

## URBAN AGRICULTURE – ECOSYSTEM AND CULTURAL FUNCTIONS OF ORCHARD VEGETATION

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### Abstract

The phenomenon of urban agriculture has lately become a much discussed issue. The idea of food production in cities seems to be in a striking contrast with the character of urban life, however, orchards are very suitable for urban agriculture by their nature. Apart from ensuring production functions (fruit production), they provide a whole range of ecosystem and cultural functions. Orchards are not a typical agricultural monoculture. Vegetation for non-production use is grown under the fruit trees. The orchard vegetation plays a role in anti-erosion function, which is mainly performed by perennial grasses (*Lolium perenne*, *Poa pratensis* etc.), it is a food source for pollinating insects (*Medicago lupulina*, *Onobrychis viciifolia* and *Vicia sativa*), and a habitat for medicinal herbs (*Plantago lanceolata*, *Rosa canina*, *Urtica dioica*). The occurrence of diverse plant species affects the functioning of the ecosystem positively and can also be used for touristic purposes.

**Key words:** tourism, plant biodiversity, urban orchards, medicinal herbs

### Introduction

The phenomenon of urban agriculture has been a much-discussed issue in recent years. The idea of food production in cities seems to be in a striking contrast with the character of urban life. However, food production in cities is just as old as cities themselves. The only circumstance that differs is the motivation. In the past, the main need was to ensure enough food at affordable prices, nowadays, there are extra drivers such as the social effect (community gardens), the support of regional food and local food security. Apart from that urban agriculture completes the urban landscape and is reflected in the structure of cities. In built-up areas, urban agriculture can be found both in the city center and in the suburban area, e.g. in gardens near houses, in backyards, in gardening colonies, on the remains of agricultural land in new developments, and recently also on the roofs or facades of buildings (green roofs and facades). The location of agriculture within the city can be economically advantageous and attractive due to the proximity of consumers and the existence of an organized market. Growing vegetables, herbs, and especially fruits is very popular in the world (Armanda et al. 2019, Horst et al. 2017, Langemeyer et al. 2021, Loker, Francis, 2020, Pimbert, 2019, Bhattarai, Conway, 2021, Ortiz et al. al. 2021, Grochulska-Salak et al. 2021, Nowysz et al. 2022).

### Material and methods

The studied orchard is located in the cadastral territory of Bohunice district (Brno-city, South Moravian region). The orchard is managed in an organic farming regime and is run by the Ovocnářské družstvo company with the trade mark Sady Lískovec. The orchard can be divided into three parts based on the age of the planted fruit trees. In all three parts of the orchard, the middle row is mowed twice a year and herbicides are not used.

Young orchard – planting of fruit trees took place in 2018. The area is 3.64 ha. Stone fruits, namely plums and apricots, were planted there. The middle row was sown with a species-rich mixture of crops.

Production orchard – fruit trees were planted in 2010. The area is 5.83 ha. Apple trees of the Gala variety were planted there. The middle row was sown with a grass mixture.

Overgrown orchard – fruit trees were planted in 1980. The area is 0.61 ha. Apple trees of the Rubín variety were planted there. The middle row was left to self-greening.

The method of phytosociological sampling was used to evaluate the vegetation. A vegetation survey was carried out in all three parts of the orchard the same day (in July 2021). The coverage of identified plant species in the sampling plots was estimated. The plant species were divided into groups according to their biological properties.

## Results

A total of 50 plant species was identified in the young orchard consisting of 21 native species, 21 archaeophytes (plants introduced to the present territory by expansion before the beginning of the modern age, i.e. until the end of the 15<sup>th</sup> century) and 8 neophytes (species introduced to Europe after the discovery of America). Dominant species were *Lolium perenne*, *Convolvulus arvensis*, *Amaranthus retroflexus*, *Papaver rhoeas*, *Conyza canadensis* a *Onobrychis viciifolia*. Following plant species can be included among the commonly occurring: *Hordeum murinum*, *Polygonum aviculare*, *Geranium pusillum*, *Taraxacum* sect. *Taraxacum*, *Bromus hordeaceus*, *Bromus sterilis*, *Poa pratensis*, *Festuca pratensis*, *Dactylis glomerata*, *Chenopodium album*, *Medicago lupulina*, *Erigeron annuus*, *Lactuca serriola*, *Plantago major*, *Myosotis arvensis*, *Trifolium repens*, *Lathyrus tuberosus*, *Trifolium pratense*, *Arenaria serpyllifolia*, *Linaria vulgaris* a *Lepidium draba*. 21 taxa with rare occurrence were recorded.

A total of 41 plant species were recorded in the production orchard comprising of 20 native plant species, 16 archaeophytes and 5 neophytes. The dominant species were *Lolium perenne*, *Hordeum murinum* a *Erigeron annuus*.

17 commonly occurring plant species were recorded which are the following ones: *Polygonum aviculare*, *Convolvulus arvensis*, *Bromus hordeaceus*, *Bromus sterilis*, *Poa pratensis*, *Festuca pratensis*, *Papaver rhoeas*, *Medicago lupulina*, *Elymus repens*, *Plantago major*, *Myosotis arvensis*, *Trifolium repens*, *Calamagrostis epigejos*, *Plantago lanceolata*, *Arenaria serpyllifolia*, *Cirsium arvense* a *Securigera varia*. 21 taxa with rare occurrence were identified.

49 plant species were identified in the overgrown orchard. These were composed of 24 native plant species, 20 archaeophytes and 5 neophytes. Species with dominant occurrence were: *Lolium perenne*, *Hordeum murinum*, *Arrhenatherum elatius* a *Conyza canadensis*. Commonly occurring plant species were: *Polygonum aviculare*, *Bromus sterilis*, *Poa pratensis*, *Festuca pratensis*, *Dactylis glomerata*, *Achillea millefolium*, *Vicia sativa*, *Lotus corniculatus*, *Amaranthus retroflexus*, *Chenopodium album*, *Plantago major*, *Myosotis arvensis*, *Trifolium repens*, *Calamagrostis epigejos*, *Papaver rhoeas*, *Medicago lupulina*, *Erigeron annuus* a *Plantago lanceolata*. 24 taxa with rare occurrence were registered.

## Discussion

Orchards are very suitable for urban agriculture by their nature. In addition to ensuring production functions (fruit production), they provide a whole range of ecosystem and cultural functions. Orchards are not a typical agricultural monoculture, and vegetation for non-production use is grown under the fruit trees. The non-production vegetation of the fruit orchard mainly ensures the anti-erosion function, but it is also a source of food and a shelter for a number of animals. The plant species composition of the orchard vegetation is decisive for providing the ecosystem functions (Vignozzi et al. 2019; Pfiffner et al. 2019; Denan et al. 2020; Sofo et al. 2020).

Higher species vegetation diversity creates a prerequisite for a successful provision of these functions. It is essential to perceive the vegetation of fruit orchards as a part of the orchard and we need to realize that the orchard as a whole has its own functions such as ecosystem services, but also cultural services (Fagerholm et al. 2016, Winkler et al. 2023). Fruit trees have aesthetic and cultural values, carrying a legacy from our ancestors who bred varieties and planted fruit trees (Baumgärtner and Bieri 2006).

Orchard products can be consumed directly or can be further processed (ciders, jams). These products find their utilization in local tourism. Urban orchards can serve for education in the field of fruit growing and urban agriculture, but also in the area of the protection of the nature, directly in practical conditions.

## Conclusion

Plant biodiversity affects a number of ecosystem functions which are important also for the urban environment. Urban orchards can be viewed as an association of plants where apart from planted fruit trees other types of plants grow too.

Orchards with a diverse vegetation composition can represent an attractive touristic place. The environment of urban orchards can be used both for touristic so for educational purposes. Urban

orchards represent an interesting area where urban agriculture, biodiversity conservation and tourism meet.

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## Souhrn

Fenomén městského zemědělství je v posledních letech velmi diskutovanou otázkou. Myšlenka produkce potravin ve městech se zdá být v nápadném kontrastu s charakterem městského života. Ovocné sady jsou svým charakterem velmi vhodné pro městské zemědělství. Vedle zajišťování

produkčních funkcí (produkce ovoce) poskytují celou řadu funkcí ekosystémových a kulturních. Ovocné sady nejsou typickou zemědělskou monokulturou a pod ovocnými stromy je pěstována vegetace pro neprodukční využití. Vegetace ovocného sadu zajišťuje řadu ekosystémových funkcí, jako jsou protierozní funkce, kterou zajišťují především vytrvalé trávy (*Lolium perenne*, *Poa pratensis* aj.), zdroj potravy pro opylující hmyz (*Medicago lupulina*, *Onobrychis viciifolia* a *Vicia sativa*) a mohou být také léčivými rostlinami (*Plantago lanceolata*, *Rosa canina*, *Urtica dioica*). Výskyt mnoha druhů rostlin působí příznivě na fungování ekosystému a může být využíván i pro turistické využití.

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