NEW DIRECTIONS IN THE STUDY OF OLIGOTROPHIC GRASSLANDS IN THE MOUNTAIN AREA

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Large areas of grasslands from Gârda de Sus communne are being abandoned. Organic and mineral fertilization combined with mulching could give a survival opportunity to these grasslands and, at the same time, to protection of some threatened species. The application of technological inputs in the first year has not been felt at the sward's and the dry matter yield's level. The floristic composition of the studied phytocenosis is represented by the type Agrostis capillaris – Festuca rubra, which comprises a number of 20-24 species.

***Key words**: mulching, fertilization, floristic composition, dry matter*

Important areas of semi-natural (oligotrophic) grasslands at European level are being abandoned. This negative situation occurred out of different reasons, such as: deficient orographic conditions, thin useful soil layer, reduced productivity, few profit obtained after area unit, imposed milk quota etc. [1, 2]. Actually, these uninteresting grasslands from economic point of view support in general a high phyto-diversity with numerous threatened species. A similar situation there is also in Gârda de Sus commune in Apuseni Mountains, where considerable areas are being abandoned, generally from the same reasons. The oligotrophic grasslands in Gârda commune, due to the deficient orography, are not appropriate for mechanic mowing, and the manual mowing is being practiced with a lower and lower intensity. For these grasslands with a high phyto-diversity new turning to account methods and sustainable use possibilities must be identified.

MATERIAL AND METHOD

The objective of our paper is to study the effect of mineral fertilization, mowing and mulching upon phyto-diversity and productivity of the oligotrophic grasslands from Gârda de Sus. The area is characterized by an annual mean temperature of 4.9 Celsius degrees and multi-annual mean rainfall of 1177 mm. Our experience has been placed in 2009 at 1320 m elevation, using randomized blocks method with 7 variants in 5 repetitions. Species studies had been performed using modified Braun-Blanquét method, and the mowing was done at *Poaceaes* blooming using a spinning mowing machine. Data processing and interpretation was made using variance analysis.

RESULTS AND DISCUSSIONS

The productivity of the respective meadow is very low, situation which explains one of the reasons for the abandonment of oligotrophic grasslands in the area. The low DM (dry matter) yield can be explained through the reduced quantities of rainfall from spring and, of course, through the reduced trophicity of the soil. The effect of mineral fertilisers' application upon our grassland is very poorly felt at the level of the DM's level (*tab.1*). Even if in some treatments' case a weak yield rising is noticed, the differences do not have statistic insurance. The same situation is seen also in the case of organic fertilisers' application (*tab. 2*).

Table 1

The influence of mineral fertilizers on the dry matter yield (2009)

Year	Variant	DM t/ha	%	difference	signifi-cance
2009	Witness	0.34	100	0.0	-
	Mulching 1/year	0.45	130.2	+ 0.10	-
	Mulching 2/year	0.35	101.7	+ 0.01	-
	Mulching 1/year+NPK 25:25:25 (annual)	0.44	127.3	+ 0.09	-
	Mulching 1/year+NPK 25:25:25 (1/2years))	0.27	78.5	- 0.07	-
	Mulching 1/year+PK 25:25 (annual)	0.31	89.5	- 0.04	-
	Mulching 1/year+PK 25:25 (1/2years)	0.19	54.1	- 0.16	-

DL(p 5%) + 0.22 DL(p 1%) + 0.30 DL(p 0,1%) + 0.40

Table 2

The influence of mineral fertilizers on the dry matter yield (2009)

Year	Variant	DM t/ha	%	difference	signifi-cance
2009	Witness	0.83	100	0.0	-
	Mulching 1/year	0.67	80.7	- 0.16	-
	Mulching 1/ year +5t/ha manure	0.94	113.2	+ 0.11	-
	Mulching 1/ year +5t/ha manure 1/2 years	0.7	84.3	- 0.13	-
	Mulching 1/ year +10t/ha manure ? years	0.68	81.9	- 0.15	-
	Mulching 1/ year +10t/ha manure 1/3 year	0.86	103.6	+ 0.03	-
	Witness	0.83	100	0.0	-

DL(p 5%) + 0,26 DL(p 1%) + 0,36 DL(p 0,1%) + 0,48

As result of technological inputs application, there were no changes recorded at the level of the treated variants' canopy. That is why, we propose to characterise the species composition of the untreated witness in all five repetitions of the experience (*tab.3*). The vegetation type of the witness is *Agrostis capillaris – Festuca rubra*. The plants from *Poaceae* family range in cover from 29.25 up to

47.75%. The cover of species *A. capillaris* is ranging between 11.25 and 27.5%, and the one of the species *F.rubra* is 17.5% in all five repetitions. Also, the persistence (K) of the species is minimum (V). Besides these two *Poaceaes*, *Anthoxantum odoratum* is also present, but with a smaller cover ranging from 0.5 to 2.75%. This species occures in four out of the five relevees. The *Cyperaceaes* and *Juncaceaes* are poorly represented (*Luzula campestris* – 0.5%). The *Fabaceaes* have a quite reduced presence being represented by *Trifolium pratense* (cover: 0.5%, K = I) and *T. repens* (cover: 0.5 - 2.75%, K = II). The plants from other botanical families (OBF) have a cover ranging from 41 up to 51.25%. Among these, a few species that are present in all five repetitions can be noticed, like: *Pimpinella major, Plantago lanceolata, Rhinanthus minor, Trollius europaeus, Viola canina*, having in general a low cover – aprox. 2.75%. Certain OBF plants are present in four out of the five repetitions: *Arnica montana, Centaurea mollis, Euphrasia stricta, Hieracium aurantiacum, Hypericum maculatum*, etc., and some species occur only accidentaly (K = I, II) such as: *Centaurea pseudophrygia, Cirsium erisithales*, etc.

The number of species of the studied phytocenosis is ranging from 20 up to 24. The Shannon index is comprised between 2.079 and 2.469, fact that corresponds to a medium phyto-diversity according to some specialists.

Table 3

The species composition of the witness in five repetitions of the experience

	Repetitions					Persistance
	R1	R2	R3	R4	R5	-
Cover %	85	86	85	82	88	-
Specii %						
Poaceae	29.25	45.5	45	37.75	47.75	-
Agrostis capillaris	11.25	27.5	27.5	17.5	27.5	V
Anthoxanthum odoratum	0.5	0.5		2.75	2.75	IV
Festuca rubra	17.5	17.5	17.5	17.5	17.5	V
Cyperacee and *Juncaceae*	0.5	-	-	-	-	-
Luzula campestris	0.5					I
Fabaceae	-	-	3.25	0.5	-	-
Trifolium pratense			0.5			I
Trifolium repens			2.75	0.5		II
Other Botanical Families	51.25	42.25	41	45.5	46.25	
Alchemilla vulgaris		2.75	2.75		5	III
Arabis hirsuta		0.5	0.5		0.5	
Arnica montana	27.5		0.5	5	0.5	IV
Centaurea mollis	2.75	0.5		2.75	0.5	IV
Centaurea pseudophrygia				5		I
Cirsium erisithales				0.5		I

	Repetitions					Persistance
Crysanthemum leucantheum				0.5		I
Euphrasia stricta	0.5	0.5	0.5	0.5		IV
Gallium mollugo				0.5		I
Genistella sagittalis	0.5					I
Gentianella lutescens			0.5	0.5		II
Hieracium aurantiacum	0.5	0.5	2.75		2.75	IV
Hypericum maculatum		5	0.5	0.5	5	IV
Knautia dipsacifolia	0.5			2.75		II
Linum catharticum		0.5	0.5			II
Pimpinella major	2.75	2.75	2.75	2.75	5	V
Plantago lanceolata	0.5	2.75	0.5	2.75	2.75	V
Plantago media	0.5					I
Polygala comosa			0.5		0.5	II
Potentilla erecta	2.75					I
Primula veris					0.5	I
Ranunculus bulbosus		0.5	2.75	0.5	0.5	IV
Rhinanthus minor	0.5	5	2.75	2.75	11.25	V
Rumex acetosa		0.5	0.5	0.5	0.5	IV
Scabiosa columbaria	0.5			0.5		II
Silene nutans		0.5	0.5			II
Stellaria graminea		0.5	0.5	0.5		III
Trollius europaeus	2.75	5	11.25	5	5	V
Thymus pulegioides	5	11.25	5	11.25		IV
Vaccinium myrtillus	2.75					I
Veratrum album	0.5				0.5	II
Veronica chamaedrys		2.75	2.75		2.75	IV
Viola canina	0.5	0.5	2.75	0.5	2.75	V
Number of species	21	21	24	24	20	
Shannon Index	2.095	2.079	2.311	2.469	2.290	

CONCLUSIONS

Application of organic and mineral fertilisers in the first year of experiences placing was not felt at the level of DM yield. The grassland type of the untreated witness is *Agrostis capillaris – Festuca rubra*. The species diversity of the studied phytocenosis is medium, and the number of species ranges from 20 up to 24.

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