AMBROSIA ARTEMISIIFOLIA L. AN INVASIVE WEED FROM RUDERAL AREAS TO DISTURBED GRASSLANDS

Veronica SĂRĂŢEANU [1], Alexandru MOISUC [1], Otilia COTUNA [1]

[1] Banat's University of Agricultural Sciences and Veterinary Medicine, Timişoara

Abstract

Common ragweed (*Ambrosia artemisiifolia* L.) is mentioned in literature as invasive weed that is commonly found in disturbed sites as roadsides, railways, gravel pits, construction sites, agricultural land, waterways etc. The greater incidence of this species in Romania is in the western counties (Timis, Arad and Bihor). In this work is presented a case study of 7 grasslands invaded with common ragweed from Valea lui Mihai (Bihor County). The dominant relief formations in the studied area are continental sand dunes, the studied being placed between the dunes. The data were collected during 2007 – 2009 period. *A. artemisiifolia* has an important participation in the studied grassland, being codominant in 3 grasslands from all 7 studied in this work, and having an important contribution in the other 4. This species has a participation comprised between 9.17% and 18.33% in the vegetation cover. Common ragweed abundance determinates the decrease of the mean species number, other species number, diversity index and pastoral value in the studied area.

Key words: *Ambrosia artemisiifolia* L., grassland, floristic composition, biodiversity, pastoral value

The role of the ecosystem disturbances on the promotion of invasive plant species is essential. Undergrazing, overgrazing and the lack of the minimal maintenance works on grasslands lead to the proliferation of invasive plant species. Environmental changes are also determined by the change of the pressure of some anthropic factors (use, fertilisation, maintenance works, management), which are influencing the botanical composition of the permanent grasslands (Sărăţeanu, V., Moisuc, A., 2004, Sărăţeanu V. et al., 2008).

In Austria, the habitat preference of *A. artemisiifolia* changed and broadened considerably during the invasion. Until 1950, most records were associated with railways, whereas in the period 1950–1974 they were for ruderal habitats not associated with traffic infrastructure. Since the 1970s, and especially in the last few years included in this study, records from roadsides increased strongly and became dominant. Fields were first colonized in the 1970s and have gained in importance since then. Habitats associated with bird feeding places and gardens peaked in the period 1950–1979, but have since become less important (Essl, F. et al., 2009).

Despite intensive search *A. artemisiifolia* was found only scarcely at river banks in Germany; according to Siedentopf (2005) it shows no linkage to riparian habitats here. Apart from small random ephemeral populations, the summer fluctuations of the water level may be the main reason for hampering or inhibiting of the establishment below the main water level, because the species seems not to be tolerant to inundation. The situation is different for torrential rivers with an extended period of summer drought, for common ragweed grows often in dried up river beds, which still provide a comparatively good supply of water (Brandes, D., 2006).

Armesto and Pickett (1986), investigating the effects of total or partial removal of the above-ground biomass of the dominant species on early successional trends in two oldfields in central New Jersey, USA, have noticed that in a 2nd year oldfield dominated by *A. artemisiifolia*, floristic composition and distribution of species cover changed markedly between the 2nd and the 3rd year, regardless of the removal treatment.

Seeds of ragweed are not airborne, normally they fall on the ground. Spread of ragweed is greatly favored by human activities. Ragweed has a higher spread potential than most indigenous annual dicotyledonous weed species and most indigenous grass weeds in Central Europe (Bohren, C., 2007).

In conformity with Csaba Szigetváry (2004) *A. artemisiifolia* seems to not have substantial transformer impact on the essential dynamic processes and structural relations of the open sand grassland. Thus, the invasion of this species is strongly related to recent disturbances and they don't threaten undisturbed vegetation.

The control of *A. artemisiifolia* using natural enemies is difficult, experiences in this direction being done by MacDonald & Kotanen (2010) in North America. They have clipped leaves to simulate damage by folivores and removed meristems to simulate apical mortality caused by stem borers, and measured the consequences for growth and reproduction. Stem biomass was only reduced by defoliation far in excess of native-range natural damage, while seed production was unaffected by our treatments. Severely damaged plants maintained seed production by allocating relatively more aboveground biomass to reproduction. The results obtained suggest that damage by natural enemies may have little impact on this plant; and enemy release may not provide a significant advantage to this species in Europe. Thus, biological control by insect folivores is unlikely to succeed unless it results in very high levels of damage.

After Hodişan *et al*. (2008), in Bihor county area *A. artemisiifolia* has occupied almost the entire territory, except the mountain area, this species being found until at 692 m a.s.l. Thus, common ragweed grows almost on any soil type.

The purpose of this work is to highlight the invasion of *A. artemisiifolia* L. in grasslands from ruderal areas and arable land, showing the impact on grassland vegetation.

MATERIAL AND METHOD

Material studied in this work is represented by 7 grasslands from Valea lui Mihai (Bihor County) invaded by common ragweed, studied during 2007-2009 period from different standpoints. The dominant relief formations in the studied area are continental sand dunes, and the studied plots are placed mainly between the dunes. The altitude is comprised between 130-160 m a.s.l., the mean of the annual temperature is 10.9 ºC, and the mean of the annual rainfalls amount is comprised between 580-620 mm.

The vegetation data were registered 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 aspects of the vegetation cover as are: floristic composition parameters (mean species number; abundance of grasses, legumes and other species; number of grasses, legumes and other species), Shannon-Wiener index (H') using natural logarithms (Cristea, V., 1991) and pastoral value (0-100 scale) according with Daget & Poissonet (1971) using the Specific Indexes (IS) of the grassland plants (0-5 scale) adapted for the Romanian vegetation by Kovacs (1979). For the statistical analysis there was used the linear regression and correlation coefficient (r).

RESULTS AND DISCUSSIONS

1. Grasslands' description

Grassland 1 is dominated by *Agrostis tenuis* and *Cynodon dactylon*. Other abundant species in the vegetation cover are *Achillea millefolium*, *Luzula campestris, A. artemisiifolia* and *Bellis perennis*. *Ambrosia artemisiifolia* has also an important contribution in the vegetation cover of this grassland representing 9.17%.

Grassland 2 is characterised by the dominance of *Lolium perenne* and *Agrostis tenuis*. There are present in a high amount *Ambrosia artemisiifolia, Poa pratensis, Cynodon dactylon, Festuca ovina, Bromus squarossus, Achillea millefolium* and *Xanthium strumarium*. The contribution of *A. artemisiifolia* in this grassland is 10%.

Grassland 3 has as dominant species *Poa pratensis, Agrostis tenuis* and *Ambrosia artemisiifolia*, the last one having a participation of 15.42%. Other species relatively abundant are *Trifolium repens, Achillea millefolium, Carex praecox, Lolium perenne* and *Cichorium intybus*.

Grassland 4 is dominated by *Cynodon dactylon* and *Festuca ovina*. Other species that participate to the formation of the biomass of this grassland are *Agrostis tenuis, Ambrosia artemisiifolia, Hieracium pilosella* and *Potentilla reptans.* Here *A. artemisiifolia* participates with 12.8%.

Grassland 5 is characterised by the dominance of *Poa pratensis* and *A. artemisiifolia*. Other species with important contribution that are accompanying the dominant ones are *Lolium perenne, Cynodon dactylon, Potentilla anserina, Achillea millefolium, Agrostis tenuis* and *Trifolium fragiferum*. *A. artemisiifolia* represents 16.25% from the vegetation cover of this grassland.

Grassland 6 is dominated by *Lolium perenne* and *A. artemisiifolia*, the last one mentioned representing 18.33% from the vegetation cover. Other species relatively abundant in this grassland are *Poa pratensis, Luzula campestris, Juncus effussus, Festuca ovina* and *Achillea millefolium*.

Grassland 7 is dominated by *A. artemisiifolia, Agropyron repens* and *Agrostis tenuis*. Other species abundant here are *Dipsacus fullonum, Festuca arundinacea* and *Juncus inflexus. A. artemisiifolia* represents 17.92% from the vegetation cover of grassland 7.

2. Influence of A. artemisiifolia on grassland floristic composition

Here were studied different correlations among *A. artemisiifolia* and floristic parameters of the grasslands (*table 1*).

There were found negative correlations between *A. artemisiifolia* abundance and mean species number (r = -0.59) and between *A. artemisiifolia* and other species number (r = -0.70), this showing that the increase of *A. artemisiifolia* abundance determinates the decrease of mean species number and other species number, this aspect being illustrated in figure 1 and figure 2.

3. Influence of A. artemisiifolia on grassland biodiversity

Mean biodiversity index (Shannon-Wiener) calculated for the studied grasslands was comprised between 3.18 and 5.3. There was also calculated the linear regression between the abundance of *A. artemisiifolia* and Shannon-Wiener index represented in figure 3. The r value obtained for these two variables was -0.57.

4. Influence of A. artemisiifolia on pastoral value

Pastoral value of the grasslands analysed in this work was comprised between 27.75 and 40.12, and the correlation coefficient r was -0.67 this meaning that the increase of *A. artemisiifolia* abundance determinates the decrease of pastoral value (*figure 4*).

Table 1

Correlation coefficients between A. artemisiifolia and floristic parameters of the studied grasslands

Specification	Mean sp. number	Grasses (A%)	Legumes (A%)	Other sp. (A%)	Grasses number	Legumes number	Other sp. number
r	-0.59	0.32	0.04	-0.42	-0.35	-0.23	-0.70

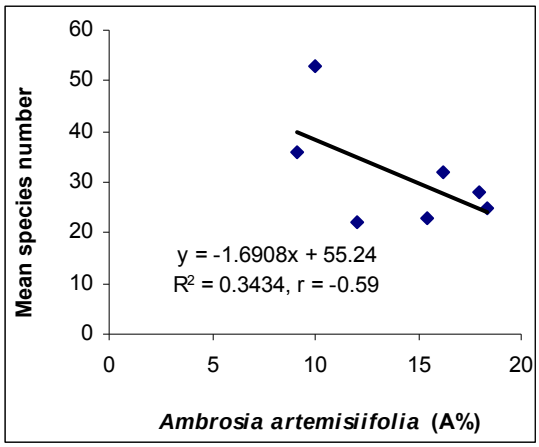

Figure 1 **Linear regression between *A. artemisiifolia* abundance and mean species number**

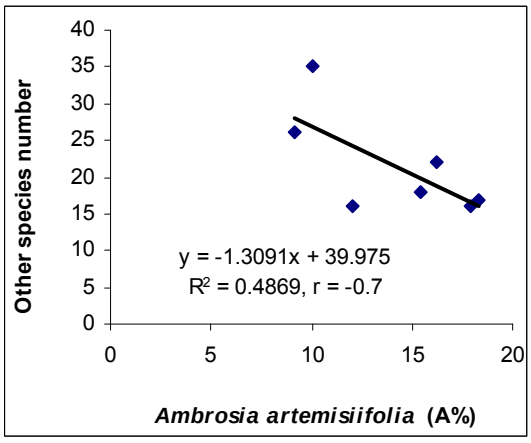

Figure 2 **Linear regression between *A. artemisiifolia* abundance and other species number**

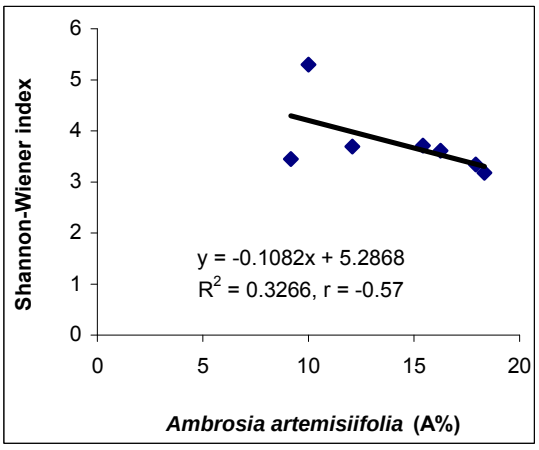

Figure 3 **Linear regression between *A. artemisiifolia* abundance and Shannon-Wiener index**

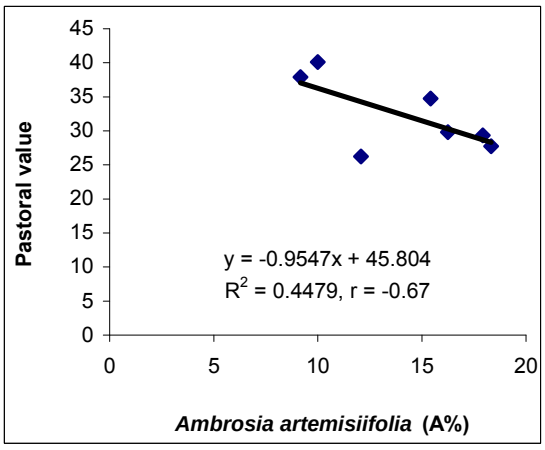

Figure 4 **Linear regression between *A. artemisiifolia* abundance and pastoral value**

CONCLUSIONS

A. artemisiifolia has an important participation in the studied grassland, being codominant in 3 grasslands from all 7 studied in this work, and having an important contribution in the other 4. This species has a participation comprised between 9.17% and 18.33% in the vegetation cover.

A. artemisiifolia abundance determinates the decrease of the mean species number, other species number, diversity index and pastoral value in studied area.

Acknowledgments

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***" financially supported by the Executive Unit for the Financing of the High Education and University Scientific Research (UEFISCSU).

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