

LOCALITIES OF *Nasturtium officinale* R. BR. ON THE GIEŁCZEW RISE (LUBELSKA UPLAND)¹

Danuta Urban*, Justyna Dresler**, Anna Iwona Mikosz*

*Institute of Soil Sciences and Environmental Management, University of Life Sciences in Lublin
Leszczyńskiego str. 7, 20-069 Lublin, danuta.urban@up.lublin.pl

**Department of Physical Geography and Paleogeography, Maria Curie-Skłodowska University
Kraśnicka Av. 2cd, 20-718 Lublin

Summary. *Nasturtium officinale* R. Br. is one of the rare species in the Polish flora. The study was performed in *Nasturtium officinale* localities in three river valleys (the Giełczew, Sierotka and Kosarzewka rivers) situated on the Giełczew Rise. The species occurs in clean, shallow, slow-flowing or standing waters, in drainage ditches, springheads and, less frequently, in ponds. The major threat for its localities is posed by succession processes, water pollution, and too intensive cleaning of drainage ditches.

Key words: *Nasturtium officinale*, localities, Giełczew Rise (Lubelska Upland)

INTRODUCTION

Nasturtium officinale R. Br. (a species from the family Brassicaceae) is a perennial with an internally empty, erect or partially decumbent, branching stem. The leaves are pinnately compound, ovate and fleshy with the terminal leaflet being larger than the others. The flowers are white, usually with purple venation, and the pods are elongated and sometimes slightly curved. Seeds are arranged in two rows and exhibit reticulate sculpture with ca. 20–25 areolae.

Nasturtium officinale is a cosmopolitan species. It is one of the rare species in the Polish flora and has been under strict species protection since 2004. Its localities have been reported from northern and western Poland [Rutkowski 1988, Buliński 2000, Zając A. and Zając M. 2001]. Localities of *Nasturtium officinale* from the Vistula river valley [Kucharczyk 2001], Lubelska Upland

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[Zajac and Zajac (eds) 2001] and Polesie Lubelskie [Banach 2008] have been reported as well. According to Fijałkowski [1995], the species is sparse in the Lublin Province and occurs mainly in drainage ditches. Tacik [1985] reports that there are no accurate data about the species distribution, because frequently it is wrongly distinguished from related species or misidentified as *Cardamine amara* L. Besides *Nasturtium officinale*, *Nasturtium microphyllum* (particularly rare) has been reported from only few localities in Poland [Tacik 1985, Smoczyk 2001, Kruk and Szymańska 2009] and a hybrid of both species *Nasturtium* × *sterile* (Airy-Shaw) Oefelein.

Like *Nasturtium microphyllum*, *Nasturtium officinale* occurs in clean, shallow, slow-flowing or standing waters, on the banks of streams and old riverbeds, in drainage ditches, and springheads. It is an indicator of water purity [Rottmaler *et al.* 1988, Rumińska and Ożarowski 1988].

It is a characteristic species for the association *Nasturtietum officinalis* (Seib. 1962) Oberd. *et al.* 1967 from the alliance *Sparganio-Glycerietum fluitantis* Br.-Bl. *et* Siss. and the class *Phragmitetea* R.Tx. *et* PRsg 1942. According to Matuszkiewicz [2005], the association, reported from the region of Wielkopolska, is poorly known.

The *Nasturtium officinale* R. Br. species has been known as a medicinal and edible plant since antiquity. The herb exhibits antiscorbutic, mild diuretic, antidiabetic and expectorant activity; it also lowers blood pressure [Rumińska and Ożarowski 1990, Broda and Mowszowicz 1996, Senderski 2004]. In recent years, research has been conducted on the use of plants from the family *Brassicaceae*, including *Nasturtium officinale*, in chemoprevention of tobacco smoke-induced lung cancer [Balcerek 2007]. The leaves of *Nasturtium officinale* are a valuable spice [Łuczaj 2008] (leaves and young plants are edible), and the herbs are used in the cosmetic industry [Senderski 2004].

The aim of the work was characterization of *Nasturtium officinale* localities in three river valleys of the Giełczew Rise (Lublin Upland). The material collected will allow tracking further changes in these localities.

STUDY AREA, MATERIALS AND METHODS

The study involved *Nasturtium officinale* localities in the valleys of the Kosarzówka (Bystrzyca tributary), Giełczew (Wieprz tributary) and Sierotka (Giełczew tributary) rivers. According to the physical-geographical division developed by Kondracki [2002], the valleys are situated on the Giełczew Rise, which is a mezoregion of the Lublin Upland. In terms of administration, the study objects are located in the Lublin Province, in the municipalities of Rybczewice (the Giełczew river valley – the village of Wygnanowice), Piaski (the Sierotka river valley – the village of Kęblów) and Bychawa (the Kosarzówka river valley – the village of Zdrapy).

Field observations were conducted in 2008–2010. In 2009, 12 phytosociological relevés were made with the method of Braun-Blanquet [1951] in the *Nasturtium officinale* localities. The phytosociological classification and nomenclature of plant communities followed that developed by Matuszkiewicz [2005]; the nomenclature for vascular plants follows Mirek *et al.* [2002]. Water samples were taken at the sites of occurrence of the largest patches of *Nasturtium officinale* in autumn 2009 and spring 2010. Reaction (pH) was measured by potentiometry, specific electrolytic conductance ($\mu\text{S}/\text{cm}$ at 20°C) was determined with the conductometric method (according to the methodology developed by Elbanowska *et al.* [1999]), the contents of Na, K, Ca, Mg and Fe – by flame atomic absorption spectrometry (FAAS), and the total N and P content was determined in the MPM 2010 photometer.

RESULTS AND DISCUSSION

In the Kęblów locality (the Sierotka river valley), *Nasturtium officinale* occurred along drainage ditches with slow-flowing water and in ditches draining springhead effusions. *Nasturtium officinale* specimens reached a height of about 0.3–0.4 m; they were richly branched and most of them flowered. Small clusters of the species were also found in the Sierotka river. The substrate was composed of mineral formations covered with a layer of silt. The size of individual patches usually reached few square meters. *Nasturtium officinale* formed dense fields and its cover reached 100%. The accompanying species included *Lemna minor*, *Myosotis palustris*, *Veronica anagallis-aquatica* and *Phragmites australis* (Tab. 1).

In the second locality in Wygnanowice (the Giełczew river valley), *Nasturtium officinale* occurred along drainage ditches with standing water and organic substrate, and in a large springhead and springhead effusions. The area of individual patches ranged from a few to several square meters. *Nasturtium officinale* specimens growing in drainage ditches were robust and reached a height of about 0.6 m; those in springhead niches were shorter and reached a height of about 0.3–0.4 m. Most of the specimens, particularly those in the drainage ditches and spring water effusion, bloomed and bore fruit. Like in the above-mentioned locality, *Nasturtium officinale* formed dense fields and its cover reached 100%. The accompanying species included *Lemna minor*, *Veronica anagallis-aquatica*, *Berula erecta*, *Myosotis palustris*, and *Phragmites australis* (Tab. 1).

In the locality in Zdrapy (the Kosarzewka river valley), *Nasturtium officinale* occurred in a few drainage ditches with standing or slow-flowing water, in a large springhead and in a pond dug in the springhead niche. Organic formations were found at the bottom of most of the drainage ditches and in the pond. Mineral formations, covered with a thin layer of silt, were found in the largest drainage ditch running parallel to the Kosarzewka river bed. The size of individual patches ranged from a few to several square meters. *Nasturtium officinale* specimens (especially those in the drainage ditches) were robust and reached a height

of about 0.8 m; they were richly branched, bloomed profusely and bore fruit. Like in the other localities, *Nasturtium officinale* formed dense fields of 100% cover. The accompanying species included *Lemna minor*, *Elodea canadensis*, *Berula erecta*, *Myosotis palustris*, *Phragmites australis*, *Phalaris arundinacea*, *Mentha aquatica*, and, very seldom, *Lythrum salicaria* and *Cirsium oleraceum*.

Table 1. Floristic composition of the association *Nasturtietum officinalis* (Seib. 1962) Oberd. *et al.* 1967

Phytosociological relevé number	1	2	3	4	5	6	7	8	9	10	11	12
Locality	K*	K	K	K	W**	W	W	W	Z***	Z	Z	Z
Layer c cover in %	100	100	100	100	100	100	100	100	100	100	100	100
Number of species in the relevés	3	4	3	4	2	3	4	3	2	5	3	2
<i>Nasturtium officinale</i>	5	5	5	5	5	5	5	5	5	5	5	5
<i>Lemna minor</i>	.	+	.	.	+	+	+	.	.	.	3	.
<i>Spirodela polyrhiza</i>	1	.	.	.	.	.	.	.	.	.	.	.
<i>Elodea canadensis</i>	.	.	.	.	.	.	.	.	.	.	.	2
<i>Phragmites communis</i>	1	.	.	.	.	.	+	.	.	.	+	.
<i>Phalaris arundinacea</i>	.	.	.	.	.	.	.	+	.	+	.	.
<i>Veronica anagallis-aquatica</i>	.	+	.	1	.	+	.	+	.	.	.	.
<i>Berula erecta</i>	.	.	+	+	.	.	+	.	+	.	.	.
<i>Lythrum salicaria</i>	.	.	.	.	.	.	.	.	.	+	.	.
<i>Cirsium oleraceum</i>	.	.	.	.	.	.	.	.	.	+	.	.
<i>Myosotis palustris</i>	.	.	+	+	.	.	.	+	.	.	.	.
<i>Mentha aquatica</i>	.	+	.	.	.	.	.	.	.	+	.	.

*K – Kęblów, **W – Wygnanowice, ***Z – Zdrapy

The waters of the study objects were characterized by alkaline reaction (Tab. 2). In general, samples taken in the spring exhibited a slightly higher pH. Conductivity ranged from 462 to 638 $\mu\text{S}/\text{cm}$ in autumn and from 462 to 621 $\mu\text{S}/\text{cm}$ in spring. The highest conductivity was reported from water samples collected in the Kęblów locality (The Sierotka river valley), and the lowest – in the Zdrapy object (the Kosarzewka river valley). Sodium and potassium content in the analyzed waters fluctuated within a fairly wide range. In autumn, the range for Na was from 4.71 to 16.70 $\text{mg}\cdot\text{dm}^{-3}$, while in spring – from 4.86 to 13.50 $\text{mg}\cdot\text{dm}^{-3}$. K content was in the range of 1.48–10.81 $\text{mg}\cdot\text{dm}^{-3}$ in autumn and 0.74–7.52 $\text{mg}\cdot\text{dm}^{-3}$ in spring. Calcium had higher values in spring (from 88.10 to 105.00 $\text{mg}\cdot\text{dm}^{-3}$) than in autumn (from 75.93 to 81.57 $\text{mg}\cdot\text{dm}^{-3}$). In contrast to calcium, the content of magnesium was higher in autumn. Iron was present in quantities not exceeding 0.19 $\text{mg}\cdot\text{dm}^{-3}$. The content of total phosphorus ranged from 0.59 to 1.01 $\text{mg}\cdot\text{dm}^{-3}$ in autumn and from 0.20 to 1.51 $\text{mg}\cdot\text{dm}^{-3}$ in spring. The amounts of total nitrogen ranged between 0.18 and 4.99 $\text{mg}\cdot\text{dm}^{-3}$ in autumn 1.03 to 7.12 $\text{mg}\cdot\text{dm}^{-3}$ in spring.

The present study indicates that *Nasturtium officinale* occurred in typical habitats associated with effusions and springhead waters (outflows of water from springhead niches, canals and ditches draining spring effusions, a pond in the springhead niche). Similar habitats are indicated by other authors [Fijałkowski 1995, Buliński 2000]. According to Czyłok *et al.* [2008] and Woźniak and Kompała [2000], *Nasturtium officinale* may occur in sand mining pits.

Table 2. Characteristics of surface waters in the study localities

Village River	Month of sam- pling	pH	Conductivity µS/cm	Na	K	Ca	Mg	Fe	P	N
Kęblów Sierotka	September	7.5	638	16.70	10.81	81.57	12.0	0.05	0.68	0.18
	May	7.4	621	13.50	7.52	105.00	11.0	0.01	0.39	7.12
Wygnanowice Giełczew	September	6.6	586	15.69	4.42	70.44	11.40	0.19	1.01	4.99
	May	7.3	561	14.30	4.40	92.40	10.70	0.03	0.39	6.86
Zdrapy Kosarzewka	September	7.1	470	4.71	1.48	75.93	8.51	0.01	0.59	0.46
	May	7.5	462	4.86	1.02	88.80	7.71	0.02	0.20	1.89
Zdrapy Kosarzewka	September	7.1	462	9.02	2.46	86.00	8.68	0.12	0.59	1.60
	May	7.3	473	5.63	0.74	88.10	7.15	0.03	1.51	1.03

Nasturtium officinale was the dominant species in all the study patches of the association *Nasturtietum officinale*. *Lemna minor*, *Myosotis palustris*, as well as *Berula erecta* and *Veronica anagallis-aquatica* were the few accompanying species. Similar dependencies were shown in the research conducted by other authors in river valleys in Italy [Biondi *et al.* 2003, Tomasi *et al.* 2003, Angiolini *et al.* 2005], Greece [Georgiadis *et al.* 1997], and in Poland [Buliński 2000]. The study of Szoszkiewicz *et al.* [2010] indicates that the association *Nasturtietum officinale* is connected with mesotrophic waters.

The major threat for the above-described *Nasturtium officinale* localities are succession processes, water pollution, and too intensive cleaning of drainage ditches. In the Kęblów and Zdrapy localities, *Nasturtium officinale* patches were partially destroyed during the cleaning of drainage ditches and canals.

CONCLUSION

1. The study localities of *Nasturtietum officinale* are the richest in the Giełczew Rise and Lublin Upland. The most robust *Nasturtium officinale* specimens (height of shoots up to 0.8 m) were found in the Zdrapy locality in the Kosarzewka river valley.

2. In all the localities, *Nasturtietum officinale* patches were associated with clean springhead waters.

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STANOWISKA *Nasturtium officinale* R. BR. NA WYNIOSŁOŚCI GIEŁCZEWSKIEJ
(WYŻYNA LUBELSKA)

Streszczenie. *Nasturtium officinale* R. Br. jest jednym z rzadszych gatunków flory Polski. Badaniami objęto stanowiska *Nasturtium officinale* w trzech dolinach rzecznych (Giełczew, Sierotka i Kosarzewka), leżących na Wyniosłości Giełczewskiej. Gatunek ten występuje tu w czystych, płytkich, wolno płynących lub stojących wodach, w rowach melioracyjnych oraz źródłiskach i rzadziej w sadzawkach. Największym zagrożeniem dla jego stanowisk są procesy sukcesji, zanieczyszczenie wody oraz zbyt intensywne oczyszczanie rowów melioracyjnych.

Słowa kluczowe: *Nasturtium officinale*, stanowiska, Wyniosłość Giełczewska (Wyżyna Lubelska)