RESEARCH REGARDING INFLUENCE OF GRAZING WITH YOUNG CATTLE ON A COMPLEX MIXTURE OF SOWED GRASSLANDS

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Abstract

In this paper, the effect of different ways of using a meadow sown with a mixture of 4 perennial grasses (Festuca pratensis, Lolium perenne, Phleum pratense and Poa pratensis, together with a perennial legume Trifolium repens of the Ladino type, was investigated, as well as the yield in live weight gain of the young female brood in three distinct experiments that totaled 11 years. On the variants harvested in a haymaking regime, 3-4 mowing were obtained on average over 4 years 11.1 t/ha dry matter (DM) and on the remaining variants mowed or grazed with cattle more often in 6-8 cycles, DM production was 12-18% lower. In return, the production of crude protein per hectare was 17-19% higher in the mowed and grazed more often compared to the hayfield variant, where 1900 kg/ha was obtained. The initial components of the sown mixture were preserved in a proportion of 93% in the version effectively grazed by the animals and only 65% was preserved in the version mowed as hay. In the pre-mountain area of the Braşov Depression located at 600 m altitude in the 3 experiments with 12-14 month old female , on the grasslands sown with complex mixtures fertilized with 190 kg/ha N and 50 kg/ha P, K, an average of 9.15 t/ha DM was achieved, 7 calves (4.9 LU/ha) were maintained in 150-160 days of the grazing season, when they achieved 835 g/day/head with 9.7 kg SM/1 kg gain at a rate of 6.1 kg/ha/day, totaling 941 kg/ha total animal weight gain yield, with high economic efficiency.

Keywords: sown grassland, use method, weight gain yield, grazing, young cattle

INTRODUCTION

The sown grasslands represent one of the most efficient means of intensifying feed production, especially for cattle, as green mass during the grazing season, or by mowing as hay, semi-silage or silage for stables, semi-silage or silage for stables (Anghel, 1984). By grazing, the animals influenced positively or negatively the productivity of vegetal cover grassland (Klapp, 1956; Simtea 1972). In this paper, we try to explain some aspects regarding sown grassland in the premountainous areas. In our country, there are few comparative studies on the effect of animal grazing and mowing on the grassy carpet of sown (temporary) grasslands. In this paper, the effect of different methods of use, respectively intervention, on the grassy carpet of a complex mixture of perennial grasses and legumes was studied, expressed through botanical composition, production, forage quality and finally, yield in live weight gain in young cattle in the Braşov Depression.

MATERIAL AND METHOD

The experiments were carried out at Magurele Braşov, situated at 600 m. a.s.l., with annual average temperatures of 7.5oC and rainfalls of 753 mm, in forest belt of beech and durmast oak on a chernozem, medium acid, rich in humus and medium supplied in nutritive elements. Three trials were carried out with young cattle of Bălţată Românească on sown grassland (Maruşca 1974-1977, Proca 1980-1982 and 1986-1989).

The sown grassland comprised three grassland mixtures located on 8 plots, each mixture was grazed by a group of young cattle of 12-14 months age, counting liveweight gain in the first trial, during four years (Maruşca Letiţia, 1977).

The composition of the complex mixture was as follows: *Festuca pratensis* – Local de Braşov (30%), *Lolium perenne* – Banat (20%), *Phleum pratense* – Suceava (20%), *Poa pratensis* – Transylvania (10%) and *Trifolium repens* – Ladino (20%).

At the beginning and the end of the experiments, soil samples were taken on the depth of 0-20 cm for agrochemical analyses (Maruşca, Proca, 1992).

The size of a grazing plot was 1,380 m.p. x 8 plots, of which in numbers 1, 4, 7 the variants were subdivided into 4 repetitions of 2 m.p.:

1. Mowing in haymaking regime (3-4 harvests);
2. Mowing more often, grazing simulation, without animals (6-8 harvests);
3. Mowing, grazing simulation, trampling and animal manure;
4. Normal grazing, 6-8 cycles, mowing unconsumed residues.

Botanical observations were carried out before each harvest on the 2 m2 plots, before the samples were harvested for dry matter and chemical analyses of forage quality.

In addition, the pastoral value was evaluated based on a floristic survey (Maruşca 2019).

The pastoral value of the grassland use options brings new possibilities for comparing their productivity.

Finally, a synthesis was prepared for 11 years (1974-77; 1980-82 and 1986-89) of three experiments with young cattle on grasslands sown with complex mixtures in the same experimental site from Măgurele-Braşov, for the rational grazing option on 8 plots 6-8 cycles and mowing of unconsumed residues.

Fertilization with chemical fertilizers was 30-60 kg/ha N per grazing cycle, on a background of 50kg/ha P2O5 and 50 kg/ha K2O.

The average level of nitrogen fertilization was 190 kg/ha, at which the contribution brought by animal manure on pasture (Lançon 1978 et al.) and that brought by symbiosis with white clover (Breazu et al. 1987) were also calculated.

The experimental animals, 12-14 month old heifers, were weighed at the beginning of grazing and every two weeks, establishing the yield in live weight gain per animal and area. Before the start of the animal experiments (1973) and at the end of the 3 experiments (1989), soil samples were taken at a depth of 0-20 cm, for agrochemical analyses. Finally, the pastoral value of the temporary meadow with complex mixture was evaluated according to the new method based on floristic survey (Maruşca 2019, 2022). The score for the forage value of the species was 9 (very good) for *Festuca pratensis, Lolium perenne, Phleum pratense* and *Dactylis glomerata*, 8 (good) for *Poa pratensis* and *Trifolium repens*, 7 (average) for *Agrostis capillaris*, *Festuca rubra, Poa annua* and *Taraxacum officinale*, 6 (mediocre) for *Agropyron repens* and the rest of the forage species.

RESULTS AND DISCUSSIONS

Before presenting the results of the influence of use modes on sown meadows, it is necessary to recall the positive or negative effect of animals on the grassy carpet through trampling, grazing and manure (Table 1). The presentation of these effects of the presence of animals on meadows compared to their absence when the green mass crop is mowed is quite suggestive, with some aspects that are more difficult to determine, so we will not insist on the. A first, more visible influence of animals occurs on the botanical composition of the grassy carpet of the grasslands (Table 2).

Thus, the botanical composition after 4 years of experimentation (1974-77) underwent major changes depending on the mode of use.

The lowest participation of the sown species was in the variant harvested by mowing in the hayfield regime where only 65%survived and the highest in the variant grazed with animals and mowed the refuse where 93% participation was recorded compared to the sown mixture. Even more important changes were between the initial components of the sown mixture.

Festuca pratensis from the initial 30% is maintained at 21% by mowing in the hayfield regime and 19% by actual grazing and by mowing more often in the pasture regime only 4-7% remains in the grassy vegetal carpet.

Lolium perenne from 20% increases to 22% in variant 4, normal grazing, and mowed refuse after grazing and between 7-11% in mowed variants (1, 2, 3).

Phleum pratense with 20% initially, is maintained at 19% by mowing in a hayfield regime and 14% by grazing followed by 6-10% in the mowed variants more often, which imitate grazing. *Poa pratensis* from 10% by vegetative propagation increased in all variants by 1.4 times in variant 1 (mowing, hayfield) to 2.4 -3.3 times in the remaining variants.

Table 1

Influence of cattle on pastures

Treading	Grazing	Dung + urine
Positive effects		
- Increase, density of vegetal conveere to a medium trampling - Stimulation of germination of seeds - Destruction of rodent habitat	- higher height of plant harvested, maintained basal leaflet and faster regrowth - stimulation of legumes fixing nitrogen - consumption of weeds useless pasture	- more supply in nutritive elements - maintained agrochemical factors of soils - stimulation of microorganism activity - spreading of seed herbage, especially legumes
Negative effects		
- decline of permeability soil for water and air - stimulation of erosion process on slope land and germination of weed seeds - destruction of vegetal cover as roads, surroundings of shelter, etc.	- partially decline of production due to more frequent cuts - rarer cover due to wrest plants - spreading of weeds uneaten of animals - spreading of specific pests	- feed refusals of ruminants - "stifle" of plants due to dung - "burning" of plants due to urine - super fertilization in stationary sites - spreading of weed seeds and stimulation its development

Trifolium repens from 20% increased to 30% in variant 3 (frequent mowing and trampled by animals) and by barely 4% in variant 1 (hayfield).

Among the spontaneous species *Agropyron repens, Agrostis capillaris* and *Poa annua* have a more significant participation

Table 2

Botanical composition of complex mixture after 4 years and pastoral value of different utilization

Botanical composition	Initial sown mixture (%)	Uses Variant			
		1	2	3	4
		Cutting hay regime	Simulation grazing by cutting	Simulation grazing and animal influence	Grazing with cattle – cutting refusals
Sown species (%)	(100)	(65)	(76)	(80)	(93)
Festuca pratensis	30	21	7	4	19
Lolium perenne	20	7	11	9	22
Phleum pratense	20	19	10	6	14
Poa pratensis	10	14	33	31	24
Trifolium repens	20	4	15	30	14
Spontaneous sp. (%)	(0)	(35)	(24)	(20)	(7)
Agropyron repens	X	11	8	3	1
Agrostis capillaris	X	4	1	1	1
Dactylis glomerata	X	3	+	-	+
Festuca rubra	X	3	+	+	1
Poa annua	X	-	4	11	1

Taraxacum officinale	X	2	5	3	2
Other species	X	12	5	2	1
Pastoral value (ind)	96.6	88.3	88.0	88.7	88.1
% of initial sown	100	91.4	91.1	91.8	91.2

From the point of view of botanical composition, variant 4, grazing with animals, mowing unconsumed residues is the most balanced compared to the proportion of species in the sown mixture.

Another indicator of the grassy carpet was the very good and constant pastoral value that reaches 88-88.7 in all variants, being 8-9% lower than the initial mixture which has an index of 96.6 pastoral value.

The average dry matter (DM) production of the variant mowed in the hay regime reached 11.1 t/ha on average over 4 years and 12-18% lower in the remaining variants (Table 3).

In contrast, crude protein production per hectare is 17-19% higher in variants 2, 3, 4 mowed and grazed more often compared to variant 1, mowed in a hayfield regime, where an average of almost 1900 kg/ha was achieve.

Table 3

Production and quality of sown grassland at different utilization modes

Mode of utilization: -cutting (3-4 cuts/year) - grazing (6-8 cycles/year)	Dry matter		Crude protein (N*6.25)		
	Total t/ha	Relative %	% DM	Total kg/ha	Relative %
Cutting utilization	11.1	100	17.1	1898	100
Simulation grazing by cutting	9.8	88	23.1	2264	119
Simulation grazing-let under cattle influence	9.1	82	24.7	2248	118
Grazing with cattle-cut feed refusals	9.5	86	23.4	2223	117

NB – sown grassland with complex mixtures at Măgurele Braşov

-annual fertilization with chemical fertilizers (250 N, 50 P_2O_5 and 50 K_2O kg/ha).

These exceptional results were also achieved as a result of fertilization with chemical fertilizers, namely 250 kg/ha N applied fractionally at 50 kg/ha per grazing cycle, on a background of 50 kg/ha P2O5 and K2O.Of particular interest is the expression of the productivity of these sown grasslandsin animal production, namely the yield in live weight gain.

To begin with, the average level of fertilization with chemical fertilizers of the 3 experiments and the additional biological input of animal manure and symbiotic fixation are presented (Table 4). From these data it results that fertilization with chemical fertilizers reaches 48% and organic fertilization reaches 52% of the total nutrient elements of 650 kg/ha. Chemical fertilizers in a quantity of 310 kg/ha active substance are composed of 190 N, 60 P2O5 and 60 K2O and organic fertilizers 340

kg/ha of which 79 kg of fertilizer elements from dung, 164 kg of urine and 98 kg from the presence of white clover.

Table 4

Final level fertilization of intensive sown grassland, grazed with young cattle
Măgurele Braşov, 1974-77, 1980-82, 1986-89

Specification	Fertilizers				
	N	P_2O_5	K_2O	Total	%
A. Chemical ferilizers	190	60	60	310	48
B. Natural resources on pasture – TOTAL	196	25	120	341	52
-dung	37	22	20	79	(12)
-urine	61	3	100	164	(25)
- -white clover contribution	98	+	+	98	(15)
TOTAL (A + B)	385	85	180	651	100
Proportion of natural resources %	51	30	67	52	*

Elements to count: ► Dung 1.6 kg DM/day and urine 8 l/day/head
► Mean content: - dung 2.4% N, 1.4% P_2O_5, 1.3% K_2O
-urine: 0.8% N, 0.04% P_2O_5, 1.3% K_2O/l
► Grazing season: 8.5% from 1130 days-head (155 days grazed)
► Mean white clover content: 28%
► Annual quantity N fixed by white clover: 3.5 kg N for 1% white clover
► Fertilizers of rainfalls, those resulted from the mineralization of organic matter and other natural resources were not taken into account.

These data confirm the special role of grazing animals, that of "fertilizer" and of white clover that of "manufacturer" of nitrogen from the atmosphere. These high levels of mineral and organic fertilizers, administered from outside or produced on the pasture, had a main effect on grass production and the yield in live weight gain of sown grasslands (table 5).

Table 5

General date and results from herbage production
and animal performances of sown grassland, Măgurele Braşov

Specification	**U.M.**	**Mean**
Chemical fertilization during grazing with cattle (mean 1l years) *)		
- N	kg/ha	190
- P_2O_5	kg/ha	60
- K_2O	kg/ha	60
- Dry matter yield grazed	t/ha	9.15
- Stocking rate (Livestock Unit)	L.U./ha	49
- Grazing season	days	154
- Days grazing	no.	1127
- Liveweight gain	g/head/day	835
- Rhythm of liveweight	kg/ha/day	6.1

- Forage consumption for 1 kg liveweight	kg DM	9.7

*) Grazing season 1974-77, 1980-82, 1986-89.

Thus, the average production over 11 years of the sown complex mixtures reaches 9.15 t/ha dry matter, which in 150-160 days of grazing with an average load of 4.9 LU/ha young bulls achieve 835 g/head, growth, between-4.1 kg/rhythm/6.1 rhythm. kg/ha, with 9.7 kg DM/kg weight gain, more than very economically advantageous.These results only influenced to a small extent the agrochemical constituents in the soil (Table 6).

Table 6

Main agrochemical characteristics of soil pastures

-depth of 0-20 cm-

Specification	UM	Soil pastures		Difference	
		natural (1973)	sown (1989)	+, -	%
Acidification, pH_{H2O}	units	5.8	5.8	0	100
Saturation in bases, V_{Ah}	%	73.6	80.0	+ 6.4	109
Humus	%	5.29	4.58	- 0.71	87
N index, IN	-	3.92	3.66	- 0.26	93
Available phosphorus, (P_{Al})	ppm	9.7	26.9	+ 17.2	277
Available potassium (K_{Al})	ppm	129.8	111.4	- 18.4	86

Compared to the initial, at the beginning of these experiments and that at their completion, the soil reaction was contained with pH index 5.8 and other compounds such as humus, N index and potassium have decreases of 7-14% and phosphorus, the supporter of white clover 8th compared to 2 initially.

All these results demonstrate the superiority of grasslands sown with complex mixtures used rationally by grazing animals.

CONCLUSIONS

Referring to sown intensive grassland, utilized by grazing, the ruminants by treading, grazing and dung etc., exert a positive influence and less negative on vegetal cover.

Harvest under cutting had as a consequence the utilization of sown grassland during 4-5 years. Under rational grazing, after the same period, the components of sown mixtures were maintained in proportion of 90%, and the grassland could be utilized economically for a longer period.

Under grazing, 23-24% crude protein was obtained, as compared to 17% CP under cutting. Crude protein yield exceeded 2200 kg/ha under grazing, being 18% higher than that under cutting.

As result of the medium chemical fertilization during 3-4 years under grazing with young cattle, an average of 9.15 t/ha DM

and 941 kg/ha live weight gain were obtained, respectively 835 g/head/day during 150-160 days of grazing. he general balance sheet of fertilizing elements on sown grassland, under intensive grazing with cattle, showed that over 50% were natural resources (dung, urine, white clover contribution, etc.), so it is not correctly to report the herbage production or animal performances to chemical fertilizers applied to area unit.

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