) from the Kałuszyńska Upland, by S k r a j n a et al. (2009) from the Mazowiecki Landscape Park, and by W ó j c i k (1965) from the Mazowsze region.

Table 1.
Cereal communities of light soils of the Łuków Plain

Association	***Arnoserido -Sclerathetum***		***Papaveretum argemones***		***Vicietum tetrasperme***		
Subassociation	typicum		typicum		scleranthetosum		typicum
Variant	typical	with *Polygonum hydropiper*	typical	typical	typical	with *Juncus bufonius*	with *Rhinanthus serotinus*
Number of relevés	35	12	8	10	10	15	10
Soil unit	7, 6	6, 9	6	6, 5	6, 5	5, 9, 8	5, 9
	A, Bw, M	A, Bw	A, Bw	A, Bw	A, Bw	A, Bw, M, Dz	A, Bw, Dz
	pl; ps.pl; ps:pl; ps; pgl.pl; pgl:ps	ps.pl; ps; pgl.pl; pgl:pl; pglp. pl; pgl.ps	ps:pl; ps; pgl:pl; pglp:ps; gl.ps	ps; pgl:ps; pgl.ps:gl; pgl; pgl:gl	ps; pgl:ps; pgl.ps:gl; pgl; pgl:gl	ps; pgl.pl; pgl.ps:gl; pgl:gl; pgl; płz:ps; pgm.gl	ps:pl; pgl. pl; pgl.ps:pl; pglp:pl
Range of number of species in relevés	7 - 17	8 - 25	13 - 23	10 - 20	10 - 20	17 - 29	10 - 27
Mean number of species in relevé	11	17	17	14	14	22	21
Number of columns	1	2	3	4	4	5	6
	S W	S W	S	W	S W	S W	S W
I. Ch. D. Arnoserido-Scleranthetum							
Arnoseris minima	V 600	V 404				I 33	
Veronica dillenii	I 3	I 8	III	100	I 10		
Anthoxanthum aristatum	I 196	I 8					
II. Ch. D. Papaveretum argemones							
Papaver argemone			V	250			
Arabidopsis thaliana			V	250		I 40	
Erophila verna	I 3		IV	175	I 10		
Myosotis stricta	I 3		IV	319			
Papaver dubium			II	87			
Veronica triphyllos			II	25			

III.Ch.D. Vicietum tetraspermae												
Vicia tetrasperma	I	0					V	590	V	343	V	425
Vicia villosa	I	17	I	50	II	37	IV	640	III	127	III	170
Bromus secalinus							I	10	I	130	III	50
Polygonum lapathifolium subsp. pallidum									I	13	II	70
IV. D. Vt scleranthetosum												
Scleranthus annuus	V	754	V	321	IV	781	V	960	V	507	I	10
Anthemis arvensis	IV	331	III	125	V	137	V	920	IV	587	II	30
V. var. z Rhinanthus serotinus												
Rhinanthus serotinus	I	46					I	60			V	1225
VI. D. form with hygrophilous species												
Polygonum hydropiper			V	150					III	327	IV	230
Gnaphalium uliginosum	I	3	IV	67					IV	147	IV	395
Juncus bufonius			II	100	I	12			IV	537	IV	810
Spergularia rubra			III	83					II	120	I	20
Mentha arvensis			III	221					II	40	I	20
Polygonum amphibium									I	40	III	90
Gypsophila muralis			I	50	I	12	I	10	II	93		
Hypericum humifusum			II	125					I	33		
Equisetum sylvaticum			II	25								
Sagina procumbens			I	17					I	40	II	245
Bidens tripartita			I	8					I	7	II	40
Stachys palustris			I	17							II	30
Potentilla anserina									II	190	I	60
Plantago intermedia									II	67		
VII. Ch. Aperion spicae-venti, Centaureatalia cyani												
Apera spica-venti	IV	184	V	479	IV	781	III	420	V	1113	IV	685
Centaurea cyanus	III	57	III	42	V	350	V	290	III	357	III	50
Vicia angustifolia	II	29	II	33	I	62	III	60	IV	73	II	80
Vicia hirsuta	I	3	I	17	II	75	IV	1005	III	330	II	70
Matricaria maritima subsp.inodora	I	6					II	70	I	40	I	10
VIII. Ch. Stellarietea mediae												
Conyza canadensis	III	141	II	58	V	187	III	90	II	53	III	50
Spergula arvensis	III	147	V	200	I	12	I	10	II	33	II	30
Viola arvensis	IV	74	II	33	III	50	IV	160	III	80	II	40
Chenopodium album	I	11	III	50	I	12	I	10	II	40	III	50
Fallopia convolvulus	I	14	I	8	II	25	II	40	II	27	IV	70
Polygonum aviculare	I	6	II	17					III	47	II	30
Galeopsis tetrahit			III	42			I	10	II	27	II	30
Myosotis arvensis	I	6	I	8	II	37	II	70	II	60	III	100
Stellaria media							I	10	II	60	III	140
Raphanus raphanistrum	I	11	II	33	II	25			I	2	I	20
Setaria pumila	I	14	II	67	I	12	I	10	I	7		
Capsella bursa-pastoris					I	12	I	10			II	30
Geranium pusillum					I	12					II	30

IX. Accompanying species												
Rumex acetosella	V	430	V	396	II	75	IV	140	IV	367	III	60
Equisetum arvense	II	29	II	67	III	100	I	20	IV	153	II	30
Arenaria serpyllifolia	I	6			IV	481	I	10			I	20
Convolvulus arvensis	II	73	II	25			III	60	II	150	I	10
Agropyron repens	I	11	III	42	I	12	I	10	II	33	I	10
Veronica arvensis	I	17	I	8	I	12	II	30	II	40	III	50
Cirsium arvense			I	8					II	60	II	40
Trifolium arvense					II	494	II	20	I	7		
Achillea millefolium			II	33	I	0	I	10	I	13	II	30
Erodium cicutarium	I	6	I	8	II	37	I	10	I	20		
Berteroa incana	I	3			II	0	I	0				
Agrostis stolonifera	I	26	I	42	I	12			II	53	I	10
Artemisia vulgaris	I	9			I	12	I	10	II	20	I	10
Polygonum persicaria	I	11	I	8					I	13	II	30
Cerastium holosteoides			I	8	I	12	I	20	I	20	II	40
Poa annua			I	8					II	53	I	10
Trifolium repens			I	8					I	13	II	80
Artemisia campestris	I	3					II	10				

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Zespoły i zbiorowiska upraw zbożowych Równiny Łukowskiej
Cz. I. Zespoły gleb lekkich

Streszczenie

Praca przedstawia charakterystykę zbiorowisk chwastów wykształcających się w uprawach zbożowych na glebach lekkich Równiny Łukowskiej. Badania prowadzono w latach 2003-2006 na terenie 182 miejscowości. Na glebach lekkich badanego terenu najczęściej notowano płaty *Arnoserido-Scleranthetum*, zespołu osiągającego na badanym terenie wschodnią granicę zasięgu występowania. Fitocenozy takie wykształcały się w różnych warunkach uwilgotnienia i były najuboższymi florystycznie zbiorowiskami zbożowymi analizowanego terenu. Prezentowana praca poszerza wiedzę nad występowaniem *Arnoserido-Scleranthetum* na wschodnich krańcach jego zasięgu. Dość często na badanym terenie spotykano też płaty *Vicietum tetraspermae scleranthetosum* zwłaszcza wariantu z *Juncus bufonius* oraz *Vicietum tetraspermae* typicum wariantu z *Rhinanthus serotinus*, które też wykształcały się w warunkach nadmiernego uwilgotnienia. Natomiast bardzo rzadko i na niewielkich powierzchniach notowano płaty *Papaveretum argemones*.