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INFLUENCE OF DIFFERENT WAYS OF HARVESTING ON SOME FORAGE PRODUCTIVE AND CHEMICAL INDICATORS FOR A NATURAL MEADOW OF *AGROSTIS CAPILLARIS-FESTUCA FALLAX* TYPE IN THE RHODOPE MOUNTAINS (SOUTHERN BULGARIA)

ВЛИЯНИЕ НА РАЗЛИЧНИ НАЧИНИ НА РЕКОЛТИРАНЕ ВЪРХУ НЯКОИ ПРОДУКТИВНИ И ХИМИЧЕСКИ ПОКАЗАТЕЛИ НА ФУРАЖ ОТ ЕСТЕСТВЕНА ЛИВАДА ОТ ТИПА *AGROSTIS CAPILLARIS-FESTUCA FALLAX* В РОДОПИТЕ (ЮЖНА БЪЛГАРИЯ)

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ABSTRACT

The experiment was conducted with a natural meadow of *Agrostis capillaris-Festuca fallax* type in the Rhodope Mountains (Smolyan region, Southern Bulgaria). The block-method in four repetitions and the harvesting plot area of 10 m2 with the following ways of use by years and undergrowths was used. The object of this study included annually (in 4 variants) and in the alternate years (in 3 variants) hay-grazing - use, grazing-hay - use, hay-grazing-grazing - use or only grazing-use of the particular regrowths in the different years. The harvesting in grazing-use mode (grazing imitation) was accomplished in height of the grass stand 10-12 cm. The harvesting in hay-making mode was accomplished in flowering phenophase of the grasses. It was established that the studying different ways of harvesting given comparatively high dry matter yields. The following indicators were estimated: 1. Dry mass (DM) yield (in t/ha) - it was established by drying constant weight at 105 Celsius degree in muffle-oven of 0.5 kg green mass samples, taken immediately after cutting each trial plot and repetition; 2. Chemical composition of the absolutely dry matter included crude protein and crude fiber contents of the basic botanical groups (grasses and legumes) in the grass stand. They were determined by infrared spectroscopy on InfraAlyzer–400. For that purpose were done calibrations of 50 plant samples for each botanical group as every tenth sample was examined by analyzing after Weende-method. The crude fat content was determined after Soxlet-method, the crude ash – by weighing after dry calcination in a muffle-oven and the nitrogen-free extract substances (NFES) as an amount among the crude protein, the

crude fiber, the crude fat and the crude ash. The crude protein and crude fiber of the grass biomass were in well-expressive opposite dependence. The others studied chemical indicators (crude fat, crude ash and NFES) had a less influence on the ways that were used for the grass stand.

Key words: natural meadow, *Agrostis capillaris-Festuca fallax* type, way of use, productive and chemical indicators, the Rhodope Mountains, Southern Bulgaria.

РЕЗЮМЕ

Експериментът бе изведен върху естествена ливада от типа *Agrostis capillaris-Festuca fallax* в Родопите (Смолянски район, Южна България). Използван беше блоковия метод в 4 повторения при големина на реколтната парцела от 10 m2. Обектът на проучването включваше ежегодно (в 4 варианта) и редуващо се по години (в 3 варианта) пасищно-сенокосно, сенокосно-пасищно, пасищно-сенокосно-пасищно или само пасищно ползване на тревостоя. Реколтирането в пасищна зрялост (чрез окосяване) бе извършвано при височина на тревостоя 10-12 cm, а в сенокосна зрялост – при цъфтеж на житните треви. Проучвани бяха следните показатели:
Между суровият протеин и суровите влакнини в тревната биомаса има добре изразена обратно пропорционална зависимост. Върху другите проучвани химични показатели начините на ползване на тревостоя оказват малко влияние.

Ключови думи: естествена ливада, тип *Agrostis capillarys-Festuca fallax*, начин на ползване, продуктивни и химически показатели, Родопи, Южна България.

ПОДРОБНО РЕЗЮМЕ

Експериментът бе изведен върху естествена ливада от типа *Agrostis capillaris-Festuca fallax*, разположена в Родопите (Смолянски район, Южна България) на 1100 m н.в. Почвите в района на изследването са предимно кафяви горски и в по-ограничен размер и на по-голяма надморска височина- планинско-ливадни почви. Кафявите горски почви са образувани предимно под букови и борови гори, в условията на планинско- горски климат, характеризиращ се с висока влажност и ниски температури, при промивен воден режим. Химичният състав на почвата в района на провеждането на опита (надморска височина 1100 m н.в.) се характеризира със средна запасеност с хумус и слаба от общ азот и фосфор. Ниски бяха стойностите на подвижния азот, фосфор и молибден. Добра бе запасеността с подвижен калий и водоразтворим бор. Почвената реакция бе кисела. Районът се характеризира с мека зима, прохладна пролет и без особени горещини лято, като сравнително топли са и есенните месеци. Данните за месечната и годишната сума на валежите за 20-год. период (1977-1996 г.) показват, че влажността е сравнително висока, като годишната сума на валежите е средно 1180.2 l/m^2, т.е. почти два пъти повече в сравнение със средната сума за страната - 620 l/m^2. Валежите в региона са неравномерно разпределени. Те имат отчетливо изразен зимен и пролетно-летен валежен максимум, като валежите през месеците април, май и юни са с определящо значение за добива от естествените тревостои. Намаленото количество на

валежите през месеците юли, август и септември, както и преобладаващият лек механичен състав на почвата предопределят неблагоприятното им отражение върху продуктивността на тревните площи. Вижда се, че в района на Смолян съществуват специфични почвено- климатични условия, които влияят в значителна степен върху количеството и качеството на тревната маса от естествените тревостои. За извеждането на експеримента беше използван блоковия метод в 4 повторения при големина на реколтната парцелка от 10 m2. Обектът на проучването включваше ежегодно (в 4 варианта) и редуващо се по години (в 3 варианта) пасищно-сенокосно, сенокосно-пасищно, пасищно-сенокосно-пасищно или само пасищно ползване на тревостоя. Реколтирането в пасищна зрялост (чрез окосяване) бе извършвано при височина на тревостоя 10-12 cm, а в сенокосна зрялост – при цъфтеж на тревите. При ежегодното реколтиране на 1ви подраст – пасищно, а 2ри подраст – сенокосно, както и при променящото се по години ползване: 1ва – пасищно-сенокосно-пасищно, 2ра - сенокосно-пасищно, а 3та - пасищно-сенокосно се получава най-много сухо вещество - 6.18 и 5.87 t/ha. Между суровият протеин и суровите влакнини в тревната биомаса има добре изразена обратно пропорционална зависимост. Най-много суров протеин има фуражът при ежегодното пасищно ползване - 310.0 g/kg сухо вещество. Начините на реколтиране на тревостоя оказват по-малък ефект върху другите проучвани химични показатели.

INTRODUCTION

The natural meadows of *Agrostis capillaris-Festuca fallax* type in Smolyan region (the Rhodope Mountains, Southern Bulgaria) occupied more a good half of the natural meadows in the region *(Cheshmedjiev, 1980; Yakimova, et al. 1977).* The conducted multiplied studies in different regions of Bulgaria (*Pavlov, 1996; Totev*, *et al. 1998*) and abroad (*Sung and Kim, 1985; Grandi, et al. 1989; Giraldez, et al. 1993*) showed that the mineral fertilization and the ways of harvesting are among the most important in farming practices.

The purpose of this study was to identify the changes in biomass productivity and chemical composition of forage from a natural meadow of *Agrostis capillaris-Festuca fallax* type under the influence of different ways of use throughout years and undergrowths in the Rhodope Mountains (Smolyan region, Southern Bulgaria).

MATERIAL AND METHODS

The field experiment was conducted during the 1993-1995 period, on a natural meadow of *Agrostis capillaris-Festuca fallax* type in the Rhodope Mountains (Smolyan region, Southern Bulgaria) at 1100 m altitude.

The soil in the experimental area was a brown forest with light mechanical structure because the chemical composition was characterized by a middle reserve of humus and a low total nitrogen and phosphorus. Low values were established by water soluble forms of nitrogen, phosphorus and molybdenum and the reserve of water soluble forms of potassium and boron was in optimum. The soil reaction was acidic.

The Smolyan region is characterized by mild winters, cool spring and hot summer without much relatively warm autumn months. Precipitation in the region are unevenly distributed. They have clearly expressed winter and spring-summer rainfall maximum, as rainfall during April, May and June are critical for the yield of the natural grasslands. The reduced rainfall in July, August and September, and the prevailing light mechanical composition of the soil determine the adverse impact on the productivity of grasslands. It is seen that in the region of Smolyan there are

specific soil and climatic conditions that affect significantly the quantity and quality of forage mass of natural grasslands.

The block-method in four repetitions and the harvesting plot area of 10 m2 with the following ways of use by years and regrowths were used. The following variants were studied:

<table>
<tr><td rowspan="2">Var. 1
(Standard)
Вар. 1
(Контрола)

Annually
Ежегодно</td><td>1st regrowth - hay-use
1ви подраст–сенокосно ползване</td><td rowspan="2">Var. 6/Вар. 6

1st year
1ва година</td><td>1st regrowth - grazing-use
1ви подраст–пасищно ползване</td></tr>
<tr><td>2nd regrowth – grazing-use
2ри подраст–пасищно ползване</td><td>2nd regrowth - hay-use
2ри подраст–сенокосно ползване</td></tr>
<tr><td rowspan="3">Var. 2/Вар. 2

Annually
Ежегодно</td><td rowspan="2">1st regrowth - grazing-use
1ви подраст–пасищно ползване</td><td rowspan="3">2nd year
2ра година</td><td>1st regrowth - grazing-use
1ви подраст–пасищно ползване</td></tr>
<tr><td>2nd regrowth - hay-use
2ри подраст–сенокосно ползване</td></tr>
<tr><td>2nd regrowth - hay-use
2ри подраст–сенокосно ползване</td><td>3rd regrowth - grazing-use
3ти подраст–пасищно ползване</td></tr>
<tr><td rowspan="3">Var. 3/Вар. 3

Annually
Ежегодно</td><td>1st regrowth - grazing-use
1ви подраст–пасищно ползване</td><td rowspan="3">

3rd year
3та година</td><td>1st regrowth - hay-use
1ви подраст–сенокосно ползване</td></tr>
<tr><td>2nd regrowth - hay-use
2ри подраст–сенокосно ползване</td><td>2nd regrowth – grazing-use
2ри подраст–пасищно ползване</td></tr>
<tr><td>3rd regrowth - grazing-use
3ти подраст–пасищно ползване</td><td></td></tr>
<tr><td rowspan="3">Var. 4/Вар. 4

Annually
Ежегодно</td><td>1st regrowth - grazing-use
1ви подраст–пасищно ползване</td><td rowspan="3">Var. 7/Вар. 7

1st year
1ва година</td><td>1st regrowth - grazing-use
1ви подраст–пасищно ползване</td></tr>
<tr><td>2nd regrowth - grazing-use
2ри подраст–пасищно ползване</td><td>2nd regrowth - hay-use
2ри подраст–сенокосно ползване</td></tr>
<tr><td></td><td>3rd regrowth - grazing-use
3ти подраст–пасищно ползване</td></tr>
<tr><td></td><td>3rd regrowth - grazing-use</td><td></td><td>1st regrowth - hay-use
1ви подраст–</td></tr>
</table>

	3ти подраст– пасищно ползване	2nd year 2ра година	сенокосно ползване
Var. 5/Вар. 5 1st year 1ва година	1st regrowth - hay-use 1ви подраст– сенокосно ползване		2nd regrowth – grazing-use 2ри подраст– пасищно ползване
	2nd regrowth - grazing-use 2ри подраст– пасищно ползване		
2nd year 2ра година	1st regrowth - grazing-use 1ви подраст– пасищно ползване	3rd year 3та година	1st regrowth - grazing-use 1ви подраст– пасищно ползване
	2nd regrowth - hay-use 2ри подраст– сенокосно ползване		2nd regrowth - hay-use 2ри подраст– сенокосно ползване
3rd year 3та година	1st regrowth - grazing-use 1ви подраст– пасищно ползване		
	2nd regrowth - hay-use 2ри подраст– сенокосно ползване		
	3rd regrowth - grazing-use 3ти подраст– пасищно ползване		

Annually all trial variants were fertilized early in spring before the start of vegetation with 80 kg/ha active substance of nitrogen (as ammonium nitrate) and 80 kg/ha active substance of phosphorus (as double superphosphate). The harvesting in hay-making mode was accomplished in flowering phenophase of the grasses by hand-mowing. The harvesting in grazing-use mode was accomplished without animals (grazing imitation) at a height of 10-12 cm of the grass stand by hand-mowing.

The following indicators were estimated: 1. Dry mass (DM) yield (in t/ha) - it was established by drying constant weight at 105 Celsius degree in muffle-oven of 0.5 kg green mass samples, taken immediately after cutting each trial plot and repetition; 2. Chemical composition of the absolutely dry matter included crude protein and crude fiber contents of the basic botanical groups (grasses and legumes) in the grass stand. They were determined by infrared spectroscopy on InfraAlyzer–400. For that purpose were done calibrations of 50 plant samples for each botanical group as every tenth sample was examined by analyzing after Weende-method.
The crude fat content was determined after Soxlet-method, the crude ash – by weighing after dry calcination in a muffle-oven and the nitrogen-free extract substances (NFES) as an amount among the crude protein, the crude fiber, the crude fat and the crude ash.

RESULTS, DISCUSSION

1. PRODUCTIVE POTENTIAL OF THE GRASS STAND

Table 1. DM yields (t/ha) by regrowths and ways of use, by years and average for the 1994-1996 period.
Таблица 1. Добиви на сухо вещество (t/ha) по подрасти и начини на ползване, по години и средно за периода 1994-1996 г.

Variant, regrowth, using way Вариант, подраст, начин на ползване		DM year yields (t/ha)			Average for the variant Средно за варианта
		1994	1995	1996	
Var. 1 (Standard) Annually Вар. 1 (Контрола) Ежегодно	1st regrowth - hay-use 1ви подраст–сенокосно ползване	3.55	4.79	4.71	
	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	1.36	1.85	1.71	
	Total for the variant Общо за варианта	4.91	6.64	6.42	5.99
Var. 2/ Вар. 2 Annually/Ежегодно	1st regrowth - grazing-use 1ви подраст–пасищно ползване	1.86	1.97	1.86	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	3.80	4.53	4.51	
	Total for the variant Общо за варианта	5.66	6.50	6.37	6.18
Var. 3/ Вар. 3 Annually/Ежегодно	1st regrowth - grazing-use 1ви подраст–пасищно ползване	1.68	0.96	0.91	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	3.19	3.05	3.05	
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	0.70	0.72	0.71	
	Total for the variant Общо за варианта	5.57	4.73	4.67	4.99
Var. 4/ Вар. 4 Annually/Ежегодно	1st regrowth - grazing-use 1ви подраст–пасищно ползване	1.70	1.76	1.60	
	2nd regrowth – grazing-use	2.06	2.48	2.38	

	2ри подраст–пасищно ползване 3rd regrowth - grazing-use 3ти подраст–пасищно ползване	0.81	0.90	0.85	
	Total for the variant Общо за варианта	4.57	5.14	4.83	4.85
Var. 5/ Вар. 5	1st regrowth - hay-use 1ви подраст–сенокосно ползване	3.49	-	-	
1st year 1ва година	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	1.31	-	-	
	Total for the year Общо за годината	4.80	-	-	
2nd year 2ра година	1st regrowth - grazing-use 1ви подраст–пасищно ползване	-	2.04	-	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	-	4.31	-	
	Total for the year Общо за годината	-	6.35	-	
3rd year 3та година	1st regrowth - grazing-use 1ви подраст–пасищно ползване	-	-	1.36	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	-	-	3.72	
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	-	-	0.88	
	Total for the year Общо за годината	-	-	5.96	5.70
Var. 6/ Вар. 6	1st regrowth - grazing-use 1ви подраст–пасищно ползване	1.80	-	-	
1st year 1ва година	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	3.73	-	-	
	Total for the year Общо за годината	5.53	-	-	
	1st regrowth - grazing-use	-	1.18	-	

2nd year 2ра година	1ви подраст–пасищно ползване 2nd regrowth - hay-use 2ри подраст–сенокосно ползване	-	3.68	-	
	3rd regrowth - grazing-using 3ти подраст–пасищно ползване	-	0.90	-	
	Total for the year Общо за годината	-	5.76	-	
3rd year 3та година	1st regrowth - hay-use 1ви подраст–сенокосно ползване	-	-	4.48	
	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	-	-	1.60	
	Total for the year Общо за годината	-	-	6.08	5.79
Var. 7/ Вар. 7 1st year 1ва година	1st regrowth - grazing-use 1ви подраст–пасищно ползване	1.60	-	-	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	3.07	-	-	
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	0.83	-	-	
	Total for the year Общо за годината	5.50	-	-	
2nd year 2ра година	1st regrowth - hay-use 1ви подраст–сенокосно ползване	-	4.30	-	
	2nd regrowth – pasture-use 2ри подраст–пасищно ползване	-	1.60	-	
	Total for the year Общо за годината	-	5.90	-	
3rd year 3та година	1st regrowth - grazing-use 1ви подраст–пасищно ползване	-	-	1.80	
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	-	-	4.42	
	Total for the year	-	-	6.22	5.87

Общо за годината	
LSD at 0.5	0.254
LSD at 0.1	0.638
LSD at 0.01	0.807

In 1994 it is obvious that the obtained dry matter by hay-use exceeded the grazing-use as an annual application and in rotation in years (Table 1). Thus, after annually using for hay production (var. 1-3) were established maximum yields – from 3.19 t/ha (2nd regrowth of var. 3) to 3.80 t/ha (2nd regrowth of var. 2), followed from 1st regrowth of the standard variant (3.55 t/ha). In the variants with annually grazing-use (var. 1-4) given lower DM yields – from 0.70 t/ha (3rd regrowth of var. 3) to 2.06 t/ha (2nd regrowth of var. 4), namely with 4.56 times and 1.84 times, respectively. Total of the year the greatest DM was obtained from variants, which were obtained also maximum yields after hay-use (var. 2 and 3) – respectively 5.66 t/ha and 5.57 t/ha. In the variants with annually variable use (var. 5-7) greatest yields were reported also after hay production – from 3.07 t/ha (2nd regrowth of var. 7) to 3.73 t/ha (2nd regrowth of var. 6). In the same group of variants the yields after grazing-use reached barely from 1.31 t/ha (2nd regrowth of var. 5) to 1.80 t/ha (1st regrowth of var. 6). In the var. 6 and 7 were obtained maximum DM yields – respectively 5.53 t/ha and 5.50 t/ha.

The obtained dry matter in 1995 almost all studying variants was relatively higher compared with the previous year except var. 3. The annual use of 1st or 2nd regrowths for hay production (var. 1 and 2) is guaranteed for obtaining the highest dry matter yields – respectively 6.64 t/ha and 6.50 t/ha. In annual grazing-use the DM yield reached 5.14 t/ha. Relatively smaller yields were obtained when the ways of harvesting were changed over the years (var. 5-7). Thus, the reported dry matter yields varied from 5.76 t/ha (var. 6) to 6.35 t/ha (var. 5). The lower yields were obtained after double (var. 6) or triple use with initial grazing (var. 7) during the previous year.

As a result of intensive ways of using var. 3 and 4 had a negative effect on the growth and development of grasses for the next year. Thus, the obtained dry matter yields in 1996 were lower than the previous year. Despite the regrowths, the driest mass was obtained by combined annual hay-grazing use (var. 1) – respectively 6.42 t/ha and grazing-hay use (var. 2) - respectively 6.37 t/ha and by different ways of use during the trial period from var. 6 (6.08 t/ha) and var. 7 (6.22 t/ha). The other variants occupied an intermediate position.

Average for the experimental period (2004-2006) the highest dry mass yields used in annually different ways (var. 1-3) were found in var. 2 (6.18 t/ha), followed by var. 1 (5.99 t/ha) and alternating ways by years (var. 5-7) in var.7(5.87 t/ha). In the annual pasture-use (var. 4) the DM yields reached barely to 4.85 t/ha.

When the annual use of the grass stand is for grazing-use only (var. 4) it accumulates the highest crude protein (310.0 g/kg dry matter). (Table 2)

2. CHEMICAL COMPOSITION OF THE GRASS BIOMASS

Table 2. Chemical composition of the grass biomass (g/kg a dry matter) by regrowths and ways of use average for a year and for the 1993-1995 period.

Таблица 2. Химически състав на тревната биомаса (g/kg сухо вещество) по подрасти и начини на ползване средно за година и за периода 1993-1995 г.

Variant, regrowth, using way Вариант, подраст, начин на ползване		Crude protein Суров протеин	Crude fiber Сурови влакнини	Crude fat Сурови мазнини	NFES БЕВ	Crude ash Сурова пепел
Average for a year						
Var. 1/ Вар.1 (Standard) (Контрола)	1st regrowth - hay-use 1ви подраст–сенокосно ползване	248	298	53	352	49
Annually Ежегодно	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	275	215	55	320	135
Var. 2/ Вар. 2	1st regrowth - grazing-use 1ви подраст–пасищно ползване	320	175	55	317	133
Annually Ежегодно	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	268	224	50	358	100
Var. 3/ Вар. 3	1st regrowth - grazing-use 1ви подраст–пасищно ползване	315	184	55	319	127
Annually Ежегодно	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	263	245	50	353	89
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	285	226	52	340	97
Var. 4/ Вар. 4	1st regrowth - grazing-use 1ви подраст–пасищно ползване	328	196	55	328	93
Annually Ежегодно	2nd regrowth - grazing-use 2ри подраст–пасищно ползване	305	214	53	332	96
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	298	203	51	319	129
Var. 5/ Вар. 5	1st regrowth - hay-use 1ви подраст–сенокосно ползване	240	290	52	349	69
1st year 1ва година	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	268	221	53	321	135
	1st regrowth - grazing-					

	use	314	178	54	310	144
2nd year 2ра година	1ви подраст–пасищно ползване 2nd regrowth - hay-use 2ри подраст–сенокосно ползване	253	230	51	351	115
	1st regrowth - grazing-use 1ви подраст–пасищно ползване	310	190	54	322	127
3rd year 3та година	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	254	253	50	361	82
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	278	231	51	344	96
Var. 6/ Вар. 6	1st regrowth - grazing-use	324	183	54	310	129
1st year 1ва година	1ви подраст–пасищно ползване 2nd regrowth - hay-use 2ри подраст–сенокосно ползване	260	219	52	364	105
	1st regrowth - grazing-use 1ви подраст–пасищно ползване	298	191	54	321	136
2nd year 2ра година	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	251	256	51	365	77
	3rd regrowth - grazing-use 3ти подраст–пасищно ползване	278	230	52	349	91
	1st regrowth - hay-use 1ви подраст–сенокосно ползване	263	254	52	358	73
3rd year 3та година	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	284	221	53	331	111
Var. 7/ Вар. 7	1st regrowth - grazing-use 1ви подраст–пасищно ползване	298	192	53	324	133
1st year 1ва година	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	256	251	51	364	78
	3rd regrowth - grazing-					

	use 3ти подраст–пасищно ползване	277	233	52	351	87
2nd year 2ра година	1st regrowth - hay-use 1ви подраст–сенокосно ползване	230	284	54	364	68
	2nd regrowth – grazing-use 2ри подраст–пасищно ползване	263	221	54	329	133
3rd year 3та година	1st regrowth - grazing-use 1ви подраст–пасищно ползване	308	188	54	326	124
	2nd regrowth - hay-use 2ри подраст–сенокосно ползване	251	229	51	364	105
Average for the 1993-1995 period						
Var. 1 (Standard) Вар. 1 (Контрола) Annually/Ежегодно		261.0	256.0	54.0	336.0	92.0
Var. 2/ Вар. 2 Annually/Ежегодно		294.0	199.0	52.0	337.0	116.0
Var. 3/ Вар. 3 Annually/Ежегодно		287.0	218.0	52.0	337.0	104.0
Var. 4/ Вар. 4 Annually/Ежегодно		310.0	204.0	53.0	326.0	106.0
Var. 5/ Вар. 5		254.0	255.0	51.0	335.0	132.0
1st year/1ва година						
2nd year/2ра година		283.0	204.0	52.0	330.0	129.0
3rd year/3та година		280.0	224.0	52.0	342.0	101.0
Var. 6/ Вар. 6		292.0	201.0	53.0	337.0	117.0
1st year/1ва година						
2nd year/2ра година		275.0	225.0	52.0	345.0	101.0
3rd year/3та година		273.0	237.0	52.0	344.0	92.0
Var. 7/ Вар. 7		277.0	225.0	51.0	346.0	99.0
1st year/1ва година						
2nd year/2ра година		246.0	252.0	54.0	346.0	100.0
3rd year/3та година		279.0	208.0	52.0	345.0	114.0

This is because the harvesting of grasses at a younger age accumulates more crude protein in the forage compared with the later phenophases of their development. The annual mineral fertilization of all studying variants with an ammonium nitrate had a positive effect as well.

When the 1st regrowth is used for grazing and 2nd regrowth for hay production the forage has also high crude protein content. The crude fiber was in opposite dependence as regards to crude protein in the forage. The highest fiber content in forage had if the 1st regrowth is used for hay production and the 2nd regrowth for grazing (var. 1, var. 5 - 1st year, var. 6 - 3rd year and var. 7 - 2nd year) –.respectively 256.0 g/kg, 255.0 g/kg, 237.0 g/kg and 252.0 g/kg a dry matter. The crude fiber had

the lowest forage content when the 1st regrowth was used for pasture and the 2nd regrowth for hay production (var. 2, var. 5 - 2nd year, var. 6 - 1st year and var. 7 - 3rd year) and also in the annual use for grazing only (var. 4).

The crude fat in annually combined uses (var. 1-3) varied from 52.0 g/kg (var. 2 and 3) to 54.0 g/kg a dry matter (var. 1). In annually changed uses (var. 5-7) the crude fat were within the limits of 51.0 g/kg (var. 5 - 1st year and var. 7 - 1st year) and 54.0 g/kg a dry matter (var. 7 - 2nd year).

As regards to the NFES was established the following variations: in annually use - from 336.0 g/kg (var. 1) to 337.0 g/kg (var. 2 and 3), while in annually changed uses were from 330.0 g/kg (var. 5 - 2nd year) to 346.0 g/kg a dry matter (var. 7 - 1st and 2nd year).

It was established that the ways of use influence the crude ash in forage and in an early age (grazing-use) grasses have higher ash content. Thus variants with annually combined uses (var. 1-3) varied from 92.6 g/kg (by 1st regrowth of var. 4) to 135.0 g/kg (by 2nd regrowth of var. 1). In annually changing uses (var. 5-7) the crude ash was in the limits of 87.0 g/kg (in var. 7 - 3rd regrowth of the 1st year) and 144.0 g/kg (in var. 5 - 1st regrowth of the 2nd year).

CONCLUSIONS

The annually harvesting of 1st regrowth - grazing-use and 2nd regrowth - hay-use and throughout the years: by grazing-hay-grazing used in the 1st year, hay-grazing used in the 2nd year and grazing-hay used in the 3rd year given highest dry matter yields (6.18 and 5.87 t/ha).

The crude protein and crude fiber of the grass biomass were in well-expressive opposite dependence. Thus, the crude protein content in annually used ways varied from 275 g/kg to 320 g/kg by grazing, while the crude fiber - from 224 g/kg to 298 g/kg by hay production. As a result of the annual use of alternating ways to harvest, the protein reached from 263 g/kg to 324 g/kg after grazing, while the crude fiber – from 219 g/kg to 290 g/kg after hay production. The others studied chemical indicators had a less effect on the ways that were used for the grass stand.

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