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Invasive woody plants in rural environment in south Slovakia

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Abstract: Invasive behaviour of the three mentioned species (*Robinia pseudoacacia* L., *Ailanthus altissima* (MILL.) SWINGLE, *Negundo aceroides* MOENCH.) of introduced woody plants in rural environment of south Slovakia endangers the structure and functioning of communities of autochthonous woody plants. Together with woody plants growing wild they can cause serious damages to environment. These species are characteristic by large genetic plasticity and adaptability so that they are dominant in competition over the species of autochthonous dendroflora.

Keywords: introduction of woody species, invasion of woody species, black locust, tree of heaven, box elder.

Introduction

Process of introduction of alochtonous woody species into our conditions had for its goal the enrichment of native dendroflora by new taxa that can be used mainly in economy as well as in the environment of man. Today are many introduced woody species an important part of gene pool and their cultivation is of great importance.

At present it is possible already to analyse also the unfavourable consequences connected with the process of introduction of new woody plants, mainly processes of naturalization and invasion of certain species (BENČAŤ et al. 1982). The problems of invasions are theoretically elaborated in detail at present (ELIÁŠ 1997 a, b).

The Danubian Basin represents approximately 12 000 km^2 most productive agricultural area of Slovakia with favourable natural conditions and therefore it is

the most suitable area for introduction of woody species. The richest assortment of introduced dendrotaxa is cultivated here, and also the occurrence of natural regeneration to growing wild of some foreign woody plants is significant here.

The Danubian Basin is bordered by loess Danubian Hills, characteristic of neogenic layers that are covered by loess material of different depth. In the area of loess hills chernozem changes gradually to brown soil chernozems, illimerized brown soils and illimerized soils from the lowland up to the foothills of the mountains. Common effects of abiotic factors affect crucially the success of introduction.

Material and methods

Introduced woody plants were used at first mainly in parks of rural seats or they were used as substitution for forest woody plants. Mainly the example of parks enables to follow gradual spread of foreign woody species and their penetration into surrounding landscape.

The area of south Slovakia offer a great possibility to the introduced woody plant to adapt its phenotype to this environment, it creates conditions for quick vegetative growth and onset of full auto reproduction in quite short time span.

Invasive woody plants known at present are able to survive unfavourable periods as droughts and hot periods or hard winters without serious damages. Their genotypic capacity provides them this possibility.

During the work on the extended essay (HOŤKA 2001) was among others observed and evaluated also the behaviour of introduced woody plants, that are taken for invasive at present, in the rural environment of the selected area in south Slovakia. During the analysis of the problem were partial results compared with results obtained in similar conditions and published earlier (ŠKOLEK 1999, LAMOŠOVÁ 1999).

Woody plants with greatest invasive potential

Black locust (*Robinia pseudoacacia* L., Leguminosae)

The introduction of black locust to Slovakia played exceedingly great role in creation of image of the agricultural landscape as a matter of fact of the whole south and mainly southwest Slovakia; it impressed its individual character on it to such an extent that we cannot even imagine they could be dragged out of the country and replaced with for instance corresponding native woody plants. No other woody plant originating from America became domesticated so well in Europe (BENČAŤ et al. 1982, KERESZTESI 1988).

Black locust was grown in a larger extent in Europe probably since 1630 (BEAN, 1980), as an ornamental plant in the Hungarian Lands during the years 1710-1720 and as an experimental forest tree species in Blhovce (BENČAŤ et al. 1982) since 1801.

Spread of this tree species was supported by bee-keepers as it is a melliferous plant, by vine-growers as it is a source of high-quality, durable wood

(MAGIC 1997a) as well as by foresters as a prospective tree species for afforestation of steppe hillsides and devastated lands (CHMELAŘ 1983). In former Czechoslovakia were about 28 thousand hectares of black locust stands in 1988 (KERESZTESI 1988), with the centre of occurrence in region of west Slovakia; there were more than 100 000 trees in the age from 4 to 200 years in 1949 localities (BENČAŤ 1989b). Large stands are mainly in south Slovakia; black locust is the main species in them (ŠKOLEK 1999).

Tree of heaven (*Ailanthus altissima*(MILL.) SWINGLE, Simaroubaceae)

Its home is in east, central and southwest China, in southern part of Korean peninsula and on a part of Japan isles. In Europe it is grown since 1751 (BEAN 1970), the largest concentration of its occurrence is around larger cities and it spreads from them mainly along the roads (KOWARIK, BOCKER 1984 in UHERČÍKOVÁ 2000).

In central Europe it was planted at first as a park tree species, mainly in large towns. In Slovakia it is known from the towns and villages from the south of Slovakia, as well as from parks and alleys. An important role at its introduction played forest tree nurseries in Lednice, where it was planted among other species since 1803 already (BENČAŤ et al. 1982) so that artificial stands were planted in smaller areas in the Danubian Basin in the fifties of the past century (JURKO, ŠOMŠÁK 1958 in UHERČÍKOVÁ 2000), and at the beginning of the eighties occurred the tree of heaven on 473 localities with the centre of occurrence in the former West Slovakian county.

Box elder (*Negundo aceroides* MOENCH., Aceraceae)

It comes from east and central part of North America. In 1688 it was introduced to Europe. Foresters started to use it in 1840 with the aim to afforest less valuable, often overflowed or waterlogged soils. We learn of the first plantations from the year 1841 (BENČAŤ et al. 1982), the oldest ones are in the river basin of Hron, in the neighbourhood of Želiezovce (MACHOVEC et al. 2000). Box elder was recommended for plantation together with black locust in protective belts of hygiene greenery in the neighbourhood of sources of pollution (BENČAŤ 1989a) and it spreads from there anemochorously (MAGIC 1997).

Woody species running wild

Among woody plants that are running wild in rural area of the south Slovakia and that many authors classify among invasive ones at present, belong *Lycium barbarum, Catalpa bignonioides, Amorpha fruticosa, Polygonum baldschuanicum, Syringa vulgaris, Symphoricarpos albus. Celtis occidentalis* (hackberry) is also classified among this group (BENČAŤ et al. 1982).

Results and discussion

Black locust grows at present in rural area of south Slovakia, mainly on the border of the original oak stands and in windbreaks where it influences significantly the floristic composition of underwood in favour of grasses. It grows rarely as underwood or in mixed stands of the same age. After harder winters it flowers a little or not at all (winter at the turn of years 2001-2002). Its occurrence gives way to box elder at the boundary of towns in the neighbourhood of brooks. It grows often together with *Lycium barbarum* along the field roads.

Black locust asserts itself in towns not only in uncared-for parts of parks but also in places with surface erosion, where it is supported or at least tolerated. In other parts inside towns its spread is mostly not supported.

Tree of heaven belongs today among the most spread introduced woody plants with large invasive potential. It spreads mainly on damaged sites and along roads. Tree of heaven is a strong light-demanding species, there was observed a very quick regeneration of individuals of tree of heaven after woody plants of the upper storey were removed and the stand was opened up, small plants achieving a gain up to 2 m and they occupied the whole area at the same time. In contrast to black locust wild animals do not damage it but it suffers from windbreaks from time to time like the black locust. If there was a stand of black locust in the studied area and tree of heaven was present in it, both woody plant species were approximately of the same age. Tree of heaven is probably capable of competition with the black locust at the beginning of invasion. Its very unpleasant property is that it sprouts at wall footings. This phenomenon was not observed with black locust.

At present spreads box elder mainly along the brooks and rivers. This phenomenon is very conclusive in the Žitava river basin. As opposed to black locust and tree of heaven there was not observed heavier damage of this tree species by frost. Box elder grows often in stand with black locust in parks through which brooks flow or in their neighbourhood without apparent negation; however, it fell back in black locust stand with growing distance from the water source.

Introduced woody plant species running wild do not represent such a threat to autochthonous phytocoenoses as the three above mentioned species. They can be eliminated from stands by hand or chemically with no larger costs.

Conclusion

It is necessary to remark that the introduced species transform together with the transformation of landscape (story of the locality) and the given phytocoenosis also; the introduced species responses to the change of outer conditions, therefore is the period from the beginning of woody plant introduction and the start of its invasive behaviour differently long.

Introduced species are much more successful in conditions that are climatically similar to the region of their origin (the same climatic region) or site to which they are invading.

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