ASSESSING THE INFLUENCE OF *AMORPHA FRUTICOSA* L. INVASIVE SHRUB SPECIES ON SOME GRASSLAND VEGETATION TYPES FROM WESTERN ROMANIA

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Abstract: *Indigo bush (Amorpha fruticosa L.) is an invasive shrub native from North America with great ecologic plasticity being found in different ecological conditions. This species is very aggressive replacing fast the native vegetation from different herbaceous vegetation communities. This species has incidence in western Romania, being spread along all the waterways (Mureş River, Danube River, Crişul Alb, Crişul Negru, Timiş, Bega, Bârzava) and their affluents, along the terestrial transport ways, but it started to be found in grasslands too. The data analyzed in this work were registered during 2005-2009 period from four grazed grasslands from Timis County (Voiteg, Moravița, Albina and Sacoşu Turcesc). There were performed vegetation surveys and the collected data were used for the calculation of different parameters of the grassland vegetation as are: floristic composition parameters and Shannon-Wiener index (H') using natural logarithms. The mapping of the aerial projection of indigo bush on 100 m^{-2} was done by dividing the studied surface into 100 sub-plots ($1m^{-1}$ x $1m^{-1}$). For each sub-plot we have evaluated the area covered with indigo bush plants (m^{-2}). The data obtained in this way helped us to analyse the spatial distribution, and to calculate the coverage index for the studied species. For the statistical analysis there was used the linear regression and correlation coefficient (r). The purpose of this research is to asses the influence of indigo bush on grasslands and its invasive potential on grassland vegetation from western Romania. There was determined the coverage index evolution and the dynamics of biodiversity. The results obtained show that indigo bush has increased invasive potential in grasslands with negative effects on the native vegetation.*

***Key words*:** *Amorpha fruticosa L., shrub, invasive, grassland, vegetation, biodiversity*

INTRODUCTION

Poorly managed agricultural and rural, disturbed areas, and aquatic ecosystems are the most prone to plant invasions (TÖRÖK *et al.*2003). In conformity with DEÁK (2005) land surfaces covered with abandoned arable land and orchards turned in unexploited weedy wet grasslands are getting invaded with different species, one of the most frequent invasives being *A. fruticosa*, they stopping the vegetation succession to a floodplain meadow vegetation type. The invasive feature of *A. fruticosa* in floodplain grasslands is mentioned also by BOTTA-DUKÁT (2005). WEBER *et* GUT (2004) assess that *A. fruticosa* represents a potential invasive plant species in Central Europe.

Amorpha fruticosa L. (indigo bush) was used in Europe as ornamental and it became invasive. It is a shrub of 1 – 3 (6) m height with impair-pinnate leaves, bright green with 5-12 elliptic - oblong leaflets dotted on the back. The pod is 6-9 mm long and coarse. It flowers from May to July. Indigo bush is sub-spontaneous in meadows, riverbanks, and along the roads. This species is mesophytic, moderate thermophyllic and indifferent to soil reaction (SĂRĂȚEANU *et al*., 2008).

Researchers, landowners, and the wide public generally has become more aware regarding the impact of invasive species; ecological invasion being considered the second serious threat of the habitats, after their fragmentation and lose. The role of ecosystems'

disturbance on invasive species propagation is essential. The most important factors that determinate the disturbance of the ecosystems and implicitly the increase of invasion incidence, are: volcanic eruptions, fire, overgrazing and undergrazing (SĂRĂȚEANU *et al*., 2007).

Accordingly with DUMITRAȘCU *et al*. (2010) *A. fruticosa* is a representative invasive species in the protected areas. As example in "Balta Mică a Brăilei" Natural Park *A. fruticosa* covers 13,877 hectares of forests, 54 hectares of pastures and 17 hectares of agriculture land. It occurs on poor, degraded, dry and sandy soils and can survive to extreme climatic conditions. Also, the specie is very productive, which leads to a high expansion with a negative impact upon the environment. Removing the *A. fruticosa* bushes is extremely difficult and involves high costs, mainly because of the specie's high productivity. The methods used are of mechanic nature, with less negative impact upon the environment and on other species.

Researches regarding the chorology of *A. fruticosa* in the Danube Delta were realised by DOROFTEI (2009). *A. fruticosa* has been identified in phytocenoses of herbaceous species such as: *Scirpo-Phragmitetum, Typhetum angustifoliae, Artemisietum arenariae, Hordetum murini, Bassietum sedoidis, Cynodonto - Poetum angustifoliae, Thelyptero - Phragmitetum.* Thus, regarding the distribution, the author mentions that the species has been identified within almost any areas, ecologic conditions and vegetation type, but the difference is made by the species frequency and dimensions.

MATERIAL AND METHODS

This study is realised during 2005-2009 on four permanent grasslands (Voiteg, Moravița, Albina and Sacoșu Turcesc) from Timiș County (western Romania) exploited by grazing. The data were collected after BRAUN-BLANQUET (1964) method cited by ARSENE (2003). There were performed vegetation surveys and the collected data were used for the calculation of different parameters of the grassland vegetation as are: floristic composition parameters and Shannon-Wiener index (H') using natural logarithms (JURKO & FAJMONOVA cited by CRISTEA, 1991).

The mapping of the aerial projection of indigo bush on 100 m^{-2} (10 m^{-1} x 10 m^{-1}) was done by dividing the studied surface into 100 sub-plots (1m^{-1} x 1m^{-1}). For each sub-plot we have evaluated the area covered with indigo bush plants (m^{-2}). The data obtained in this way helped us to analyse the spatial distribution, and to calculate the coverage index for the studied species, which is the ratio between the total surfaces covered by the indigo bush (sum of the areas covered in 100 sub-plots) and the total area of the plot (100 m^{-2}). For the statistical analysis there was used the linear regression and correlation coefficient (r).

RESULTS AND DISCUSSIONS

Grassland from Voiteg is dominated by *Agropyron repens* and *Festuca valesiaca.* Other species with important contribution are *Poa pratensis, Achillea millefolium, Juncus effussus* and *Plantago lanceolata*. Characterising the correlation coefficients calculated among indigo bush coverage index, species number and H' from Voiteg grassland there was determined a negative correlation indicating that the increase of the indigo bush coverage index determinates the decrease of species number (r = -0.79) and biodiversity (r = -0.57) (figure 1).

Grassland from Moravița is dominated by *Agropyron repens* and *Festuca pseudovina.* An important contribution to the vegetation cover of this grassland is due to *Daucus carota, Carduus acanthoides, Carthamus lanatus* and *Polygonum aviculare*. Analyzing the values of the correlation coefficient obtained are similar with the results obtained for Voiteg grassland (r = -0.83; r = -0.51) (figure 2).

Grassland from Albina is dominated by *Cynodon dactylon* and *Festuca valesiaca*. Other species abundant in this grassland are: *Lolium perenne, Ononis spinosa, Achillea millefolium* and *Eryngium campestre*. The correlation coefficients among *A. fruticosa* coverage index and species number and H' calculated for this grassland show the most powerful correlation index, this having the same value for both parameters (r = -0.97) (figure 3).

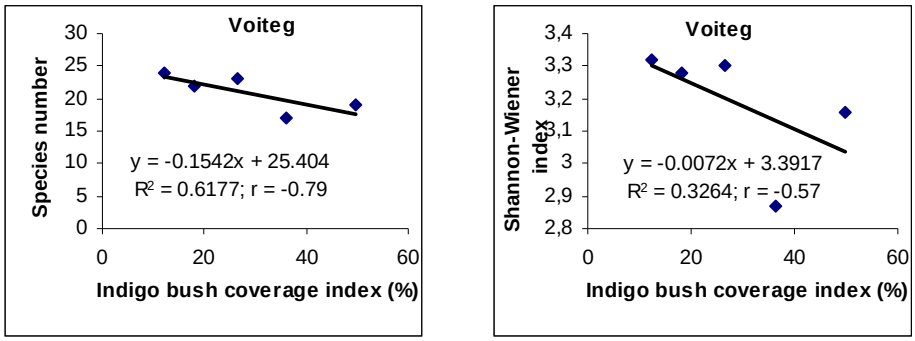

Figure 1: Correlation among *A. fruticosa* coverage index and species number and Shannon-Wiener index (*H'*) in Voiteg grassland

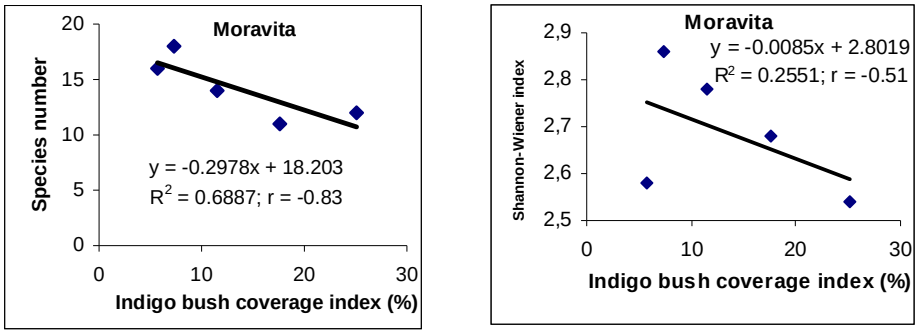

Figure 2: Correlation among *A. fruticosa* coverage index and species number and Shannon-Wiener index (*H'*) in Moraviţa grassland

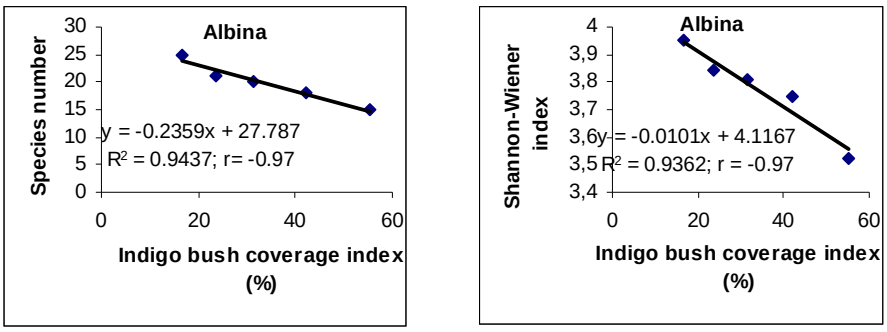

Figure 3: Correlation among *A. fruticosa* coverage index and species number and Shannon-Wiener index (*H'*) in Albina grassland

Grassland from Sacoşu Turcesc is dominated by *Agropyron repens* and *Achillea millefolium.* Other species that have an important participation are: *Festuca valesiaca, Juncus effussus, Plantago lanceolata* and *Daucus carota*. There isn't found any correlation among *A. fruticosa* coverage index and species number and biodiversity index (figure 4).

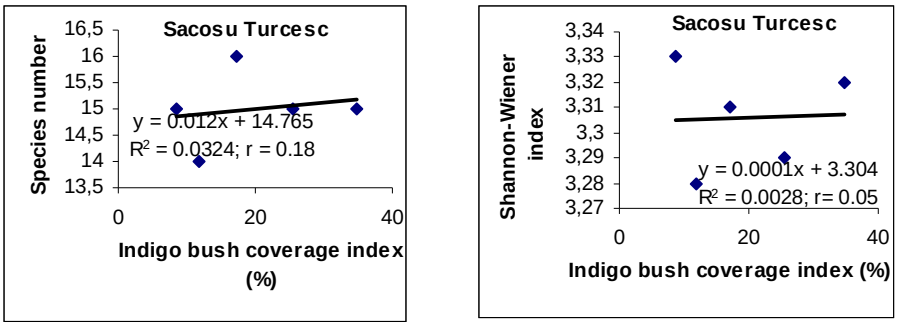

Figure 4: Correlation among *A. fruticosa* coverage index and species number and Shannon-Wiener index (*H'*) in Sacoşu Turcesc grassland

CONCLUSIONS

The coverage index of indigo bush has influence on the species number and Shannon-Wiener index in the case of three grasslands from the four analysed here.

In Sacoşu Turcesc grassland wasn't determined a correlation among those parameters, even the coverage index of *A. fruticosa* is great.

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