

Diversity of ancient woody species in urban forests

Beata Fornal-Pieniak¹ ✉, Marcin Ollik², Ewa Zaraś-Januszkiewicz¹, Barbara Żarska¹

¹ Warsaw University of Life Sciences – SGGW, Faculty of Horticulture, Biotechnology and Landscape Architecture, Department of Environment Protection, Nowoursynowska 159, 02-787 Warsaw, Poland, e-mail: beata_fornal_pieniak@sggw.pl

² Warsaw University of Life Sciences – SGGW, Faculty of Agriculture and Biology, Department of Experimental Design and Bioinformatics, Nowoursynowska 159, 02-787 Warsaw, Poland

ABSTRACT

Mostly parks and forest are the most important ‘green islands’ in urban ecological network. Urban forests are belong to green areas and collected many plant species. The main aim of the article was characteristic of ancient plant species in urban forests in Tarnów. The field studies were carried out in years 2011–2012. It covered 80 phytosociological records on the area 500 m² in herb layer of urban forests and in forest nature on oak-hornbeam. The results showed that many ancient plant species were growing in urban forest but less than in nature reserves.

KEY WORDS

ancient woody species, urban forest

INTRODUCTION

Urban areas are highly modified and complex landscapes, within which green or open areas are seen as valuable for human well-being as well as wildlife (Pickett et al. 2001, 2004). Many cities have a network of habitat fragments or ‘urban greenways’ comprising areas of semi-natural habitats, secondary succession, ruderal and pioneer environments and open areas. These habitats may be important features for biodiversity both as stable and as transient habitats (McIntyre 2000; McIntyre et al. 2001) and may also be valuable for their possible function as “corridors” and “stepping stones” to facilitate species dispersal Kirby (1995). Parks and urban forest are the most important elements in urban ecological network. Ancient forest plant species – plant

species which are characteristic for ancient woodland (above 200 year old) and old woodlands (200–100 years old) according to Wulf (2003). The main aim of the article was characteristic of ancient woody plant species in urban forest in Tarnów.

MATERIAL AND METHODS

Tarnow is a city in southeastern Poland (50°00'45" N 20°59'18" E). The city has been situated in the Lesser Poland Voivodeship.

It covered 80 phytosociological records on the area 500 m² in herb layer of urban forests and in forest nature on oak-hornbeam habitat (4 objects), reserves (4 objects, located out of the city); 160 – total numbers of records.

Flora analysis included number of “ancient plants” on study areas.

RESULTS

The occurring plant species were represented by forest plants (*Tilio-Carpinetum*), grasses plants (*Molinio-Arrhenatheretea*), synantropical plants (*Artemisietea vulgaris*). It was observed higher frequently and diversity of plant species in nature reserve (29 species) than in the urban forests (23 species) (tab. 1). Native, ancient species for example *Anemone nemerosa*, *Stellaria holostea*, *Corydalis cava*, *Anemone ranunculoides* are strongly connected with natural habitats.

Table 1. List of ancient plant species in nature reserves and urban forests

| Nature reserves | Urban forests |
|------------------------------|--------------------------------|
| 1 | 2 |
| <i>Acer campestre</i> | <i>Acer campestre</i> |
| <i>Anemone nemerosa</i> | <i>Anemone nemerosa</i> |
| <i>Anemone ranunculoides</i> | <i>Anemone ranunculoides</i> |
| <i>Asarum europaeum</i> | <i>Asarum europaeum</i> |
| <i>Carex pilosa</i> | <i>Circaea lutetiana</i> |
| <i>Circaea lutetiana</i> | <i>Convallaria majalis</i> |
| <i>Convallaria majalis</i> | <i>Corydalis cava</i> |
| <i>Corydalis cava</i> | <i>Corylus avellana</i> |
| <i>Corylus avellana</i> | <i>Dactylis polygama</i> |
| <i>Dactylis polygama</i> | <i>Gagea lutea</i> |
| <i>Gagea lutea</i> | <i>Galeobdolon luteum</i> |
| <i>Galeobdolon luteum</i> | <i>Luzula pilosa</i> |
| <i>Lathyrus vernus</i> | <i>Maianthemum bifolium</i> |
| <i>Luzula pilosa</i> | <i>Melampyrum nemorosum</i> |
| <i>Maianthemum bifolium</i> | <i>Mercurialis perennis</i> |
| <i>Melampyrum nemorosum</i> | <i>Oxalis acetosella</i> |
| <i>Melica nutans</i> | <i>Poa nemoralis</i> |
| <i>Mercurialis perennis</i> | <i>Polygonatum multiflorum</i> |
| <i>Milium effusum</i> | <i>Pulmonaria officinalis</i> |
| <i>Oxalis acetosella</i> | <i>Stachys sylvatica</i> |
| <i>Paris quadrifolia</i> | <i>Stellaria holostea</i> |
| <i>Phyteuma spicatum</i> | <i>Tilia cordata</i> |

| 1 | 2 |
|--------------------------------|------------------------|
| <i>Poa nemoralis</i> | <i>Viola mirabilis</i> |
| <i>Polygonatum multiflorum</i> | |
| <i>Pulmonaria officinalis</i> | |
| <i>Stachys sylvatica</i> | |
| <i>Stellaria holostea</i> | |
| <i>Tilia cordata</i> | |
| <i>Viola mirabilis</i> | |

CONCLUSIONS

- Oak hornbeam sites in urban forests are not so disturbed by anthropogenic pressure because ancient plants are still occurring there.
- More ancient plants were growing in nature reserves than urban forests.

REFERENCES

- Braun-Blanquet J. 1951. Pflanzensoziologie. Springer Verlag, Wien.
- Matuszkiewicz J.M. 2001. Zespoły leśne Polski (Forest communities in Poland). PWN, Warsaw.
- McIntyre N.E. 2000. Ecology of urban arthropools: a review and a call to action. *Annals of the Entomological Society of America*, 93, 825–835.
- McIntyre N.E., Rango J., Fagan W.F., Faeth S.H. 2001. Ground arthropool community structure in a heterogeneous urban environment. *Landscape and Urban Planning*, 52, 257–274.
- Pickett S.T.A., Candenasso M.L., Grove J.M. 2004. Resilient cities: meaning, models and metaphor for integrating the ecological socio-economic and planning realms. *Landscape and Urban Planning*, 69, 369–384.
- Pickett S.T.A., Candenasso M.L., Grove J.M., Nilon C.H., Pouyat R.V., Zippere W.C. 2001. Urban ecological systems: linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. *Annual Review of Ecology and Systematics*, 32, 127–157.
- Wulf M. 2003. Preference of plant species for woodlands with differing habitat continuities. *Flora*, 198, 444–460.