APPROACH ON THE SHRUB INVASIVE SPECIES IMPACT ON WESTERN ROMANIAN GRASSLANDS

STUDIU ASUPRA IMPACTULUI SPECIILOR INVAZIVE DE ARBUŞTI ASUPRA PAJIŞTILOR DIN VESTUL ROMÂNIEI

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Abstract: *This work presents a study realised on some grassland from western Romania that are characterised by the presence of shrubs. Those have a great impact on the vegetation because they determine changes in the structure of the vegetation carpet, but also they are affecting the grassland exploitation too, especially through the diminishing of the useful surface.*

Rezumat: *Această lucrare prezintă un studiu realizat asupra unor pajişti din vestul României, care sunt caracterizate prin prezența arbuştilor. Aceştia au un impact deosebit asupra vegetației, prin faptul că determină modificări în structura covorului vegetal, dar afectează şi exploatarea pajiştilor, mai ales prin diminuarea suprafeței utile.*

Key words**:** *grassland, invasive shrub, vegetation, impact*.
Cuvinte cheie: *pajişte, arbust invaziv, vegetație, impact.*

INTRODUCTION

This study is realised on the invasion of two shrub invasive species respectively *Sarothamnus scoparius* Koch. (*Cytisus scoparius* L.), and *Amorpha fruticosa* L., both being taxa of *Fabaceae* family. *Fabaceae* family comprises about 350 genera, most of them being cosmopolite and having more than 10,000 species. In Romania we are finding 30 genera with 208 spontaneous species (HODIŞAN & POP, 1976).

Sarothamnus scoparius Koch. (*Cytisus scoparius* L.) (Scotch broom) is a shrub with erect stem, ramified in thin branches green during entire year, having a height of 2 m. The leaves are alternate, hairy when are young and the lower ones shortly stalked, with three small, oblong leaflets, the upper ones, near the tips of the branches, sessile and small, often reduced to a single leaflet. The flowers are large bright yellow, papilionaceous, fragrant flowers, in bloom from May to July. The fruit is a pod hairy on the edges, but smooth on the sides, containing 8-15 seeds. This species is toxic, the toxicity being manifested when it is consumed by animals in great amount, and the milk produced by the animals that have consumed this plant is toxic for humans (after PÂRVU, 2000). This species grows in the area of oak forests, shrubs, and forest edges (after CIOCÂRLAN, 2000). It is an olygotrophic, mesophytic, calcifug, resistant to drought, and sensitive to hard frost (PÂRVU, 2000). In the places where *Sarothamnus scoparius* is introduced invaded the grassland, cultivated land, river meadows, along the road, and river banks. This species tolerates a great diversity of soils with pH among 4.5 – 7.5 (JOHNSON, 1982; WILLIAMS, 1981).

Amorpha fruticosa L. (indigo bush) is an invasive shrub original from North America, in Europe was used as ornamental and it became invasive (PRODAN & BUIA, 1958; CIOCÂRLAN, 2000). Indigo bush is a shrub with 1 – 3 (6) m height, the leaves are impair-pinnate, bright green with 5-12 elliptic - oblong leaflets dotted on the back. The pod is 6-9 mm long and coarse (PRODAN & BUIA, 1958). It flowers from May to July. It is sub-spontaneous in meadows, the riverbanks, and along the roads (CIOCÂRLAN, 2000). This species is mesophytic, moderate thermophyllic and indifferent to soil reaction (after SANDA *et al*., 2000).

Ecological and economic impact of the invasive species is perceived from local level to global scale. Researchers, landowners, and the public generally become more aware on the impact of this phenomenon. Ecological invasion is considered the second serious threat for natural habitats, after their fragmentation and lose (KELLY, S., 2003). The role of disturbances from ecosystems in promoting of invasive plant species is essential. From the natural agents that determine the disturbance of ecosystems and that determines the increasing of invasion incidence, the most important are: volcanic eruptions, fire, overgrazing and undergrazing (PAUCHARD, A., 2002). In Romania, only 6.6% from grassland surface is not affected by degradation processes. Erosion and landslides affected the biggest surfaces of the grasslands (60%). Humidity excess, alkalinity affects every 10%, or less from the total surface. Must be retained that there are 379 000 ha with parental material on the surface, which are in fact totally degraded grasslands (MOISUC A. *et* DUKIC D, 2002).

MATERIALS AND METHOD

This study is realised on two grasslands from western Romania affected by the invasion of two shrub invasive species respectively *Sarothamnus scoparius*, and *Amorpha fructicosa*, both being taxa of *Fabaceae* family. The data were collected twice a year during 2005-2007: at the end of May and at the beginning of September.

One of the research methods used in this work is mapping the aerial projection of invasive plant species (shrubs and herbs) on 100 m^{-2} (10 m x10 m) plots divided in 25 m^{-2} (5m x 5m) sub plots. The data obtained in this way helped us to analyze spatial distribution, and to calculate the coverage index for studied species, which is the ratio in percent of the surface covered by shrubs, to the surface of the plot.

Also, these data helped us to calculate the spreading coefficient, which represents the increase in surface covered by shrubs starting from a reference surface of $1m^2$ between two years ($year^{-1}$).

RESULTS AND DISCUSSION

Sarothamnus scoparius (Scotch broom) was introduced in western Romania in 1865 being planted for ornamental purpose at Bocşa Română (Caraş Severin County) (MARUŞCA, 1995; MARUŞCA, CAPŞA & DINCĂ, 1999). In the area where is introduced the scotch broom now are great surfaces invaded with it. Thus, this species is noticed in 2005 as invasive in grassland from the perimeter of Bocşa, Biniş, Reşiţa, Târnova, Păltiniş, Ezeriş, Fârliug (Caraş Severin County). In the perimeter of Reşiţa we noticed the presence of *Sarothamnus scoparius* on a grassland invaded by *Pteridium aquilinum*. Here we have noticed the great invasive capacity of scotch broom that can increase its coverage index on a surface dominated by bracken. This fact is favoured because this species is proliferating vegetative and generative.

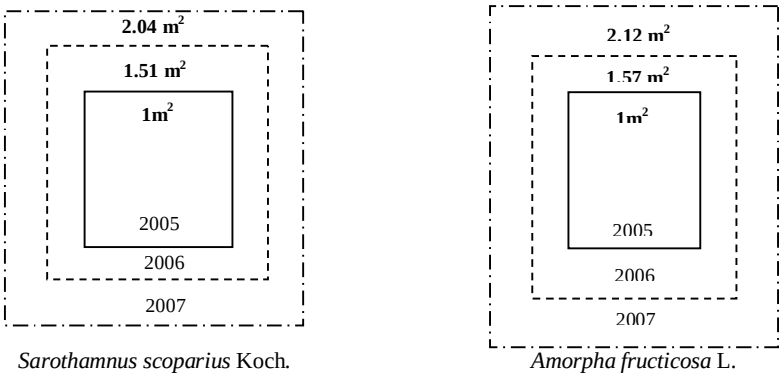
Another invasive species from *Fabaceae* family is *Amorpha fruticosa* (indigo bush) that also has a great spread in western Romania invading great surfaces of meadows along Crişului Channel and in conformity with the observations taken in 2005. Also, this species is found in 2005 on great surfaces of grassland along the road and railroad in the perimeter of Ilia (Hunedoara County), and along the river Mureş and Danube. The invasive characteristic of indigo bush in Danube's meadow is signalled by DIHORU (2004) too. *Amorpha fruticosa* is also found in 2005 in the area of Voiteg, Deta, Moraviţa, Timişoara (Timiş County) and Grădinari (Caraş Severin County).

In conformity with BOOTH *et al.* (2003) an invasive species once is set can facilitate the invasion of other species. In conformity with this theory, the vegetation community became more invisible when the invasion of a species takes place, thus increasing the possibility that the number of the species that are invading that ecosystem will increase. LEVINE &

D'ANTONIO (1999) say that the presence of more than one invasive species in the same vegetation community is determined by the fact that the biotope is favourable for many more species.

The occupation models of the surface presented before is framing in the model of radial expansion described by COUSENS & MORTIMER (1995) conforms to it the invasive plants are expanding through a circular advancing front. Thus, the initial surface covered increases with a half of the radius of the previous generation, and the expansion rate is constant. The small differences appeared in most of the studied cases are explained by the theory enounced by MAXWELL *et al*. (2003) conforms to some individuals from the initial population are spreading far away from the invasion source forming a new satellite population of this species. The satellite populations will act as a new invasion source continuing to spread as the original source of invasion.

All the spreading coefficients (fig. 1) are increased, showing that the species studied here on these grasslands are increasing the covered surfaces in a very short time. With this type of diagram, as are these presented for every species studied in this research can be realised a rapid diagnose of the grassland concerning the evolution of the populations of invasive species in short time (2-3 years). This kind of diagnose can be useful for the setting of some prevention measures concerning the expansion of these species in the herbaceous vegetation communities.



Sarothamnus scoparius Koch. *Amorpha fructicosa* L.

Figure 1. Evolution of the spreading coefficient during three years

The evaluation models of this type can be used in the case of the grasslands placed inside the protected areas, in buffer areas and very close by them, especially when is the danger that one ore more invasive species are affecting the habitat of some rare or endangered species. An example in this way is the diminishing of the habitat of *Tulipa hungarica* ssp. *undulatifolia*, endemic species in the Natural Park Porțile de Fier, due to the spread of the invasive species *Ailanthus altissima* ornamental species original from China but invasive in the area mentioned before.

CONCLUSIONS

The data collected in this research show that *Sarothamnus scoparius* Koch. And *Amorpha fructicosa* L. acts as invasive species because their spreading coefficient is growing from a year to another conform to the theory of radial expansion described by COUSENS & MORTIMER (1995). Both species are diminishing the useful surface of the grasslands where they are spreading. In the case that they are not kept under control they will cover most of the useful surface of the grassland. The costs necessary to control these invasive shrubs in

grassland will increase from a year to another because the surface covered with them is growing in this way too.

ACKNOWLEDGEMENTS

This work contains data from the project no. 408/2007 code ID_59 "Inventory of the invasive plant species from western Romania and the elaboration of some efficient fast tools for the evaluation of their dynamics and impact on the vegetation" coordinated by Veronica Sărățeanu and supported by the Executive Unit for the Financing of the High Education and University Scientific Research (UEFISCSU).

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