

## HARMFUL PLANTS IN GRASSLAND VEGETATION ASS. *TRIFOLIO-AGROSTIETUM STOLONIFERAE* MARKOVIĆ 1973 IN VOJVODINA\*

DEJANA DŽIGURSKI, LJILJANA NIKOLIĆ<sup>1</sup>

*SUMMARY:* Grassland phytocenosis stands *Trifolio-Agrostietum stoloniferae* in Vojvodina comprise 157 plant species. Floristic composition analysis of ass. *Trifolio-Agrostietum stoloniferae* stands revealed the presence of 22 poisonous species (14.01%), of which 4 (2.55%) were highly poisonous and 18 (11.46%) mildly poisonous. In addition, the worthless weed plant group comprises of 67 taxa (42.68%). The studied stands include 13 invasive species.

**Key words:** *Trifolio-Agrostietum stoloniferae*, pasture vegetation, wet meadows, poisonous plants, weeds.

### INTRODUCTION

Meadows and pastures are extremely important natural resources characterizing the vegetation in Serbia. In addition to their phytocenological, phytogeographic and syntaxonomic value, grasslands are of great economic importance (Kojić et al., 2004). Natural and semi-natural grasslands in Serbia cover about 1.4 million hectares of land (Ačić et al., 2013).

The vegetation of meadows and pastures forms herbaceous communities of a predominantly closed-system character, consisting of multi mesophytes. The value of plant species varies greatly, from very harmful and toxic to those of high quality (Mrfat-Vukelić et al., 2003). Grassland productivity is particularly positively affected by increased biodiversity. This apparent correlation has been attributed mainly to niche complementarity and facilitation among species, as well as to the “sampling effect”, i.e. an increased probability of including a highly productive or highly competitive species at the higher diversity levels (Assaf et al., 2011).

The productivity and biodiversity of meadows and pastures are also affected by the weed species. As weeds in these ecosystems are generally of low nutritional value and have unpleasant taste and odor, their presence adversely affects the

---

Original scientific paper / *Originalni naučni rad*

<sup>1</sup>Dejana Džigurski, PhD, assistant professor, Ljiljana Nikolić, PhD, assistant professor, University of Novi Sad, Faculty of Agriculture, Serbia.

Corresponding author: Dejana Džigurski, e-mail: dejana@polj.uns.ac.rs; phone: +381 21 485-3451.

\*This paper is part of the project TR -31016 titled „Improvement of Forage Crops Production on Fields and Grasslands“ - subsidized by the Ministry for Science and Technological Development of the Republic of Serbia.

ecosystem quality. Until the 1930s, with the exception of the species of the Poaceae and Fabaceae families that are considered desirable and useful, all others were categorized as worthless and harmful plants. Typically, the weeds found on natural meadows and pastures are classified into the following three categories: highly poisonous plants, mildly poisonous (or harmful) plants, and worthless weed (Mrfat-Vukelić et al., 1997). It should be noted that very adaptive and aggressive invasive species—by competing for space, light, water and nutrients, thus hindering the growth of desirable forage plants—directly affect pasture biodiversity and biomass.

In Vojvodina, pasture vegetation ass. *Trifolio-Agrostietum stoloniferae* Marković 1973 developed as a semi-ruderal phytocoenosis of a secondary character. It belongs to *Agropyro-Rumicion* Nordh. 1940 alliance, *Agrostietalia stoloniferae* Oberd 1967 formation, comprising mesophilic grassland (pasture) phytocenoses formed in Vojvodina at stream valley floors, as well as surfaces close to settlements and roads. More broadly, this vegetation belongs to mesophilic meadow community *Molinio-Arrhenatheretea* Tx. 1937 (Kojić et al., 2004).

The aim of this paper is to analyze the presence of harmful (highly poisonous, mildly poisonous, and worthless) weeds in stands of pasture association *Trifolio-Agrostietum stoloniferae* in Vojvodina.

## MATERIJAL I METOD RADA

Phytocenological studies of ass. *Trifolio-Agrostietum stoloniferae* stands in Vojvodina pertain to the areas surrounding the streams: Borkovac, Zovalj, Rovača, Mandelos, Kudoš, Jegrička, Tamiš, Nera, Begej and Brzava, Kikinski kanal, Podunavlje and Potisje.

Weed species of natural meadows and pastures are categorized as highly poisonous plants, mildly poisonous (or harmful) plants and worthless weeds, according to Mrfat-Vukelić et al. (1997).

## RESULTS AND DISCUSSION

Stands of the ass. *Trifolio-Agrostietum stoloniferae* in Vojvodina comprise 157 plant species (Tab. 1), which is considered as high plant diversity (Lazić, 1995; Džigurski and Nikolić, 2012). According to Butorac (2004), this association in Eastern Slavonia and Baranja includes 122 taxa, with 80 taxa found in Srem region. This great floristic wealth characterizing the stands in Vojvodina probably stems from the diverse ecological conditions prevailing in periodically flooded and thus wetter areas. Stands of the sub-association *Trifolio-Agrostietum stoloniferae* subass. *agrostetosum albae* Marković 1973 developed here, as well as at surfaces of much stronger xerophilic character, where a stand *Trifolio-Agrostietum stoloniferae* subass. *cynodontetosum* Marković 1973 formed.

Floristic composition analysis indicates that families Asteraceae (29 taxa), Poaceae (23 taxa) and Fabaceae (19 taxa) are the most abundant, followed by Lamiaceae and Cyperaceae (with 9 taxa each) and Scrophulariaceae (7 taxa) families.

Table 1. Poisonous plants in the floristic composition of the ass. *Trifolio-Agrostietum stoloniferae* in Vojvodina (HPP – highly poisonous plant, MPP – mildly poisonous plant, WS – worthless species)

Tab. 1. Štetne biljke u florističkom sastavu sastojina ass. *Trifolio-Agrostietum stoloniferae* u Vojvodini (HPP - vrlo otrovna biljka, MPP - slabo otrovna biljka, WS - loša i bezvredna vrsta)

<b>Fam. Equisetaceae</b>		<b>Fam. Scrophulariaceae</b>	
<i>Equisetum arvense</i> L.	HPP	<i>Gratiola officinalis</i> L.	MPP
<b>Fam. Ranunculaceae</b>		<i>Kickxia elatine</i> (L.) Dum.	
<i>Ranunculus polyanthemus</i> L.	MPP	<i>Linaria vulgaris</i> Mill.	
<i>Ranunculus repens</i> L.	MPP	<i>Odontites rubra</i> Gilib.	
<i>Ranunculus sardous</i> Cr.	MPP	<i>Rhinanthus rumelicus</i> Vel.	MPP
<b>Fam. Amaranthaceae</b>		<i>Veronica arvensis</i> L.	WS
<i>Atriplex litoralis</i> L.		<i>Veronica chamaedrys</i> L.	WS
<b>Fam. Brassicaceae</b>		<b>Fam. Verbenaceae</b>	
<i>Capsella bursa-pastoris</i> (L.) Med.	MPP	<i>Verbena officinalis</i> L.	
<i>Rorippa austriaca</i> (Cr.) Bess.	WS	<b>Fam. Lamiaceae</b>	
<i>Rorippa sylvestris</i> (L.) Bes.		<i>Calamintha vulgaris</i> (L.) Druce.	WS
<i>Sinapis arvensis</i> L.	WS	<i>Glechoma hederacea</i> L.	
<b>Fam. Caryophyllaceae</b>		<i>Lycopus europaeus</i> L.	
<i>Cerastium caespitosum</i> Gilib.	WS	<i>Lycopus exaltatus</i> L.	
<i>Cerastium dubium</i> (Bast.) Schw.	WS	<i>Mentha aquatica</i> L.	MPP
<i>Stellaria graminea</i> L.	WS	<i>Mentha longifolia</i> (L.) Nath.	MPP
<b>Fam. Apiaceae</b>		<i>Mentha pulegium</i> L.	MPP
<i>Daucus carota</i> L.		<i>Mentha verticillata</i> L.	
<i>Eryngium campestre</i> L.	WS	<i>Prunella vulgaris</i> L.	WS
<i>Pastinaca sativa</i> L.		<b>Fam. Asteraceae</b>	
<i>Sium latifolium</i> L.		<i>Achillea millefolium</i> L.	
<i>Torilis anthriscus</i> (L.) Gmel.	WS	<i>Ambrosia artemisiifolia</i> L.	WS
<i>Torilis arvensis</i> (Huds.) Link.	WS	<i>Artemisia vulgaris</i> L.	WS
<b>Fam. Chenopodiaceae</b>		<i>Artemisia maritima</i> L.	
<i>Chenopodium album</i> L.		<i>Bellis perennis</i> L.	WS
<b>Fam. Convolvulaceae</b>		<i>Bidens tripartita</i> L.	WS
<i>Convolvulus arvensis</i> L.		<i>Carduus acanthoides</i> L.	MPP, WS
<i>Calystegia sepium</i> (L.) Br.	WS	<i>Carduus nutans</i> L.	MPP, WS
<b>Fam. Oenotheraceae</b>		<i>Cichorium intybus</i> L.	WS
<i>Epilobium adnatum</i> Gris.		<i>Cirsium arvense</i> (L.) Scop.	MPP, WS
<b>Fam. Euphorbiaceae</b>		<i>Cirsium lanceolatum</i> (L.) Scop.	MPP, WS
<i>Euphorbia cyparissias</i> L.	HPP	<i>Crepis setosa</i> Hall.	WS
<i>Euphorbia esula</i> L.	HPP	<i>Erigeron canadensis</i> L.	WS
<i>Euphorbia platyphyllos</i> L.	HPP	<i>Eupatorium cannabinum</i> L.	WS
<b>Fam. Rubiaceae</b>		<i>Helminthia echinoides</i> Gaertn.	
<i>Galium aparine</i> L.		<i>Inula britannica</i> L.	
<i>Galium mollugo</i> L.	WS	<i>Matricaria chamomilla</i> L.	
<i>Galium verum</i> L.	WS	<i>Matricaria inodora</i> L.	WS
<i>Sherardia arvensis</i> L.	WS	<i>Picris hieracioides</i> L.	WS
<b>Fam. Geraniaceae</b>		<i>Pulicaria dysenterica</i> (L.) Bemb.	
<i>Geranium dissectum</i> Jusl.	WS	<i>Senecio erucifolius</i> L.	MPP
<i>Geranium pusillum</i> Burm.	WS	<i>Sonchus arvensis</i> L.	WS
<b>Fam. Primulaceae</b>		<i>Sonchus asper</i> (L.) Mill.	
<i>Lysimachia nummularia</i> L.	WS	<i>Stenactis annua</i> (L.) Nees.	
<b>Fam. Malvaceae</b>		<i>Taraxacum officinale</i> Web.	
<i>Althea officinalis</i> L.		<i>Xanthium italicum</i> Mor.	
<i>Malva sylvestris</i> L.	WS	<i>Xanthium spinosum</i> L.	WS
<b>Fam. Lythraceae</b>		<i>Xanthium strumarium</i> L.	WS
<i>Lythrum salicaria</i> L.	WS	<i>Xeranthemum annuum</i> L.	WS

<i>Lythrum virgatum</i> L.	WS	<b>Fam. Alismataceae</b>	
<b>Fam. Fabaceae</b>		<i>Alisma plantago-aquatica</i> L.	WS
<i>Galega officinalis</i> L.	MPP	<b>Fam. Juncaceae</b>	
<i>Lotus angustissimus</i> L.		<i>Juncus articulatus</i> L.	WS
<i>Lotus corniculatus</i> L.		<i>Juncus compressus</i> Jacq.	WS
<i>Lotus tenuis</i> W. et K.		<i>Juncus gerardii</i> Lois.	
<i>Medicago falcata</i> L.		<i>Juncus inflexus</i> L.	WS
<i>Medicago lupulina</i> L.		<b>Fam. Cyperaceae</b>	
<i>Medicago sativa</i> L.		<i>Bolboschoenus maritimus</i> (L.) Palla	WS
<i>Ononis arvensis</i> L.	WS	<i>Carex distans</i> L.	WS
<i>Ononis spinosa</i> L.	WS	<i>Carex divulsa</i> Good.	WS
<i>Trifolium angulatum</i> W. et K.		<i>Carex hirta</i> L.	WS
<i>Trifolium campestre</i> Schreb		<i>Carex praecox</i> Schreb.	WS
<i>Trifolium filiforme</i> L.		<i>Carex spicata</i> Huds.	WS
<i>Trifolium fragiferum</i> L.		<i>Carex vesicaria</i> L.	
<i>Trifolium hybridum</i> L.		<i>Carex vulpina</i> L.	WS
<i>Trifolium pratense</i> L.		<i>Heleocharis palustris</i> (L.) R. Br.	WS
<i>Trifolium repens</i> L.		<b>Fam. Poaceae</b>	
<i>Trifolium striatum</i> L.		<i>Agropyrum repens</i> (L.) P. B.	
<i>Vicia angustifolia</i> Gruf.		<i>Agrostis alba</i> L.	
<i>Vicia hirsuta</i> (L.) S. F. Gray.		<i>Agrostis verticillata</i> Vill.	
<b>Fam. Plantaginaceae</b>		<i>Alopecurus pratensis</i> L.	
<i>Plantago lanceolata</i> L.		<i>Andropogon ischaemum</i> L.	WS
<i>Plantago major</i> L.	WS	<i>Bromus arvensis</i> L.	WS
<i>Plantago media</i> L.	WS	<i>Bromus commutatus</i> Schr.	
<b>Fam. Polygonaceae</b>		<i>Bromus mollis</i> L.	WS
<i>Polygonum aviculare</i> L.	WS	<i>Bromus tectorum</i> L.	
<i>Rumex crispus</i> L.	MPP	<i>Calamagrostis epigeios</i> (L.) Roth.	WS
<i>Rumex hydrolapathum</i> Huds.	MPP	<i>Cynodon dactylon</i> (L.) Pers.	
<i>Rumex pulcher</i> L.	MPP	<i>Dactylis glomerata</i> L.	
<b>Fam. Rosaceae</b>		<i>Eleusine indica</i> (L.) Gaertn.	
<i>Agrimonia eupatoria</i> L.	WS	<i>Festuca arundinacea</i> Schreb.	
<i>Crataegus monogyna</i> Jacq.	WS	<i>Festuca pratensis</i> Huds.	
<i>Potentilla anserina</i> L.	WS	<i>Festuca pseudovina</i> Hack.	
<i>Potentilla argentea</i> L.	WS	<i>Hordeum maritimum</i> With.	
<i>Potentilla reptans</i> L.	WS	<i>Hordeum murinum</i> L.	
<b>Fam. Sambucaceae</b>		<i>Lolium perenne</i> L.	
<i>Sambucus ebulus</i> L.	WS	<i>Phragmites communis</i> Trin.	WS
<b>Fam. Plumbaginaceae</b>		<i>Poa pratensis</i> L.	
<i>Statice gmelinii</i> Willd.		<i>Poa trivialis</i> L.	
<b>Fam. Urticaceae</b>		<i>Setaria glauca</i> (L.) P. B.	WS
<i>Urtica dioica</i> L.	WS	<b>Fam. Typhaceae</b>	
<b>Fam. Dipsacaceae</b>		<i>Typha angustifolia</i> L.	
<i>Dipsacus laciniatus</i> L.	WS	<i>Typha latifolia</i> L.	
<i>Dipsacus sylvestris</i> Huds.			

Prior studies on ass. *Trifolio-Agrostietum stoloniferae* in Vojvodina (Lazić, 1995; Stojanović et al., 1996; Džigurski and Nikolić, 2012) revealed the presence of 107 (68.15%) weed species, indicating the need for more comprehensive weed flora analysis, aimed at determining its composition and effect on biodiversity and productivity of these stands. Mrfat-Vukelić et al. (1997) also point out high participation of weed species in the vegetation of Serbian meadows and pastures (36.0-75.6% of all species), indicating significant floristic diversity.

Floristic composition analysis of ass. *Trifolio-Agrostietum stoloniferae* stands in Vojvodina indicated the presence of 22 toxic plants (14.01%), of which 4 (2.55%) were highly poisonous and 18 (11.46%) mildly poisonous. All the identified plants

belonging to families Euphorbiaceae (*Euphorbia cyparissias*, *E. esula* and *E. platyphyllos*) and Equisetaceae (*Equisetum arvense*) are classified as highly poisonous. Majority of the mildly poisonous plants belong to Asteraceae (*Carduus acanthoides*, *C. nutans*, *Cirsium arvense*, *C. lanceolatum* and *Senecio erucifolius*), Ranunculaceae (*Ranunculus polyanthemus*, *R. repens* and *R. sardous*), Polygonaceae (*Rumex crispus*, *R. hydrolapathum* and *R. pulcher*) and Lamiaceae (*Mentha aquatica*, *M. longifolia* and *M. pulegium*) families. The worthless plant group comprises 67 taxa (42.68%). The findings of this analysis are in line with the composition of ass. *Trifolio-Agrostietum stoloniferae* in the region of Serbia, where Mrfat-Vukelić et al. (2003) noted the presence of 17.7% poisonous species, of which 3.8% were highly poisonous and 13.9% mildly poisonous. In general, the authors determined that the mean participation of harmful species in the communities of *Molinio-Arrhenetheretea* class in Serbia, in addition to *Festuco-Brometea* class, is the greatest, when compared to other grassland phytocoenoses classes. Somewhat lower percentage of poisonous plants in the stands of the analyzed phytocenoses in Vojvodina stems from greater floristic wealth of these stands, confirming the positive effect of biodiversity on the quality of pasture vegetation.

The floristic composition of the analyzed stands includes 13 invasive plant species. Of these, *Ambrosia artemisiifolia*, *Bellis perennis*, *Carduus nutans*, *Cirsium arvense*, *Euphorbia esula*, *Eupatorium cannabinum*, *Linaria vulgaris*, *Lotus corniculatus*, *Lythrum salicaria*, *Rumex crispus*, and *Trifolium repens* are recognized as invasive for European region (Global Invasive Species Database). In addition, *Ambrosia artemisiifolia*, *Eleusine indica* and *Xanthium spinosum* are on the List of Invasive Species on the Territory of Vojvodina (IASV). With the exception of *Trifolium repens*, *Ambrosia artemisiifolia* and *Cirsium arvense*—characterized by abundance and coverage scores of 2-5 in the studied stands—the abundance and coverage scores for the remaining invasive species are relatively low.

## CONCLUSION

Grassland phytocenosis stands *Trifolio-Agrostietum stoloniferae* in Vojvodina comprise 157 plant species. Stands of sub-association *Trifolio-Agrostietum stoloniferae* subass. *agrostetosum albae* Marković 1973 form in periodically flooded and wetter habitats, whereas stands *Trifolio-Agrostietum stoloniferae* subass. *cynodontetosum* Marković 1973 are typically found in much more arid habitats.

The most diverse families are Asteraceae (29 taxa), Poaceae (23 taxa) and Fabaceae (19 taxa).

Floristic composition analysis of ass. *Trifolio-Agrostietum stoloniferae* stands revealed the presence of 22 poisonous species (14.01%), of which 4 (2.55%) were highly poisonous and 18 (11.46%) mildly poisonous. In addition, the worthless weed plant group comprises of 67 taxa (42.68%).

The studied stands include 13 invasive species that – due to their high biological potential, competitive ability, adaptability and aggressiveness – contribute to the reduction of biodiversity, quality and productivity of grassland ecosystems. Population monitoring of the listed invasive species is thus necessary in order to prevent further structural destruction and impoverishment of floristic composition.

Powerful anthropo-zoogenic effects on pasture ecosystems lead to substantial changes in the floristic composition of these ecosystems. Thus, negative flora selection is also affected by excessive eutrophication and soil compaction, which

further accelerate the decline in biodiversity and reduce the productivity of pasture ecosystems. Better habitat management is thus recommended, as a prevention of their further degradation, ensuring existence of pasture vegetation in the future.

## REFERENCES

- AČIĆ, S., ŠILC, U., VRBNIČANIN, S., CUPAĆ, S., TOPISIROVIĆ, G., STAVRETOVIĆ, N., DAJIĆ STEVANOVIĆ Z.: Grassland communities of stol mountain (eastern Serbia): Vegetation and environmental relationships. Arch. Biol. Sci., Belgrade, 65(1)211-227, 2013.
- ASSAF, T.A., BEYSCHLAG, W., ISSELSTEIN, J.: The relationship between plant diversity and productivity in natural and in managed grasslands. Applied ecology and environmental research, 9(2)157-166, 2011.
- BUTORAC, B.: Ekološka analiza vegetacije Fruškogorskog lesnog platoa. Matica srpska, 75-81, 2004.
- Global Invasive Species Database (ISSG, GISP, IUCN)
- DŽIGURSKI, D., NIKOLIĆ, LJ.: Pašnjačka asocijacija *Trifolio-Agrostietum stoloniferae* Marković 1973 u Vojvodini. Acta herbológica, 21(1)31-39, 2012.
- IASV - List of invasive species in AP Vojvodina [Internet]. Verzija 0.1beta. Anačkov G, Bjelić-Čabrilo O, Karaman I, Karaman M, Radenković S, Radulović S, Vukov D & Boža P, editori. Novi Sad (Serbia): Departman za biologiju i ekologiju; 2011 [citirano 2011. Maj 22.]. Dostupno na: <http://iasv.dbe.pmf.uns.ac.rs/index.php?strana=baza>.
- KOJIĆ, M., MRFAT-VUKELIĆ, S., DAJIĆ, Z., ĐORĐEVIĆ-MILOŠEVIĆ, S.: Livade i pašnjaci Srbije. Institut za istraživanja u poljoprivredi, 2004.
- LAZIĆ, D.: Florističko-ekološka analiza sastojina ass. *Trifolio-Agrostietum stoloniferae* Marković 1973 na području Vojvodine. Diplomski rad, Prirodno-matematički fakultet, Inst. za biologiju, Novi Sad, 1995.
- MRFAT-VUKELIĆ, S., KOJIĆ, M., AJDER, S., DAJIĆ, Z.: Biodiverzitet korovske flore livadske vegetacije Srbije. Zbornik radova V kongresa o korovima, Beograd, 143-169, 1996.
- MRFAT-VUKELIĆ, S., TOMIĆ, Z., DAJIĆ, Z., LAZAREVIĆ, D., PUDLO, V.: Štetne biljke u livadskim zajednicama Srbije. Biotechnology in Animal Husbandry 19(3-4)71-75, 2003.
- STOJANOVIĆ, S., VUČKOVIĆ M., RADULOVIĆ, S.: Karakteristike i zastupljenost korovskih biljaka u pašnjačkoj asocijaciji *Trifolio-Agrostietum stoloniferae* Marković 1973. na području Vojvodine. V Kongres o korovima. Banja Koviljača, 18-21 Jun, 1996. pp. 242-251.

ŠTETNE BILJKE U PAŠNJAČKOJ ASS. *TRIFOLIO-AGROSTIETUM*  
*STOLONIFERAE* MARKOVIĆ 1973 U VOJVODINI

DEJANA DŽIGURSKI, LJILJANA NIKOLIĆ

**Izvod**

Sastojine ass. *Trifolio-Agrostietum stoloniferae* u Vojvodini čini 157 biljnih vrsta. Zbog prisustva čak 68,15% korovskih vrsta u florističkom sastavu i njihovog uticaja na biodiverzitet i produktivnost ove pašnjačke zajednice, urađena je analiza korovske flore sa posebnim osvrtom na prisustvo otrovnih, loših i bezvrednih biljaka. Tako je konstatovano je 14,01% otrovnih biljaka (vrlo otrovnih je 2,55% i slabo otrovnih 11,46%) i 42,68% loših i bezvrednih korovskih biljaka. U istraživanoj pašnjačkoj vegetaciji zastupljeno je i je 13 invazivnih vrsta.

**Ključne reči:** *Trifolio-Agrostietum stoloniferae*, pašnjačka vegetacija, vlažne livade, otrovne biljke, korovi.

Received / *Primljen*: 26.08.2013.

Accepted / *Prihvaćen*: 25.10.2013.