EVALUATION OF THE DYNAMICS OF SPONTANEOUS VEGETATION IN SHORT ROTATION COPPICE PLANTATIONS (HYBRIDS OF THE GENERA *SALIX*)

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INTRODUCTION

The rapid increase in allocation of agricultural land to plantations of fast-growing trees with willow (*Salix* spp.) or poplar (*Populus* spp.) for production of biomass for heat and/or electricity is projected in the short-term in many regions of the world (Faaij, 2006). A large-scale shift from "conventional" arable crops to fast-growing tree plantations will have implications on a range of environmental issues (Weihe, Dimitriou, 2012). The increase of biodiversity loss in agricultural landscapes is often discussed in the context of bioenergy, on account of non-traditional crops that can be grown for energy purposes in the future (Baum, Bolte, Weih, 2012). Research of biodiversity in plantations of fast-growing trees resulted in contradictory conclusions (Hartley, 2002). Cultivation of crops for energy purposes affects biodiversity both positively and negatively (Firbank, 2008). Moreover, the confluence of climate change and urbanization, together with the globalized spread of non-native species, makes spontaneous vegetation likely to play a significant role in the future development of urban and rural ecosystems across the globe (George et al., 2009).

MATERIAL AND METHODS

Fig. 1 SRC plantations in research area Kolíňany

Research area and experimental plots

- The experiments were carried out on agricultural land previously crooped for cereals and root-crops and located in research site belonging to Slovak University of Agriculture in Nitra (Fig. 1), cadastral area Kolíňany, Nitra district.
- The research was conducted inside plantations of fast-growing trees. Five experimental plots were allocated by us with extent of 12 m x 2 m, namely within five planted varieties of Swedish provenance of genus *Salix* - Gudrun, Inger, Sven, Tora, Tordis.
- In the constant experimantal plots qualitative and quantitative characteristics of phytocenoses were recorded in periodical two weeks intervals during the growing period of 2013 (from 12th of March 2013 to 16th of January 2014).

Floristic assessment of vegetation and data analysis

- The abundance of taxa was evaluated by the Braun-Blanquet scale also expressed in percentage (Braun-Blanquet, 1964).
- The names of taxa were listed by Marhold, Hindák (1998).
- The persistence of species (persistence category by Jurko, 1990), which served as the basis for expressing the coefficient of species significance in the phytocenoses, was expressed.
- The obtained results were evaluated by the medium of multivariate statistical program CANOCO 4.5 for Windows and CanoDraw. Data analysis was carried out by the means of principal components analysis – PCA.

RESULTS

The first results of the ongoing research of spontaneous herbaceous vegetation in undergrowth of SRC (short rotation coppice) plantations (*Salix* spp.) offer the real state of phytocenosis dynamics during the growing period 2013 in conditions of South-western Slovakia. Specific species composition, the most differing from other varieties, was characterized by herbaceous undergrowth observed in variety Sven. On the contrary, observed herbaceous undergrowth of varieties Tora and Tordis as well as varieties Gudrun and Inger was characterized by a similar species composition.

Fig. 2 Experimental plot of variety Tordis (Salix spp.) with invasive neophyte Solidago canadensis (10th of October 2013)

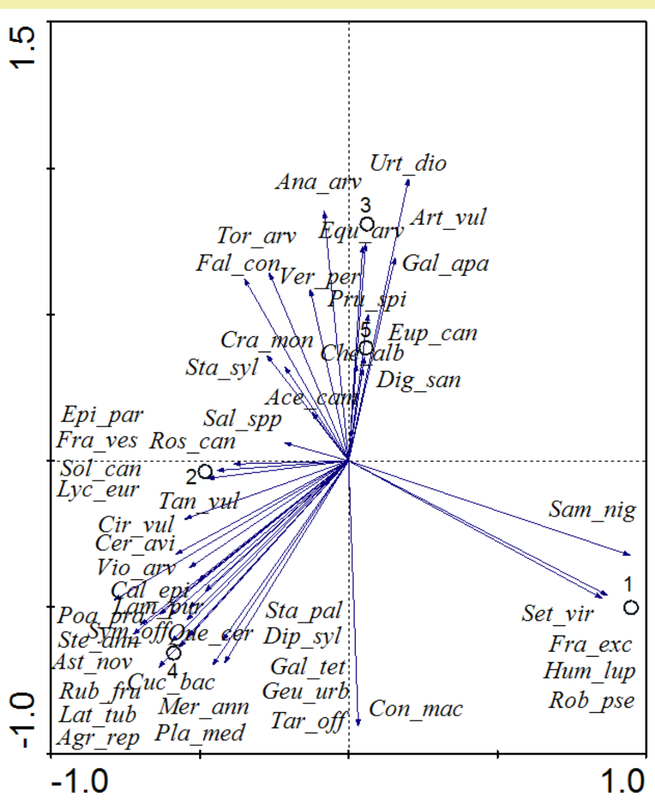

Fig. 3 The affinity of the detected species of herbaceous undergrowth to the each of observed varietes of genus Salix in the growing period 2013-2014 by means of PCA ordination diagram (1-Sven, 2-Tordis, 3-Gudrun, 4-Tora, 5-Inger)

Fig. 4 Aspect of phytocenose of variety Tora (genus Salix) in the end of vernal aspect (23rd of May 2013)

High phytodiversity was recorded in the herbaceous undergrowth of the variety Tora (Fig. 4), which represented 34 vascular plant species. The highest species richness was observed in the herbaceous undergrowth of this variety already in the spring aspect. In this vegetation stand, it is necessary to take into account the fact that the observed experimental plot is situated in the marginal zone, which might cause due to its southern exposition the increased tendency of the species (the edge effect). A significant share of the total abundance in the undergrowth of this variety contributed also the two invasive neophytes *Aster novi-belgi* agg. and *Stenactis annua*, defined similarly by the highest persistence category by Jurko (1990). In regard to the results from the spring aspect it can be concluded that the herbaceous undergrowth of observed phytocenosis of the variety Sven was characterized by the lowest phytodiversity already from the beginning of our research and was retaining this condition during the whole growing period (22 vascular plant species). The herbaceous undergrowth in the varieties Tora, Gudrun and Inger was characterized by the occurrence of two invasive neophytes - *Aster novi-belgi* agg., *Stenactis annua* and *Solidago canadensis*. The lowest occurrence of invasive neophytes was recorded in the variety Sven, specifically only one species - *Aster novi-belgi* agg. A strong link to herbaceous undergrowth of the variety Sven was mainly found in the species *Sambucus nigra*. The high affinity to herbaceous undergrowth of the variety Tora was recorded for the apophytes *Agropyron repens* and *Geum urbanum*, and also for invasive neophytes *Stenactis annua* and *Aster novi-belgi* agg. For the herbaceous undergrowth of the variety Tordis, the abundance of the archaeophytes *Conium maculatum*, *Tanacetum vulgare* and especially invasive neophyte *Solidago canadensis* was typical (Fig. 2). Tighter interactions to herbaceous undergrowth of the variety Gudrun was observed for perennial species *Equisetum arvense*, *Artemisa vulgaris*, *Urtica dioica*, as well as for several annual herbs – *Galium aparine*, *Anagallis arvensis*, *Fallopia convonvulus*. Apophytes *Urtica dioica*, *Eupatorium cannabinum*, deciduous shrub *Prunus spinosa* and annual herbs like *Galium aparine*, *Fallopia convonvulus* and *Veronica persica* was characterized mainly by its affinity to observed phytocenosis in the variety Inger (Fig. 3).

CONCLUSION

The biggest differences in species composition of herbaceous undergrowth in the growing period of 2013 were recorded for the variety Sven. The difference between the biggest (herbaceous undergrowth of the variety Tora) and the lowest (herbaceous undergrowth of the variety Sven) phytodiversity of herbaceous level were 12 vascular plant species. The herbaceous undergrowth in the variety Tordis was characterized by the highest (3 plant species) and in the variety Sven (1 plant species) by the lowest occurrence of invasive neophytes. Invasive neophytes did not have a significant effect on the plant species abundance in SRC plantations during growing period of 2013. Also, they did not demonstrably reduce phytodiversity in plantations and they did not change the character of the biotopes significantly. The herbaceous undergrowth for each variety was formed mainly by ruderal and synanthropic species. Requirements to a specific variety of energy plants were not well identified for the large amount of the recorded weed species.

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