

## NOTE ABOUT THE INVASIVE PLANTS IN THE ARAD COUNTY (WEST ROMANIA)

Gheorghe PELE<sup>1</sup>, Aurel ARDELEAN<sup>2</sup>, Violeta TURCUȘ<sup>\*2</sup>

<sup>1</sup>ANIF Arad, Romania

<sup>2</sup>„Vasile Goldiș” Western University, Arad, Romania

\* **Correspondence:** Violeta Turcus, Vasile Goldis Western University Arad, Faculty of Natural Sciences, no. 91-93 Rebreanu St., Arad, Romania, tel/fax +40-257-228622, email: biologic@uvvg.ro

Received: april 2008; Published: may 2008

**ABSTRACT.** The paper presents a list of non-native invasive plants in the Arad county (West Romania). For each of 10 found species, the authors mention the main biological, ecological, and chorological traits, as well as their populations locations in the Arad county. These data combines informations from scientific references and original results. It is mentioned that the most infested area in the Arad county is the Mureș Valley. For some species like *Ambrosia artemisiifolia*, *Xanthium strumarium* subsp. *italicum* and *Amorpha fruticosa* specific management measures should be taken.

**Keywords:** invasive plants, Arad county, management, *Ambrosia artemisiifolia*, *Xanthium strumarium* subsp. *italicum*, *Amorpha fruticosa*

### INTRODUCTION

The flora of a region has a continuous dynamic: some species restrain their areas, other species migrate and occupy new biogeographical territories. In the last two centuries, man became the most important agent in spreading plant species. Introducing new useful plants is a process generated the accidental introduction of weeds. We know today many examples, from antiquity to our days (Cousens and Mortimore, 1995). Plants introduced are known as exotic, non-native, non-indigenous, etc. species. When a species manifests the tendency to increase its habitat or biogeographical area, it is considered an invasive. There are many definitions of invasive species (Pysek, 1995, Dihoru, 2004):

- non-native species in a semi-natural habitat;
- native or non-native species entering in a new (type of) habitat;
- non-native or native plant species increasing its populations;
- any non-native species.

It appears that the meaning of „invasive plant” must be analysed according to context. In this paper, we deal with the invasive plants in the Arad county, and we consider as belonging to this category non-native plants for Romania, introduced by man or other dissemination agent. In this view, we focus on species in biogeographical expansion, and we exclude species as *Pteridium aquilinum* or *Juncus effusus* (commonly considered as invasive in meadows), or weeds infesting new fields.

Not any non-native species become invasive: some of them are filtered by the biotope or biocenosis factors. Plants that find a similar environment to that of their native area succeed. In the Romanian flora there are introduced species that behave like natives now (*Robinia pseudacacia*, *Ailanthus glandulosa*, *Elodea canadensis*, *Acorus calamus*).

The economic effects of plant introductions can have also negative effects on the local biodiversity. There is well known that the introduction of (plants and animal) species is the second cause of reducing biodiversity, after the destruction of habitats. Disappearing of a native plant species can lead to lost of animals that use it as food or shelter.

Adventive plants such as *Ambrosia artemisiifolia* are generating pollen allergies. *Robinia pseudacacia* modifies the whole structure of plant communities. *Xanthium strumarium* subsp. *italicum* or *Conyza canadensis* are hard to control weeds in cultivated or abandoned fields.

In any case, the control of invasives is to be done, first by putting native species in a favorable conditions for competitions. If this strategy is not enough, control methods (physical, chemical or biological) must be applied. Fighting against invasives by biological methods is an expensive and risky method because it can require introducing new parasite or predator species in an ecosystem. Beside, global warming can bring advantages to invasives.

Although countries have a quarantine system, the globalization of trade is still a factor of plants migrations.

### MATERIALS AND METHODS

Our study was carried out during 2005-2006, in most communes of the Arad county. We recorded species and observations about their habitat and abundance. We used the current works to identify species (Ciocârlan, 2000). The names were taken from the electronic *Flora Europaea* ([www.rbge.org.uk](http://www.rbge.org.uk)). The following description list includes also the economic importance of the described plants, and the management methods. We ignored recently introduced

plants that can survive as sub-spontaneous for 1-2 years, in insignificant populations.

## RESULTS AND DISCUSSIONS

### *Ambrosia artemisiifolia* L., *Asteraceae*

Annual plant, with composed leaves, similar of those of *Artemisia*, as the epitet in the scientific name. Male inflorescences at extremities, female ones (1-3), at the base of each inflorescence group. Fruits resting enveloped in supreme leaves.

It originates in the USA, and was introduced accidentally in Europe after 1850, by mean of a cereal seed transportation. Is a ruderal plant with some tendency to become a weed (Fărcășescu et al., 2007). It is one of the most noxious pollen producer (Faur and Ianovici, 2001).

Săvulescu (1952-1976, IX, p. 303) cites this species in the Cluj Region and the Banat Region, but at present, is almost common to south Romania (Ciocârlan, 2000). Hodișana and Morar (2007) mention this species as common for the whole Western Romanian Plain, including too the Arad county. We found populations of *A. artemisiifolia* in Arad, Sâmbăteni, Vinga, Șiria, Ghioroc, Șemlac, Ghioroc, Lipova, and there is a high propability that it occurs in many other localities too.

The plant grows in moderate to xeric conditions, at the road sides, abandoned fields (at least the first 1-2 years following the cultivation). As a weed, we found *A. artemisiifolia* in potato, maize, bean, sunflower, and soybean cultures. It does not grow in wheat fields, because the competition in the dense carpet created by the wheat plants.

As management tools, any method to destroy its populations must be applied before the plant produces pollen.

According to our results, *A. artemisiifolia* is one of the most dangerous invasives in the studied area, and its expansion will be amplified by the aridization and warming of the climate. The presence of the plant in one location should be taken as a public healthy problem.

### *Amorpha fruticosa* L., *Fabaceae*

Clonal shrub, 1-3 m high. Composed leaves, purple flowers at the top of branches.

It originates in North America and was introduced in Europe both as ornamental plant, and to protect soils against erosion. Used also as a tinctorial and in medicine, the plant expresses a typical sub-spontaneous and invasive behaviour. It has a good resistance to environment factors.

It grows on floodplain areas, as well in hilly regions.

In the studied area, we found the species on the whole Mureș Valley, from Lipova to Cenad, and in the Crișul Alb Valley, where it forms dense patches, sometimes on many acres surfaces.

To reduce its expansion requires to cut many times in the year and planting native trees in its proximity (in order to shadow the clones of *Amorpha fruticosa*).

### *Ceratophyllum demersum* L., *Ceratophyllaceae*

Aquatic plants, with stems exceeding 2 m in lenght. Many small leaves at each node, small flowers. Spiny fruit of 4-5 mm lenght.

Current romanian botanical works present this species as cosmopolite one (e.g. Ardelean, 2006), but it originates from the northern side of the USA, and became well spread because of changes (amateur and professional works in aquaculture).

It prefers sandy substratums an can propagate by the vegetative way. *C. demersum* forms dense communities, sometimes monospecific, eliminating ather aquatic plants. In comparison to other species the vegetation season starts earlier and it can colonize ponds of 0.5 m to 15 m depth. Other interesant characteristic is the ability to compete phytoplankton by using light and mineral nitrogen, as well as by eliminating inhibitors (allelopathy).

Săvulescu (1972-1976, III, pp. 53-54) cites the species, in the Arad county, at Sendlac, Pecica, Bocsig, Ceala; besides these locations, we found the species in Ineu. For the moment, there is no need to apply specific methods to reduce the populations of the *C. demersum*.

To control this plant, herbicides can be used, but not in fishing ponds. A biological way to reduce its abundance is to populate the ponds with herbivorous fish (*Ctenopharyngodon idella*), even the plant does not constitute the favourite menu of this fish species. Mechanical methods to eliminate the plant are expensive.

### *Cytisus scoparius* (L.) Link. (*Sarothamnus scoparius* (L.) Wimmer ex Koch), *Fabaceae*

Deciduous leaves shrub, originated in southern Europe an Asia. Green branches, and a hight about 2 m. The flowers have a vivid yellow colour; it gives to the plant a high decorative value. It is also a medicinal plants because of an alcaloid (spartein).

The plant is cited by Săvulescu (1952-1976, V, pp. 77-78), in the Arad county, at Moneasa, Gurahonț, Căsoaia. It seems that *C. scoparius* was introduced during the Habsburg Empire dominion in order to provide food for the game in winters. We identified the species in the same locations, on soils with conditions similar to those described by HOSHOVSCHI (1986 at [www.tela-botanica.org](http://www.tela-botanica.org)): mean pH, sunny habitats, without winds.

In spite of an important seed production, the expansion of species is limited to some areas but this potential should send to continuous survey.

When the populations become massive, plants must be destroyed by cutting. We disaprouve planting this species to be used as forrage for big game (deers) inside botanical reserves and national parks.

### *Impatiens glandulifera* Royle, *Balsaminaceae*

Annual herbaceous plant, 2 m high. Two or three big leaves per node. Axilar inflorescences. Big pink flowers, that gives a spectacular aspect to the plant.

It originates from Himalaya, and was introduced in Europe as ornamental plant. As *Reynoutria japonica*, it prefers riparian habitats in hilly areas. In Romania, it

can be found in many counties: Cluj, Bistrița-Năsăud, Prahova, Brașov, Hunedoara, Mureș (Săvulescu, 1952-1976, VI, p. 168).

We identified the species in the Mureș Valley, near Săvârșin. A possible way of seeds transportation is water. Another one is putting illegally contaminated soil from gardens along rivers. Taking into consideration the situation of waters management in the Arad county, this species have all chances to spread more.

***Phytolacca americana* L., *Phytolaccaceae***

There are 25 species in the *Phytolacca* genus. *P. americana* originates in North America, and was introduced on other continents for many purposes (tintorial plant, decorative, edible fruits in some cases). In Europe it was first cultivated in Spain, Portugal, and France for the colouring of wines. Recently, was discovered that the plant contains an anti-viral protein used against HIV.

Herbaceous plant that reaches 2 m in height, with a huge root, and a sympodial ramification system. Fruits are black berries, preferred (so disseminated) by birds. In the USA, the fruits were used to be eaten by migratory pigeon, nowadays extinct species.

It prefers fertile soils; plants on poor soils have smaller heights. *Phytolacca* grows at forest borders, uncultivated surfaces near villages and towns. The populations we found were not numerous. It was proved that leaves are toxic for ruminants (www.telabotanica.org). Cases of toxicity were reported at horses, cows and pigs. For sheep, the lethal dose is estimated to 500-1000 mg fresh plant per kg animal weight.

The invasiveness of this species is made by some factors as:

- producing many seed (10 seeds in a berry, hundreds of berries per individual);
- easily dissemination by birds;
- long time kepted viability of seeds in soil;
- reduced predatorism by herbivorous, due to the toxicity.

We found this species in Arad, Lipova, Radna, Macea, Șiria, Săvârșin in small populations. Săvulescu (1952, p. 611) reports this species as present mainly in the southern parts of Romania. At present, we consider this species to be not very dangerous, in order to apply specific eradications methods. *Flora Europaea* mentions the species, with the synonym *P. decandra*, in southern and central Europe.

As management measure, we recommend to destroy plants (easy to recognize) before they produce fruits.

***Reynoutria japonica* Houtt., *Polygonaceae***

Vigorous perennial herbaceous plant, 2 m high, with rhizome. Large leaves, numerous white flowers in dense inflorescences.

Originating from Japan, this species can hybridate with *R. sachalinensis* (Pysek et al., 2003) and can easily propagate by vegetative way. Late in summer, when in blossom, the shrubs of *R. japonica* create patches in riparian zones. In Romania it was introduced

as an ornamental plant and escaped from gardens becoming sub-spontaneous.

We find this species in the Crișul Alb Valley, at Lipova, Șiria, Sebiș, and Dezna. It seems that the species will spread to new zones, given its reproductive potential and the lack of predators or parasites, as the process took place in Europe. The only reasonable measure to limit the spreading of *R. japonica* is to cut young stems many times a year. Local application of herbicides is expensive but could be a good method in case of huge populations.

***Robinia pseudacacia* L., *Fabaceae***

Tree native from the southern parts of the USA, with a height going to 20 m. Composed leaves (7-21 leaflets), and paired, characteristic thorns. White-yellowish, odorant flowers.

The vivacity of this tree is given by the symbiosis with nitrogen fixation bacteria, that allows it to colonize unfertile soils, and by vegetative multiplication. It prefers sandy soils, where it forms specific plant communities.

The trees was introduced in Europe about 1600 as an ornamental plant. It is also appreciated as one of the most visited by bees plant. It provides protection against wind and wind erosion. The wood is dense and suitable to be used for domestic purposes. On degraded lands, *Robinia pseudacacia* virtually do not have competitors among other tree species.

Besides its economic importance, there was noticed an expansion of this species from plains to hill areas, during the last decades. If so far, measures to reduce sub-spontaneous populations were not to be applied, the situation has changed, and will not be the same the next years.

In our opinion, the management of this species should be build considering at least two nuances:

- in plain areas, in the ecological reconstruction of dumps we should encourage the expansion of *R. pseudacacia*. In plains it is a very well adapted species to aridity. In ecological reconstruction, the strategy should include cultivating during the 10-15 first years, until soil and community become stable; after this stage, native trees are suitable to replace the species.
- in hilly forests, *R. pseudacacia* should be eliminated, because its presence lead to significant changes in herbaceous community. So, the plants under *R. pseudacacia* canopy (*Bromo sterili-Robinetum* Pócs 1954 - Sanda, 2002) are: *Bromus sterilis*, *Anthriscus trichosperma*, *Urtica dioica*, *Conium maculatum* *Chelidonium majus*, while under the native broadleaf forest grow *Geranium robertianum*, *Sanicula europaea*, *Dactylis aschersoniana* etc. A such example is presented by Arsene (2003), from the Lunca Pogănișului botanical reserve (Timiș county), where the replacement of *Quercus robur* and *Fraxinus excelsior* by *Robinia pseudacacia* created the conditions of quasi-disappearance of *Fritillaria meleagris*.

***Rudbeckia laciniata* L., Asteraceae**

Perennial plant, with rhizome, and a height exceeding 2 m in height in good habitats. The leaves are 2-3 leaflets composed. Big inflorescences, until 12 cm in diameter.

Introduced in Europe in 1750 (Săvulescu, IX, pp. 325-326), as a decorative plant. It is typical for the plain and hilly areas, along river sides, as well in abandoned fields or neglected areas near gardens.

We identified the species in the Zimbru Valley, near Gurahonț, as mentioned by Ardelean (2006), in compact patches. We did not notice any management measure applied. We suppose this species will spread, in the absence of control.

***Xanthium strumarium* L. subsp. *italicum* (Moretti) D. Löve (= *X. italicum* Moretti), Asteraceae**

This subspecies became last decades a common weed in Romania. It differs from *X. strumarium* by the size of fruits (16-25 mm, in comparison with 15 mm), by the highest density of fruit spines, and by its pleasant smell.

Annual plant, up to 1 m high, with triangular, lobed leaves. The fruits are in pairs, closed in a common spiny structure (united hypsophilles).

Săvulescu (1952-1976, IX, p. 312) cites the species in Romanian plain areas, and in the Arad county at Apateu. In fact, *X. s.* subsp. *italicum* is very common and frequent, being easily spread by sheep. It occurs as a weed in maize, sunflower, soybean, but can be found in many ruderal areas. Another facilitating factor in spreading the fruits is water, knowing that *Xanthium* species grows in floodplains.

We identify this subspecies in the majority of Arad county localities, sometimes in huge populations, as well as weed or ruderal. It is to be expected to assist to the expansion of this thermophilous species in the conditions of climate warming.

As control methods, plant rotation (the plant do not find conditions in wheat fields), mechanical destruction are the most effective.

**CONCLUSIONS**

We identified 10 plant invasive species in the county of Arad.

Among these species, the most problematic are *Ambrosia artemisiifolia*, *Xanthium strumarium* subsp. *italicum*, *Amorpha fruticosa*.

The most infested area with invasive plants appears the Mureș Valley.

There is not a strategy to limit the expansion of invasive plants in the Arad county. at least there is a need to apply control methods of *Ambrosia artemisiifolia* because its allergenic pollen just like in other European countries (e.g. Hungary).

**REFERENCES**

- Ardelean A., Flora și vegetația județului Arad, Ed. Academiei Române, București, 2006
- Arsene G.G., Contribuție la corologia speciei *Fritillaria meleagris* L. în România, Lucrări științifice, U.S.A.M.V.B. Timișoara, Facultatea de Agricultură, XXXV, pp. 467-472, 2003
- Ciocârlan, V., Flora mică ilustrată a României. *Pteridophyta* et *Spermatophyta*, Ed. Ceres, București, 2000
- Coste, I., Probleme ecologice ale agriculturii și spațiului rural din România – un punct de vedere, în „Omul și mediul”, Zilele Academice Timișene, ed. a VIII<sup>a</sup>, 22 mai 2003, Academia Română, Filiala Timișoara, Comisia pentru Combaterea Poluării Mediului (on CD-ROM), 2003
- Cousens, R., Mortimer, M., Dynamics of weed populations, Cambridge University Press, pp. 21-44, 1995
- Dihoru, G., Invasive plants in Romania's flora, Analele Universității din Craiova, IX (XLV), pp. 73-82, 2004
- Faur, A., Ianovici, N., Dinamica polenului de *Ambrosia artemisiifolia* L., Conferința Națională de alergologie și Imunologie, Târgu-Mureș, 2001
- Fărcășescu, A., LAUER, K.F., *Ambrosia artemisiifolia* L.: a segetal species with a tendency to expansion in the Timiș County, Lucrări științifice, U.S.A.M.V.B. Timișoara, Facultatea de Agricultură, XXXIX, I, pp. 471-482, 2007
- Hartzler, R.G., Buhler, D.D., Stoltenberg, D.E., Emergence characteristics of four annual weed species, Weed Science, 47, 5, pp. 578-584, 1999
- Hodișan, N., Morar, G., Răspândirea speciei invazive floarea pusteii (*Ambrosia artemisiifolia* L.), buruiiană de carantină în nord-vestul României, Lucrări științifice, USAMVB Timișoara, Facultatea de Agricultură, XXXIX, pp. 499-502, 2007
- Pyšek, P., On the terminology used in plant invasions studies, in Pyšek, P., Prach, K., Rejmanek, M., Wade, M., 1995, Plant invasions: general aspects and special problems, SPB Academic Publishing, The Hague, The Netherlands, pp. 71-81, 1995
- Pyšek, P., How reliable are data on alien species in Flora Europaea?, Flora, 198, pp. 499-507, 2003
- Pyšek, P., Brock, J.H., Bimova, K., Handak, B., Jarosik, V., Koukolikova, I., Pergl, J., Stepanek, J., Vegetative regeneration in invasive *Reynoutria* (*Polygonaceae*) taxa: the determination of invasibility at the genotype level, American Journal of Botany, 90, 10, pp. 1487-1495, 2003
- Pyšek, P., Prach, K., Plant invasion and the role of riparian habitats: a comparison of four species alien to central Europe, Journal of Biogeography, 20, pp. 413-420, 1993
- Rejmanek, M., What makes a species invasive?, in Pyšek, P., Prach, K., Rejmanek, M., Wade, M., 1995, Plant invasions: general aspects and

special problems, SPB Academic Publishing,  
The Hague, The Netherlands, pp. 3-13, 1995

Sanda, V., Vademecum ceno-structural privind covorul  
vegetal din România, Ed. Vergiliu, București,  
2002

Săvulescu, T. (main red.), Flora Republicii Populare /  
Socialiste România, I-XIII, Ed. Academiei  
Republicii Populare / Socialiste Române,  
București, 1952-1976

