

**RESEARCHES REGARDING ALIEN PLANTS FROM THE LEFT BANK OF  
THE TISA-RIVER, BETWEEN VALEA VIȘEULUI AND PIATRA (ROMANIA)**

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**Abstract**

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The work dealing with the study of the alien flora and vegetation alongside the river Tisa between Valea Vișeului and Piatra (Romania). The humid habitats including 56 alien species, from which the most frequent taxa are: *Aster lanceolatus*, *Bidens frondosa*, *Erigeron annuus*, *Galingsoga quadriradiata*, *Helianthus tuberosus*, *Impatiens glandulifera*, *I. parviflora*, *Oenothera biennis*, *Reynoutria japonica*, *Solidago gigantea* subsp. *serotina*, *Xanthium strumarium* subsp. *italicum*. It was identified also a new species for Romania: *Perilla frutescens*, and other species are less known for the region: *Callistephus chinensis*, *Cosmos bipinnatus*, *Oenothera erythrosepala*, *Partenocissus quinquefolia*. It was analysed the coenological structure of two nonnative plant communities from the region: *Helianthemum tuberosi* (Moor 1958) Oberd. 1967, and *Reynoutrietum japonicae* GÖRS 1974 corr. Hilbig 1995.

**Key words:** alien (nonnative) flora, invasive species, alien plant communities, plant coenology, river Tisa, Romania

**Introduction**

The researches in regard to the immigration of alien plants in Romania are lately more and more frequent [2, 11, 47, 48], although there are numerous anterior data regarding the presence of alien plants in our country, and preoccupations in the survey of this phenomenon are also found again in some works from the past century [5, 6, 9, 19, 29, 32, 33, 34, 41, 51, 53, 56 etc.].

The necessity of such researches results out of the remark that the impact of alien species on the biodiversity, equilibrium and functions of natural ecosystems, on agriculture, health, economy and other domains of human activity, in different regions of the world, is more and more rising [14, 17, 24, 26, 27, 54, 57 etc.].

Humid habitats associated with watercourses are some of the most threatened with the invasion of nonnative plants [1, 10, 21, 31, 35, 39, 57 etc.]. In this context, we have searched the alien (nonnative) plants from the left bank of the Tisa river, from its entrance to the exit out of our country, in parallel with the stocktaking of aquatic plants within the same sector (according to the international project „Macrophytes, River Corridor, Land Use, Habitats, a multifunctional study in the Danube catchments based on a GIS approach”), in september, 2004.

We studied the alien vascular species of the bank and pebble of the Tisa, the pro-

tection dam along the river, as well as the other fields placed in the immediate vicinity of the watercourse (brush-woods, forests, meadows, crops, waste places etc.), till maximum 100 m from the riverbank.

The registrations were made in the following localities: 1-Valea Vişeuului; 2-Defileul Tisei; 3-Lunca la Tisa; 4-Bocicoi; 5-Crăciuneşti; 6-Tisa; 7-Camara; 8-Sighetu Marmaţiei; 9-Sarasău; 10-Câmpulung la Tisa; 11-Săpânţa; 12-Remeţi; 13-Teceu Mic; 14-Piatra. All the collected plants are kept in the herbarium of the University of Agricultural Sciences and Veterinary Medicine Jassy (Iaşi).

## Results and discussion

### a. Alien (nonnative) flora of the Tisa area

As a result of our investigations, 56 alien species have been identified in the close proximity of the watercourse of Tisa (including the alien species given by other authors from this area, too [4, 6, 7, 27, 31, 33]) (table 1).

Table no 1:

Alien plant species from Tisa glades (in the close proximity of the watercourse)

Species	Ctg, inv.	Locality													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Alcea rosea</i> L.	H,c								+						
<i>Amaranthus albus</i> L.	X,i								+			+			
<i>Amaranthus blitoides</i> S.Watson	X,i					+			+						
<i>Amaranthus caudatus</i> L.	H,n				+				+	+	+			+	
<i>Amaranthus crispus</i> (Lesp. & Thévenau) N.Terracc.	X,i								+					+	
<i>Amaranthus deflexus</i> L.	X,i			+					+						
<i>Amaranthus hypochondriacus</i> L.	H,c								+	+					
<i>Amaranthus lividus</i> L.	X,i								+		+				
<i>Amaranthus powellii</i> S.Watson	X,i	+								+	+		+		
<i>Amaranthus retroflexus</i> L.	X,i	+		+		+		+	+	+		+		+	+
<i>Ambrosia artemisiifolia</i> L.	X,i	+								+		+	+	+	+
<i>Aster lanceolatus</i> Willd.	H,i	+		+	+	+	+	+	+	+	+	+	+	+	+
<i>Atriplex hortensis</i> L.	H,n				+							+			
<i>Bassia scoparia</i> (L.) A.J.Scott	H,i								+						
<i>Bidens frondosa</i> L.	X,i	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Brassica juncea</i> (L.) Czern.	H,i								+	+	+	+			
<i>Brassica napus</i> L.	H,c						+		+						
<i>Brassica rapa</i> L. subsp. <i>rapa</i>	H,n								+	+					
<i>Brassica rapa</i> L. subsp. <i>sylvestris</i> (L.) Janch.	H,n								+		+				
<i>Calendula officinalis</i> L.	H,c								+						
<i>Callistephus chinensis</i> (L.) Nees	H,n	+				+			+	+	+	+		+	+
<i>Chamomilla suaveolens</i> (Pursh) Rydb.	X,i	+		+		+			+			+		+	
<i>Conyza canadensis</i> (L.) Cronq. (L.) Cronquist	X,i	+				+	+		+	+		+		+	+
<i>Cosmos bipinnatus</i> Cav.	H,n	+				+			+		+	+		+	

Species	Ctg. inv.	Locality													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Cucurbita pepo</i> L.	H,c								+						
<i>Cuscuta campestris</i> Yunck.	X,i	+				+	+		+	+					+
<i>Echinocystis lobata</i> (Michx.) Torr. & A.Gray	X,i					+			+		+	+	+	+	+
<i>Elsholtzia ciliata</i> (Thunb.) Hyl.	X,i	+	+	+	+				+	+					+
<i>Erigeron annuus</i> (L.) Pers. subsp. <i>annuus</i>	X,i	+		+	+	+		+	+	+	+	+	+	+	+
<i>Erigeron annuus</i> (L.) Pers. subsp. <i>strigosus</i> (Mühl. ex. Willd.) Wagenitz	X,i	+			+										
<i>Euphorbia marginata</i> Pursh	H,c									+					
<i>Galinsoga parviflora</i> Cav.	X,i	+			+	+		+	+	+		+			+
<i>Galinsoga quadriradiata</i> Ruiz & Pav.	X,i	+		+	+	+	+	+	+	+	+	+	+	+	+
<i>Helianthus annuus</i> L.	H,c									+		+		+	+
<i>Helianthus tuberosus</i> L.	H,i	+		+	+	+	+	+	+	+	+	+	+	+	+
<i>Impatiens glandulifera</i> Royle ( <i>Impatiens roylei</i> Walp.)	H,i	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Impatiens parviflora</i> DC.	H,i	+	+	+	+	+	+		+	+	+	+	+	+	+
<i>Ipomoea purpurea</i> Roth	H,c-n								+		+				
<i>Iva xanthifolia</i> Nutt.	X,i									+					
<i>Juncus tenuis</i> Willd.	X,i		+				+								+
<i>Lycium barbarum</i> L.	H,i	+			+		+		+		+	+			+
<i>Medicago x varia</i> Martyn	H,i								+	+					
<i>Nicandra physalodes</i> (L.) Gaertn.	H,c									+					
<i>Oenothera biennis</i> L.	H,i			+	+		+	+	+	+	+	+	+	+	+
<i>Oenothera erythrosepala</i> Borbás	H,n	+								+					
<i>Oxalis corniculata</i> L.	X,i								+						
<i>Oxalis stricta</i> L. ( <i>O. europaea</i> Jord.)	X,i			+		+	+	+	+			+	+	+	
<i>Parthenocissus quinquefolia</i> (L.) Planch.	H,i					+		+					+	+	
<i>Perilla frutescens</i> (L.) Britton	H,c(?)												+		
<i>Reynoutria japonica</i> Houtt.	H,i	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rhus typhina</i> L.	H,c										+				
<i>Rudbeckia laciniata</i> L.	H,n														+
<i>Sicyos angulatus</i> L.	H,n									+					
<i>Sisyrinchium bermudiana</i> L.	X,i										+				
<i>Solidago gigantea</i> Aiton subsp. <i>serotina</i> (Kuntze) McNeill	H,i	+		+	+	+	+	+	+	+	+	+	+	+	+
<i>Tanacetum parthenium</i> (L.) Sch.Bip.	H,n									+					
<i>Veronica persica</i> Poir.	X,i	+			+				+	+					
<i>Xanthium strumarium</i> L. subsp. <i>italicum</i> (Moretti) D.Löve	X,i	+		+	+	+	+		+	+	+		+	+	+
<b>Total species</b>		<b>23</b>	<b>6</b>	<b>16</b>	<b>17</b>	<b>21</b>	<b>16</b>	<b>16</b>	<b>43</b>	<b>26</b>	<b>24</b>	<b>24</b>	<b>16</b>	<b>26</b>	<b>20</b>

Alien plant categories and their status (column 2): H-hemerophyte; X-xenophyte; c-casual; n-naturalized; i-invasive [40; 43].

Localities (columns 3-16): 1-Valea Vișeuului; 2-Defileul Tisei; 3-Lunca la Tisa; 4-Bocicoi; 5-

Crăciunești; 6-Tisa; 7-Camara; 8-Sighetu Marmației; 9-Sarasău; 10-Câmpulung la Tisa; 11-Săpânța; 12-Remeți; 13-Teceu Mic; 14-Piatra.

Naturally, the proportion of alien species in the local flora is positively correlated with the intensity of the anthropic influence relative to the environment. So, the least number of alien species (6 taxa) was registered in the Tisa defile (downstream from Valea Vișeului), where the anthropic pressure is only determined through the presence of the railway, while the biggest number of alien species (43 taxa) was met near the town Sighetu Marmației (Máramarossziget) where the anthropic stress to the environment touches a higher level (because of the intense traffic, cast trashes, industrial activities etc.) (table 1).

The geographic origin of these species is as follows: America - 37 species (North America - 29; Central America - 2; South America - 6), Asia - 11 species (East Asia - 4; Central Asia - 3; West Asia - 4); Mediterranean Area - 15 species.

The alien species of the humid habitats along the Tisa river belong to two distinct categories, after their introduction way [40, 43]: H - hemerophytes (deliberately introduced plants), in number of 33 species (19 from America, 10 from Asia, and 4 from Mediterranean Area) and X - xenophytes (accidentally introduced plants), in number of 23 species (18 from America, 2 from Asia, and 3 from the Mediterranean Area).

All of the xenophyte species from the Tisa basin have an invasive status (i) in Romania (they form naturalized populations that produce reproductive offspring at a considerable distance from the parent plants, and have a great potential of reproduction [40, 43]).

Of the hemerophytes, about 39 % have an invasive status (i), while 32% of them are only naturalized ones (n) (forming stable populations without human intervention); other 29 % are casual ones (c) (persisting as sub-spontaneous species with human aid only, through a regular re-introduction of them [40; 43]).

Among the identified species, some are met with a high frequency (75-100%) along the whole riverbed (Romanian section), forming often dense vegetation groups or facies within the different natural or anthropogenous phytocoenoses (e.g. *Aster lanceolatus*, *Bidens frondosa*, *Erigeron annuus*, *Galinsoga quadriradiata*, *Helianthus tuberosus*, *Impatiens glandulifera*, *I. parviflora*, *Oenothera biennis*, *Reynoutria japonica*, *Solidago gigantea* subsp. *serotina*, *Xanthium strumarium* subsp. *italicum*). Other species are more rarely met (frequency of 50-75%) (*Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Callistephus chinensis*, *Chamomilla suaveolens*, *Conyza canadensis*, *Cosmos bipinnatus*, *Echinocystis lobata*, *Elsholtzia ciliata*, *Oxalis stricta* etc.), or sporadically, in a few localities (frequency of 15-50%), as scattered individuals into different vegetal communities (*Amaranthus caudatus*, *Cuscuta campestris*, *Helianthus annuus*, *Ipomoea purpurea*, *Juncus tenuis*, *Oenothera erythrosepala*, *Parthenocissus quinquefolia* etc.). Finally, some species were causally met, in one-two locality only (*Alcea rosea*, *Amaranthus hypochondriacus*, *Euphorbia marginata*, *Ipomoea purpurea*, *Perilla frutescens*, *Rudbeckia laciniata* etc.).

One of this nonnative species (*Perilla frutescens*) has not been quoted from Romania till now, as spontaneous or sub-spontaneous one, and other species are new or less known from the explored region (*Bidens frondosa*, *Callistephus chinensis*, *Cosmos bipinnatus*, *Impatiens parviflora*, *Oenothera erythrosepala*, *Parthenocissus quinquefolia* etc.).

#### **b. Aspects regarding the vegetation edified by alien (nonnative) plants**

Because of favorable conditions of environment, a lot of alien plant species of the explored territory, as *Helianthus tuberosus*, *Reynoutria japonica*, *Aster lanceolatus*, *Impatiens glandulifera*, *I. parviflora*, *Echinocystis lobata*, *Solidago gigantea* subsp. *serotina*, *Elsholtzia ciliata* and so on, have a copious development, forming more or less heterogeneous phytocoenoses, which displace the native vegetal communities on large areas.

Some of the most representative nonnative vegetal communities from the Tisa everglade, as those edified *Helianthus tuberosus*, respectively *Reynoutria japonica*, are integrated in the coenotaxonomic system [30, 38, 44, 45] as follows:

Class *Galio-Urticetea* Passarge ex Kopecký 1969

Ord. *Convolvuletalia sepium* Tx. 1950

All. *Senecion fluviatilis* Tx. 1950

Ass. *Helianthetum tuberosi* (Moor 1958) Oberd. 1967

Ass. *Reynoutrietum japonicae* Görs 1974 corr. Hilbig 1995

Ass. ***Helianthetum tuberosi*** (Moor 1958) Oberd. 1967 [Syn.: *Helianthus tuberosus* - *Convolvulion* - Gesellschaft] (table 2, rel. 1-4).

The phytocoenoses of this vegetal association are met in the Tisa everglade both along the protection dam and in the meadows, near the border of the forests, whence these can spread even into the neighbouring crops.

This sort of weedy vegetation, often met also in Central Europe [15, 18, 30, 38 etc.], consists in extensive vegetal communities (50-100 m<sup>2</sup>), in structure of whose, besides the dominant species (*Helianthus tuberosus*), which reaches the maximal values of AD and about 2 m height, other species, as *Agrostis stolonifera* (AD+1) and *Solidago gigantea* subsp. *serotina* (AD+1) can also be distinguished.

With a raised frequency there are, too: *Artemisia vulgaris*, *Erigeron annuus*, *Tanacetum vulgare*, *Calystegia sepium*, *Rubus caesius* etc.

In the floristic structure of these phytocoenoses, which involve 55 species in all (18-30 species / rel.), the characteristic species of the superior coenotaxa hold a percentage of about 30%.

The settlement of these phytocoenoses within or in the vicinity of water meadows is signaled by the high number of characteristic species of the *Molinio-Arrhenatheretea* class (about 30%). A good representation have also the *Stellarietea mediae* class (20%), as a result of the contact with adjacent crop fields, while other vegetation classes (*Artemisietea vulgaris*, *Bidentetea* etc.) are less represented. In the structure of this vegetal association the most important bioforms are the hemicryptophytes (43.6%), therophytes (27.3%) and geophytes (16.4%).

The ecological profile, indicated by the analysis of the ecological indicators, testifies the mesophilous-mesohygrophilous (Um=3.3), mesothermophilous (Tm=3.3) and lightly acido-neutrophilous (Rm=3.5) character of these vegetal communities (nevertheless, there are amphotolerant species towards temperature and soil reaction: T0=29.6%; R0=43.4%).

Polyploid species within the investigated phytocoenoses exceed the diploid ones both numerically (Id.n=0.87) and as covering value (Id.c=0.01).

On the basis of the phyto-geographical analysis, we note that on a general Eurasian background (47.2%), the contributory role in the constitution of the examined phytocoenoses the alien (21%), and cosmopolitan species (11.3%) show also a significant contribution.

Tall weed phytocoenoses edified by *Helianthus tuberosus*, with a similar structure and ecology were also quoted from Cluj county (Coplean - on the Someş bank) (1 relevées) by PÁZMÁNY, 1970 [37], then from Socond Valley and Ariniş Valley (4 relevées) (Satu Mare county) [25] and from everglades of the Târnava Mare, Târnava Mică, Mureş, Râul Negru rivers (as *Helianthus tuberosus* agg. (DC) by KOVÁCS, 2004 [23].

From Moldavia, this association was first quoted without relevées or other specifications by DOBRESCH & KOVÁCS [12], but recently, GURĂU [16] published from the Caşin-Oneşti Depression 7 phytocoenoses dominated by *Helianthus tuberosus* with a xeromezophilous (!) character.

Ass. ***Reynoutrietum japonicae*** Görs 1974 corr. Hilbig 1995 [Syn.: *Polygonetum cuspidati* (Moor 1958) Oberd. et al. 1967; *Fallopia japonica* (*Senecion fluviatilis*)-Gesellschaft; *Polygonum cuspidatum* - *Convolvulion* Gesellschaft; *Reynoutria japonica* community] (table 2, rel. 5-8).

*Reynoutria japonica* is one of the alien plants with a marked invasive character in the Tisa everglades, forming very developed phytocoenoses, 2-4 m in height, having areas up to 100-150 m<sup>2</sup>.

Such tall phytocoenoses cover the soil in a very high percentage (up 100%), being difficult to traverse them, and shadowing in great measure the soil. Therefore the companion species are rather few ones (13-29) and following rather peripherally distributed.

Besides the dominant species (*Reynoutria japonica*), the following species are frequently met (though without a notable covering): *Helianthus tuberosus*, *Solidago gigantea* subsp. *serotina*, *Rubus caesius*, *Glechoma hederacea*, *Artemisia vulgaris*, *Erigeron annuus*, *Tanacetum vulgare*, *Agrostis stolonifera*, *Pastinaca sativa*, *Clematis vitalba* etc.

Of the 49 species met in the structure of these phytocoenoses, 31.3% are characteristic ones for the superior coenotaxa (*Senecion fluviatilis*, *Convolvuletalia sepium*, *Galio-Urticetea*); 20.8% of them derive from the vegetation of the mesophilous meadows (*Molinio-Arrhenartheretea*); 12.5% of them rest on *Artemisietea*, respectively *Stellarietea* classes, and less species belong to other vegetation classes.

The dominant bioforms in these phytocoenoses are the hemicryptophytes (37.5%) and therophytes (20.8%), followed by the phanerophytes (16.7%), geophytes (12.5%) etc.

From ecological view point, the communities edified by *Reynoutria japonica* are mesophilous-mesohygrophilous (Um=3,5), mesothermophilous (Tm=3.2) and lightly acid-neutrophilous (Rm=3.7) ones; a lot of species are amphotolerant to temperature (20,8%) and soil reaction (37,5%).

Diploids and polyploids have an equable repartition in the floristic structure of these phytocoenoses (Id.n=1,0), but the polyploid species (like *Reynoutria japonica*) lead obviously in the soil coverage (Id.c=0,01).

Table no 2: *Helianthetum tuberosi* (Moor 1958) Oberd. 1967 (rel. 1-4);  
*Reynoutrietum japonicae* Görs 1974 corr. Hilbig 1995 (rel. 5-8)

Coverage (%)	100	90	100	100	100	100	100	100
Area (sq.m)	100	50	50	50	100	150	100	100
No. species	18	25	30	18	23	30	24	14
No. rel.	1	2	3	4	5	6	7	8
<i>Helianthus tuberosus</i>	5	5	5	5	+	+	+	+
<i>Reynoutria japonica</i>	-	+	-	-	5	5	5	5
<b><i>Senecion fluviatilis</i></b>								
<i>Solidago *serotina</i>	1	1	-	+	+	+	+	+
<i>Impatiens glandulifera</i>	-	-	+	+	-	+	-	-
<i>Aster lanceolatus</i>	-	+	-	+	-	-	-	-
<i>Eupatorium cannabinum</i>	-	-	+	-	-	-	-	-
<i>Echinocystis lobata</i>	-	-	-	-	-	+	+	-
<b><i>Convolvuleta sepium</i></b>								
<i>Calystegia sepium</i>	-	+	+	+	+	-	-	+
<i>Rubus caesius</i>	+	+	+	-	+	+	+	+
<i>Angelica sylvestris</i>	-	-	+	-	-	-	+	-
<i>Cucubalus baccifer</i>	-	-	+	-	-	-	-	-
<b><i>Galio-Urticetea</i></b>								
<i>Glechoma hederacea</i>	-	-	+	+	+	+	+	-
<i>Humulus lupulus</i>	+	-	+	-	+	-	-	-
<i>Urtica dioica</i>	-	-	+	+	-	+	-	-
<i>Polygonum dumetorum</i>	-	-	+	+	-	-	-	-
<i>Impatiens parviflora</i>	-	+	+	-	-	-	-	-
<i>Salvia glutinosa</i>	-	-	+	-	-	-	-	-
<i>Parthenocissus quinquefolia</i>	-	-	-	-	+	-	-	+
<i>Sambucus ebulus</i>	-	-	-	-	+	-	-	-
<i>Anthriscus sylvestris</i>	-	-	-	-	+	-	-	-
<i>Anthriscus *trichosperma</i>	-	-	-	-	-	+	-	-
<b><i>Artemisietea vulgaris</i></b>								
<i>Artemisia vulgaris</i>	+	+	+	+	+	+	+	+
<i>Erigeron annuus</i>	+	+	+	+	+	+	+	-
<i>Tanacetum vulgare</i>	+	+	+	+	+	+	-	+
<i>Elymus repens</i>	-	+	-	+	+	+	-	-
<i>Oenothera biennis</i>	+	-	-	-	-	+	+	-
<i>Daucus carota</i>	-	-	-	-	+	+	+	-
<b><i>Bidentetea tripartitae</i></b>								
<i>Mentha longifolia</i>	+	-	+	-	-	+	-	-
<i>Xanthium *italicum</i>	+	-	-	+	+	-	-	-
<i>Echinochloa crus-galli</i>	-	-	+	-	-	-	-	-
<i>Polygonum lapathifolium</i>	-	-	+	-	-	-	-	-
<i>Bidens frondosa</i>	-	-	-	-	-	+	+	-
<i>Lycopus europaeus</i>	-	-	-	-	-	+	+	-
<i>Polygonum amphibium</i> f. terrestris	-	-	-	-	-	-	-	+
<b><i>Stellarietea mediae</i></b>								
<i>Galinsoga quadriradiata</i>	-	+	+	-	-	+	+	-
<i>Cirsium arvense</i>	-	+	+	-	-	-	-	+
<i>Conyza canadensis</i>	-	-	+	-	+	+	-	-
<i>Setaria pumila</i>	+	-	-	-	+	-	-	-

No. rel.	1	2	3	4	5	6	7	8
Amaranthus retroflexus	-	-	+	-	-	-	-	-
Ambrosia artemisiifolia	-	-	+	-	-	-	-	-
Chenopodium album	-	-	+	-	-	-	-	-
Chenopodium polyspermum	-	-	+	-	-	-	-	-
Galeopsis tetrahit	-	+	-	-	-	-	-	-
Lathyrus tuberosus	-	+	-	-	-	-	-	-
Trigonella coerulea	-	-	+	-	-	-	-	-
Oxalis stricta	-	-	-	-	+	-	+	-
Torilis arvensis	-	-	-	-	-	+	-	-
<i>Molinio-Arrhenatheretea</i>								
Agrostis stolonifera	1	1	+	+	+	-	+	+
Pastinaca sativa	+	-	+	-	+	+	+	+
Galium molugo	-	+	+	-	-	+	+	-
Equisetum palustre	+	+	-	-	-	-	+	-
Taraxacum officinale	-	-	+	+	-	+	-	-
Tussilago farfara	-	+	-	-	+	+	-	-
Knautia arvensis	+	-	+	+	-	-	-	-
Vicia cracca	+	+	-	+	-	-	-	-
Trifolium pratense	-	-	+	+	-	-	-	-
Achillea millefolium	-	+	+	-	-	-	-	-
Trifolium repens	-	-	+	-	-	-	-	-
Centaurea jacea	+	-	+	-	-	-	-	-
Calamagrostis epigejos	-	+	-	-	-	-	-	-
Mentha x verticillata	-	+	-	-	-	-	-	-
Potentilla anserina	+	-	-	-	-	-	-	-
Lysimachia nummularia	-	+	-	-	-	-	-	-
Lysimachia vulgaris	-	+	-	-	-	-	-	-
Dactylis glomerata	-	-	-	-	-	-	+	-
Plantago major	-	-	-	-	-	+	-	-
Prunella vulgaris	-	-	-	-	-	+	-	-
Vicia sepium	-	-	-	-	-	+	-	-
<i>Aliae</i>								
Salix alba	-	-	-	-	-	+	+	-
Salix elaeagnos	-	-	-	-	-	-	-	+
Alnus glutinosa	-	-	-	-	-	+	-	-
Clinopodium vulgare	-	-	+	-	-	-	-	-
Phragmites australis	+	-	-	-	-	-	-	-
Clematis vitalba	-	-	-	-	+	-	+	+
Bracypodium sylvaticum	-	-	-	-	-	-	+	-
Cerastium sylvaticum	-	-	-	-	-	-	+	-
Cornus sanguinea	-	-	-	-	+	-	-	-

Place and date of the relevées: 1-Tisa (02.09.04); 2-Sighetu Marmației (03.09.04); 3-Sarasău (04.09.04); 4; 8-Teceu Mic (05.09.04); 5-Crăciunești (02.09.04); 6-Săpâța (04.09.04); 7-Remeți (05.09.04); \*=subspecies

In regard of the phyto-geographic analysis, after the Eurasian element (45.8%), an important participation has the alien (nonnative) element (23%, wherein 18.8% from America, and 4.2% from Asia).

From Romania, this association was firstly recorded by SZABÓ (1971), in the Sărățel-Chiraleș-Lechința region [52]. Then it was also quoted (on riverbanks, border of



roads, waste places, along of the fences) in other places from Transylvania: near by Valea Vinului Station (on the valley of Someșul Mare) (without relevés) [45], Țara Secuilor [23] and Crișana (without relevés) [13].

Regarding their structure and ecology, these tall weedy communities with *Reynoutria japonica* are similar to those described from some Central European countries [15, 22, 30 etc.].

### Conclusions

The humid habitats from the Tisa glades shelter a relativ rich alien flora, including 56 species (for the most part native from North America), of which 33 are hemerophytes and 23 xenophytes.

The most frequent species (75-100%) are: *Aster lanceolatus*, *Bidens frondosa*, *Erigeron annuus*, *Galinsoga quadriradiata*, *Helianthus tuberosus*, *Impatiens glandulifera*, *I. parviflora*, *Oenothera biennis*, *Reynoutria japonica*, *Solidago gigantea* subsp. *serotina*, *Xanthium strumarium* subsp. *italicum*.

All of the identified xenophytes and 39% of the hemerophytes have an invasive character in the Tisa everglades (the Romanian river bank section).

One of the identified species (*Perilla frutescens*) have not been quoted from Romania till now, as spontaneous or sub-spontaneous one, and other species are new or less known from the region (*Bidens frondosa*, *Callistephus chinensis*, *Cosmos bipinnatus*, *Impatiens parviflora*, *Oenothera erythrosepala*, *Parthenocissus quinquefolia* etc.).

Two vegetal communities with a nonnative character, less known in Romania, which displace the native vegetal communities from the Tisa glades on large areas are presented, namely: *Helianthetum tuberosi* (Moor 1958) Oberd. 1967, and *Reynoutrietum japonicae* Görs 1974 corr. Hilbig 1995.

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