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Alien invasive species communities of the Zvolenská kotlina - basin

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Abstract: This paper contains the most widespread stands of the alien invasive species which are consist of communities of the North American species like *Helianthus tuberosus* and *Solidago canadensis* in the area of the Zvolenská kotlina - basin. The *Fallopia japonica*, East Asian species, forms small groups and stands. All species populate deficiently cultivated or upkeep of sites. From the synmorphological, syngenetic and synecological point of view, there are standard communities, which are described also from other areas of Slovakia. The exemptions are stands with *Helianthus tuberosus*, which are developed both at localities regularly influenced by floods, underground water or only odd flooded.

Keywords: alien invasive species, *Fallopia japonica*, *Helianthus tuberosus, Solidago canadensis*, Zvolenská kotlina.

Introduction

The global problem of the studying alien invasive species and their communities is to understand general relations, which knowing would imply to better protection against to invasions. Causes of the invasions are usual explained as the combination of phytogeographic, geohistorical, evolutional,

chorological and site`s factors including disturbance, syngenetic and structural signs plant communities. In conditions of the Zvolenská kotlina - basin the way of cultivating (or non-cultivating) of the landscape is secondary cause of genesis of alien species communities. These communities are spread mainly on agriculture non-exploiting land, damping sites, etc., which come into being mainly in last years of twenty century. Using other words, in the Zvolenská kotlina - basin, the invasions are image of the land keeping and using.

This paper knots on works of KONTRIŠOVÁ & KONTRIŠ (1996) and KONTRIŠ & al. (1999). Its aim is to come up with knowing phytocoenolgical situation of the most widespread alien species *Fallopia japponica, Helianthus tuberosus* and *Solidago canadensis*.

Methods

Vegetation research was made oddly in years 1999-2003 with Zurich-Montpelier School methods (MORAVEC & al. 1994). The plant species nomenclature is according to ČERVENKA & al. (1986) and MARHOLD & HINDÁK (1998), syntaxonomy according to JAROLÍMEK & al. (1997) and VALACHOVIČ & al. (2001) and ecological values are in sense of ELLENBERG & al. (1992) and JURKO (1982).

Result and discussion

The community with *Fallopia japonica* (Tab. 1, relevés 1-4)

The spesies *Fallopia japonica* was introduced to our territory as the decorative park plant. Its natural occurrence was limited in Japanese, China, Korea and Taiwan. In Slovakia it occurs areas from the lowland to the submontane belt, especially in the river floodplains. On the similar sites it is spread also in the Zvolenská kotlina - basin. There is usually in smaller stands at the feet of the Poľana Mt.

Fallopia japonica formes usually small (20-40 m^2) stands with the height cca 3m. There are polyphyllous stands with low species diversity. The community consists of eighteen angiosperms species. Average number (8,75) of species is 1% higher than VALACHOVIČ & AL. (2001) state. There are minimum 7 and maximum 11 species. Their degree of cover (besides the dominant species) is usually about 5 %, only sometimes 15 %. The higher cover has creeping plant *Calystegia sepium* and polykormons nitrophytes and seminitrophytes like *Urtica dioica, Elytrygia repens* and *Humulus lupulus*. This community could be positively differentiated clearly by dominant species less by *Calystegia sepium.* On the other hand, negative differentiation is possible by absence particularly dominant species of the other communities. Syngeneticaly, it is followed by species of the class *Galio-Urticetea,* and order *Calystegietalia*, etc. (*Calystegia sepium, Galium aparine, Aegopodium podagraria,, Humulus lupulus*) to community with *Helianthus tuberosus*.

The community with *Helianthus tuberosus* (Tab. 1, relevés 5-14)

Helianthus tuberosus is a neophyt from North America, which broke to Europe in the beginning of the 16th century as the decorative, later also economic plant. Its stands occur usually areas in the lowland and hill country belts. In the Zvolenská kotlina - basin, it spontaneously occurs non-exploiting biotopes lying in Hron floodplains and rarely in its confluents ones. There is prefers biotopes late moorland meadows, old Hron bed, non-exploiting places after building activities, abandoned dumps of the topsoil, etc. Similar feature of floodplain`s biotopes is high content of the nutrition, the relief which was formed by river activity and deposites of the soil. Differences of the relief altitude (about 2 m) are not related to the floristic structure of phytocoenosis. Biotopes on abandoned building places have smaller amount of nutrient. There are two variants according to the moisture and amount of nutrient. The first one is depended on sites with relatively constant moisture and the second one is depended on sites with various moisture and greater luminous in stands. The first variant is in floristic relationship with stands with *Fallopia japonica*, the second one with stands dominated by the species *Solidago canadensis*.

The physiognomy of the both variants is given by dominant species *Helianthus tuberosus*. Well turned it was described by JAROLÍMEK & AL. (1977). The first variant is almost third poorer in species than the second one. Total number is 19 species (the average is 10,6; minimum 9; maximum 12 ones). The second variant has the total number 28 species (the average 12,6; min. 11; max. 14). Higher cover of the low layer of the herbaceous layer (60%) has the second variant because of more amount of the light in these stands and lower density of *Heliathus tuberosus*.

There are more differential species, besides *Helianthus tuberosus*, for this community such as *Arctium lappa* and *Dactylis glomerata*. The first variant is differentiated from the second by *Heracleum sphondylium*, *Calystegia sepium*, *Galium aparine* and *Humulus lupulus.* The second variant is differentiated by *Phragmites australis, Calamagrostis epigejos, Solidago canadensis, Lathyrus pratensis, Balota nigra, Anthriscus sylvestris.* Concurrently, first three species show floristic relationship of this variant with the community with *Solidago canadensis.*

In global syngenesis, the stands of this community followed the successional stage that head to typical willow-poplar stands with submontane nature (absence of *Salix alba, Populus alba*, etc.) or to submontane alder forests (*Aegopodio-Alnetum*) and temporary floodplain forests. The result from this syngenesis and the fact that the species occur also in floodplain forests (*Rubus caesius, Aegopodium podagraria,* etc.) is that communities with *Helianthus tuberosus* from Zvolen surrounding have the same nature as communities *Helianthus tuberosus – Aegopodium podagraria* which was described by OBERDORFER (1983) from alluvium floodplain area of Danube, Pre-Alps.

The community with *Solidago canadensis* (Tab. 1, relevés 15-18)

Solidago canadensis got to Europe as the decorative plant in the half of the 16th century. Nowadays, it is spread usually in lowland belt. Analogous to the Malé Karpaty Mts., in the Zvolenská kotlina - basin, it occurs in anthropogenic sites like abandoned building sites, railway embankments, road edges, stream shores and soil embankments. This species forms large stands especially in Hron`s floodplain, namely on dumps of building materials and on the outcrops which come into being from motorway and bridge body building places.

Solidago canandensis forms thick but luminous stands, so there are many heliophilous species like *Elytrigia repens, Calamagrostis epigejos, Tanacetum vulgare, Poa trivialis, Poa pratensis, Carex hirta, Apera spica-venti, Daucus carota* in the herb layer. These species positive differentiate this community from other ones with *Falopia japponica* and *Helianthus tuberosus*. This biotopes have relatively low quality and there are evolutionarily less constant than previous communities. Floristic composition, namely high number of species (41), point out to mentioned statement.

Conclusion

Alien species communities with *Fallopia japonica* and *Helianthus tuberosus* occupy biotopes in an alluvial flats which are to come into being by change of functional landscape using and nowadays, there are presented like non-eploiting places. The community with *Helianthus tuberosus* is developed on sites with hydropedological mode which is influenced by permanent floods, underground water and on sites inundate only sometimes. The community with *Solidago canadensis* occurred on various anthropogenic biotopes with low class quality.

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Localities of relevés

1. Selce willage, ashore of the Selčiansky potok, nearby the railway, terrain is influenced by waste-dump, 5x5 m, the height of the stand 350 cm, 4.10.1999.
2. Rudlová willage near Banská Bystrica, nearby the railway, 5x5 m, the height 250 cm, 16.9. 2000.
3. Jakub, the forest stand line between the forest and the road, 5x5 m, the height 280 cm, 16.9. 2000
4. Radvaň, the left shore of Hron, near the railway, 5x5 m, the height 390 cm, 20.9.2001, 335 m a.s.l.
5. Radvaň, the left shore of Hron between the railway and the dike, closely the railway station, 5x5 m, the height 230 cm, 5.10.2002 335 m a.s.l.
6. Peťkovský háj, closely the altitude 332,5; the line of the littoral stand on the left side of Hron, 5x5 m, the height 180 cm, 5.10.2002, 330 m a.s.l.
7. Iliaš, the righ shore of Hron, nearby the drainage channel, 5x10 m, the height 190 cm, 15.10.2001, 321 m a.s.l.
8. Hronsek-Závrať, the right shore of Hron, closely the bushes line, 5x5m, the height 260 cm, 15.10. 2001, 308 m.a.s.l.
9. Hájniky, the right shore of Hron, near the bushes line closely the build-up area, in place between Hron and the dike, 5x5 m, the height 260 cm, 15.10.2001, 306 m a.s.l.
10. Zvolen, housing estate Západ, the right shore of Hron, cca 50 m from the bridge, 6x6 m, the height 240 m, 9.11. 1998, 283 m a.s.l.
11. Zvolen, bellow the housing estate Podborová, the left side of Hron, terrain is influenced by embankment, 5x5 m, 9.11.1998, 287 m a.s.l.
12. Sliač, the left side of the railway, bellow the farm, around the pastures, 10x5 m, 9.11.1998, 293 m a.s.l
13. Zvolen, the right side of the road, opposite Veľká Strža, above the wastewater treatment plant, 10x5 m, 13.11. 1998, 283 m a.s.l.
14. Zvolen, the left road side, between the filling station and the wastewater treatment plant, the alluvium of Hron, 13.11.1998, 286 m a.s.l.

15. Zvolen, the housing estate Západ, the right shore of Hron near the bridge, 5x6 m, the abandoned place, 9.11.1998, 283 m a.s.l.
16. Zvolen, bellow the housing estate Podborová, near the railway, 9.11.1998, 287 m a.s.l.
17. Zvolen, the right road side, opposite Veľká Strža, above the wastewater treatment plant, 13.11.1998, 283 m a.s.l.
18. Zvolen, the railway station in the town, above the exercising-ground of the driving school, the slope below the railway and bridge, 5x5 m, 13.11. 1998, 309 m a.s.l.

Tab. 1 Communities of alien invasive species in the Zvolenská kotlina – basin.

Community with	Fallopia japonica				Fj	Helianthus tuberosus 1.					Ht1	Helianthus tuberosus 2.					Ht2	Solidago canadensis				Sc
Reevé No.	1	2	3	4	F	5	6	7	8	9	C	10	11	12	13	14	C	15	16	17	18	F
Fallopia japonica	5	5	5	5	4	.	.	.	.	.		.	.	.	.	.		.	.	.	.	
Calystegia sepium	2	1	1	+	4	+	.	+	.	+	III	.	.	.	.	.		.	.	.	.	
Helianthus tuberosus	.	+	.	.	1	5	5	5	5	5	V	5	5	5	5	5	V	2	+	+	.	3
Galium aparine	+	.	.	1	2	+	+	r	r	+	V	.	.	.	.	.		.	.	.	.	
Phragmites australis	.	.	.	.		.	.	.	.	.		+	+	+	.	+	IV	.	+	+	.	2
Solidago canadensis	.	.	+	.	1	.	.	.	.	.		1	+	+	1	+	V	5	5	5	5	4
Tanacetum vulgare.	.	.	.	.		.	.	+	+	.	II	.	.	+	+	.	II	2	1	1	1	4
Carex hirta.	.	.	.	.		.	.	.	.	.		.	.	.	.	+	I	1	1	+	1	4
Calamagrostis epigejos	.	.	.	.		.	.	.	.	.		.	.	+	+	.	II	.	+	3	2	3
Galio-Urticetea																						
Urtica dioica.	1	.	+	+	3	+	+	2	+	1	V	1	2	4	1	+	V	.	+	+	.	2
Rubus caesius	+	.	.	+	2	+	+	.	.	+	III	2	+	.	+	2	IV	+	.	.	.	1
Aegopodium podagraria	+	.	+	+	3	+			+		II	.	1	.	1	.	II	.	.	.	.	

Solidago gigantea	.		+	.	1	.	.	+	.	+	II	.	+	+	.	+	III	+	.	.	.	1
Chaerophyllum aromatic.	.	+	.	.	1							.	+	.	.	.	I	+	.	.	.	1
Humulus lupulus	.	.	1	+	2	.	.	+	.	.	I	.	.	.	.	.		.	.	.	.	
Heracleum sphondylium	.	.	.	.		.	.	+	+	.	II	.	.	.	.	.		.	.	.	.	
Aster novi-belgii	.	.	.	.		.	.	.	.	.		.	.	.	+	.	I	+	.	.	.	1
Anthriscus sylvestris	.	+	.	.	1	.	.	.	.	.		.	+	+	.	.	II	.	.	.	.	
Chelidonium majus	.	.	.	+	1	.	.	.	.	.		.	+	+	.	.	II	.	.	.	.	
Poa trivialis	.	.	.	.		.	.	+	.	.	I	.	.	.	.	.		2	+	.	.	2
Artemisietea																						
Artemisia vulgaris	+	.	.	+	2	+	+	+	1	+	V	.	+	.	+	+	III	+	+	.	.	2
Elytrigia repens	.	1	+	.	2	1	+	.	.	+	III	1	1	1	.	.	III	2	2	.	.	2
Arctium lappa	.	+	.	.	1	+	1	.	+	+	IV	+	.	+	+	.	III	.	.	.	.	
Silene latifolia ssp.alba	.	.	.	.		.	.	.	.	.		.	+	.	.	.		.	+	.	.	1
Cichorium intybus	.	.	.	.		.	.	.	.	.		.	.	.	+	.	I	.	.	+	.	1
Ballota nigra	.	.	.	.		.	.	.	.	.		.	+	+	.	.	II	.	.	.	.	
Daucus carota.	.	.	.	.		.	.	.	.	.		.	.	.	.	.		+	.	+	.	2
Others																						

Cirsium arvense	.	+	.	.	1	.	r	+	.	+	III	+	.	+	.	+	II	+	+	+	.	1
Achillea millefolium	.	.	.	.		+	.	.	+	.	II	+	.	.	.	.	I	+	+	1	.	3
Vicia cracca	.	.	.	.		.	+	.	r	.	II	+	.	.	.	.	I	+	+	+	.	3
Dactylis glomerata	.	.	.	.		.	.	.	r	r	II	.	.	.	2	1	II	+	+	.	.	2
Lathyrus pratensis	.	.	.	.		.	.	.	.	.		+	.	.	.	1	II	.	.	.	.	
Poa palustris	.	.	.	+	1	.	.	.	.	.		.	.	.	.	.		1	+	.	.	2
Apera spica-venti	.	.	.	.		.	.	.	.	.		.	.	.	+	.	I	+	.	1	.	2
Hypericum perforatum	.	.	.	.		.	.	.	.	.		.	.	.	.	.		.	.	+	+	2

Fj = *Fallopia japonica*; Ht = *Helianthus tuberosus*; Sc = *Solidago canadensis*
F = frequency; C = class of constancy

Species in one relevé:
with value 1: *Deschampsia caespitosa* (18), *Equisetum palustre* (15)
with value +: *Cucubalus baccifer* (11), *Roegneria canina* (16), *Festuca sp.* (15), *Cuscuta epithymum* (15), *Silene vulgaris* (15), *Salix* fragilis (E_2 15), *Salix alba* (E_2 15), *Carduus crispus* (16), *Valeriana officinalis* (16), *Astragalus glycyphyllos* (17), *Pastinaca sativa* (17), *Melilotus officinalis* (17), *Tussilago farfara* (17), *Ajuga reptans* (18), *Equisetum arvense* (18)