ACTA SOCIETATIS
BOTANICORUM POLONIAE
Vol. 56, nr 1: 155–167
1987

Iva xanthiifolia Nutt. and its communities within Warsaw

BARBARA SUDNIK-WÓJCIKOWSKA

Department of Phytogeography, Warsaw University,
Al. Ujazdowskie 4, 00-478 Warszawa, Poland

(Received: February 11, 1986. Accepted: April 8, 1986)

Abstract

Iva xanthiifolia Nutt., a north-American therophyte has been recorded in Warsaw only for the last 25–40 years. Here, it occurs as a ruderal epoecophyte. It may be considered as an invasive species in the town as it spreads very quickly. The paper represents the attempt at the determination of the coenological amplitude of *Iva xanthiifolia* Nutt. It also considers syntaxonomic affiliation of the communities with this species on the grounds of the deductive method of syntaxonomic classification of anthropogenic plant communities.

Key words: invasive species, coenological amplitude, derivative community, deductive method of the syntaxonomic classification

INTRODUCTION

Iva xanthiifolia Nutt. is a species introduced from the North America, a ruderal epoecophyte recorded within Warsaw for the last 25–40 years. It occurs in other Polish towns as well, but usually its sites are fairly scarce and in some towns, e.g. Poznań it seems to recess (B. Jackowiak — unpublished data). However, several-years' floristic investigations in Warsaw have showed its rapid and continuous expansion within the town; here and there, it even has been very abundant (Sudnik-Wójcikowska 1986, 1987a, 1987b). Therefore, Warsaw creates a very good object for the studies on the biology and ecology of this species. The work aims to determine the syntaxonomic affiliation and coenological amplitude of *Iva xanthiifolia* Nutt., mainly on the grounds of the analysis of phytosociological relevés (records).

In the relevant literature there are different approaches to the classification of communities with *Iva xanthiifolia* Nutt. Most authors classify them into the class *Chenopodietea*. Then, these communities are considered as a distinct association or facies of some associations from the alliance *Sisymbrion*.

Others include them in the alliance *Eu-Arction* from the class *Artemisietea*. Some emphasize the intermediate character of these communities and their simultaneous contribution to both classes. Also the synthaxonomic rank of the species varies. Some authors consider *Iva xanthiifolia* as a character-species of the association, others — as a differential species or only a constant companion.

It has been already well known that both community types invaded by this species and permanence of its establishment in newly occupied area, are related to the continentalism, strictly speaking to the limitation of the effect of Atlantic climate (e.g. Froebe and Oesau 1969). Therefore, it should be made clear that the results obtained in Warsaw, although based on the rich phytosociological data, may have only a local meaning.

MATERIAL AND METHODS

The observations on the flora of Warsaw, concerning also the distribution of *Iva xanthiifolia* Nutt., were conducted in 1977–1985 (the species distribution in Warsaw cf. — Fig. 1). In the growing season of 1985 205 relevés were also recorded. The area of patches with *Iva xanthiifolia* was usually not very big — mostly several to twenty square meters. It resulted from the specific distribution of this species, i.e. small agglomerations in wasteland and neglected lawns, or in long narrow belts along fences and roads. It should be stressed that sample areas were selected as to include only these phytocoenoses where abundance of *Iva xanthiifolia* Nutt. amounted to 2–5, exceptionally to 1. It is, of course, insufficient to any conclusions of successional trends.

All relevés were tabulated. The paper presents only numerical data resulting from that and a synoptic table with the widen information scope — Table 1 (after Tomaszewicz 1977). Species names were taken after Rothmaler (1976), classification system of communities — after Matuszkiewicz (1981), moreover, syntaxa not described in his work were named according to the other authors, i.e. the full syntaxa names were quoted.

The material presented, as well as field observations on habitats and communities *Iva xanthiifolia* Nutt. associated with, were used to determine the coenological amplitude of this species in the area under study.

In the relevés character-species of different classes were fairly constant. Therefore, the whole data were divided into 3 groups (however, it has to be admitted that this division is conventional and not perfect):

A. The relevés where character-species of the class *Chenopodietea* prevailed, whereas character-species of the class *Artemisietea* were absent or occured only once (abundance + or 1).

B. The relevés where character-species of the class *Artemisietea* dominated, whereas character-species of the class *Chenopodietea* were absent or occurred only once (abundance + or 1).

C. The relevés where character-species of both these classes were numerous.

Table 2 contains numerical data on each of these groups such as:

— the number of relevés that belong to each of them;

— percentage of the total of relevés;

— systematic group value (systematischer Gruppenwert) of character-species of each of the classes: *Chenopodietea*, *Artemisietea* and *Plantaginetea*.

Table 3 includes all the relevés that belong to A group, Table 4 — to B group, whereas Table 5 contains 20 randomly selected relevés that belong to C group, the most numerous. The relevés were ordered similarily to the way suggested by Kopecký and Hejný (1978) i.e. in respect of the presence or absence of species character of higher syntaxa.

To determine syntaxonomic rank of the communities with *Iva xanthiifolia* Nutt., the deductive method of syntaxonomic classification of anthropogenic plant communities (Kopecký 1978, Kopecký and Hejný 1978) was used.

RESULTS

I. From the table with all the relevés data, as well as from the synoptic table with the widen information scope (Table 1) it may be inferred that:

1. The number of species in a relevé ranged from several to 40, and only, to some extent, depended on the patch size.
2. Character-species of following classes were highly constant: *Chenopodietea* (*Chenopodium album* — IV constancy class, the alliance *Sisymbrion*: *Sisymbrium loeselii* — III), *Artemisietea* (*Artemisia vulgaris* — V), *Plantaginetea* (the alliance *Polygonion avicularis*: *Polygonum arenastrum* — IV, *Lolium perenne* — III, *Plantago maior* — III).
3. Beside species belonging to three mentioned above classes, other highly constant companions were: *Agropyron repens* — III, *Taraxacum officinale* — III, *Conyza canadensis* — III, also *Atriplex tatarica* (II) — a species with narrower ecological amplitude and fairly high constancy.
4. The character-species with the highest value of the coefficient of cover were those belonging to the class *Artemisietea* (*Artemisia vulgaris* — 725) and *Plantaginetea* (*Lolium perenne* — 736, *Polygonum arenastrum* — 420), whereas the coefficient value for the character-species of the class *Chenopodietea* was lower (*Chenopodium album* — 204, *Sisymbrium loeselii* — 139).

5. The total value of the coefficient of cover was the highest for the group of species character of the class *Plantaginetea*, lower for the class *Artemisietea* and the lowest for the class *Chenopodietea* (1427 > 940 > 701).
6. The systematic group value of character-species was the highest for the class *Plantaginetea*, lower — for the class *Chenopodietea* and the lowest — for *Artemisietea* (3.9 > 2.1 > 1.4).

Table 1

Synoptic table with the widen information scope for the total number relevés of communities with *Iva xanthiifolia* Nutt.

Number of relevés = 205

Species	Abundance						Constance	Coefficient of cover
	5	4	3	2	1	+		
a	b	c	d	e	f	g	h	i
Iva xanthiifolia	45	70	72	16	2	0	V 100	5513
Ch. Sisymbrion, Sisymbrietalia:								
Sisymbrium loeselii	–	–	1	6	27	79	III 55	139
Sisymbrium officinale	–	–	–	3	14	33	II 24	61
Lactuca serriola	–	–	–	–	–	37	I 18	2
Atriplex nitens	–	–	1	3	8	21	I 16	64
Hordeum murinum	–	–	1	2	9	15	I 13	58
Lepidium ruderale	–	–	–	–	5	16	I 10	13
Bromus tectorum	–	–	–	1	4	11	I 8	19
Sisymbrium altissimum	–	–	–	1	3	12	I 8	16
Chenopodium strictum	–	–	–	–	–	14	I 7	1
Tussilago farfara	–	–	–	–	2	10	I 6	5
Descurainia sophia	–	–	–	–	2	4	I 3	5
Urtica urens	–	–	–	–	–	5	I 2	1
Psyllium indicum	–	–	–	–	–	4	I 2	1
Salsola kali ssp. *ruthenica*	–	–	–	–	1	–	I 1	2
Malva neglecta	–	–	–	–	–	2	I 1	1
Lepidium densiflorum	–	–	–	–	–	1	I 1	1
Atriplex oblongifolia	–	–	–	–	–	1	I 1	1
Bromus sterilis	–	–	–	–	–	1	I 1	1
Chenopodium murale	–	–	–	–	–	1	I 1	1
Ch. Chenopodietea:								
Chenopodium album	–	–	1	7	50	74	IV 64	204
Galinsoga parviflora	–	–	–	–	6	44	II 24	17
Sonchus oleraceus	–	–	–	–	2	35	I 18	7
Atriplex patula	–	–	1	2	4	20	I 13	46
Solanum nigrum	–	–	–	–	3	16	I 9	8
Galinsoga ciliata	–	–	–	–	1	18	I 9	3
Echinochloa crus-galli	–	–	–	–	2	14	I 8	6
Setaria pumila	–	–	–	–	–	17	I 8	1
Polygonum lapathifolium ssp. *pallidum*	–	–	–	–	–	8	I 4	1

Table 1 — continued

a	b	c	d	e	f	g	h	i
Setaria viridis	–	–	–	–	2	3	I 2	5
Eragrostis minor	–	–	–	–	1	2	I 2	3
Digitaria sanguinalis	–	–	–	–	1	3	I 2	3
Oxalis stricta	–	–	–	–	–	4	I 2	1
Raphanus raphanistrum	–	–	–	–	–	2	I 1	1
Euphorbia peplus	–	–	–	–	–	2	I 1	1
Lamium purpureum	–	–	–	–	–	1	I 1	1
Digitaria ischaemum	–	–	–	–	–	1	I 1	1
							Chenopodietea:	701
Ch. Eu-Arction:								
Arctium lappa	–	–	–	2	6	64	II 35	35
Ballota nigra	–	–	–	–	4	28	I 16	11
Lamium album	–	–	–	–	2	4	I 3	5
Chelidonium majus	–	–	–	–	1	6	I 3	3
Armoracia rusticana	–	–	–	–	–	7	I 3	1
Arctium tomentosum	–	–	–	2	–	3	I 2	17
Leonurus cardiaca	–	–	–	–	3	2	I 2	7
Ch. Onopordetalia:								
Berteroa incana	–	–	–	–	3	24	I 13	8
Carduus acanthoides	–	–	–	–	2	11	I 6	5
Erysimum cheiranthoides	–	–	–	–	–	13	I 6	1
Silene alba	–	–	–	–	–	12	I 6	1
Melilotus officinalis	–	–	–	–	–	12	I 6	1
Melilotus alba	–	–	–	–	–	11	I 5	1
Artemisia absinthium	–	–	–	–	–	6	I 3	1
Onopordum acanthium	–	–	–	–	–	4	I 2	1
Anchusa officinalis	–	–	–	–	–	4	I 2	1
Reynoutria japonica	–	–	–	1	1	–	I 1	11
Verbascum densiflorum	–	–	–	–	–	2	I 1	1
Hyoscyamus niger	–	–	–	–	–	2	I 1	1
Dipsacus sylvestris	–	–	–	–	–	1	I 1	1
Chaerophyllum temulum	–	–	–	–	–	1	I 1	1
Arctium minus	–	–	–	–	–	1	I 1	1
Reseda lutea	–	–	–	–	–	1	I 1	1
Malva sylvestris	–	–	–	–	–	1	I 1	1
Ch. Artemisietea:								
Artemisia vulgaris	–	–	3	52	92	44	V 93	725
Tanacetum vulgare	–	–	–	3	12	49	II 31	57
Urtica dioica	–	–	–	1	3	12	I 8	16
Solidago gigantea	–	–	–	–	–	10	I 5	1
Calystegia sepium	–	–	–	1	–	4	I 2	9
Solidago canadensis	–	–	–	–	1	1	I 1	13
Saponaria officinalis	–	–	–	–	–	2	I 1	1
Rumex obtusifolius	–	–	–	–	–	2	I 1	1
							Artemisietea:	940
Ch. Polygonion avicularis:								

Table 1 — continued

a	b	c	d	e	f	g	h	i
Polygonum arenastrum	–	–	4	29	41	59	IV 65	420
Plantago major	–	–	–	4	12	91	III 52	68
Lolium perenne	2	4	11	36	19	29	III 49	736
Poa annua	–	–	1	9	21	50	II 40	149
Chamomilla suaveolens	–	–	–	–	9	71	II 39	25
Capsella bursa-pastoris	–	–	–	–	3	46	II 24	10
Ch. Plantaginetea:								
Rumex crispus	–	–	–	–	–	11	I 5	1
Carex hirta	–	–	–	–	1	8	I 4	3
Agrostis gigantea	–	–	–	1	–	4	I 2	9
Agrostis stolonifera	–	–	–	–	1	1	I 1	3
Potentilla anserina	–	–	–	–	–	2	I 1	1
Alopecurus geniculatus	–	–	–	–	–	1	I 1	1
Rorippa sylvestris	–	–	–	–	–	1	I 1	1
							Plantaginetea:	1427
Other companions:								
Taraxacum officinale	–	–	–	–	25	96	III 59	66
Agropyron repens	–	3	8	20	37	45	III 55	501
Conyza canadensis	–	–	–	6	10	73	III 43	79
Atriplex tatarica	–	1	5	12	15	30	II 31	262
Convolvulus arvensis	–	–	–	–	7	48	II 27	19
Amaranthus retroflexus	–	–	–	2	8	33	II 26	39
Achillea millefolium	–	–	–	–	7	47	II 26	19
Trifolium repens	–	–	1	5	12	27	II 22	92
Acer negundo (juv.)	–	–	–	–	3	45	II 22	10
Agrostis tenuis	–	–	1	3	1	33	I 19	30
Medicago lupulina	–	–	–	–	–	32	I 16	1
Cirsium arvense	–	–	–	–	3	26	I 14	9
Matricaria maritima ssp. *inodora*	–	–	–	–	1	27	I 14	4
Polygonum lapathifolium ssp. *lapathifolium*	–	–	–	1	–	27	I 14	10
Cannabis sativa	–	–	–	–	6	20	I 13	16
Trifolium pratense	–	–	–	–	4	20	I 12	11
Dactylis glomerata	–	–	–	–	6	16	I 11	15

Accidental companions (constancy < 10%):
Acer pseudoplatanus, A. saccharinum, Aesculus hippocastanum, Aethusa cynapium, Agrostemma githago, Anagallis arvensis, Anthemis arvensis, Anthriscus sylvestris, Apera spica-venti, Artemisia campestris, Aster novi-belgii, Bidens frondosa, B. tripartita, Briza media, Bromus hordeaceus ssp. *hordeaceus, B. inermis, Bunias orientalis, Calamagrostis epigejos, Cardaminopsis arenosa, Carum carvi, Centaurea cyanus, C. stoebe, Chaenarrhinum minus, Chaerophyllum aromaticum, Chamomilla recutita, Cichorium intybus, Corispermum leptopterum, Coronilla varia, Datura stramonium, Daucus carota, Diplotaxis muralis, Equisetum arvense, Erigeron annuus, Erodium cicutarium, Fallopia convolvulus, F. dumetorum, Festuca pratensis, Fraxinus excelsior, Helianthus annuus, H. tuberosus, Heracleum sphondylium* ssp. *flavescens, Hesperis matrionalis, Humulus lupulus, Impatiens paryiflora, Leontadon autumnalis, Linum usitatissimum, Lobularia maritima, Lotus corniculatus, Lupinus polyphyllus, Lycopersicon esculentum, Malus domestica, Malva pusilla, Medicago falcata, Mentha longifolia, Oenothera depressa, Oe.* sp., *Papaver dubium, Parthenocissus inserta, Pastinaca sativa, Phaseolus* sp., *Phleum pratense, Plantago lanceolata, Poa compressa, P. palustris, P. pratensis, Polygonum amphibium, P. persicaria, Populus alba, Quercus robur, Raphanus sativus, Robinia pseudoacacia, Rosa* sp., *Rumex acetosa, R. acetosella, R. maritimus, Sambucus nigra, Secale cereale, Senecio vernalis, S. viscosus, S. vulgaris, Selaria verticillata, Sinapis arvensis, Solanum dulcamara, S. tuberosum, Sonchus arvensis, Stellaria media, Symphoricarpos rivularis, Symphytum officinale, Tagetes signata, Thlaspi arvense, Torilis japonica, Triticum aestivum, Trifolium hybridum, Vicia angustifolia, V. cracca, Xanthium albinum* ssp. *riparium.*

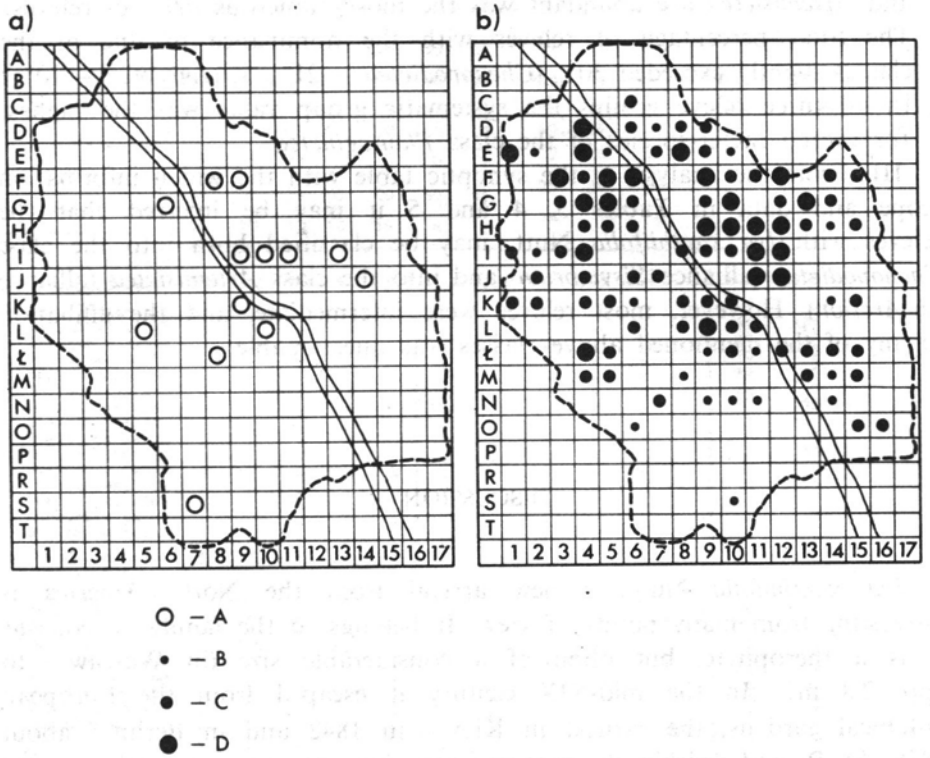

Fig. 1. Distribution of *Iva xanthiifolia* Nutt. within Warsaw. a — on the grounds of earlier data of various authors (1959–1971), b — on the grounds of author's investigations (1977–1985). A — literature or herbarium data, B — species occasional in a square, C — species several times in a square, D — species common in a square

II. From the data analysis concerning three distinguished groups of relevés (Table 2) it may be concluded that:

1. The relevé group where character-species of both classes: *Chenopodietea*

Table 2

Numerical data on individual groups of relevés of communities with *Iva xanthiifolia* Nutt.

Relevé group	Number of relevés	% of the total number of relevés	Systematic group value of species character of the class:		
			Artemisietea	*Chenopodietea*	*Plantaginetea*
A	43	21.0	1.2	3.6	9.0
B	21	10.2	5.0	0.4	7.2
C	141	68.8	1.8	2.4	3.2
	205	100.0	1.4	2.1	3.9

and *Artemisietea* are abundant was the most numerous (69% of relevés).
2. The total percentage of relevés with the dominance of one of the classes slightly exceeded 30% (*Chenopodietea* — 21%, *Artemisietea* — 10%).
3. In all three relevé groups the systematic group value was the highest for the character-species of the class *Plantaginetea*.

III. From the analysis of the synoptic table with the widen information scope and data in Tables 3, 4 and 5 it may be inferred that the relevés with *Iva xanthiifolia* Nutt. may be classified both into the class *Chenopodietea* (alliance *Sisymbrion*) and into the class *Artemisietea* (alliance *Eu-Arction*). However, most relevés were intermediate, and the affiliation to any of the mentioned above classes was questionable.

DISCUSSION

Iva xanthiifolia Nutt., a new arrival from the North America is interesting from many points of view. It belongs to the family *Asteraceae*. It is a therophyte, but often of a considerable size (in Warsaw — to app. 2.8 m!). In the mid-XIX century it escaped from the European botanical gardens, the earliest in Kiev — in 1842 and in Berlin — about 1858. In Poland (within its contemporary boundaries) it was first noted in Wrocław in 1932 (Meyer 1932, Scheuermann 1934). It started to be more frequent in Poland only after the Second World War. The earliest Warsaw data came from 1959 (Żukowski 1960). It seems possible that the species arrived in town during, or just after, the war. In the course of floristic studies in Warsaw over the last years (Sudnik-Wójcikowska 1987a), when the whole town area was divided into squares (Fig. 1), *Iva xanthiifolia* was recorded in so many as 45% of squares. It indicated extremely rapid, in 25–40 years, spread of the species all over the analysed area. The preliminary results of the questioning on the distribution of *Iva xanthiifolia* Nutt. in other Polish towns suggest that, hitherto, it has not been so expansive in any of them. Perhaps in Warsaw the war destruction of buildings in 85%, then, their very quick reconstruction and town development have played some role. Probably, it also matters that Warsaw has always been an important transport junction.

It is impossible to predict how the dynamics of *Iva xanthiifolia* Nutt. will look like in a near future. At present, in Warsaw it definitely may be treated as an invasive species.

Iva xanthiifolia grows most frequently in the building sites where the work is continued for several years, the area has been neglected, and soils with degraded profile occur. The end of the construction, putting

Table 3

Derivative community of Iva xanthiifolia /Chenopodietea/Artemisietea/. Relevés predominated by character-species of the class Chenopodietea

Successive relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43		
Relevé number	138	22	58	35	123	122	37	63	147	1	42	76	164	98	131	125	62	51	130	118	137	110	56	187	165	49	127	158	115	60	39	50	151	81	77	126	205	75	48	121	113	15	47	Con-	Coeffi-
Date	14. 09.	12. 08.	17. 08.	13. 08.	14. 09.	14. 09.	13. 08.	17. 08.	16. 09.	21. 05.	13. 08.	20. 08.	17. 09.	2. 09.	14. 09.	14. 09.	17. 08.	14. 08	14. 09.	11. 09.	14. 09.	11. 09.	17. 08.	25. 09.	21. 09.	13. 08.	14. 09.	17. 09.	11. 09.	17. 08.	13. 08.	14. 08.	17. 09.	20. 08.	20. 08.	14. 09.	26. 09.	18. 08.	13. 08.	14. 09.	11. 09.	1. 08.	13. 08.	stan-	cient
Relevé area /m^2/	6	5	2	2	12	4	8	6	8	6	8	8	9	3	10	6	6	6	6	2	9	7	8	4	4	5	8	10	12	6	4	6	8	4	6	12	5	5	6	6	7	8	5	cy	of
Cover /%/	70	100	85	100	80	60	90	90	100	100	100	100	100	50	60	80	70	95	60	100	95	70	100	50	50	100	100	100	100	60	80	80	80	80	100	75	90	90	50	95	75	90	50		cover
Number of species	16	12	8	9	16	14	16	11	18	13	12	7	11	10	12	14	11	9	12	14	13	13	16	18	11	17	15	13	11	22	13	16	15	11	10	17	10	16	8	9	13	11	8		
Iva xanthiifolia	3.3	5.5	3.3	5.5	5.5	3.3	4.4	4.4	5.5	5.5	5.5	5.5	5.5	3.3	3.3	3.3	4.4	5.5	3.3	4.4	2.2	4.4	4.4	3.3	2.2	3.3	4.4	5.5	4.4	2.2	3.3	4.4	4.4	3.3	5.5	4.4	4.4	3.3	3.2	3.3	3.3	5.5	3.2	V	100	5704
Ch. Chenopodietea																																													
Chenopodium album	+	1.1	1.1	1.1	+	+	+	+	1.1	1.1	+	+	+	+	1.1	.	+	1.1	1.1	1.1	1.1	+	2.2	+	+	+	+	+	+	.	+	.	1.1	+	+	+	+	.	.	.	.	.	.	.	V	81	185
Galinsoga parviflora	.	.	1.1	+	.	+	+	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	II	23	25
Sonchus oleraceus	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	I	19	2
Galinsoga ciliata	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	12	1
Solanum nigrum	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	12	1
Echinochloa crus-galli	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	7	12
Eragrostis minor	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	5	12
Setaria pumila	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	5	1
Digitaria sanguinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	12
Atriplex patula	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Polygonum lapathifolium ssp. pallidum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I	2	1
Oxalis stricta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Euphorbia peplus	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Digitaria ischaemum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Ch. Sisymbrietalia, Sisymbrion																																													
Sisymbrium loeselii	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	1.1	+	+	+	+	+	1.1	1.1	+	+	.	+	.	.	.	.	.	+	.	1.1	+	+	.	1.1				II	40	61
Sisymbrium officinale	.	.	.	.	.	.	.	.	.	.	+	1.1	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	1.1	+	.	1.1	.	.	1.1	+	2.2	.			II	33	101
Hordeum murinum	.	.	.	.	.	.	.	.	.	.	+	1.1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1.1	.	.	.	.	.	.	1.1	+	3.3	.	.	.	1.1	.			II	21	135
Lactuca serriola	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	14	1
Atriplex nitens	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I	14	1
Bromus tectorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	9	24
Lepidium ruderale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	I	9	12
Chenopodium strictum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I	5	1
Sisymbrium altissimum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Tussilago farfara	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Descurainia sophia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I	2	11
Ch. Artemisietea																																													
Artemisia vulgaris	1.1	+	+	+	+	.	.	.	.	.	.	.	.	.	.	+	+	1.1	+	1.1	1.1	1.1	1.1	1.1	+	1.1	1.1	+	1.1	1.1	.	+	1.1	1.1	1.1	+	1.1	+	+	1.1	+	1.1	1.1	.	IV	74	213
Tanacetum vulgare	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Ch. Onopordetalia																																													
Erysimum cheiranthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Ch. Eu-Arction																																													
Arctium lappa	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Lamium album	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Ch. Plantaginetea																																													
Polygonum arenastrum	1.1	.	+	+	.	1.1	1.1	2.2	.	.	+	+	1.1	+	+	1.1	+	+	.	2.2	.	1.1	.	+	+	+	2.2	+	+	2.3	1.1	1.1	+	1.1	+	2.2	+	1.1	2.2	2.2	1.1	.	V	81	416
Poa annua	+	+	.	+	+	1.1	1.1	.	.	1.1	+	.	1.1	+	+	1.1	+	+	.	+	.	+	.	+	.	+	+	1.1	+	.	+	1.1	+	.	.	2.2	.	1.1	2.2	.	.	.	IV	63	127
Lolium perenne	+	1.1	.	.	+	.	2.3	.	.	.	.	.	.	.	1.1	3.3	+	.	.	.	5.5	1.1	+	.	.	.	4.4	.	2.2	1.1	2.3	.	2.2	.	+	2.2	2.2	+	+	5.5	4.4	2.2	+	III	54	1118
Plantago major	.	+	.	+	+	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	III	49	68
Chamomilla suaveolens	.	+	.	.	+	.	+	.	.	.	.	.	+	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	42	16
Capsella bursa-pastoris	.	.	.	.	.	+	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	23	2
Rumex crispus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I	5	1
Agrostis gigantea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	41
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Carex hirta	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	2	1
Other companions																																													
Taraxacum officinale	.	.	+	.	+	+	+	1.1	+	1.1	.	.	+	.	.	.	.	.	+	+	+	.	.	.	.	.	+	.	+	.	.	+	+	.	.	.	.	+	.	+	+	.	III	44	27
Amaranthus retroflexus	+	+	.	.	+	2.2	.	.	1.1	.	+	1.1	.	+	1.1	1.1	.	+	.	+	+	.	+	.	.	+	.	+	.	.	+	.	.	.	.	.	.	+	.	+	.	.	II	40	90
Conyza canadensis	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1.1	.	+	.	+	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2.2	+	+	.	1.1	II	40	79
Agropyron repens	1.1	.	+	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	+	4.4	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	3.3	.	.	.	1.1	1.1	II	35	874
Convolvulus arvensis	.	.	.	.	+	+	.	+	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	1.1	.	+	1.1	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	II	28	26
Acer negundo /juv./	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	II	23	2
Atriplex tatarica	+	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	.	II	21	43

Accidental companions /I class of constancy/: Achillea millefolium /10/+, /20/+, /26/+, /30/+, /38/+, /41/+; Aesculus hippocastanum /juv./ /10/+; Aethusa cynapium /23/+; Agrostis tenuis /24/+, /26/+, /30/+, /32/+, /38/+; Bromus inermis /17/2.2, /26/+; B. hordeaceus ssp. hordeaceus /1/+, /2/+,/26/+, /38/+, /43/+; Briza media /33/+; Cannabis sativa /4/+, /18/+; Cardaminopsis arenosa /3/+; Centaurea cyanus /21/+; Cirsium arvense /25/+; Dactylis glomerata /8/+, /27/+; Datura stramonium /9/+; Daucus carota /25/+ ; Fallopia convolvulus /25/+, /34/+; F. dumetorum /26/+; Festuca pratensis /8/+; Helianthus tuberosus /9/+, /10/+, /15/+, /24/+; Leontodon autumnalis /1/+; Linum usitatissimum /11/+; Malva pusilla /17/+, /9/+, /11/+, /16/+, /31/+, /42/+; Matricaria maritima ssp. inodora /21/+, /43/+; Medicago falcata /21/+, /32/+; M. lupulina /24/+, /30/+; Oenothera depressa /1/+, /36/+; Plantago lanceolata /8/+, /17/+; Poa compressa/26/+; P. pratensis /17/+, /33/1.1; Polygonum amphibium f. terrestre /30/+; P. lapathifolium ssp. lapathifolium /5/+, /6/+, /9/+, /19/+, /30/+, /36/+; P. persicaria /23/+; Robinia pseudoacacia /1/+, /37/2.2; Sambucus nigra /juv./ /11/+, /28/+; Secale cereale /30/+; Senecio viscosus /5/+, /36/+; S. vulgaris /9/+, /10/+; Solanum tuberosum/9/+, /31/+, /37/+; Symphytum officinale /9/+; Tagetes sigmata /11/+; Trifolium pratense /21/+; T. repens /10/+, /21/+, /24/1.1, /30/+, /42/+, /41/+; Xanthium albinum ssp. riparium /9/1.1, /23/+.

Table 4

Derivative community of Iva xanthiifolia - /Chenopodietea/Artemisietea/. Relevés predominated by character-species of the class Artemisietea

Successive relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
Relevé number	182	68	73	150	28	142	83	5a	103	8	155	160	163	145	183	172	208	6a	7	31	78		Coeffi-
Date	25. 09.	18. 08.	18. 08.	17. 09.	12. 08.	14. 09.	20. 08.	21. 05.	7. 09.	25. 05.	17. 09.	17. 09.	17. 09.	16. 09.	25. 09.	21. 09.	26. 09.	21. 05.	25. 08.	12. 08.	20. 08.	Con-	cient
Relevé area /m^2/	6	6	5	7	6	5	9	5	8	7	7	4	8	6	6	5	5	5	2	4	7	stancy	of
Cover /%/	100	100	100	95	90	100	70	70	100	90	100	100	90	95	100	100	90	60	100	95	100		cover
Number of species	9	10	8	11	16	9	9	13	16	11	14	8	12	9	13	15	13	12	8	10	11		
Iva xanthiifolia	5.5	4.4	3.3	4.4	4.4	3.3	3.3	4.4	5.5	5.5	4.4	4.4	5.5	3.3	5.5	3.3	3.3	3.4	5.5	4.4	5.5	V 100	6250
Ch. Chenopodietea																							
Chenopodium album	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I 10	1
Oxalis stricta	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I 10	1
Setaria viridis	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I 15	1
Ch. Sisymbrietalia, Sisymbrion																							
Sisymbrium officinale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	I 14	1
Hordeum murinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1.1	I 10	24
Descurainia sophia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	I 5	24
Sisymbrium loeselii	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	I 5	1
Lepidium ruderale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I 5	1
Ch. Artemisietea																							
Artemisia vulgaris	1.1	1.1	2.2	+	1.1	2.2	1.1	1.1	1.1	1.1	2.2	2.2	1.1	2.2	1.1	2.2	3.3	1.1	+	1.1	1.1	V 100	965
Tanacetum vulgare	.	.	.	+	+	.	+	.	+	.	1.1	.	.	.	+	1.1	.	.	.	+	+	III 43	51
Urtica dioica	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	I 10	1
Solidago gigantea	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I 5	1
Ch. Onopordetalia																							
Melilotus officinalis	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	I 10	1
Carduus acanthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I 5	1
Berteroa incana	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I 5	1
Ch. Eu-Arction																							
Arctium lappa	.	.	.	.	.	.	.	.	+	+	.	+	+	.	+	+	2.2	+	.	.	.	II 38	86
Ballota nigra	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	I 10	1
Chelidonium majus	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	I 10	1
Arctium tomentosum	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	I 5	83
Lamium album	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	I 5	23
Ch. Plantaginetea																							
Lolium perenne	3.3	+	.	.	1.1	.	1.1	.	2.2	.	.	2.2	+	3.3	4.4	2.2	2.2	.	.	.	1.1	III 57	1061
Polygonum arenastrum	2.2	+	.	3.3	2.2	.	+	.	.	+	.	.	2.2	.	.	+	.	.	.	.	+	III 43	431
Plantago major	.	.	.	2.2	.	.	+	.	+	+	.	+	.	.	+	1.1	.	.	.	.	+	III 43	111
Poa annua	.	.	.	.	.	.	.	1.1	1.1	+	+	2.2	1.1	.	1.1	.	2.2	+	.	.	.	II 33	262
Chamomilla suaveolens	.	.	.	.	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	.	+	II 29	3
Capsella bursa-pastoris	.	.	.	.	+	.	.	+	+	.	+	.	.	.	.	.	.	1.1	1.1	.	.	II 24	49
Potentilla anserina	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I 5	1
Carex hirta	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I 5	1
Other companions																							
Taraxacum officinale	.	.	+	1.1	+	+	.	+	+	+	+	.	.	+	+	1.1	1.1	+	.	+	+	IV 71	77
Agropyron repens	2.2	+	+	.	1.1	+	2.3	.	.	.	4.4	+	1.1	2.2	.	2.2	1.1	.	.	1.1	1.1	IV 67	752
Convolvulus arvensis	+	.	.	.	+	+	.	+	+	+	.	.	.	.	.	+	.	.	1.1	+	.	III 43	28
Atriplex tatarica	+	2.2	2.2	.	+	.	.	.	.	.	.	.	+	2.2	.	.	1.1	.	.	2.2	.	II 38	359
Acer negundo /juv./	.	.	+	.	+	+	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	II 29	3
Dactylis glomerata	.	.	.	.	.	.	.	1.1	.	1.1	.	.	.	.	+	.	1.1	+	.	.	.	II 24	49

Accidental companions /I class of constancy/: Achillea millefolium /4/+, /5/+, /8/+, /16/+, /19/+, /20/+; Aethusa cynapium /12/+; Agrostis tenuis /1/2.2, /11/+, /16/2.2; Artemisia campestris /4/+; Bromus inermis /2/+; B. mollis /5/+; Cannabis sativa /2/+, /6/1.1, /13/+, /14/+; Chaerophyllum aromaticum /15/+; Cirsium arvense /11/+; Conyza canadensis /4/+, /5/+, /21/+; Daucus carota /17/1.1; Fallopia convolvulus /6/+, /20/+; F. dumetorum /11/+; Festuca pratensis /2/+; Helianthus tuberosus /2/+; Matricaria maritima ssp. inodora /16/+, /17/+; Medicago falcata /4/+; Poa pratensis /10/2.3; Polygonum amphibium f. terrestre /1/+, /3/1.1, /5/+; P. lapathifolium ssp. lapathifolium /1/+; Sambucus nigra /11/+, /13/+, /19/+; Senecio vulgaris /8/+; Sonchus arvensis /18/+; Stellaria media /8/+, /19/+; Trifolium repens /4/2.2, /16/+.

Table 5

Derivative community of Iva xanthiifolia - /Chenopodietea/Artemisietea/. Selected relevés with the simultaneous, more numerous contribution of character-species of the classes Chenopodietea and Artemisietea

Successive relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Relevé number	69	107	108	133	135	177	30	74	88	93	100	104	157	178	190	192	10	32	86	92		Coeffi-
Date	18. 08.	7. 09.	7. 09.	14. 09.	14. 09.	24. 09.	12. 08.	18. 08.	2. 09.	2. 09.	3. 09.	7. 09.	17. 09.	24. 09.	25. 09.	25. 09.	27. 06.	12. 08.	2. 09.	2. 09.	Con-	cient
Relevé area /m^2/	6	9	10	9	9	8	12	8	6	10	11	8	8	8	6	10	12	8	6	8	stan-	of cover
Cover /%/	90	90	75	80	70	90	100	70	90	90	90	90	85	75	90	100	85	100	80	100	cy	
Number of species	28	23	13	24	39	23	25	40	20	28	27	29	26	29	23	23	23	12	21	16		
Iva xanthiifolia	4.4	4.4	4.4	4.4	3.3	5.5	5.5	3.3	3.3	5.5	4.4	5.5	4.4	3.3	3.3	2.2	3.3	5.5	3.3	5.5	V	100	6125
Ch. Chenopodietea																						
Chenopodium album	+	1.1	1.1	1.1	2.2	1.1	.	1.1	+	+	+	.	+	+	1.1	1.1	+	+	1.1	.	V	85	292
Galinsoga parviflora	+	.	.	.	+	+	.	.	+	+	+	+	1.1	+	.	.	+	.	.	+	III	55	30
Atriplex patula	.	.	+	.	1.1	.	.	+	.	+	.	1.1	+	.	.	.	.	.	.	+	II	35	53
Sonchus oleraceus	+	+	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	+	.	II	35	4
Galinsoga ciliata	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	+	.	.	.	I	20	2
Setaria pumila	.	.	.	+	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	I	20	2
Solanum nigrum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	I	15	2
Echinochloa crus-galli	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	I	10	1
Polygonum lapathifolium ssp. pallidum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I	5	1
Ch. Sisymbrietalia, Sisymbrion																						
Sisymbrium loeselii	+	2.2	+	1.1	2.2	1.1	+	1.1	+	+	+	+	1.1	+	1.1	2.2	.	+	1.1	1.1	V	95	442
Lactuca serriola	+	.	.	.	+	+	+	+	+	.	.	.	.	.	.	+	.	.	+	+	III	45	5
Atriplex nitens	+	.	.	.	.	.	.	1.1	1.1	.	.	.	.	.	3.3	.	+	.	+	.	II	35	240
Sisymbrium altissimum	.	.	+	.	.	.	.	+	.	.	+	.	.	.	+	2.2	.	.	.	.	II	25	90
Lepidium ruderale	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	II	20	2
Tussilago farfara	.	.	.	.	+	.	.	+	.	.	.	.	.	.	1.1	.	.	.	.	.	I	15	26
Bromus tectorum	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I	15	2
Chenopodium strictum	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	I	15	2
Hordeum murinum	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I	10	1
Psyllium indicum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	10	1
Sisymbrium officinale	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I	5	1
Ch. Artemisietea																						
Artemisia vulgaris	+	+	1.1	1.1	2.2	2.2	1.1	1.1	3.3	1.1	2.2	1.1	1.1	+	2.2	+	2.2	1.1	1.1	1.1	V	100	877
Tanacetum vulgare	+	+	+	.	.	+	+	+	+	+	1.1	+	2.2	+	.	+	+	.	+	.	IV	75	119
Urtica dioica	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	+	.	+	II	25	3
Solidago gigantea	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	I	15	2
Calystegia sepium	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	I	5	25
Solidago canadensis	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	10	1
Rumex obtusifolius	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	I	5	1
Ch. Onopordetalia																						
Berteroa incana	.	+	.	1.1	+	.	.	+	.	+	+	+	.	+	+	+	.	.	.	.	III	50	30
Melilotus officinalis	.	+	.	.	.	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	II	25	3
Erysimum cheiranthoides	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	I	20	2
Silene alba	.	+	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	I	20	2
Melilotus alba	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	I	20	2
Carduus acanthoides	.	1.1	.	.	.	1.1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I	15	51
Anchusa officinalis	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I	10	1
Artemisia absinthium	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	I	10	1
Onopordum acanthium	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I	5	1
Verbascum densiflorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I	5	1
Hyoscyamus niger	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I	5	1
Ch. Eu-Arction																						
Arctium lappa	.	.	.	.	.	.	.	+	.	+	+	+	.	+	.	.	1.1	.	+	1.1	II	40	53
Ballota nigra	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	+	.	+	+	+	II	40	4
Armoratia rusticana	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	I	15	2
Arctium tomentosum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	I	10	1
Ch. Plantaginetea																						
Polygonum arenastrum	.	.	.	+	+	+	1.1	+	1.1	1.1	2.2	2.2	1.1	.	+	1.1	+	.	1.1	+	IV	75	329
Chamomilla suaveolens	+	.	.	.	.	+	+	+	+	+	1.1	+	+	.	.	.	.	+	+	.	III	55	30
Lolium perenne	+	.	.	.	1.1	.	+	+	2.2	1.1	.	1.1	.	.	.	.	.	+	3.3	.	III	45	352
Plantago major	+	.	.	.	+	.	1.1	.	.	+	1.1	.	+	.	+	.	+	.	+	.	III	45	54
Capsella bursa-pastoris	+	.	.	+	.	.	+	.	.	+	.	+	.	.	+	.	.	.	.	.	II	30	3
Poa annua	.	.	.	.	.	.	.	.	+	.	.	+	1.1	.	.	.	+	.	1.1	.	II	25	52
Rumex crispus	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	I	10	1
Carex hirta	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	I	10	1
Other companions																						
Agropyron repens	.	2.2	.	+	+	2.2	+	.	1.1	1.1	+	1.1	+	2.2	1.1	1.1	1.1	1.1	+	+	V	90	442
Conyza canadensis	+	+	+	+	+	+	+	+	+	+	+	.	+	2.2	+	+	.	.	1.1	+	V	85	120
Taraxacum officinale	.	.	.	+	+	+	.	.	+	.	+	+	+	.	.	.	+	.	+	+	III	50	5
Medicago lupulina	+	.	+	.	.	+	.	+	.	.	+	+	+	+	.	+	.	.	.	+	III	50	5
Trifolium repens	.	+	2.2	.	.	+	+	+	.	.	1.1	+	+	+	.	.	.	.	.	.	III	45	116
Atriplex tatarica	1.1	+	.	.	1.1	.	1.1	1.1	.	.	.	+	+	.	.	.	.	1.1	.	.	II	40	127
Achillea millefolium	.	+	.	.	.	+	+	+	.	+	.	+	.	+	.	.	.	.	.	.	II	35	4
Matricaria maritima ssp. inodora	+	.	.	.	+	+	+	+	.	.	+	.	.	.	.	.	+	.	.	.	II	35	4
Cirsium arvense	+	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+	.	.	.	.	II	35	4
Acer negundo /juv./	+	.	.	+	+	.	.	.	+	+	.	+	.	+	.	.	.	.	.	.	II	35	4
Polygonum lapathifolium ssp. lapathifolium	.	.	.	+	+	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	II	25	3
Xanthium albinum ssp. riparium	.	.	+	+	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	II	20	27
Helianthus tuberosus	.	.	+	.	.	.	.	+	.	.	.	.	+	.	1.1	.	.	.	.	.	II	20	2

Accidental companions /I class of constancy/: Acer saccharinum /juv./ /12/+; Aethusa cynapium /8/+, /11/+, /16/+; Agrostis tenuis /1/+, /5/+, /6/+, /14/+; Amaranthus retroflexus /4/+, /5/1.1, /10/+, /19/+; Anthemis arvensis /1/+, /8/+; Apera spica-venti /2/+, /13/+; Artemisia campestris /8/+; Bidens frondosa /1/+, /19/+; Bromus hordeaceus ssp. hordeaceus /5/+; Bunias orientalis /14/+; Cannabis sativa /1/+, /2/+, /5/+, /12/+; Carum carvi /6/+, /10/+; Centaurea stoebe /2/+, /4/+, /8/+; Chaenarrhinum minus /5/; Chamomilla recutita /2/+; Cichorium intybus /12/+; Convolvulus arvensis /10/+, /12/+, /20/+; Corispermum leptopterum /4/+; Coronilla varia /8/+, /14/+; Dactylis glomerata /10/+; Datura stramonium /7/+; Daucus carota /14/+, /15/+; Equisetum arvense /14/1.1; Fallopia convolvulus /16/+; Hesperis matronalis /17/+; Lobularia maritima /5/+; Lupinus polyphyllus /1/+; Mentha sp. /1/+; Oenothera depressa /2/+, /4/+, /15/+, /20/+; Oe. sp. /4/+, /5/+, /9/+, /13/+; Papaver dubium /16/+; Pastinaca sativa /4/+; Plantago lanceolata /8/+, /11/+, /17/+; Poa compressa /11/+; P. palustris /17/+; Reseda lutea /16/+; Robinia pseudoacacia /13/+; Rumex acetosa /6/+, /14/+; R. acetosella /14/+; Sambucus nigra /juv./ /9/+, /10/+; Secale cereale /17/+; Senecio viscosus /4/+; S. vulgaris /5/+; Sinapis arvensis /15/+; Solanum tuberosum /17/+; Sonchus arvensis /8/+; Symphytum officinale /5/+; Trifolium hybridum /11/+; T. pratensis /1/+, /8/+; Vicia cracca /14/+.

area in order, planting of lawns (mowing!) limit the species distribution. *Iva xanthiifolia* Nutt. may be also frequently found in older parts of the town. There, houses are not high, yards and lawns small and neglected, small workshops, stores are typical. Then, the species grows along fences and walls, in rubbish-dumps and in wasteland. Also long construction or reconstruction of transport routes favours its growth. Gradual putting the area in order eliminates this species. It can only survive where mowing is difficult or neglected, i.e. near railings, lawn margins, in cracks between pavestones in not so much-walked-in areas (e.g. near lanterns), in green belts along parking places and motorways, in the neglected railway areas etc.

Iva xanthiifolia Nutt. is in Warsaw a typical ruderal epoecophyte. Hitherto, it has not been observed to enter segetal communities, only occasionally in field margins at roadsides. However, its encroachement into arable fields, sometimes in mass, has been observed in the south-eastern part of Central Europe (e.g. in Ukraine — Shchebrina 1949, in Czechoslovakia — Krippelová 1969, Hejný et al. 1973, in Hungary — Terpó-Pomogyi 1975). There it has been taken for the "quarantine weed", i.e. an anthropophyte dangerous to crop. Within Warsaw no encroachement of *Iva xanthiifolia* Nutt. to semi-natural or close to natural communities has been observed, so far.

The analysis of the data from Tables 1, 3, 4, 5 and the synoptic table enables to determine the coenological amplitude of *Iva xanthiifolia* Nutt. While doing that one has to remember, that all data concern one town only and particular natural-geographical conditions. The species may occur both in phytocoenoses where therophytes (the class *Chenopodietea*) or perennial species (the class *Artemisietea*) dominate. The most often, however it grows in the intermediate phytocoenoses where species of both classes occur (2/3 of the total number of relevés). Surely it reflects the course of succession, subsequent stages of growth and stabilization of ruderal vegetation. However, to determine whether and to what extent *Iva xanthiifolia* retreats in the course of this process the studies in permanent plots are necessary.

The frequent occurence in nearly all relevés of the character-species of the class *Plantaginetea* (high constancy and a value of the coefficient of cover — Table 1, as well as the highest systematic group value for character-species of this class — Table 2) may be interpreted differently. It does not reflect successional trends but only specific use of land neighbouring on the patches with *Iva xanthiifolia* Nutt., which often occur along streets, roads, paths, crossings and at the side of the overtrodden areas. Therefore, species of this class easily enter and are constant in the phytocoenoses with *Iva xanthiifolia* Nutt., especially in their margins. In some cases it may indicate the occurrence of the complexes of communities. However, this species very rarely (a few times) enters commu-

nities from the class *Plantaginetea*. Mostly, it has very slight chance of survival there, as these communities exist due to the same man activities that eliminate *Iva xanthiifolia* Nutt.

Now the syntaxonomic rank of the communities with *Iva xanthiifolia* Nutt. should be discussed. Most authors attempt to classify them into one of the classes, either *Chenopodietea*, or *Artemisietea*. Fijałkowski (1967) suggests to distinguish a new association *Ivaetum xanthiifoliae* (the class *Chenopodietea*). Froebe and Oesau (1969), as well as Grüll (1983) record *Iva xanthiifolia* mainly in the communities of the alliance *Sisymbrion*, while Gutte (1971) — in *Sisymbrietum loeselii* Gutte 1969, belonging also to the class *Chenopodietea*. Eliaš (1978) remarks that the species may form facies in the communities of the alliance *Sisymbrion* (at the high constancy of species of the class *Artemisietea*). He also thinks that there are grounds to classify *Iva xanthiifolia* Nutt. communities into one distinct association. Hejný et al. (1979) approve of *Ivaetum xanthiifoliae* Fijałkowski 1967 (where, however, *Iva xanthiifolia* has got the rank of a differential species). They also stress that the species enters communities of the alliance *Sisymbrion* much easier than those with perennial species. Fijałkowski (1978) considers *Iva xanthiifolia* as a character-species of the discussed association. However, he classifies it into the alliance *Eu-Arction*, class *Artemisietea*. Janecki (1983) includes this association in the alliance *Arction lappae* R. Tx. 1937 em. Siss. 1946, the class *Rudero-Secalietea* Br.-Bl. 1936. On the other hand, Krippelová (1969) describes communities with *Iva xanthiifolia* Nutt. as facies of some associations of the alliance *Sisymbrion* (e.g. *Atriplicetum tataricae* Ubrizsy 1949, *Atriplicetum nitentis*) or the alliance *Eu-Arction* (e.g. *Arctio-Ballotetum nigrae* Br.-Bl. et de Leew 1936 em. Ubrizsy (1949) and more rarely of the class *Plantaginetea*. In one of the earlier papers on this species Hejný (1958) stresses the fact that communities with *Iva xanthiifolia* Nutt. are intermediate between communities of therophytes and those where perennials dominate.

From the phytosociological data presented here it may be also inferred that communities are intermediate between two classes: *Chenopodietea* and *Artemisietea* (alliances: *Sisymbrion* and *Eu-Arction*) and it ought to be reflected in their classification. I think that the deductive method of syntaxonomic classification of anthtropogenic communities (Kopecký 1978, Kopecký and Hejný 1978) adequately reflects reality without modyfing the system that exists. According to this method communities with *Iva xanthiifolia* may be treated as derivative communities (Derivatgesellschaften — D_g). Such communities are mainly composed of the character-species of higher syntaxonomic units and companions — one of them *Iva xanthiifolia* Nutt., occurs with the high constancy and cover. At the same time these are communities classified between two higher syntaxa (classes or alliances). After the authors of this method it may be written as follows:

— derivative community *Iva xanthiifolia* [*Chenopodietea*/*Artemisietea*],
— derivative community *Iva xanthiifolia* [*Sisymbrion*/*Eu-Arction*].

Then, *Iva xanthiifolia* would not be considered as a character or differential species, it would be only a leading species selected among companions, the one with the high constancy and the high value of the coefficient of cover.

Thus the description of communities with *Iva xanthiifolia* Nutt. should be as follows:

1. These are derivative communities.
2. They are quantitatively dominated by *Iva xanthiifolia* — a leading species, without the rank of a character or differential species.
3. They lack their specific characteristic species combination associated only with one syntaxon of the higher rank. However, character-species of three classes: *Chenopodietea*, *Artemisietea* and *Plantaginetea* occur at the same time with great constancy. It seems possible to determine that syntaxonomically those communities are intermediate between the class *Chenopodietea* and that of *Artemisietea* (alliances: *Sisymbrion* and *Eu-Arction*).

Acknowledgments

I would like to express my gratitude to Prof. W. Matuszkiewicz, Prof. Z. Podbielkowski and Doc. H. Tomaszewicz for the possibility to discuss the methods and results presented in the paper.

REFERENCES

Eliaš P., 1978. *Sambucetum ebuli* a ine ruderalne spoločenstva v meste Trnave. Preslia 50: 225–252.

Fijałkowski D., 1967. Zbiorowiska roślin synantropijnych miasta Lublina. Ann. UMCS, Sec. C, 22: 195–233.

Fijałkowski D., 1978. Synantropy roślinne Lubelszczyzny. PWN, Warszawa-Łódź.

Froebe H. A., Oesau A., 1969. Zur Soziologie und Propagation von *Iva xanthifolia* im Stadtgebiet von Mainz. Decheniana 122: 147–157.

Grüll F., 1983. Výskyt a charakteristika rostlinného společenstva s *Iva xanthifolia* v Brné. Zpr. Čs. Bot. Společ. 18: 141–144.

Gutte P., 1971. Zur Verbreitung einiger Neophyten in der Flora von Leipzig. Mitt. Sekt. Spez. Bot. 2: 5–24.

Hejný S., 1958. *Iva xanthifolia* Nutt. v ČSR. Acta Facult. Rerum Natur. Univ. Comenianae, Bot. 2: 323–342.

Hejný S., Jehlík V., Kopecký K., Kropač Z., Lhotská M., 1973. Karanténní plevele Československa. Studie ČSAV 8: 110–113.

Hejný S., Kopecký K., Jehlík V., Krippelová T., 1979. Přehled ruderálních rostlinných společenstev Československa. Rozpravy ČSAV 89: 3–100.

Janecki J., 1983. Człowiek a roślinność synantropijna miasta na przykładzie Warszawy. Rozpr. Nauk. Monogr., Wyd. SGGW-AR, Warszawa. pp. 3–131.
Kopecký K., 1978. Deduktive Methode syntaxonomischer Klassifikation anthropogener Pflanzengesellschaften. Acta Bot. Slov. Acad. Sci. Slov., Ser. A, 3: 373–384.
Kopecký K., Hejný S., 1978. Die Anwendung einer deduktiven Methode syntaxonomischer Klassifikation bei der Bearbeitung der strassenbegleitenden Pflanzengesellschaften Nordostböhemens. Vegetatio 36: 43–51.
Krippelová T., 1969. Verbreitung der *Iva xanthifolia* Nutt. und ihr Vorkommen in der Pflanzengesellschaften in der ČSSR. Biologia 24: 738–758.
Matuszkiewicz W., 1981. Przewodnik do oznaczania zbiorowisk roślinnych Polski. PWN, Warszawa.
Meyer K., 1932. Über den gegenwärtigen Stand der Bahnfloristik in Schlesien. Jhber. Schles. Ges. vater. Kultur 104: 76–91.
Rothmaler W., 1976. Exkursionsflora für die Gebiete der DDR und der BRD. Kritischer Band. Volk Wissen Volkseigener Verl., Berlin.
Scheuermann R., 1934. Mittelmeerpflanzen der Güterbahnhofe des rheinwestf. Industriegebiets. Fedde Repert. 76: 65–89.
Sudnik-Wójcikowska B., 1986. Distribution of some vascular plants and anthropopressure zones in Warsaw. Acta Soc. Bot. Pol. 55: 481–496.
Sudnik-Wójcikowska B., 1987a. Flora miasta Warszawy i jej przemiany w ciągu XIX i XX w. Wyd. UW, Warszawa (in press).
Sudnik-Wójcikowska B., 1987b. Dynamik der Warschauer Flora in den letzten 150 Jahren. Gleditschia 15 (in press).
Shchebrina A. F., 1949. K ekologii *Iva xanthifolia* Nutt. po nabludeniyam v okrestnostyakh Voronezha. Bot. Zhurn. 34: 76–84.
Terpó-Pomogyi M., 1975. Az *Iva xanthifolia* Nutt. közép-Európai megtelepedése és elterjedése. Bot. Közlem. 62: 19–23.
Tomaszewicz H., 1977. Proposal of new syntaxonomic classification of *Myriophyllo-Nupharetum* W. Koch 1927 phytocenoses and their distribution in Poland. Acta Soc. Bot. Pol. 46: 423–436.
Żukowski W., 1960. Nowe stanowiska roślin synantropijnych ze szczególnym uwzględnieniem Polski północno-zachodniej. Fragm. Flor. Geobot. 6: 481–488.

Iva xanthiifolia Nutt. i jej zbiorowiska na obszarze m.st. Warszawy

Streszczenie

Celem pracy było przedstawienie amplitudy cenologicznej *Iva xanthiifolia* Nutt. na terenie Warszawy oraz określenie pozycji syntaksonomicznej zbiorowisk tego gatunku. Materiał stanowi 205 zdjęć fitosocjologicznych z obszaru miasta, w których gatunek występuje z ilościowością od 5 do 2 (tylko sporadycznie 1). Wśród zdjęć można było wyróżnić 3 grupy: 1) zdjęcia z przewagą gatunków charakterystycznych z klasy *Chenopodietea*; 2) zdjęcia z przewagą gatunków charakterystycznych z klasy *Artemisietea*; 3) zdjęcia, w których liczniej występują obok siebie gatunki charakterystyczne z obu klas. Jest warte podkreślenia że ostatnia grupa zdjęć okazała się najliczniejsza (69% ogółu zdjęć).

Zbiorowiska z *Iva xanthiifolia* Nutt. wchodzą zatem w obręb klas: *Chenopodietea* (związek *Sisymbrion*), *Artemisietea* (związek *Eu-Arction*). Bardzo rzadko i przejściowo gatunek ten wkracza do zbiorowisk z klasy *Plantaginetea* (chociaż trzeba zaznaczyć, że gatunki

charakterystyczne z tej klasy występują w zdjęciach z dużą ilościowością, stałością i wartością współczynnika pokrycia). *Iva xanthiifolia* Nutt. nie była natomiast do tej pory notowana w Warszawie w zbiorowiskach segetalnych (tylko sporadycznie — na skraju pól) oraz w zbiorowiskach półnaturalnych i zbliżonych do naturalnych. Jest więc typowym epekofitem ruderalnym.

Przynależność syntaksonomiczna zbiorowisk z *Iva xanthiifolia* Nutt. może być określona z pomocą dedukcyjnej metody klasyfikacji syntaksonomicznej antropogenicznych zbiorowisk roślinnych (Kopecký 1978, Kopecký i Hejný 1978). Są to tzw. zbiorowiska pochodne, a więc złożone głównie z gatunków charakterystycznych wyższych jednostek syntaksonomicznych i z gatunków towarzyszących, z których jeden, w tym przypadku *Iva xanthiifolia* Nutt., występuje z dużą stałością i wartością pokrycia. Jednocześnie zbiorowiska te zajmują najczęściej pozycję pośrednią między dwoma wyższymi syntaksonami, co, zgodnie z sugestią autorów metody należałoby zapisać:

— zbiorowisko pochodne *Iva xanthiifolia*-[*Chenopodietea*/*Artemisietea*],
— zbiorowisko pochodne *Iva xanthiifolia*-[*Sisymbrione*/*Eu-Arction*].

Tak więc zbiorowiska z *Iva xanthiifolia* Nutt. najogólniej scharakteryzować można następująco: 1) są to zbiorowiska pochodne; 2) ilościowo dominuje w nich *Iva xanthiifolia* Nutt., która jest gatunkiem przewodnim, nie ma natomiast rangi gatunku charakterystycznego (lub wyróżniającego); 3) cechuje je brak własnej charakterystycznej kombinacji gatunków, która byłaby związana z jedną jednostką syntaksonomiczną wyższej rangi, natomiast jednocześnie i z dużą stałością występują gatunki charakterystyczne z trzech klas: *Chenopodietea*, *Artemisietea* i *Plantaginetea*. Wydaje się możliwe określenie pozycji syntaksonomicznej zbiorowisk, jako pośredniej między klasami: *Chenopodietea* i *Artemisietea* (związkami: *Sisymbrion* i *Eu-Arction*).

Notowany w Warszawie zaledwie od 25–40 lat, północnoamerykański terofit, jakim jest *Iva xanthiifolia* Nutt., z pewnością zasługuje na uwagę. Jest tak między innymi ze względu na inwazyjny, przynajmniej na razie, charakter występowania gatunku na terenie Warszawy. Jak się wydaje, podobne tempo ekspansji nie zostało dotąd stwierdzone w innych naszych miastach. Jest interesujące, jak w przyszłości będzie się kształtowała dynamika występowania tego gatunku.