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Kenophytes chorologically related to the habitats of railway grounds in central eastern Poland

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Abstract: The objective of the paper is to present a list of kenophytes chorologically related to the habitats of railway grounds in central eastern Poland. Out of the 950 species of vascular plants recorded there, 114 are kenophytes. Most of them often occur in different types of synanthropic habitats (*Acer negundo, Amaranthus retroflexus, Cardaria draba, Chamomilla suaveolens, Conyza canadensis*, *Eragrostis minor, Impatiens parviflora, Medicago sativa, Sisymbrium loeselii*). However, 27 demonstrate a strong connection with railway lines. They settle directly on tracks and their edges and in the vicinity of loading ramps and distribution stations. They migrate both along used railway tracks as well as those which are partially or completely excluded from use. The most pioneer habitats are taken by *Amaranthus albus, Bromus japonicus, Centaurea diffusa*, *Erysimum marschallianum, Lepidium virginicum, Linaria repens, Oenothera subterminalis, O. wienii*, *Portulaca oleracea* ssp. *oleracea, Rubus laciniathus* and *Sisymbrium altissimum*. On the slopes of embankments and wide edges, where the influence of the human factor is somewhat lesser, we find *Artemisia dracunculus, Atriplex tatarica, Lactuca tatarica, Lathyrus nissolia, Oenothera hoelscheri, Potentilla intermedia, Sisymbrium wolgense* and *Vicia pannonica*.

Key words: kenophytes, railway areas, vascular plants, distribution pattern, central eastern Poland

1. Introduction

In the synanthropisation process of the vegetation cover, from the perspective of the last five hundred years, the increasing role of newcomers (kenophytes) becomes noticeable. According to Zając *et al*. (1998), as many as 251 species have this status in Poland at present, 135 of which do not go beyond human-made habitats (epekophytes) while 116 are agriophytes – the taxa which endanger natural flora. Kenophytes have covered the whole contemporary territory of Poland, inter alia, the valleys of big rivers (the Vistula and Oder), large urban centres and communications routes, including railway lines which connect them, are characterised by particular density of their localities.

A wide range of ecological conditions prevailing in different types of railway track habitat enables the penetration and spreading of species demonstrating a high degree of tolerance to the anthropogenic factor. They become a permanent or transitional element of their vegetation cover.

Floral data in the *Distribution Atlas of Vascular Plants in Poland* (Zając & Zając 2001) referring to the kenophytes of railway grounds in central eastern Poland are largely incomplete. The extents of plants are not static, thus changes in occurrence and further dispersion of species take place in front of our eyes. The continuation of observations of recorded railway stations together with the penetration of further sections of the railway line will enable us to evaluate the possibility of the spreading of this plant group in the habitats of routes which are used intensively as well as those excluded from use, with the indication of invasive plants.

2. Material and methods

The group of kenophytes chorologically related to the habitats of railway grounds has been distinguished on the basis of floristic research carried out in the area of central eastern Poland (the Lublin Upland, Roztocze, Western Volhynia and Polesie) (Fig. 1). Data come from our own published and unpublished materials which have been collected in the years 1998-2005 (Święs & Wrzesień 2002, 2003; Wrzesień 2003, 2005). During the research, all types of habitats accompanying railway grounds along a section of approximately 900 km were

analysed, inter alia, tracks, freight yards, ridges and slopes of railway embankments, excavations and drainage ditches and the edges of adjacent semi-natural communities, like for example forests and meadows, were taken into consideration.

The flora was studied using the method of mapping all the species on a 1 km grid (883 squares). These fields represent a decimal extension of the grid of squares accepted in *Distribution Atlas of Vascular Plants in Poland* – ATPOL (Zając 1978; Zając & Zając 2001).

3. Results

Out of the 950 species constituting the spontaneous flora of railway grounds in central eastern Poland 114 are kenophytes. Approximately 27 species are chorologically related to the habitats of routes used intensively and partly (Table 1). Most of them settle directly on tracks and their edges and in the vicinity of loading ramps and distribution stations. The most pioneer habitats are chosen by *Amaranthus albus, Bromus japonicus, Centaurea diffusa*, *Erysimum marschallianum, Lepidium virginicum, Linaria repens, Oenothera subterminalis, O. wienii*, *Rubus laciniathus, Portulaca oleracea* ssp. *oleracea* and *Sisymbrium altissimum*. On the slopes of embankments and wide edges, where the influence of

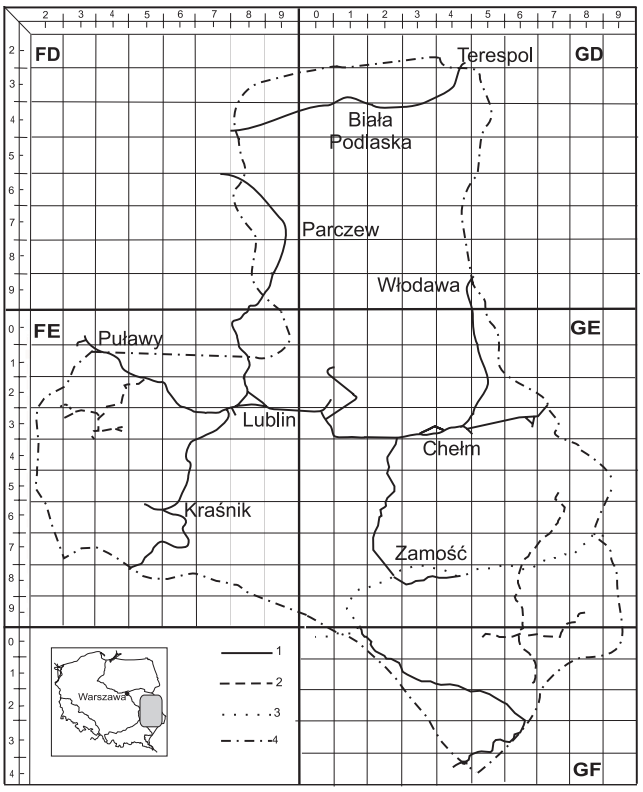

Fig. 1. Study area against the background of ATPOL grid squares Explanations: 1 – normal, 2 – narrow and, 3 – wide gauge railway lines, 4 – border of the study area

Table 1. Kenophytes chorologically related to the habitats of railway grounds

List of kenophytes	Geographical-historical group	*Habitats	
		railways	other
Amaranthus albus L.	Epecophyte	2	1
Ambrosia artemisiifolia L.	Epecophyte	2	-
Artemisia dracunculus L.	Epecophyte	1	-
Asclepias syriaca L.	Epecophyte	2	1
Atriplex tatarica L.	Epecophyte	3	1
Bromus japonicus Thunb. ex Murr	Epecophyte	3	1
Bromus squarrosus L.	Epecophyte	2	-
Bunias orientalis L.	Epecophyte	3	2
Centaurea diffusa Lam.	Epecophyte	2	1
Diplotaxis tenuifolia (L.) DC	Epecophyte	3	1
Eragrostis albensis H. Scholz	Hemiagriophyte	2	1
Erysimum marschalianum Andrz. ex M. Bieb	Epecophyte	2	-
Geranium sibiricum L.	Epecophyte	2	1
Kochia scoparia (L.) Schrad.	Epecophyte	3	1
Lathyrus nissolia L.	Hemiagriophyte	1	-
Lepidium virginicum L.	Epecophyte	2	-
Linaria repens (L.) Mill.	Epecophyte	1	-
Oenothera salicifolia Desf. ex G. Don	Epecophyte	2	1
Oenothera wienii Renner ex Rostański	Epecophyte	2	1
Portulaca oleracea L. ssp. *oleracea*	Epecophyte	2	1
Potentilla intermedia L. non Wahlenb.	Epecophyte	2	1
Rubus laciniatus Willd.	Epecophyte	1	-
Rumex confertus Willd.	Hemiagriophyte	3	2
Salsola cali L. ssp. *ruthenica*	Epecophyte	2	1
Sisymbrium altissimum L.	Epecophyte	3	1
Sisymbrium wolgense M. Bieb. ex E. Fourn.	Epecophyte	2	-
Vicia pannonica Crantz	Hemiagriophyte	1	-

Explanations: 1 – rare (1-20 localities), 2 – dispersed (21-50), 3 – frequent (more than 51), * – squares of 10x10 km

the human factor is somewhat lesser, settle *Artemisia dracunculus, Atriplex tatarica, Lactuca tatarica, Lathyrus nissolia, Oenothera hoelscheri, Potentilla intermedia, Sisymbrium wolgense* and *Vicia pannonica*.

Epekophytes, species connected to ruderal habitats, prevail in the kenophyte group, while agriophytes are represented exclusively by *Eragrostis albensis, Lathyrus nissolia, Rumex confertus* and *Vicia pannonica*. One may not, however, determine precisely the patterns of distribution with regard to the habitat type for them. They occur both in open sections, in the immediate vicinity of natural and semi-natural ecosystems as well as on station grounds.

Analysing the origin region of kenophytes migrating along railway tracks, we may see that the eastern European-western Asian species definitely prevail over those characterised by a high degree of spreading and abundance of localities (Table 1, Fig. 2). The Asian species and those of anthropogenic origin have the smallest share.

The diversified land sculpture, soil cover, hydrological conditions and the urbanisation degree of the grounds across which railway line sections run, influence the number of kenophyte localities in particular meso-regions.

The greatest density of occurrence is observed in the area of the Lublin Upland while the smallest one in Roztocze, where the tracks of standard and broad-gauge railway cut through forest ecosystems. Polesie and Western Volhynia, despite their floral distinctiveness, come in the middle.

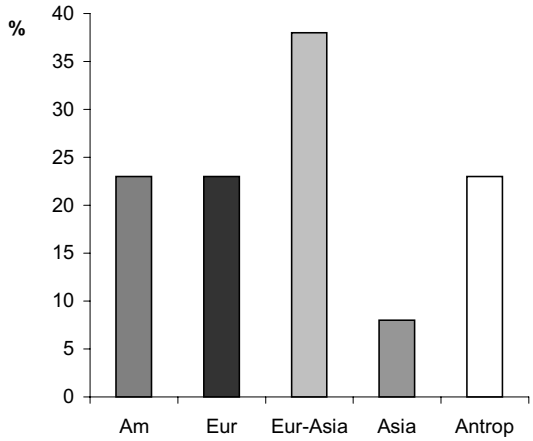

Fig. 2. Origin of kenophytes occurring in the railway areas (Data acc. to Table 1)
Explanations: Am – American, Eur – European, Eur-Asia – Eastern European-Western Asiatic, Asia – Asiatic, Antrop. – anthropogenic

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