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Aesthetic aspects of plant communities of ruderal urban sites in Szczecin

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Abstract. Synanthropization of plant cover, connected with urban development, contributes to the appearance of specialized ruderal plant communities, adapted to habitats exposed to human influence. A lot of published data have focused on urban flora, but the aesthetic aspect of perennial and temporary plant communities at urban sites has been frequently omitted. Currently the practical use of such plant communities is limited by the lack of descriptive information available. In this study great attention has been paid to variability of urban communities, defined by: aesthetic aspects, flowering period, and colour variability in flowering communities. In Szczecin, *Artemisio-Tanacetetum vulgaris, Calamagrostietum epigeji, Dauco-Picridetum hieracioidis*, and *Rudbeckio-Solidaginetum* have been recognized as especially decorative. They could be used to reduce the costs of establishing and maintaining urban green areas.

Key words: urban sites, ruderal vegetation, flowering aspects, flower colour

1. Introduction

In recent years, intensive human management has exerted a significant effect on landscape. Rapid urban development plays a major role in habitat degradation, linked with shortage and salinity of water, soil degradation, air pollution, and mechanical damage. It leads to the development of nitrophilous communities, tolerant to stressful urban conditions (Kim et al. 2002; Wojcieszczuk 1980). Habitats like waysides, slopes of railway tracks and roads, banks of watercourses, undeveloped plots in the city centre and suburbs, or wastelands, are commonly occupied by the well-adapted and resistant ruderal urban communities (Janecki 1983; Sudnik-Wójcikowska 1992; Chmiel 1993; Juśkiewicz-Swaczyna & Endler 2003; Chyliński & Fornal 2005). Currently the aesthetic and ecological values of such plant communities are indiscernible and underestimated. However, colourful flowering plant communities in cities have a positive influence on human senses. The high diversity of plants and its colour variability may arouse aesthetic feelings and respect for local flora. Many studies have concentrated on analyzing urban flora but only few have paid attention to their aesthetic aspect.

The presented study brings a fresh view of possible ornamental use of some ruderal urban communities, distinguished by rich species composition, intensity and colour variability, long flowering period, and adaptation to difficult conditions.

2. Materials and methods

The field research was conducted during the growing season in 2005 in Szczecin. Nine potentially attractive ruderal urban communities, in respect of being floriferous, were localized and identified. The plots were situated within the city boundaries and characterized by various degrees of human pressure: earthworks, rubble heaps, embankments, treaded areas, or areas subject to ploughing and mechanical damage.

At the selected plots we recorded all plant species, with their cover-abundance and sociability recorded on the Braun-Blanquet scale, and next we identified and classified the analyzed phytocoenoses (Matuszkiewicz 2006). The species names follow the works of Mirek *et al.* (2002) and Rutkowski (2004).

The present study was largely based on weekly observations, during which we completed and checked the list of plant species, determined their flowering period, colour variability, and phenophase (flower buds, full flowering, shedding of flowers, fruits), and took photographs at various phenological stages of ruderal communities. Aesthetic features of the analyzed plant communities are recorded in tables, including the Latin name, cover-sociability, flower colour, and extent of the flowering period.

3. Results

Patches of Artemisio-Tanacetetum vulgaris, Calamagrostietum epigeji, Dauco-Picridetum hieracioidis, and Rudbeckio-Solidaginetum, as the most common and desirable communities for decorative purposes, were chosen for detailed description.

Artemisio-Tanacetetum vulgaris Br.-Bl. 1931 corr. 1949

This plant community consists of tall perennials and a small group of biennials. It has overgrown an area anthropogenically changed and neglected for many years. The dominant species is *Tanacetum vulgare*, which is a species characteristic for this community and creates tall, dense stands. It is accompanied by species of the order *Onopordetalia acanthi*: *Arrhenatherum elatius*, *Daucus carota*, and *Echium vulgare*. The community mainly consists of hemicryptophytes resistant to unfavourable soil conditions and traffic pollutants.

Inflorescences of the dominant species – *Tanacetum* vulgare – cause the yellow colouring of the whole plot

during the growing season (Table 1). However, the species composition is rich in attractive flowering plants. Colour stages:

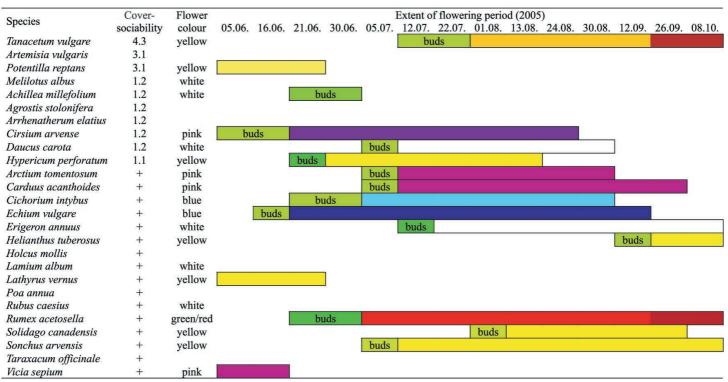
Green – from 5th June to 12th July. The dominant colour is determined by the green leaves of *Tanacetum vulgare* and *Potentilla reptans*.

Green with colourful elements – from 12th July to 1st August. It is the continuation of *Tanacetum vulgare* vegetative growth, accompanied mostly by white inflorescences of: *Achillea millefolium*, *Daucus carota*, *Erigeron annuus*, and *Melilotus alba*. Species with flowers coloured from light blue to deep crimson (*Arctium tomentosum*, *Carduus acanthoides*, *Cichorium intybus*, *Cirsium arvense*, *Echium vulgare*, and *Lathyrus tuberosus*) grow individually or in small groups, hence they are less noticeable. Only a few species are yellowblooming: *Hypericum perforatum* and *Sonchus arvensis*.

Yellow – from 1st August to 12th September. It is initiated by *Tanacetum vulgare* blooming. It is one of the longest and especially valuable colour stages. The whole plot is covered by erect yellow flower heads of *Tanacetum vulgare*. Furthermore, the yellow colour is complemented by simultaneously blooming species, such as: *Hypericum perforatum*, *Solidago canadensis*, and *Sonchus arvensis*. Among them, also white inflorescences are noticeable: *Achillea millefolium*, *Daucus carota*, *Erigeron annuus* and *Melilotus alba*. Blue and purple flowers are represented by infrequent *Cirsium arvense*, *Carduus acanthoides* and *Cichorium intybus*.

In mid-September, the first *Tanacetum vulgare* inflorescences turn dark brown, and this is the end of the

Table 1. Flowering aspect of Artemisio-Tanacetetum vulgaris



Species	Cover-	Flower	Extent of flowering period (2005)										
	sociability	colour	05.07.	12.07.	22.07.	01.08.	13.08.	24.08.	30.08.	12.09.	26.09.	08.10	
Calamagrostis epigejos	4.5	purple/straw											
Solidago canadensis	2.2	yellow			buds								
Solidago altissima	1.3	yellow				bu	ds						
Potentilla reptans	1.3	yellow											
Achillea millefolium	1.2	white		buds									
Tanacetum vulgare	1.2	yellow				buds							
Artemisia vulgaris	+												
Cirsium arvense	+	pink											
Helianthus tuberosus	+	yellow						bu	ds				
Symphytum officinale	+	purple					-						

Table 2. Flowering aspect of Calamagrostietum epigeji

attractive period in the community. Although *Helianthus tuberosus*, *Solidago canadensis*, and *Sonchus arvensis* are still blooming, it does not improve the appearance of the whole plot.

Calamagrostietum epigeji Juraszek 1928

This community is found in an area devastated for a long time. The plot is located in a sheltered and dry spot, distant from roads. The community consists of 10 tall perennial species, among which *Calamagrostis epigejos* is the dominant and creates a dense stand. The participation of *Solidago canadensis* s.s. and *Solidago canadensis* var. *scabra* (*S. altissima*), which are characteristic species of *Rudbeckio-Solidaginetum* community, is also conspicuous. *Helianthus tuberosus* has been observed occasionally. It reaches the optimum stage of development in late summer.

This community is distinguished by the late aesthetic expression, among which 2 colours co-dominate: the green of foliage and yellow of *Solidago* inflorescences (Table 2).

Colour stages:

Green – from 7th July to 24th August. This effect is created by dark green, long *Calamagrostis epigejos* leaves and light green *Solidago canadensis* tussocks. At the beginning of August the green community colour is diversified by flowering companion species: white inflorescences of *Achillea millefolium* and yellow of *Tanacetum vulgare*. At the end of August most of *S. canadensis* flower buds turn yellow.

Green and yellow – from 24th August to 12th September. The plot is very attractive because of colour intensity. The dominant colour is the yellow of *Solidago canadensis* inflorescences and light green leaves. The spindle-like, light purple panicles of *Calamagrostis epigejos* overlook the tall and dense stand. Later, the latter species turns straw-coloured, while the former continues flowering yellow.

Since 26th September, *Calamagrostietum epigeji* looses its decorative value. The only bright and colourful element in the plot is created by the tall, yellow inflorescences of *Helianthus tuberosus*.

Dauco-Picridetum hieracioidis (Fab. 1933) Görs 1966

This community grows on a gentle, sunny slope and consists of 14 species. The co-dominant *Cichorium intybus* and *Daucus carota* create a field-patch structure. The phytoceonosis is represented mostly by perennial species, although *D. carota* is a biennial plant.

During our observations, the community was dominated by whiteness of *Daucus carota* and light blue of *Cichorium intybus* (Table 3).

Colour stages:

Secolar	Cover-	Flower											
Species	sociability	colour	05.07.	12.07.	22.07.	01.08.	13.08.	24.08.	30.08.	12.09.	26.09.	08.10.	
Cichorium intybus	3.4	blue											
Daucus carota	3.3	white											
Lolium perenne	1.2									-			
Artemisia vulgaris	1.1												
Sonchus arvensis	1.1	yellow											
Taraxacum													
officinale	+												
Erigeron annuus	+	white			buds								
Melilotus officinalis	+	yellow											
Plantago lanceolata	+												
Solidago altissima	+	yellow						buds					
Tanacetum vulgare	+	yellow		bu	ıds								
Trifolium repens	+	white											

Table 3. Flowering aspect of Dauco-Picridetum hieracioidis

Blue and white – from 7th July to 1st August, when bluish inflorescences of *Cichorium intybus* predominate over white *Daucus carota* umbels in respect of height and quantity. The whole plot is then densely covered by flowering species. In late August, species like *Melilotus officinalis* and *Sonchus arvensis* add their yellow elements.

White and blue – from 1st to 24th August. This is the period of intensive *Daucus carota* development, when the tall white umbels dominate the whole community. Blue colour is only a complement and a background to the magnificent *Daucus carota*. Yellow colour is poorly represented, by *Melilotus officinalis*, *Sonchus arvensis*, and *Tanacetum vulgare*.

Blue and white with yellow elements – from 24 August to 12th September. Blue colour becomes predominant again, but the smaller quantity of *Cichorium intybus* is quite noticeable. Most *Daucus carota* inflorescences set seeds and only few of them still have flowers. Attention is drawn to sporadic species whose flowers are yellow.

In mid-September *Dauco-Picridetum hieracioidis* looses its aesthetic value.

Rudbeckio-Solidaginetum R.Tx. et Raabe 1950

This community is composed of tall and thriving nitrophilous species. The dominant is *Solidago canadensis*

(characteristic species), accompanied by some other perennial plants, which reach the optimum stage of development in late summer (*Pimpinella saxifraga*, *Medicago sativa*, *Medicago lupulina*, *Cichorium intybus*, *Melandrium album*) (Table 4).

Colour stages:

Green with colourful elements – from 5th June to 1st August. The community colour is defined by light and dark green tones, broken by colourful flowering species: yellow (*Lotus corniculatus*, *Medicago lupulina*, *Oenothera biennis* s.s., *Potentilla argentea*, *Tragopogon pratensis* s.s.), white (*Achillea millefolium*, *Berteroa incana*, *Daucus carota*, *Erigeron annuus*, *Melandrium album*, *Melilotus alba*), or blue to purple (*Cichorium intybus*, *Cirsium arvense*, *Echium vulgare*, *Knautia arvensis*, *Medicago sativa*) In the second half of July, most of the species are in full blossom. The dominance of white and blue flowers is conspicuous.

Light yellow and white – from 1st August to 30th August. Flower buds of *Solidago canadensis* create light yellow spots. Initially they are in contrast to species with white inflorescences. In the second half of August, the white colour gradually vanishes (*Achillea millefolium*, *Berteroa incana*, *Daucus carota*, *Erigeron annuus*, *Pimpinella saxifraga*). Flowering species are then dominated by yellow (*Lotus corniculatus*, *Oenothera biennis*, *Senecio jacobaea*) and blue colours (*Ballota nigra*,

Species	Cover-	Flower	-				1	Extent of	floweri	ng period	d (2005)					
s S	sociability	colour	05.06.	16.06.	21.06.	30.06.	05.07.	12.07.	22.07.	01.08.	13.08.	24.08.	30.08.	12.09.	26.09.	08.10.
Solidago altissima	3.4	yellow						buo	ls			~				
Solidago canadensis	3.3	yellow								bu	ıds					
Poa pratensis	2.4															
Pimpinella saxifraga	2.3	white														
Achillea millefolium	1.3	white					bu	ds								
Artemisia vulgaris	1.3														-	
Medicago sativa	1.3	purple														
Melilotus albus	1.3	white			buds											
Rubus caesius	1.3	white	14								20					
Lotus corniculatus	1.2	yellow	buds				_									
Medicago lupulina	1.2	yellow														
Cichorium intybus	1.1	blue					buds									
Dactylis glomerata	1.1															
Daucus carota	1.1	white			buds			_			_					
Echium vulgare	1.1	blue														
Melandrium album	1.1	white								_						
Erigeron annuus	+	white	buds													
Agrimonia eupatoria	+	yellow					buds									
Berteroa incana	+	white														
Cerastium arvense	+	white														
Cirsium arvense	+	purple														
Convolvulus arvensis	+	pink														
Knautia arvensis	+	pink	bu	ıds		_										
Oenothera biennis	+	yellow			buds											
Potentilla argentea	+	yellow														
Rumex acetosa	+	green/red														
Senecio jacobaea	+	yellow			buds											
Taraxacum officinale	+															
Tragopogon pratensis	+	yellow	buds													
Trifolium pratense	+	white								94 G						

Table 4. Flowering aspect of Rudbeckio-Solidaginetum

Cichorium intybus, Echium vulgare, Knautia arvensis, Medicago sativa).

Yellow – from 30^{th} August to 8^{th} October. It is characterized by intensive yellow flowers of *Solidago canadensis* and scanty white flowers of other species. In mid-September the yellow colour of *S. canadensis* gets darker, and in October it turns light brown.

4. Discussion

Currently, most of the society perceive ruderal urban plants as common weeds and do not appreciate their stability and aesthetic value. In cities usually only predictable and repeatable ornamental plants are cultivated, which are quite often not resistant to changeable environmental conditions. This study shows that places under strong human pressure could be sown or planted with species compositions that form ruderal urban communities.

The best places for such natural flowerbeds are open spaces in parks or landscape gardens, on the outskirts of towns, in the immediate vicinity of houses, roundabouts, or along public transport routes (Sowa 1964; Wróbel 2006). Janecki (1983) mentions *Artemisio-Tanancetum vulgaris* and *Rudbeckio-Solidaginetum* communities as useful in urban space on account of aesthetic value. Similarly, Wysocki and Sikorski (2009) point out the value of *Rudbeckio-Solidaginetum* for its aesthetic aspects in landscape architecture. The presented study confirms this view through observations of abundant and long-term flowering of *Solidago canadensis*. The community *Rudbeckio-Solidaginetum* is floristically rich, consisting of numerous profusely blooming species. Janecki (1983) noted that *Echium vulgare*, *Melilotus alba*, and *Oenothera biennis* in their structure and colour resemble flower beds. He recommended this community for use in urban architecture and mowing once in autumn.

The community *Artemisio-Tanacetetum vulgaris* overgrows rural and urban neglected lawns (Wysocki & Sikorski 2009). In Szczecin it occurred in an area neglected for a long time, near Mieszka I Street. Many authors (Sowa 1964; Zając 1974; Janecki 1983; Matusz-kiewicz 2006; Wysocki & Sikorski 2009) state that it is dominated by *Tanacetum vulgare* and a number of sporadic species. Janecki suggested using that community in urban areas on account of its aesthetic value (long-term blooming – July to September) as well as low cost (mowing once a year). However, *Artemisio-Tanacetetum vulgaris* may produce allergic reactions due to *Artemisia* species.

Moreover, to create stable patches of *Artemisio-Tanacetetum vulgaris* and *Rudbeckio-Solidaginatum*, a few growing seasons are needed.

Aside from stable perennial vegetation, a great role is played by flowering plant communities consisting of annuals and biennials, e.g. *Dauco-Picridetum hieracioidis*, which perfectly suits in the needs of urban green areas and can be introduced and maintained at low cost (sowing and mowing once a year).

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