

CONTRIBUTIONS TO THE PRODUCTIVITY ASSESSMENT OF BANAT PLAIN HALOPHILOUS GRASSLANDS

Teodor Marușca^{*,***}, Doru Ioan Pătruț^{**}, Marcela M. Dragoș^{*},
Cristina C. Comșia^{*}, Cristina I. Porr^{*}

^{*}Grasslands Research And Development Institute, 5 Cucului St., Brașov, 500128, România

^{**}The Banat University of Agricultural Sciences and Veterinary
Medicine "King Mihai I of Romania" Timisoara

^{***}Corresponding author: maruscat@yahoo.com

Abstract

Banat's halophilic grasslands have a fairly significant spread on halomorphic soils such as solonchak and solonetz, where other grass species do not survive. The productivity of these grasslands is very different, respectively from 2.3 PV (pastoral value) with 0.19 t/ha GMP (green mass production) in *Champhorosmetum annuae* up to 73.4 VP and 24.84 t/ha GMP in *Agrostio - Beckmannietum*. The optimum load with animals, especially sheep, is also extremely variable, depending on the productivity from 0.15 to 2.39 LU/ha calculated for 160 days of grazing.

Keywords: halophilous grasslands, pastoral value, green mass production, grazing capacity.

INTRODUCTION

The permanent grasslands existing on halomorphic soils (solonetz and solonchak) have the widest spread in the Western Plain of Romania, especially in Banat on the interfluves Bârzava - Timiș, Timiș - Bega and Bega - Aranca - Mureș. They were studied more from a floristic point of view (Bujoreanu *et al* 1962), geobotanical (Bujoreanu *et al* 1968;

Grigore 1971) and ecophysiological (Pop 1977; Pătruț 2003).

In our country there are studies and research on halophilic grasslands in other areas, especially in Moldova (Iacob 1978, Iacob *et al* 2014).

Regarding the productivity of halophilous grasslands and their grazing capacity, we have less data, an objective that we try to present in this paper.

MATERIAL AND METHOD

In order to evaluate the productivity of halophilic meadows, the geobotanical surveys from the doctoral thesis entitled "Research on the biodiversity of halophilic vegetation in the Banat Plain" prepared by Doru Ioan Pătruț under

the scientific coordination of Prof. Dr. Ioan Coste from USAMVB - Timișoara were used.

The method of evaluating grassland productivity has been widely presented and used in several papers that have appeared in

this journal, so we no longer present it (Marușca 2019, Marușca, Nicolin

2020, Marușca et al 2020).

The following cenotaxonomic units were studied:

Cl. PUCCINELLIO - SALICORNIETEA, Țopa 1939

Ord. PUCCINELLIETALIA, Soó 1940

Al. *Puccinellion limosae* (Klika 1937), Webdelbg 1943,1950

As. *Camphorosmetum annuae* (Rapaics 1916), Soó (1933) 1968

As. *Puccinellium limosae* Rapaics 1927

As. *Hordeetum hystericis* (Soó 1933), Wandelbg 1943

Al. *Festucion pseudovinae* Soó 1933

As. *Artemisio - Festucetum pseudovinae* (Magyar 1928), Soó (1933) 1945

As. *Achilleo - Festucetum pseudovinae* (Magyar 1928), Soó (1933) 1945

Al. *Beckmanion eruciformis* Soó 1933

As. *Agrostio - Beckmannietum* (Rapaics 1916), Soó 1933

Al. *Juncion gerardii* Wendelbg 1943

As. *Juncetum gerardi* (Warming 1906), Nordh 1923

Al. *Cypero - Spergularion* Slavnič 1948

As. *Heleochloëtum alopecuroidis* Rapaics 1927

As. *Agrostio - Caricetum distantis* Soó 1940

We had some difficulties in establishing the grazing capacity, knowing that the duration of the season is shorter than that of other grasslands from the same area, located on soils with higher trophicity. Although the optimum length of the grazing season on

halophilous grasslands is one-third to one-half shorter than on normal grassland in terms of soil reaction, the animals are permanently kept for about 160 days, which has been taken into account for comparison to other grasslands.

RESULTS AND DISCUSSION

For the complex characterization of the halophilic grassland's vegetation from Banat, in the mentioned doctoral thesis, 474 geobotanical surveys were drawn up (table 1).

The average vegetation cover was 88.7%, respectively from 72% for As. *Puccinellium limosae* up to

100% for As. *Agrostio - Beckmannietum*.

The average number of cormophytes is less than only 47 species with differences from 13 to 112 on a grassland association.

The participation of forage species in the grass carpet is 60-95% for the most valuable

associations and 4-21% for the degraded ones.

The pastoral value (PV) of the associations is directly

proportional to the degree of participation of forage species in the grass carpet (table 2).

Table 1

General data on phytodiversity and vegetation of halophilic grasslands from the Banat Plain

No.	Grassland association	Number		Vegetation cover	Participation (%)	
		Survey	Species		Forager	Harmful
1	<i>Camphorosmetum annuae</i>	84	29	73	4	69
2	<i>Puccillietum limosae</i>	50	34	72	60	12
3	<i>Hordeetum hystricis</i>	60	65	93	10	83
4	<i>Artemisio -Festucetum pseudovinae</i>	83	68	93	63	30
5	<i>Achilleo - Festucetum pseudovinae</i>	116	112	98	80	18
6	<i>Agrostio - Beckmannietum</i>	5	13	100	95	5
7	<i>Juncetum gerardi</i>	20	29	85	82	3
8	<i>Heleochloëtum alopecuroidis</i>	5	20	84	21	63
9	<i>Agrostio - Caricetum distantis</i>	51	54	96	89	7
	AVERAGE	53	47	88	56	32

Table 2

Productivity of halophilic grasslands from the Banat Plain

No.	Grassland association	Pastoral value		Green mass production	
		ind.	%	t/ha	%
1	<i>Camphorosmetum annuae</i>	2,3	6	0,19	3
2	<i>Puccillietum limosae</i>	46,5	125	3,84	58
3	<i>Hordeetum hystricis</i>	6,8	18	0,72	11
4	<i>Artemisio -Festucetum pseudovinae</i>	35,1	95	4,02	61
5	<i>Achilleo - Festucetum pseudovinae</i>	49,2	133	5,35	81
6	<i>Agrostio - Beckmannietum</i>	73,4	198	24,84	377
7	<i>Juncetum gerardi</i>	39,9	108	4,44	67
8	<i>Heleochloëtum alopecuroidis</i>	12,0	32	1,25	19
9	<i>Agrostio - Caricetum distantis</i>	68,2	184	14,61	222
	AVERAGE	37,1	100	6,59	100

The average for the 9 halophilic associations in the study area PV is 37.1 (mediocre) with differences from degraded for *Camphorosmentum annuae* (PV 2,3) and very low for *Hordeetum hystricis* (PV 6,8), to good for *Agrostio - Caricetum* (PV 68.2) and *Agrostio - Beckmannietum* (PV 73.4).

Good pastoral values were recorded in our country, in the

Măcin Mountains (68.1 VP) at *Puccinellietum limosa* (Popescu et al 2013, Marușca et al 2019).

The same halophilic association dominated by *Puccinellia limosa* in the conditions of Jebel and Sânmihaiul Român with data from the diploma thesis, have PV 54 (average) very close to the one evaluated with data from the synthesis of the doctoral thesis, where PV was 46.5 (Marușca 1964,

Pătruț 2003).

In terms of green mass production (GMP) with feed qualities, there are big differences between the associations studied.

Very low yields of useful phytomass of 0.19 - 1.25 t/ha was evaluated for the degraded ones and up to 14.61 - 24.84 t/ha for the good and very good ones, which are the same as the pastoral valuable ones.

Lower to medium yields of 4-6 t/ha GMP was evaluated in associations dominated by *Puccinellia limosa* and *Festuca*

pseudovina (Pătruț 2003).

Very close results, four decades ago, were also achieved in other stations in Banat (Jebel and Sânmihaiul Român) with 4.91 t/ha GMP for *Puccinellia limosa* and 4.84 t/ha for *Festuca pseudovina* (Marușca 1964).

Given that the associations of halophilic grasslands are spread mosaically on small areas for economic reasons, the assessment was made at the level of phytocenological alliance (table 3).

Table 3

Optimal grazing capacity of halophilic grassland alliances in a 160-day season for biodiversity conservation

No.	Grassland association	Green mass production t/ha	Animal loading LU/ha	% to the average	Value
1	<i>Puccinellion limosae</i>	1,58	0,15	18	Degraded
2	<i>Festucion pseudovinae</i>	4,69	0,45	54	Low
3	<i>Beckmanion eruciformis</i>	24,84	2,39	285	Excellent
4	<i>Juncion gerardii</i>	4,44	0,43	51	Low
5	<i>Cypero - Spergularion</i>	7,93	0,76	90	Mediocre
	Average	8,70	0,84	100	Average

The useful MV production of the five grassland alliances is 8.7 t/ha GMP, with very large differences, from 1.58 t/ha as assessed at *Puccinellion limosae* to 24.84 t/ha at *Beckmanion eruciformis*.

The GMP production evaluated at *Puccellion limosae* from Banat was 117% higher than that of the similar alliance from Măcinului Mountains (Popescu et al 2013, Marușca et al 2019).

An average production of 4.44 t/ha was estimated at *Juncion*

gerardii, which is 135% higher than that of the similar alliance in the Babadag Plateau, which has lower rainfall conditions (Dihoru, Donita 1970, Marușca and co. 2020).

The optimal grazing capacities vary from 0.15 LU/ha for the degraded grasslands to 2.39 LU/ha for the most valuable, respectively 16 times higher.

Given the very small assortment of valuable forager species that support a higher soil salting regime, it is finally proposed to introduce into the crop and

improve the species *Beckmannia eruciformis* for fodder in the

conditions of our country.

CONCLUSIONS

The halophilous grasslands in Banat are extremely heterogeneous in terms of floristic composition and forage productivity.

The most degraded halophilous grassland associations are *Camphorosmentum annuae*, *Hordeetum hystericis* and *Heleocharidetum alopecuroides* and

the most valuable floristic and forager are the associations *Agrostio - Beckmanietum* and *Agrostio - Caricetum distantis*.

The pastoral value varies between 2.3 - 73.4 and the green mass production was estimated at 0.19 - 24.84 t/ha with an optimal grazing capacity up to 2.39 LU/ha in 160 days grazing season.

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