A. CWENER[1], P. CHMIELEWSKI[2]
[1]Institute of Biology, Maria Curie-Skłodowska University
19 Akademicka Str., 20-033 Lublin, Poland
acwener@wp.pl
[2]Zamość Natural Society
74/59 Partyzantów Str., 22-400 Zamość, Poland
pchmielewski4@wp.pl

SYNATHROPIZATION OF XEROTHERMIC GRASSLANDS IN THE DZIAŁY GRABOWIECKIE (LUBLIN UPLAND, SE POLAND)

Key words: anthropophytes, xerothermic grasslands, Działy Grabowiecke (SE Poland)

Abstract. The Działy Grabowieckie region is located in the Lublin Upland (SE Poland). The occurrence of xerothermic grasslands is typical for this region. Twenty-two sites with xerothermic grasslands were investigated in 2005—2009. In the course of the study, we registered both synathropic vascular plant species, which were permanently connected with grasslands, and those aliens that present a potential threat for native species or ecosystems. The available published data was used to compare the past and present occurrence of synathropic species in xerothermic grasslands. The number of synathropic species decreased together with the cessation of use. Some archeophytes (e.g. *Onobrychis viciifolia, Pastinaca sativa, Cichorium intybus*) are at present permanently connected with xerothermic grasslands; however, kenophytes, such as *Robinia pseudoacacia, Solidago gigantea* and *S. canadensis*, pose a potential threat for xerothermic plant communities.

Introduction

The Działy Grabowieckie region is located in the Lublin Upland (SE Poland), on the migration route of steppe species from the Podole mainstay to North-East Europe. The occurrence of xerothermic grasslands is typical for this region. Thermophilous species can be found on balks, roadbanks and marginal parts of fields, but typical xerothermic plant communities occur on steep slopes with limestone outcrops. In Poland, xerothermic grasslands are represented by extrazonal fragments of steppes. They are seminatural habitats and maintain that character due to human activities. Most of them were grazed until the early 70's. At present they are not cultivated and undergo natural succession.

The aim of this work is to analyze the share of antropophytes in the xerothermic flora and to compare the past and present degree of synathropization of xerothermic grasslands of the Działy Grabowieckie region.

Materials and methods

The research was conducted in the southeastern part Poland in the Działy Grabowieckie region (Fig. 1). Twenty two sites with xerothermic grasslands were investigated

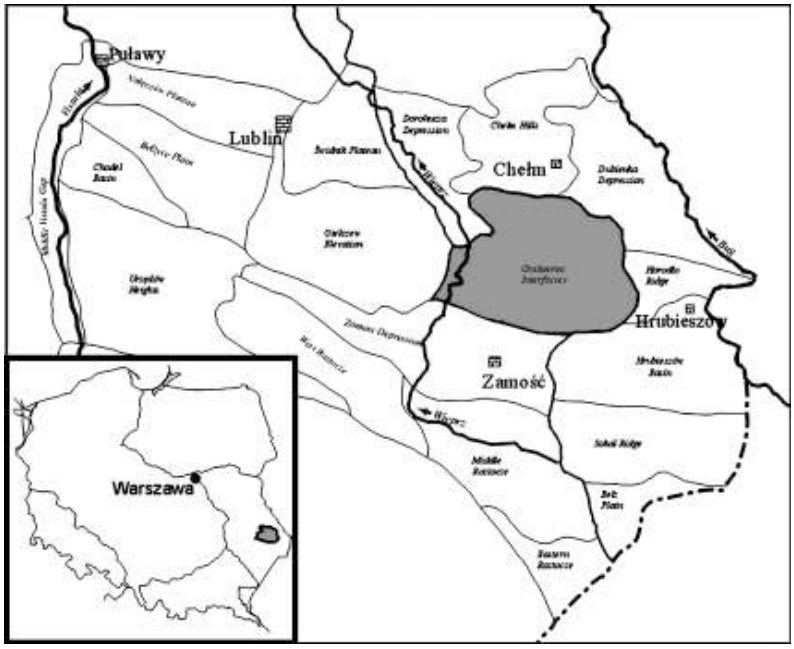

Fig. 1. Location of Działy Grabowieckie region

in 2005—2009. All slopes with xerothermic vegetation were localized in the catchment area of the Wolica River. The areas of investigated grassland plots ranged from 0.2 to 4.5 ha. At each site, all species of vascular plants were registered. In order to idenify the frequency of occurrence of taxa, the classes of frequency were determined as follows: I class – species occurring on less than 5 % of sites; II class – species occurring on 5.1–25 % of sites, III – species occurring on 25.1–50 % of sites; IV – species occurring on 50.1–75 % of sites, and V class – species occurring on more than 75.1% of the investigated sites. The contribution of species to geographical and historical groups was determined (following Kornaś, 1968). Although there is limited information on the flora of investigated sites, the historical data was taken into consideration. Most of floral data is included in enumerations of rare species in the Lublin Region (Fijałkowski, 1954, 1958, 1959, 1969, 1961, 1963, 1964a,b; Fijałkowski, Adamczyk, 1990; Fijałkowski, Izdebski, 1957). Only for one site, the Broczówka Nature Preserve, sufficiently complete historical data is available (Fijałkowski, Adamczyk, 1980). Data from literature was compared with the current one.

Results

At all sites, 380 species of vascular plant were noted totally: 34 % of them were native synanthropic species and 11 % were anthopophytes (Fig. 2). Fourteen of native synanthropic species (e.g. *Dactylis glomerata**, *Daucus carota*, *Rubus caesius*) achieved V class of frequency, while fourteen (such as *Artemisia vulgaris*, *Cirsium arvense*, *Taraxacum offici-*

* Authors of plant names at taxa are cited in Table.

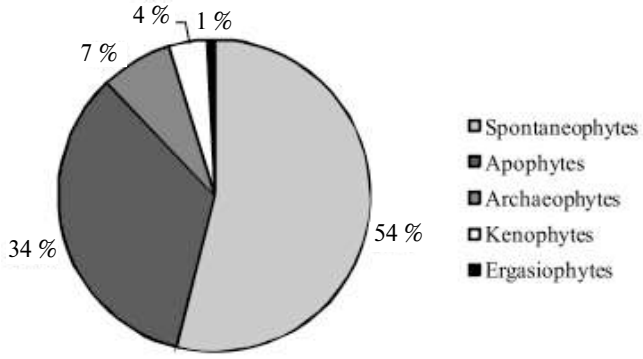

Fig. 2. Percentage of species from different historical and geographical groups of xerothermic grasslands flora in the Działy Grabowieckie region

nale) – IV class of frequency. Majority of antropophytes registered in xerothermic sites are connected with segetal (*Stellarietea mediae* class) and ruderal (*Artemisietea vulgaris* class) habitats (Table). They mostly originated from southern Europe or southwestern Asia, with only some kenophytes being of North American origin. Most of archaeophytes are annual plants (therophytes), but one third of kenophytes are megaphanerophytes (Table).

Most of antropophytes have been registered only in one site (I class of frequency); they are rather connected with cultivated sites and grow in marginal parts of grasslands. Among them there are plants escaped from cultivation (*Parthenocissus inserta*, *Rumex longifolius*) but also rare and endangered weed species, e.g. *Caucalis platycarpos* or *Thymelaea passerina*. The species classified to II class of frequency are also numerous. This group, aside from termophilous weeds (*Valerianella dentata*, *Vicia angustifolia*), include expansive kenophytes, such as: *Acer negundo*, *Robinia pseudoacacia*, *Solidago gigantea*). Two archaeophytes (*Lactuca serriola*, *Pastinaca sativa*) and two kenophytes (*Erigeron annuus*, *Onobrychis viciifolia*) are relatively frequent in warm habitats, and occur in more than 25% of investigated sites. Only one species, *Cichorium intybus*, belongs to IV class of frequency, but it mainly grows in distributed places, sporadically occurring in well-developed grasslands.

Anthropophytes that are presently frequent in xerothermic sites also usually occurred in the grasslands in the past. They are noted in relevés and mentioned in various flora notes. *Cichorium intybus*, *Pastinaca sativa* and *Onobrychis viciifolia* are mentioned more frequently. In literature from the 1950s and the 1960s there is no information on the occurrence of such expansive species as *Acer negundo* or *Robinia pseudoacacia* in xerothermic grasslands. The number of antropophytes preferring well-illuminated habitats (heliophytes and similar groups) decreases as a result of natural succession. For example, in «Broczówka» Nature Preserve, 12 antropophytes occurred (8 % of all flora): *Echinops sphaerocephalus*, *Erigeron annuus*, *E. ramosus*, *Euphorbia falcata*, *E. platyphyllos*, *Fumaria vaillantii*, *Lathyrus tuberosus*, *Lepidium perfoliatum*, *Malva alcea*, *Onobrychis viciifolia*, *Stachys annua*, *Valerianella dentata*. At present only *Echinops sphaerocephalus* remains and, together with other antropophytes (*Cichorium intybus*, *Medicago* x *varia*, *Malus* sp.), make up 2 % of all plant species occurring in the reserve (Cwener, Nowak, unpublished data).

Anthropohytes occurring in xerothermic grasslands in the Działy Grabowieckie region

Nr	Species	Familly	Life form	Syntax. affinity	Class of frequency	Geogr. and hist. group	Origine
1	*Acer negundo* L.	*Asteraceae*	M	Q-F	II	Kn	Am N, SE
2	*Adonis aestivalis* L.	*Ranunculaceae*	T	St	II	Ar	Eur S, Asia SW
3	*Anagalis arvensis*L.	*Ranunculaceae*	H	F-B	I	Ar	Eur S, Asia S & SW
4	*Anchusa officilnalis*L.	*Boraginaceae*	H	Art	I	Ar	Eur SE
5	*Anthemis ruthenica* M. Bieb.	*Asteraceae*	T	Art	I	Kn	Eur SE
6	*Avena fatua* L.	*Poaceae*	T	St	I	Ar	Asia SW
7	*Ballota nigra* L.	*Lamiaceae*	C,H	Art	I	Ar	Eur S
8	*Bromus japonicus* Thunb. ex Murray	*Poaceae*	T	—	I	Kn	Eur S & Asia W
9	*Bromus secalinus* L.	*Poaceae*	T,H	St	I	Ar	—
10	*Capsella bursa-pastoris* (L.) Medik.	*Brassicaceae*	T	St	I	Ar	—
11	*Carduus acanthoides* L.	*Asteraceae*	H	Art	II	Ar	Eur S (N)
12	*Caucalis platycarpos* L.	*Apiaceae*	T	St	I	Ar	Eur S, Asia SW
13	*Centaurea cyanus* L.	*Asteraceae*	T	St	I	Ar	Eur S
14	*Cichorium intybus* L.	*Asteraceae*	H	Art	IV	Ar	Eur S, Asia SW
15	*Consolida regalis* Gray	*Ranunculaceae*	T	St	II	Ar	Eur SE
16	*Conyza canadensis* (L.) Cronq.	*Asteraceae*	T,H	St	II	Kn	Am N (N)
17	*Erigeron annuus* (L.) Pers.	*Asteraceae*	H	Art	III	Kn	Am N (N)
18	*Fumaria officinalis* L.	*Papaveraceae*	T	St	I	Ar	Eur S
19	*Juglans regia* L.	*Juglandaceae*	M	—	I	Kn	Asia SW, C & W
20	*Lactuca serriola* L.	*Asteraceae*	H	St	III	Ar	Eur S, Asia SW
21	*Lathyrus tuberosus* L.	*Fabaceae*	H	St	I	Ar	Asia SW
22	*Leonurus cardiaca* L.	*Lamiaceae*	C	Art	II	Ar	Eur SE
23	*Matricaria maritima* L.	*Asteraceae*	T,H	St	I	Ar	—
24	*Medicago* x *varia* Martyn.	*Fabaceae*	H	Art	II	Kn	Asia SW
25	*Myosotis arvensis* (L.) Hill	*Boraginaceae*	T,H	St	II	Ar	EurS, Asia SW
26	*Onobrichis viciifolia* Scop.	*Fabaceae*	H	F-B	III	Kn	Eur S & SE
27	*Parthenocissus inserta* (A. Kern.) Fritsch	*Vitaceae*	L	Art	I	Kn	Am N (E)
28	*Pastinaca sativa* L.	*Apiaceae*	H	Art	III	Ar	Eur S, Asia W

End of table

Nr	Species	Familly	Life form	Syntax. affinity	Class of frequency	Geogr. and hist. group	Origine
29	*Pinus nigra* J. F. Arnold	*Pinaceae*	M	V-P	I	Kn	Eur S, Afr NW, Asia W
30	*Populus* x *canadensis* Moench	*Salicaceae*	M	Sp	II	Kn	Am N
31	*Robinia pseudoacacia* L.	*Fabaceae*	M	R-P	II	Kn	Am N (E)
32	*Rumex longifolius* DC.	*Polygonaceae*	H	Ph	I	Kn	Eur NE
33	*Solidago gigantea* Aiton	*Asteraceae*	H,G	Art	II	Kn	Am N
34	*Stachys annua* (L.) L.	*Lamiaceae*	T	St	I	Ar	Eur SE
35	*Thlaspi arvense* L.	*Brassicaceae*	T,H	St	I	Ar	Asia SW
36	*Thymelaea passerina* (L.) Coss. & Germ.	*Thymelaeaceae*	T	St	I	Ar	Eur S, Asia SW
37	*Valerianella dentata* (L.) Pollich	*Valerianaceae*	T	Art	II	Ar	Eur S (N)
38	*Veronica persica* Poir.	*Scrophulariaceae*	T	St	I	Kn	Asia SW
39	*Vicia angustifolia* L.	*Fabaceae*	T	St	II	Ar	—
40	*Vicia hirsuta* (L.) Gray	*Fabaceae*	T	St	II	Ar	Eur S
41	*Vicia tetrasperma* (L.) Schreb.	*Fabaceae*	T	St	II	Ar	Eur S
42	*Vicia villosa* Roth	*Fabaceae*	T	St	I	Ar	Eur S (N)
43	*Viola arvensis* Murray	*Violaceae*	T	St	II	Ar	—

N o t e: Life form: M — megaphanerophytes, L — lianas, C — chamaephytes, H — hemicryptophytes, G — geophytes, T — therophytes; Phytosociological group: Sp — *Salicetea purpureae*, Art — *Artemisietea vulgaris*, F-B — *Festuco-Brometea*, Ph — *Phragnitetea*, Q-F — *Querco-Fagatea*, R-P — *Rhamno-Prunetea*, St — *Stellarietea mediae*, V-P — *Vaccinio-Piceetea*; Class of frequency: I — species occurring in less than 5% of sites, II — species occurring in 5.1—25 % of sites, III — species occurring in 25.1—50 % of sites, IV — species occurring in 50.1—75 % of sites; Geographical-and-historical group: Ar — archaeophytes, Kn — kenophytes; Orgin: Afr NW — North-West Africa, Am N — North America, Am N (E) — North America (eastern part), Am SE — South-East America, Asia SW — South-West Asia, Asia C & W — Central and West Asia, Asia S & SW — South and South-East Asia, Asia W — West Asia, Eur NE — North-East Europe, Eur S — South Europe, Eur SE — South-East Europe, Eur S & SE — South and South-East Europe, Eur S (N) — South Europe (northern part).

Conclusion

Xerothermic grasslands are seminatural habitats so synanthropic native plant species take a great share in their flora. Alien species comprise up to 11 % of the grasslands flora on the Działy Grabowieckie region. Some antropophytes (*Cichorium intybus*, *Pastinaca sativa*, *Onobrychis viciifolia*) occur in grasslands frequently while others spread occasionally from adjoining habitats (*Adonis aestivalis*, *Veronica persica*, *Viola arvensis*). Their presence, even for a long period, did not result in negative changes in

the grassland structure. Moreover, grasslands may be mainstay for rare and endangered weed species (*Caucalis platycarpos*, *Thymelaea passerina*). However, some kenophytes not occurring in the grasslands in the past (*Acer negundo*, *Robinia pseudoacacia*) can pose a threat to xerothermic plants and their communities.

REFERENCES

Cwener A., Nowak M. Actual state and changes of flora and vegetation in the Broczówka steppe reserve // Acta Univ. Lodz, Folia Biol. Oecol. — 2011. – **7.** – P. 163–176.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. I. Fragm. // Flor. Geobot. — 1954. — **1**(2). — S. 81—93.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. II. Fragm. // Flor. Geobot. — 1958. — **3**(2). — S. 5—18.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. III. Fragm. // Flor. Geobot. — 1959. — **5**(1). — S. 11—35.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. IV. Fragm. // Flor. Geobot. — 1960. — **6**(3). — S. 262—286.

Fijałkowski D. Miłek wiosenny (*Adonis vernalis* L.) w województwie lubelskim // Ann. Univ. Mariae Curie-Skłodowska. Sect. C. — 1961. — **16**. — S. 50—74.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. VI. Fragm. // Flor. Geobot. — 1963. — **9**(2). — S. 219—237.

Fijałkowski D. Wykaz rzadszych roślin Lubelszczyzny. Cz. VII. Fragm. // Flor. Geobot. — 1964a. — **10**(4). — S. 453—471.

Fijałkowski D. Zbiorowiska kserotermiczne okolic Izbicy na Wyżynie Lubelskiej // Ann. Univ. Mariae Curie-Skłodowska. Sect. C. — 1964b. — **19**(14). — S. 239—259.

Fijałkowski D., Adamczyk B. Roślinność stepowa w Broczówce k. Skierbieszowa // Ann. Univ. Mariae Curie-Skłodowska. Sect. C. — 1980. — **35**(7). — S. 65—76.

Fijałkowski D., Adamczyk B. Zespoły i flora projektowanego Skierbieszowskiego Parku Krajobrazowego. — Lublin, Wydawnictwo UMCS, 1990. — 196 s.

Fijałkowski D., Izdebski K. Zbiorowiska stepowe na Wyżynie Lubelskiej // Ann. Univ. Mariae Curie-Sklodowska. Sect. C. — 1957. — **12**(4). — S. 167—200.

Kornaś J. Klasyfikacja geograficzno-historyczna roślin synantropijnych zadomowionych w Polsce // Materiały Zakładu Fitosocjologii Stosowanej. — U.W. Warszawa-Białowieża, 1968. — N 25. — S. 33—61.

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А. Квенер[1], П. Хмелевський[2]

[1] Інститут біології, Університет імені М. Кюрі-Склодовської, м. Люблін, Польща

[2] Замоське природниче товариство, м. Замостя, Польща

СИНАНТРОПІЗАЦІЯ КСЕРОТЕРМІЧНИХ ЛУК У ДЗЯЛИ ГРАБОВЕЦЬКІ (ЛЮБЛІНСЬКА ВИСОЧИНА, ПІВДЕННО-СХІДНА ПОЛЬЩА)

Регіон Дзяли Грабовецькі розміщений на Люблінській височині (Південно-Східна Польща). Протягом 2005—2009 рр. були досліджені 22 локалітети ксеротермічних лук, характерних для цього регіону. Зауважимо, що синантропні види, які постійно пов'язані з пасовищами, становлять потенційну загрозу для місцевих видів. Наявні в літературі дані використано для порівняння поширення синантропних видів на ксеротермічних луках у минулому і тепер. Кількість таких видів скоротилася після припинення їх використання. Деякі археофіти (наприклад, *Onobrychis viciifolia, Pastinaca sativa, Cichorium intybus*) постійно пов'язані з ксеро-

термічними луками, проте кенофіти, такі як *Robinia pseudoacacia, Solidago gigantea* та *S. canadensis*, є потенційною загрозою для ксеротермічних рослинних угруповань.

Ключові слова: антропофіти, ксеротермічні луки, Дзяли Грабовецькі, Південно-Східна Польща.

А. Квенер[1], П. Хмелевский[2]

[1] Институт биологии, Университет имени М. Кюри-Склодовской, г. Люблин, Польша

[2] Замойское естественное общество, г. Замойсц, Польша

СИНАНТРОПИЗАЦИЯ КСЕРОТЕРМИЧЕСКИХ ЛУГОВ В ДЗЯЛЫ ГРАБОВЕЦКИ (ЛЮБЛИНСКАЯ ВОЗВЫШЕННОСТЬ, ЮГО-ВОСТОЧНАЯ ПОЛЬША)

Регион Дзялы Грабовецки расположен на Люблинской возвышенности (Юго-Восточная Польша). В период 2005—2009 гг. были исследованы 22 местообитания ксеротермических лугов, характерных для этого региона. Отметим, что синантропные виды, постоянно связанные с пастбищами, представляют потенциальную угрозу для местных видов растений. Имеющиеся в литературе данные были использованы для сравнения распространения синантропных видов на ксеротермических лугах в прошлом и в настоящее время. Количество синантропных видов сократилось после прекращения использования лугов. Некоторые археофиты (например, *Onobrychis viciifolia, Pastinaca sativa, Cichorium intybus*) постоянно связаны с ксеротермическими лугами, однако кенофиты, такие как *Robinia pseudoacacia, Solidago gigantea* и *S. canadensis*, представляют собой потенциальную угрозу для ксеротермических растительных сообществ.

Ключевые слова: антропофиты, ксеротермические луга, Дзялы Грабовецки, Юго-Восточная Польша.