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THE SITE OF WESTERN RAGWEED (*AMBROSIA PSILOSTACHYA* DC.) IN THE WESTERN PART OF SZCZECIN LOWLAND

STANOWISKO AMBROZJI ZACHODNIEJ (*AMBROSIA PSILOSTACHYA* DC.) W ZACHODNIEJ CZĘŚCI NIZINY SZCZECIŃSKIEJ

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Streszczenie. Ambrozja zachodnia (*Ambrosia psilostachya* DC.) jest gatunkiem inwazyjnym notowanym w Polsce na nielicznych stanowiskach. W zachodniej części Niziny Szczecińskiej jest to 3 stanowisko. Zbiorowisko z ambrosją zachodnią występuje na poboczu dwupasmowej drogi Berlin–Szczecin–Chociwel na glebie wytworzonej z piasków (słabogliniastego i gliniastego lekkiego) przesuszonych, nieco zasolonych, o odczynie obojętnym, z niewielką zawartością próchnicy i CaCO_3 (od 3 do 5%). Na podstawie 9 zdjęć fitosocjologicznych fitocenozy z obecnością tego gatunku zaliczono do zespołu *Diantho-Armerietum elongatae* z wyraźną tendencją nawiązującą do zbiorowiska z rzędu *Arrhenatheretalia*, z racji znacznego udziału w nim gatunków zbiorowisk seminaturalnych – *Festuca rubra* (S = V, D = 3000) i *Arrhenatherum elatius* (S = IV, D = 750). Ambrozja zachodnia jest stałym składnikiem fitocenoz (S = V), osiągając w nich znaczne pokrycie (D = 3139).

Key words: *Ambrosia psilostachya*, cover coefficient, *Diantho-Armerietum elongatae*, invasive species, phytosociological stability, western part Szczecin Lowland.

Słowa kluczowe: *Ambrosia psilostachya*, *Diantho-Armerietum elongatae*, gatunki inwazyjne, stałość fitosocjologiczna, współczynnik pokrycia, zachodnia część Niziny Szczecińskiej.

INTRODUCTION

The genus *Ambrosia* is a member of the family *Asteraceae* and it includes about 40 species. Most of them come from North America. Since the late 60s of the twentieth century, western ragweed has been present in France, northern Italy, Balkan countries, southern Austria, Hungary, Ukraine, and recently in Poland. The presence of three species of *Ambrosia* has been reported in Poland: *Ambrosia artemisiifolia* L., *Ambrosia psilostachya* DC. (Photo 1), and *Ambrosia trifida* L. Western ragweed (*Ambrosia psilostachya*) originates from the south-eastern part of North America and it occurs mainly in in prairie habitats (Bassett and Crompton 1975).



Photo 1. Western ragweed (*Ambrosia psilostachya* DC.). Photography by T. Leśnik
Fot. 1. Ambrozja zachodnia (*Ambrosia psilostachya* DC.). Fot. T. Leśnik

The first records of its occurrence in Europe come from 1869. The introduction of this species is not connected to any particular North American raw plant materials, however there is a visible connection to railway grounds. It is not clear how *Ambrosia* made its way to other habitats, nevertheless its presence in lawns and playing fields suggests that it could have been introduced with contaminated grass seeds. Locally it may have the status of an epiphyte. Its sites can be found in Germany, the Netherlands, Spain and Italy. In the United Kingdom its presence was recorded in 1903 (Chłopek and Tokarska-Guzik 2006).

On our grounds the presence of *Ambrosia* was first recorded in 1900 in the area of Szczecin (Meusel and Jäger 1992). Most sites were recorded after World War II. In the Atlas rozmieszczenia roślin... (2001) report 19 sites of *Ambrosia* in western Poland including two sites in Szczecin. Ćwikliński (1974) reports its presence in the area of Szczecin Dąbie railway station.

Ambrosia artemisiifolia is much more common in Poland, out of 57 sites that have been recorded, only one was found in the area of Szczecin. According to the study by Ćwikliński (1974) it inhabits the railway area of the Port of Szczecin. Currently there are many confirmed sites of *Ambrosia artemisiifolia* in Poland. On the coast its presence was recorded by Misiewicz (1976), and in the area of Przemyśl, Łódź, Lublin and in Silesia by Tacik (1971).

Western ragweed occurs mostly in the central and northern parts of the country, almost exclusively in ruderal habitats such as: railway grounds, transshipment places, river ports, roadsides, barrens, landfills, yards, lawns and playgrounds. It grows best in sunny, sheltered locations on dry substrate of low fertility. It also inhabits swardy grounds, especially on poor sandy soils, where locally it competes effectively with other plants (Sudnik-Wójcikowska 2011). It is an invasive species, similarly to *Ambrosia artemisiifolia* often reported in the vicinity of granaries, where imported raw materials from North America, such as grain, soybeans, maize, grass and clover, are stored. It also occurs close to grain cleaning plants, grain mill plants, as well as fat and fodder processing plants. After the political changes in Poland which took place after 1989 and the significant reduction of grain import from North America, both species of *Ambrosia* are rare. According to Rapiejka (2004a), western ragweed is classified as species occurring temporarily and rapidly perishing on the given area. Thus its sites disappear quickly.

According to Ratyńska (2011), both species of *Ambrosia* (*Ambrosia artemisiifolia* and *Ambrosia psilostachya*) are exceptionally widespread on the roadsides in Hungary. They produce pollen, which is one of the most potent allergens. According to her, so far both taxa are relatively rarely recorded in Poland and they occur mainly along routes. The allergen of both species of *Ambrosia* pollen has a strong sensitisation and is the most common cause of hay fever in North America (Taciak 1971; Rapiejko 2004b). In the areas where ragweed pollen occurs en masse, about 6 to 12% of the population reveals oversensitivity to the pollen allergen of this plant (Rapiejko 2004b). Ragweed pollen grains are relatively light, which allows their long-range transport. Pollen of different *Ambrosia* species is widespread in aeroplankton in many European countries (Mandrioli et al. 1998). Mass allergic reactions occur mainly among persons oversensitive to ragweed pollen allergens when pollen count is at the level from 40 to 200 pollen grains per m³ of air. High pollen count has been observed i.a. in Szczecin, Wrocław, Opole, Sosnowiec, Cracow, Lublin and Rzeszów. Medium pollen count has been reported in Warsaw, Bydgoszcz and Piotrków Trybunalski. According to Chłopek and Tokarska-Guzik (2006) both species of ragweed (*Ambrosia artemisiifolia* and *Ambrosia psilostachya*) are main sources of pollen in aeroplankton in the Upper Silesia. They do not exclude the possibility that the pollen of these taxa may be transported with the wind from neighbouring countries (Czech Republic, Slovakia, Ukraine and Hungary). High pollen counts prevailed from mid-August to the second decade of September. The highest pollen count in the air during the day varied from 127 to 222 grains per m³ of air.

The aim of the study is the ecological and phytosociological characteristics of communities with a significant participation of western ragweed (*Ambrosia psilostachya*).

MATERIAL AND METHODS

To create the characteristics of communities with a significant participation of western ragweed (*Ambrosia psilostachya*), 9 phytosociological relevés were used. The phytosociological relevés were made on 20th August 2010 on the area of about 25 m² using the popular among geobotanists Braun-Blanquet method (Dzwonko 2007). The site was inspected again in July 2011. The area where *Ambrosia* is present comprises of about 0.3 hectares. Some of the plant patches (6 relevés) were classified as *Diantho-Armerietum elongatae* and as

impoverished communities of *Festuca rubra*-*Poa pratensis* (3 relevés), using the study by Matuszkiewicz (2007). The names of plant species were given after Mirek et al. (2002). Phytosociological stability and cover coefficients of species in plant communities were calculated after Dzwonko (2007). A pooled soil sample was collected in the study area, and its salinity level as well as soil pH were determined with potentiometric method. The content of CaCO_3 in soil was established with field method using 10% HCl. Grain size distribution was determined by organoleptic tests.

RESULTS AND DISCUSSION

The community with western ragweed on the studied area occurs on the roadside of a Berlin–Szczecin–Chociwel highway (Photo 2).



Photo 2. The site of western ragweed at the roadside of Berlin–Szczecin–Chociwel highway. Photography by T. Leśnik

Fot. 2. Stanowisko ambrozji zachodniej na poboczu drogi szybkiego ruchu Berlin–Szczecin–Chociwel. Fot. T. Leśnik

The geographical coordinates of the site from Geoportal reading are as follows: $53^{\circ} 24' 10''$ and $14^{\circ} 43' 23''$. Currently, the two-lane road built by Germans before WWII is being rebuilt and is going to become a highway from Berlin, which probably will lead to Gdańsk in the future. The surface on which the presence of western ragweed has been recorded is a grassy enclave surrounded by Goleniowska Forest from west and east (Fig. 1).

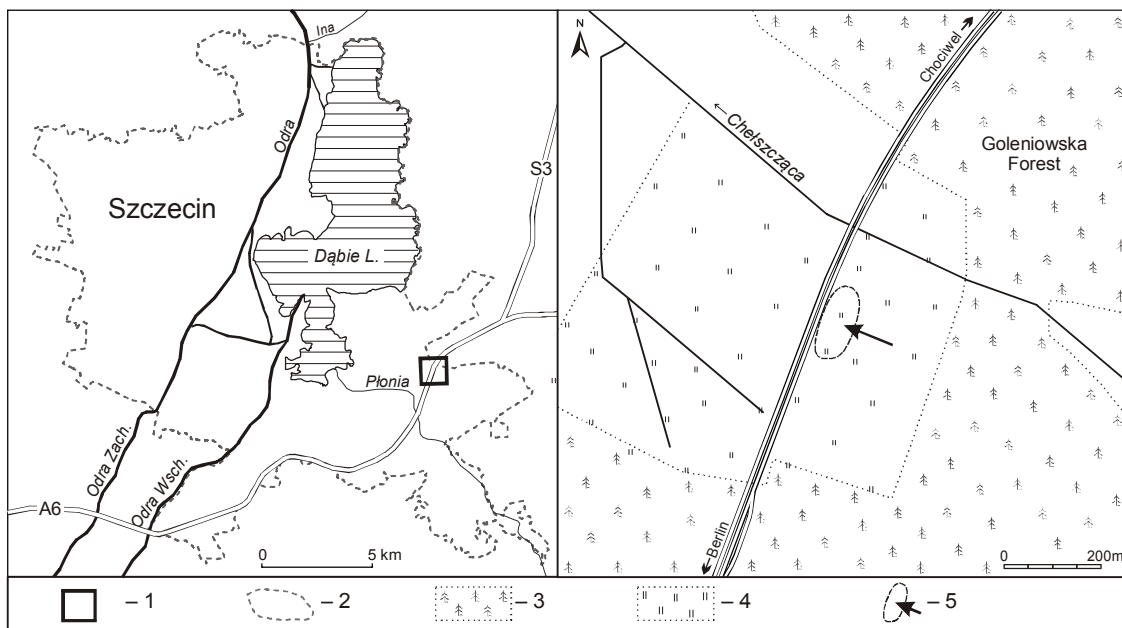


Fig. 1. The location of western ragweed (*Ambrosia psilostachya* DC.) site. 1 – the location of the studied area, 2 – administrative borders of the city of Szczecin, 3 – pine forest, 4 – grasslands, 5 – the site of western ragweed

Rys. 1. Lokalizacja stanowiska ambrozji zachodniej (*Ambrosia psilostachya* DC.). 1 – powierzchnia badań, 2 – granica administracyjna miasta Szczecin, 3 – lasy sosnowe, 4 – obszary trawiaste, 5 – stanowisko ambrozji zachodniej

It covers several hectares of abandoned, grassy, unused grounds. The substrate for the community comprises of soils varied as regards grain size distribution, which at places are formed by slightly loamy or loamy light sands. The surface on which western ragweed occurs is slightly elevated in comparison to the central part of the enclave, where river Chelszcząca flows (Fig. 1). The lower land comprises of muck-mineral soil and peat. The places inhabited by *Ambrosia* occupy about 0.3ha, the soil there is desiccated, with low content of humus and with neutral pH (pH in H₂O = 7,06 and pH in 1 M KCl = 6,88). Brief but clear effervescence was observed, which indicates the content of CaCO₃ at 3 to 5%. The soil where *Ambrosia psilostachya* occurs is moderately saline (173.80 µS). It is located on the roadside and the level of the soil salinity may be affected by the winter use of sodium chloride and calcium chloride against ice on the road.

Phytocenoses occurring on the studied area were classified as *Diantho-Armerietum elongatae* (6 plant patches) and as impoverished communities of *Festuca rubra-Poa pratensis* (3 relevés). 60 species of moss and vascular plants are found in their structure. The average coverage of undergrowth is significant – 89%, and the number of species in the phytosociological relevé ranges from 10 to 19, at average it is 14 (Table 1). Western ragweed (*Ambrosia psilostachya*) in both syntaxa is a regular component of the community (S = V). It is relatively abundant (D = 3500) in *Diantho-Armerietum elongatae* phytocenoses. *Armeria maritima* ssp. *elongata* is also frequently found (S = V), however its cover coefficient is lower (D = 708).

Table 1. *Ambrosia psilostachya* DC. in phytocenons *Diantho-Armerietum elongatae* and within impoverished community *Festuca rubra-Poa pratensis*

Tabela 1. *Ambrosia psilostachya* DC. w fitocenozach *Diantho-Armerietum elongatae* oraz w obrębie zubożalego zbiorowiska *Festuca rubra-Poa pratensis*

Successive No. Numer kolejny	1	2	3	4	5	6	1-6	7	8	9	7-9	1-9			
No.of relevé in the field Numer zdjęcia w terenie	3	4	7	6	1	2	average średnia	5	8	9	average średnia	average średnia			
Cover of herb layer Pokrycie warstwy zielonej [%]	95	85	95	95	90	90	92	95	80	80	85	89			
Number of species Liczba gatunków	18	19	17	15	15	14	16	11	10	11	11	14			
							S	D			n	D	S	D	
<i>Ambrosia psilostachya</i>	2.3	3.3	4.4	3.3	3.4	2.3	V	3500	3.3	2.2	2.2	3	2417	V	3139
ChAss. <i>Diantho-Armerietum elongatae</i>															
<i>Armeria maritima</i>															
ssp. <i>elongata</i>	1.2	1.1	2.2	1.1	1.2	1.2	V	708	.	.	.			IV	472
I ChCl. <i>Koelerio glaucae-Corynephoretea canescens</i>															
<i>Brachythecium albicans</i> d	1.3	1.2	2.3	.	.	.	III	458	.	.	.			II	306
<i>Potentilla argentea</i>	1.2	1.1	.	1.2	.	.	III	250	.	.	.			II	167
<i>Carex arenaria</i>	1.1	2.2	.	+	.	.	III	392	.	.	.			II	250
<i>Festuca ovina</i>	4.5	2.3	.	.	.	.	II	1333	.	.	.			II	889
<i>Ceratodon purpureus</i> d	1.3	1.2	.	.	.	.	II	167	.	.	.			II	111
<i>Helichrysum arenarium</i>	1.1	1.2	.	.	.	.	II	167	.	.	.			II	111
<i>Trifolium arvense</i>	.	.	.	.	1.2	+	II	100	.	.	.			II	67
II ChCl. <i>Molinio-Arrhenatheretea</i>															
<i>Festuca rubra</i>	1.2	3.3	3.3	3.3	2.3	2.3	V	2542	4.4	3.3	2.2	3	3917	V	3000
<i>Arrhenatherum elatius</i>	.	1.2	1.1	1.1	1.2	1.1	V	417	.	1.2	3.3	2	1833	IV	750
<i>Achillea millefolium</i>	.	.	2.2	1.2	2.2	1.1	IV	750	1.1	.	1.2	2	333	IV	611
<i>Taraxacum officinale</i>	.	.	1.2	2.2	1.2	1.2	IV	542	.	.	.			III	361
<i>Plantago lanceolata</i>	.	.	3.3	.	2.3	2.3	III	1208	.	.	.			II	806
<i>Plantago major</i>	.	.	1.2	2.3	1.2	.	III	458	.	.	.			II	306
<i>Leontodon autumnalis</i>	.	.	1.1	1.2	.	.	II	167	.	.	.			II	111
<i>Rumex acetosa</i>	.	+	.	.	.	.	I	17	.	+	+	2	67	II	33
<i>Vicia cracca</i>	.	.	.	.	.	.			+	+	.	2	67	II	22
III ChCl. <i>Artemisietea vulgaris</i>															
<i>Melandrium album</i>	.	.	+	+	+	.	III	33	+	.	+	2	67	III	56
<i>Artemisia vulgaris</i>	.	.	+	.	.	1.2	II	100	.	+	.	1	33	II	78
<i>Berteroa incana</i>	+	.	.	.	.	.	I	17	+	.	.	1	33	II	22
<i>Hypericum perforatum</i>	.	.	.	.	.	.			+	+	.	2	67	II	22
<i>Cirsium arvense</i>	.	.	.	.	.	.			.	+	+	2	67	II	22
IV ChCl. <i>Festuco-Brometea</i>															
<i>Artemisia campestris</i>	+	3.3	.	.	1.2	+	IV	742	.	.	.			III	494
<i>Potentilla arenaria</i>	1.2	1.2	.	.	.	.	II	167	.	.	.			II	111
V ChCl. <i>Agropyretea intermedio-repentis</i>															
<i>Elymus repens</i>	.	.	.	.	3.3	3.4	II	1250	.	.	.			II	1250
VI ChCl. <i>Trifolio-Geranietea sanguinei</i>															
<i>Galium verum</i>	1.2	.	1.2	.	2.3	.	III	458	.	.	.			II	306
VII ChCl. <i>Nardo-Callunetea</i>															
<i>Hieracium pilosella</i>	2.2	+	.	.	.	.	II	308	.	.	.			II	308
VIII Accompanying species – Gatunki towarzyszące															
<i>Arenaria serpyllifolia</i>	+	1.2	.	.	.	.	II	100	.	.	.			II	67

Explanations – objaśnienia: S – constancy – stałość fitosocjologiczna, D – cover coefficient – współczynnik pokrycia, n – numer of relevés – liczba zdjęć.

Plant species occurring only in I degree of phytosociological constance in plant communities. After a name of species the next number of the relevé in which species occurred is given and in brackets the quantity degrees and sociability – Gatunki roślin występujące w zbiorowisku wyłącznie w I stopniu stałości. Po nazwie gatunku podano numer kolejny zdjęć, w których wystąpił gatunek, w nawiasach – stopień ilościowości i towarzyskości.

I: *Chondrilla juncea* 5 (1.1), *Cladonia* sp.d 1 (1.2), *Corynephorus canescens* 2 (1.2), *Hypochoeris radicata* 2 (+), *Rumex acetosella* 2 (+), *Sedum acre* 1 (1.3), II: *Dactylis glomerata* 9 (+), *Galium mollugo* 7 (1.2), *Holcus lanatus* 9 (2.2), *Poa annua* 6 (2.3), *Potentilla reptans* 3 (2.3), *Trifolium repens* 4 (1.2); III: *Anthriscus sylvestris* 9 (+), *Artemisia absinthium* 1 (+), *Medicago lupulina* 4 (1.2), *Urtica dioica* 7 (1.2), *Solidago canadensis* 8 (+), *Verbascum phlomoides* 2 (+); VII: *Agrostis capillaris* 3 (1.2); VIII: *Allium vineale* 6 (1.2), *Erodium cicutarium* 3 (+), ChCl. *Epilobietea angustifolii*: *Calamagrostis epigejos* 4 (3.3); ChCl. *Stellarietea mediae*: *Conyza canadensis* 7 (+), *Crepis tectorum* 4 (+), *Geranium pusillum* 6 (+), *Lepidium ruderae* 7 (+), *Sisymbrium loeselii* 9 (+), *Thlaspi arvense* 3 (+), *Vicia hirsuta* 8 (+), *Viola arvensis* 5 (+).

The floristic structure of the association is dominated by species of *Koelerio glaucae-Corynephoretea canescenstis* class. Most of them reaches the 3rd degree of stability, and the greatest coverage is exhibited by *Festuca ovina* (D = 1333). Species of the *Molinio-Arrhenatheretea* class also have a significant share in the structure of phytocenoses. The dominant taxon among them is *Festuca rubra* (S = V, D = 3000). *Arrhenatherum elatius* (S = IV, D = 750) and *Achillea millefolium* (S = IV, D = 611) are also very common constituents – Table 1. The above mentioned species are associated to drier meadows.

The observed patches of *Diantho-Armerietum elongatae* are contained within the habitat spectrum of this syntaxon, which includes slightly poor sandy soils or sandy-loamy soils usually within perennial fallows, dry and extensive pastures, dirt and asphalt roads waysides. The association exhibits a considerable local-habitat variability and apart from the typical form, it is characterised by different forms connected as regards floristic composition to *Spergulo vernalis-Corynephorietum* grasslands or *Nardus* grasslands (*Nardo-Callunetea*) and also to typical meadow communities of *Arrhenatheretalia* order – the latter forms are particularly common (Matuszkiewicz 2007). In our case phytocenoses of the association with western ragweed are connected by their floristic composition to meadow communities of *Arrhenatheretalia* order.

Misiewicz (1976) occasionally found western ragweed on railway grounds of Gdańsk and Gdynia ports. It occurred in three sites (railway embankment, quay, landfill, dumping ground) and at places it occurred in great amounts. Krasicka-Korczyńska and Korczyński (1994) conducted studies over the distribution of *Ambrosia psilostachya* in Bydgoszcz. According to them, western ragweed prefers well aerated, well-drained and fertile soil. It grows best on abandoned fields and grounds with mechanically ruffled soil. In Bydgoszcz it occurs in many diverse habitats, mainly within synanthropic communities. With time western ragweed may dominate also grassland communities, dry pastures as well as cultivated fields on sandy soils with negligent mechanical cultivation (Tacik 1971). In 1989 Krasicka-Korczyńska and Korczyński (1994) described 13 sites of western ragweed in Bydgoszcz, and they recorded its presence in 19 plant patches located on roadsides, railway embankments, playing fields, lawns, rubble and extensive rye and potato plantations, as well as in home gardens. Despite frequent lawn mowing, it maintains well also in grassland communities. Since 1989 the number of sites in Bydgoszcz has increased to 68. It also occurs outside the city, in Pieczyska at the Lagoon Koronowski and on the lawn of a housing estate in Szubin. The research of Korczyński and Krasicka-Korczyńska (2011a) showed that *Ambrosia psilostachya* is a permanent constituent of synanthropic flora of Bydgoszcz and it occurs mainly on ruderal grasslands, roadsides and lawns. The area of the occupied patches usually amounts to about 50 m². Its presence is primarily connected to well-drained, sandy soils with neutral pH. Earthworks conducted in connection with new investments and setting up new green urban areas favours the dispersion of this plant. Cover coefficients of western ragweed are greatly varied and they range from 2000 (lawns) to 4500 (roadsides) and 5000 (abandoned farmlands). Biomass production of this species is connected to the production of synanthropic communities and city lawns. According to Korczyński and Krasicka-Korczyńska (2011b) mowing is a factor which eliminates the given species from plant communities. It limits the number of shoots in a patch and has lesser impact on a single specimen. Western ragweed,

unlike some other anthropophytes, succeeded in Bydgoszcz by increasing its acreage of occurrence. It was not hindered by the fact that in past years it was classified as quarantine species (Karnkowski 1994).

CONCLUSIONS

1. Western ragweed (*Ambrosia psilostachya* DC.) occurs on the area of 0,3 ha on the roadside of two-lane Berlin–Szczecin–Chociwel highway and is a regular constituent of the community ($S = V$) reaching in it the significant cover coefficient ($D = 3139$).
2. Taking into account the existing literature sources, it is its third site in the area of western Szczecin Lowland (within the administrative borders of the city of Szczecin).
3. Phytocoenoses with western ragweed were classified as *Diantho-Armerietum elongatae* with a clear tendency connected by the floristic composition to the community of *Arrhenatheretalia*, due to the frequent presence of meadow species communities *Festuca rubra* ($S = V$, $D = 3000$) and *Arrhenatherum elatius* ($S = IV$, $D = 750$).
4. The substrate for plant patches is sandy soil (slightly loamy and light loamy sand), desiccated, with low content of humus, with neutral pH, and the content of CaCO_3 from 3 to 5%.

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Abstract. Western ragweed (*Ambrosia psilostachya* DC.) is an invasive species recorded in Poland in few sites. In the area of western Szczecin Lowland it is the 3rd site. The community with ragweed occurs on the roadside of a two-lane Berlin–Szczecin–Chociwel highway on soil formed by sands (slightly loamy and light loamy), desiccated, slightly salinized, with neutral pH, and with low content of humus and CaCO₃ (from 3 to 5%). On the basis of 9 phytosociological relevés, phytocoenoses with its presence were classified as *Diantho-Armerietum elongatae* with a clear tendency connected to the community of *Arrhenatheretalia*, due to a significant share of semi-natural communities species such as *Festuca rubra* (S = V, D = 3000) and *Arrhenatherum elatius* (S = IV, D = 750). Western ragweed is a regular constituent of phytocoenoses (S = V) and it reaches a significant coverage in them (D = 3139).

*We would like to thank Professor Habilitated Doctor Karol Latowski from the Department of Plant Taxonomy at the Adam Mickiewicz University in Poznań for designation of taxon of *Ambrosia psilostachya* DC.*

