

BASIC PHYTOCENOLOGICAL AND ECONOMICAL CHARACTERISTICS OF NATURAL MEADOWS AND PASTURES OF SERBIA¹

M. Kojić, Slavica Mrfat-Vukelić, Suzana Đorđević-Milošević²

Abstract: In this paper, the most important phytocenoses of valley, hill and mountain meadows and pastures as well as meadows situated on high mountains, are presented. Beside the phytocenological traits, also their economical value based on the presence of weed species in their floristic compositions is presented. The greatest economical value is determined for following meadow and pasture associations: valley meadows (*Trifolio pallidi-Alopecuretum pratensis* and *Poo-Alopecuretum pratensis*), meadows and pastures situated on hills (*Agrostietum vulgaris* and *Danthonietum calycinae*) and high mountains (*Poetum violaceae*).

Key words: natural grasslands, phytocenological characteristics, economical value.

Introduction

Natural meadows and pastures take vast areas of Serbia. They are situated from plain – low land region to high mountain regions, in different climatic, edaph and orographic conditions. Therefore, meadow and pasture plant associations demonstrate great floristic and phytocenological diversity and different economical value.

Considering that natural meadows have great importance in regard to the development of livestock production, meadows and pastures were research themes and subjects of numerous authors, from the phytocenological as well as economical aspect. Recent phytocenological studies have provided great material for assessment of phytocenological status of meadow-pasture vegetation. Certain differences in methodological approach and identification of single phytocenosis are present, as well as their sintaxonomic interpretation. Great number of meadow and pasture phytocenoses was selected and described, over hundred. It is still necessary to precisely describe, using synthetic and comparative analysis, and generalize more individual, partial results, in order to obtain more realistic picture of the plant-sociological position/status of our meadow-pasture vegetation.

In this regard, we will attempt to present basic meadow – pasture vegetation from the plant – sociological aspect as well as economical, analyzing in the process the most present and most important grassland plant associations.

Material and methods

Phytocenological analysis of meadow and pasture plant associations and determination of their sintaxonomic status are based on principles and methodological procedures of Swiss-French Phytocenological School (*Braun-Blanquet, 1964; Horvat, 1949*).

Global assessment of the quality of meadow – pasture plant associations, that is, evaluation of their importance relating to livestock production, is based on analysis of the presence of weed species (harmful, poisonous and worthless plant species) in floristic composition of certain phytocenoses (*Kojić et al, 2001*).

Results and discussion

I. Basic phytocenological characteristics of meadow and pasture vegetation

Meadows and pastures of Serbia have been intensively investigated over last 50 years by numerous authors and from the phytocenological aspect. These researches have given us the great scientific and research material to be used in further investigations of most significant characteristics and traits of meadow

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² Momčilo Kojić, Faculty of Agriculture, Zemun, Slavica Mrfat-Vukelić, JKP Vodovod, Kruševac, Suzana Đorđević-Milošević, Ministry of Agriculture, Forestry and Water Management

and pasture vegetation. However, it should be pointed out that not all of the mentioned investigations were carried out uniformly in regard to the concept and method, so in certain cases, conclusions about identification of certain meadow and pasture associations can not be accepted. Special problem is circumstance relating to the fact that some researchers haven't considered the issue of the syntaxonomic status of analyzed plant associations. Nevertheless, regardless of all mentioned shortcomings, results obtained so far offer possibility to obtain general impression about phytocenological characteristics of meadow and pasture associations of Serbia. Also, in order to achieve overall revalorization of entire grassland vegetation of Serbia, it is necessary to direct the future research in two main directions: a) verification, harmonization and supplementation of previous researches, and b) phytocenological investigation of meadow-pasture complexes which haven't been explored and investigated so far.

Valley meadows

Serbian valley meadows, according to previous researches, include approximately 40 plant associations, that are included in 10 vegetation alliances, from 4 vegetation classes *Molinio-Arrhenatheretea*. From phytocenological aspect and according to the degree of their presence – diffusion and economical significance, the following 4 associations of valley meadows are most important:

Association *MOLINIETUM COERULEAE* s.l. is the most important valley meadow plant association, widely spread especially in Central and West Europe, and also very important in our country. Due to the wide geographical diffusion of this association, several variants of *Molinietum*, were determined and described and they are usually given the status of special associations..

Association *POO-ALOPECURETUM PRATENSIS* is valley meadow plant association of extremely good quality, widely spread in eastern parts of Serbia. Components of this phytocenosis are developed in river valleys, predominantly on alluvial soils.

Association *TRIFOLIO PALLIDI-ALOPECURETUM PRATENSIS* is the most typical and widely spread phytocenosis of valley meadows in western parts of Serbia. This association with dominant species *Alopecurus pratensis* represents a form of **vikarne** phytocenosis compared to *Alopecuretum* that can be found in East Serbia (as. *Poo-Alopecuretum*), which, due to the specific plant-geographical conditions, has entirely different syntaxonomic status. Components of as. *Trifolio pallidi-Alopecuretum pratensis* populate relatively fertile alluvial soils.

Association *ARRHENATHERETUM ELATORIS* s.l. is also widely spread valley meadow association of Central Europe and western parts of Balkan peninsula, however slightly less significant for Serbia. Several variants of this association can be found, especially in Vojvodina (as. *Arrhenatheretum medioeuropaeum*, as. *Ononido-Arrhenatheretum*). *Arrhenatheretum* in Vojvodina covers considerable areas on high-quality soil (chernozem).

Hill meadows and pastures

Hill meadows and pastures belong, mainly, to widely spread vegetation class *Festuco-Brometea*. Total of 45 meadow and pasture associations of this class from 7 vegetation alliances and included into 3 rows, were identified and described. Of this number, 7 associations are mostly spread and represent most important hilly meadow and pasture associations:

Association *BROMETUM ERECTI* can be found on medium deep soil, dry to moderately moist soil of neutral to base reaction, predominantly on south hill slopes. Association *Brometum erecti* is considerably more spread in western parts of Balkan Peninsula than in Serbia.

Association *FESTUCETUM VALESIAEAE* is typical representative of *Festucion valesiaca*. It has xerothermic character and can mostly be found on relatively shallow skeletal soils of "smonica" type.

Of 13 described associations with single dominant association *Chrysopogon gryllus*, mostly spread are: as. *AGROSTIO-CHRYSOPOGONETUM GRYPILLI* (in West and Central Serbia) and as. *TEUCRIO-CHRYSOPOGONETUM GRYPILLI* (in East Serbia). These are constant meadow associations, mainly developing in habitats of climatogenic forest association *Quercetum frainetto-cerris*.

Association *Agrostio-Chrysopogonetum grylli* populates slopes, plateaus, terraces, it predominantly soils of parapodzolic type, acidophil and acido-neutrophil character.

Association *Teucrio-Chrysopogonetum grylli* is present in East Serbia mainly on south expositions, slopes and plateaus.

Special variant of *Chrysopogonetum* is present in lowlands, in Vojvodina, where it presents pannonian, steppe association with specific traits and syntaxonomic status (as. *CHRYSOPOGONETUM PANNONICUM*).

Association *DANTHONIETUM CALYCINAE* is widely spread hilly meadow associations in diffusion zone of the *Chrysopogonetum*, but on slightly more favourable habitats, and it can be found also above this zone.

Association *AGROSTIETUM VULGARIS* is also widely spread in the hilly regions of Serbia, also in the diffusion zone of the *Chrysopogonetum*. Components of this association represent transition phase (that can last for decades) towards the final phytocenosis with *Chrysopogon*, and sometimes it can be found above this zone 600 to 700m above sea level (which is the upper limit for *Chrysopogonetum*).

Mountain and high mountain meadows and pastures

Pastures of the type *NARDETUM* populate vast hill and mountain regions of different sea levels, different climatic edaphic and orographic characteristics (Kojić et al, 1994.). Pasture association in broader sense, *NARDETUM STRICTAE sensu lato*, due to its presence on different habitats, and diverse ecological conditions, forms great number of phytocenoses of different floristic composition, with *Nardus stricta* with edifyingly dominant role. In Serbia, in hill, mountain and high mountain regions, 12 pasture associations of *Nardetum* were described, associations of specific floristic, syntaxonomic and other characteristics, but with single mutual trait and that is absolute domination of *Nardus stricta* in all of them.

Association *POETUM VIOLACEAE* is widely spread association located in high mountain region of Serbia (Pavlović, 1974; Rajevski, 1990 and others). On various mountains (Kopaonik, Stara planina, Šara etc.) components of *Poetuma* appear on relatively warmer habitats, on deeper as well as shallow soils, usually between 1500 and 2000m above sea level, or higher.

Quality of natural meadows and pastures

Economical significance of natural grasslands depends on two main factors: quality of the plant cover (chemical composition, that is nutritious value of plants that are included into floristic composition of meadow and plant associations) and yield. We will indicate single dimension of this issue, not considering all the parameters determining the economical value of meadow-pasture phytocenoses, and that is presence of weed species (very poisonous, slightly poisonous and for other reasons worthless plants) in floristic composition of most spread valley, hill and mountain, that is high mountain grasslands of Serbia.

Based on several years of research, Kojić et al. (2001) have completed morphological study of weeds on natural meadows and pastures in Serbia, based on the analysis of 48 meadow-pasture associations. In order to obtain certain idea regarding the economical value of mostly spread meadow and pasture phytocenoses, data relating to the presence of weeds in floristic composition of more important valley, hill, mountain and high mountain grasslands is presented in following tables (Tables 1, 2 and 3).

Table 1. Presence/ share of weeds in floristic composition of valley meadows (1- Total number of species, 2- Total number of weed species, 3- % of weed species, 4- % highly poisonous weeds, 5- % slightly poisonous weeds, 6- % worthless weeds)

Meadow associations	1	2	3	4	5	6
<i>Molinietum coeruleae</i>	49	33	67,3	4,1	10,2	53,0
<i>Agrostio-Juncetum effusi</i>	41	31	75,6	4,9	12,2	58,5
<i>Arrhenatheretum elatioris</i>	41	26	63,4	-	17,1	46,3
<i>Bromo-Cynosuretum cristati</i>	47	33	70,2	2,1	17,0	51,1
<i>Cynosuro-Caricetum hirtae</i>	53	34	64,2	1,9	19,7	43,4
Average/Prosek	46,2	31,4	68,1	2,6	15,2	50,5

Table 2 Presence/share of weeds in floristic composition of hill meadows (1- Total number of species, 2- Total number of weed species, 3- % of weed species, 4- % highly poisonous weeds, 5- % slightly poisonous weeds, 6- % worthless weeds)

Meadow associations	1	2	3	4	5	6
<i>Festucetum valesiacaе</i>	61	40	65,6	3,3	13,1	49,2
<i>Danthonietum calycinae</i>	66	37	56,1	1,5	10,6	43,9
<i>Agrostietum vulgaris</i>	75	44	58,7	4,0	13,3	41,3
<i>Agrostio-Chrysopogonetum</i>	105	67	63,8	2,9	14,3	46,7
<i>Teucrio-Chrysopogonetum</i>	101	55	54,5	3,0	8,9	42,6
Average/prosek	81,6	48,6	59,7	2,9	12,0	44,7

Table 3. Presence/share of weeds in floristic composition of mountain and high-mountain meadows (1- Total number of species, 2- Total number of weed species, 3- % of weed species, 4- % highly poisonous weeds, 5- % slightly poisonous weeds, 6- % worthless weeds)

Meadow associations	1	2	3	4	5	6
<i>Nardetum strictae s.l.</i>	54	33	61,1	2,8	13,1	45,1
<i>Trifolio-Nardetum strictae</i>	73	47	64,4	1,4	15,1	47,9
<i>Poetum violaceae</i>	58	38	65,5	3,4	8,6	53,5
<i>Poo violaceae-Nardetum</i>	46	27	58,7	2,2	13,0	43,5
<i>Poo violaceae-Geraniumetum</i>	52	37	58,3	-	5,0	53,3
Average/prosek	56,6	36,4	61,6	2,0	11,0	48,7

Data presented in tables 1, 2 and 3 clearly indicate that share of weed species in floristic composition of natural grasslands in Serbia is very high. Depending on the plant association of certain meadow-pasture areas, the presence of weeds varies from 54,5 to 75,6%. Over 1/2 up to 3/4 of species in our meadow and pasture phytocenoses belongs to the category of weeds. However, important is the fact that the majority of weed species is from the category of worthless weeds and slightly poisonous, whereas the presence of highly poisonous weeds is relatively low (up to 4,9%).

In regard to valley meadows, according to the evaluation of floristic composition, components of the association *Arrhenatheretum elatioris* are of the highest quality (no poisonous weed species, and presence of weeds is the lowest compared to other valley meadows) (tab.1).

In case of hill meadows, the lowest presence of weeds in their plant cover was determined (54,5-65,6%). According to these analyses, hill meadows of *Danthonietum calycinae* type are of the highest quality, since the presence of highly poisonous and slightly poisonous species is very low, and in general the presence of weed species is low (tab. 2).

Mountain and high-mountain meadows and pastures, from the economical aspect, according to the floristic composition, have positive characteristics since presence of highly poisonous weeds is insignificant (0-3,4%, average 2% of total number of species). In regard to the quality, among analyzed associations of mountain and high-mountain meadows and pastures, the worst quality was registered for as. *Poetum violaceae*.

Conclusion

Analysis of previous phytocenological researches indicates that over 100 meadow and pasture associations from several vegetation alliances and rows, classified in 4 classes in Serbia have been described so far.

The mostly spread valley meadows are: as. *Molinietum coeruleae*, as. *Poo-Alopecuretum pratensis*, as. *Trifolio pallidi-Alopecuretum pratensis* and as. *Arrhenatheretum elatioris*.

Among numerous meadow and pasture associations, the most important are: as. *Brometum erecti*, as. *Festucetum valesiacaе*, as. *Agrostio-Chrysopogonetum grylli*, as. *Teucrio-Chrysopogonetum grylli*, as. *Agrostietum vulgaris* and as. *Danthonietum calycinae*.

The mostly spread meadow and pasture associations in mountain and high-mountain region of Serbia are: *Nardetum strictae* and *Poetum violaceae*.

The following meadow and pasture associations are of the greatest economical importance: valley meadows (*Trifolio pallidi-Alopecuretum pratensis* and *Poo-Alopecuretum pratensis*), hill meadows (*Agrostietum vulgaris* and *Danthonietum calycinae*) and high mountain meadows (*Poetum violaceae*).

Due to unsynchronized and methodically not unified previous researches detailed critical analysis and harmonization of results of previous investigations of meadow and pasture vegetation of Serbia is necessary.

OSNOVNE FITOCENOLOŠKE I EKONOMSKE KARAKTERISTIKE PRIRODNIH TRAVNJAKA I PAŠNJAKA SRBIJE

M. Kojić, Slavica Mrfat-Vukelić, Suzana Đorđević-Milošević

Rezime

U ovom radu su predstavljene najvažnije fitocenoze nizijskih, brdskih i planinskih livada i pašnjaka, kao i livada koje se nalaze na visokim planinama. Pored fitocenoloških odlika i njihova ekonomska vrednost zasnovana na prisustvu korivskih vrsta u florističkom sastavu je predstavljena. Najveća ekonomska vrednost je određena za sledeće livadske i pašnjačke asocijacije: ravničarske livade (*Trifolio pallidi-Alopecuretum pratensis* i *Poo-Alopecuretum pratensis*), livade i pašnjaci u brdskom regionu (*Agrostietum vulgaris* i *Danthonietum calycinae*) i visokim planinama (*Poetum violaceae*).

Ključne reči: prirodni travnjaci, fitocenološke karakteristike, ekonomska vrednost.

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