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BOTANICAL COMPOSITION AND NUTRITIONAL VALUE OF FODDER FROM OF SPECIES AND VARIETIES PERENNIAL MEADOW GRASSES

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Abstract

The botanical and chemical composition with perennial forage grasses in the conditions of the Central Balkan Mountain was analyzed, where Festuca arundinacea (98.3%) had the highest share in spring, while Bromus inermis in summer grass stand (94.8%). Meadow fescue and Italian ryegrass (cv.K-13) had the slightest share in the first and second regrowth, respectively. The perennial meadow grasses are of good quality and high DM content. Bromus inermis (DM-911.7 and CP-145.2 g kg^{-1}) and Dactylis glomerata (DM-910.1 and CP-138.7 g kg^{-1}) had the highest values of DM and CP. The aboveground mass of Lolium perenne had the least amount of DM (901.1 g kg^{-1}), but with a good content of CP (131.7 g kg^{-1}). The dry matter and CP in the biomass of Lolium multiflorum varied from 905.5 to 905.8 g kg^{-1} and from 96.0 to 110.1 g kg^{-1}, respectively, with CP concentration prevailing by 14.7% in the feed mass of cv.K-29t compared to cv.K-13. Festuca pratensis formed biomass with a higher CP content (by 3.1%) and CFr (by 10.6%) compared to Festuca arundinacea. A high correlation was found (r = 0.92) between the amount of DM and the percentage share of the species. Crude protein content correlated positively with the amount of CF (r = 0.77), calcium (r = 0.76), GE (r = 0.84) and FUG (r = 0.89).

Key words*: botanical composition, quality, crude protein.*

INTRODUCTION

Meadow grasses of the family *Poaceae* are a major and widespread component in natural meadows and pastures (Tenikecier & Ates, 2018). Their share in the grass stand dominatesd (up to 80-90%) compared to other types of perennial grasses. Abiotic and edaphic environmental factors conditionally limit or stimulate their development in the formation of sustainable and long-lasting fresh biomass with maximum efficiency (Deru et al., 2015).

Perennial meadow grasses are a cheap resource for meeting the food needs of farm animals. In this regard, the following species are extremely important: *Dactylis glomerata* L., *Lolium perenne* L., *Festuca pratensis* Huds., *Festuca arundinacea* Schreb., *Phleum pratense* L., *Lolium multiflorum* Lam., *Arrhenatherum elatius* (L., P. Beauv. ex J. Presl & C. Presl.), *Festuca rubra* L. and *Bromus inermis* Leyss. (Tomić et al., 2007).

The nutritional value of the feed mass is a variable related to the structure and quantitative share of the plants. Therefore, the botanical composition of grass stand gives a real idea of the quality and degree of digestibility of the vegetative mass by ruminants (Sabiniarz & Kozłowski 2009; Churkova, 2010; Churkova & Churkova, 2021a). The content of nutrients affects the taste of aboveground biomass and its better utilization.

In mountainous areas, the grass stand of *Festuca pratensis* Huds. are also slightly preferred with lower digestibility by animals compared to meadow fescue and perennial ryegrass (Cougnon, 2013; Cougnon et al., 2014).

In the conditions of the Central Balkan Mountain, the pure and mixed crops of Kenthucky bluegrass, red and tall fescue, show high resistance and adaptability (Naydenova & Mitev, 2017) correlating with relatively constant annual productivity.

Artificial grass stand with a predominant share of *Dactylis glomerata* L. (over 75%), register a high content of dry matter (909.7 g kg^{-1}) and crude fiber (346.3 g kg^{-1}) (Bozhanska et al., 2018). Crops with *Lolium perenne* L. show tolerance of grazing and are characterized by high productivity and quality of the feed mass (Katova, 2019).

The aim of the present study is to determine and analyze the botanical and basic chemical composition of grass stand of perennial forage grasses originating in Serbia in the conditions of the Central Balkan Mountains.

MATERIALS AND METHODS

The field experiment was conducted in 2016-2019, in the experimental field of the Research Institute of Mountain Stockbreeding and Agriculture - Troyan, Bulgaria.

Agroclimatic characteristics in the experimental area

The soils in the experimental area are light gray, pseudopodzolic. The content of the main nutrients in the soil layer was: from 0-20 cm - total N - 20.2 mg/1000 g, P_2O_5 - 2.4 mg/100 g, K_2O - 9.9 mg/100 g, humus - 1.44% and from 20-40 cm - total N - 8.6 mg/1000 g, P_2O_5 - 1.2 mg/100 g, K_2O - 5.9 mg/100 g, humus - 0.96%.
Perennial species of meadow grasses are characterized by a long vegetation period, and the water and temperature regime in the experimental area play a crucial role in the adaptation, development and quality of the feed mass (Staniak, 2016). For the experimental years, the air temperature during the vegetation period (15.2°C) was 0.4°C higher than for the multi-year period (14.8°C), Table 1.
The average daily temperature was with the lowest values (15.0°C) in 2017 and with the highest (15.3°C) in 2018.

Table 1. Average monthly temperatures and precipitation amounts during the vegetation periods of the experiment

Years / Months	2016	2017	2018	2019	Average for 2016-2019	Average for 1967-2015
Temperature (°C)						
March	7.4	8.1	5.1	7.5	7.0	5.5
April	13.4	10.1	14.5	10.2	12.1	10.6
May	14.0	14.5	16.7	14.8	15.0	15.5
June	20.0	19.9	18.7	19.9	19.6	18.8
July	21.1	20.6	20.4	20.2	20.6	20.8
August	20.0	20.4	20.3	20.4	20.3	20.7
September	16.2	16.4	15.8	16.2	16.2	15.8
October	9.5	9.8	11.2	11.5	10.5	10.9
Average	15.2	15.0	15.3	15.1	15.2	14.8
Precipitation (mm)						
March	58.5	60.7	83.2	16.5	54.7	63.2
April	115.2	90.4	22.8	106.9	83.8	65.6
May	161.5	133.1	82.5	82.4	114.9	107.7
June	56.9	113.2	174.3	234.6	144.8	113.3
July	42.2	186.6	241.1	106.7	144.2	99.7
August	82.8	13.2	9.4	37.7	35.8	76.9
September	26.2	38.9	30.0	21.9	29.3	87.6
October	51.3	126.3	56.2	48.0	70.5	66.6
Sum	594.6	762.4	699.5	654.7	678.0	680.6

In the second vegetation, meadow grasses grew in the conditions of the highest average temperatures for March (8.1°C) and the lowest for April (10.1°C), and in the third vegetation their development started at the lowest temperatures in March (5.1°C) and the highest for April (14.5°C) and May (16.7°C) compared to the same months in 2016 and 2019, and compared to the multiannual period.
The average air temperature in the first and fourth vegetation was 15.2°C and 15.1°C., respectively. The vegetation amount of precipitation in the year of sowing (594.6 mm) and in the fourth vegetation (654.7 mm) was inferior in amount to that for a four-year (678.0 mm) and multi-year period (680.0 mm).
The relative difference of the indicator for 2016 and 2019 was 14.0-14.4% and 3.6-3.8%, respectively.
In the third vegetation (second harvest year) the precipitation amount was 699.5 mm with a total maximum (241.1 mm) and minimum (9.4 mm) of the indicator in the summer months (July and August) compared to the other experimental years and the multiannual period. The highest amount of vegetation precipitation

(762.4 mm) was registered in the year after sowing. In relative terms, the difference in value during the year compared to the average for the study period and that for a longer period was equal to 12.4 and 12.0%, respectively.

The experiment included seven cultivars of fodder grasses originating in Serbia, such as: perennial ryegrass - cv. K-11 (*Lolium perenne* L.); Italian ryegrass - cv. K-13 (*Lolium multiflorum* L.); Italian ryegrass - cv. K-29t (*Lolium multiflorum* L.); tall fescue – cv. K-20 (*Festuca arundinaceae* Scherb.); meadow fescue - cv. K-21 (*Festuca pratensis* Huds.); cock's foot – K-24 (*Dactylis glomerata* L.); smooth brome – cv. BV-1 exp. *Bromus inermis* Leyss. The variants were set by the block method in four replications with the size of the harvest plot 5 m^2. Sowing was done by hand, scattered, with a sowing rate consistent with that for the species in pure condition at 100% seed germination. A single fertilization with N at a dose of 60 kg/ha active substance was applied. For the experimental period, nine cuttings were made: three in the year of sowing (2016) - in the form of sanitary mowing and six - distributed in the period of the second (2017), third (2018) and fourth (2019) vegetation.

For the purpose of the study, the following indicators were reported and analyzed:

Botanical composition of the grass stand - determined by weight by analysis of grass samples (in the air-dry state) at each mowing and from each variant, taken at each mowing from each variant. They were weighed in air dry condition and the percentage of weeds was determined by weight.

Basic chemical composition of dry fodder mass analyzed by *Weende* method: Crude protein (CP, g kg^{-1}) according to *Keldahl* (according to BDS/ISO-5983); Crude fiber (CFr, g kg^{-1}); Crude fat (CF, g kg^{-1}) (according to BDS/ISO-6492) - extracted in an extractor type *Soxhlet*; Ash (g kg^{-1}) - (according to BDS/ISO-5984) decomposition of organic matter by gradual combustion of the sample in a muffle furnace at 550°C; Dry matter (DM, g kg^{-1}) - empirically calculated from % of moisture; Nitrogen-free extracts (NFE, %) = 100 - (CP, % + CFr, % + CF, % + Ash, % + Moisture, %) converted to g kg^{-1}; Calcium (Ca, g kg^{-1}) - according to Schottz (complexometric) and Phosphorus (P, g kg^{-1}) - with vanadate-molybdate reagent by the method of Gericke and Curmis – spectrophotometer (*Agilent 8453 UV - visible Spectroscopy System*), measuring in the area of 425 ηm.

Feed Units for Milk (FUM) and Feed Units for Growth (FUG) were empirically measured and calculated on the basis of equations, according to the experimental values of CP, CFr, CF and NFE, recalculated by the digestibility coefficients according to Todorov (2010): Gross energy (GE, MJ/kg DM) = 0.0242*CP + 0.0366*CF + 0.0209*CFr + 0.017*NFE - 0.0007*Zx and Exchange energy (EE, MJ/kg DM) = 0.0152*DP (Digestible protein) + 0.0342*DF (Digestible fat) + 0.0128*DFr (Digestible fiber) + 0.0159*DNFE (Digestible NFE) - 0.0007*Zx.

Statistical data processing was performed by analysis of variance (ANOVA).

RESULTS AND DISCUSSIONS

Botanical composition of grass stand of perennial meadow grasses

Climatic conditions in the experimental area and the mode of use have an impact on the botanical composition of the grass stand (Pawluczuk & Grabowski, 2014; Babić et al., 2019; Churkova & Churkova, 2021b).

On average for the period, tall fescue provided the highest share of the main crop (98.3%) in **spring grass stand** and respectively the lowest degree of weed infestation (1.7%) compared to the other perennial grasses included in the experiment. Good drought resistance and a strong root system have had a positive effect on the share of Smooth brome in **summer regrowths**. Representatives of cv. BV-1exp cultivar form a grass mass with the lowest weed infestation (5.2%) and the highest share (94.8%) of that grass in the second regrowths. For the test period, meadow fescue and Italian ryegrass (cv. K-13) had the lowest share in the first and second regrowth, respectively.

Summer grass stand had a higher share of weeds compared to spring. In the first regrowth, the relative share of weeds was from 1.7% (tall fescue) to 4.3% (meadow fescue), and in the second from 5.2% (smooth bromegrass) to 20.1% (perennial ryegrass).

The cultivars of Italian ryegrass (Figures 1 and 2) had the highest percentage share of the main grass crop in the spring (cv. K-13 - 98.1%) and

summer biomass (cv. K-29t - 94.7%). In contrast, meadow fescue (93.3%) and smooth brome (93.2%) occupied the lowest share in spring grass stand, while perennial ryegrass (86.9%) in summer grass stand. *Lolium perenne* L. is a perennial forage crop with a clear competitiveness and demanding to soil and air humidity. For the experimental period, perennial ryegrass had the lowest share in the biomass formed in the second regrowth and respectively with the lowest values of the indicator.

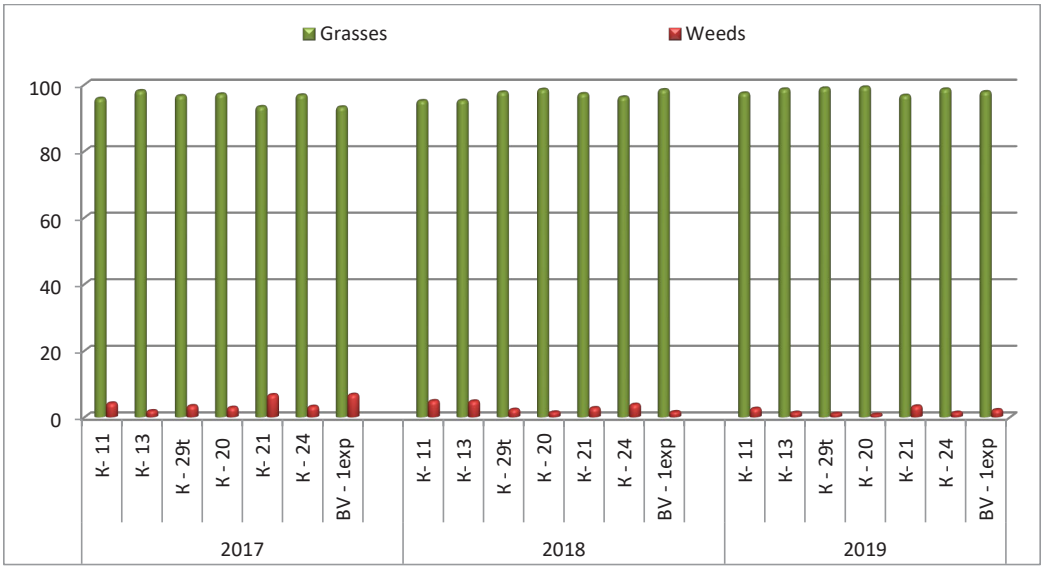

Figure 1. Botanical composition of grass stand of perennial meadow grasses by years (first regrowth, %)

Meadow fescue is tolerant to summer droughts, despite that their persistence negatively affects the growth and yield of the crop (Babić et al., 2010). In this case, the share of meadow fescue and smooth brome in the spring and summer regrowth was extremely equal.

The relative difference between the values was 0.3% (*Festuca pratensis* Huds.) and 0.2% (*Bromus inermis* Leyss). As a typical pasture grass, meadow fescue grows intensively throughout the vegetation season, but after mowing its development is suppressed.

Its share in the grass stand of the first and second regrowth reached 97.2 and 74.1% (2018) and 96.7 and 89.4% (2019).

In the case of smooth brome, this tendency was maintained in the fourth vegetation, when the difference in the weight percentage of the main crop between the regrowths was minimal (0.7%).

In the third and fourth vegetation, tall fescue (98.5 and 99.2%) and smooth brome (94.4 and 97.1%) realized the highest share in the fodder mass during spring and summer mowing compared to the other grasses included in the experiment.

In the experimental area, the soils have an unfavorable water-air regime, but are suitable for growing fodder grasses (Penkov et al., 1992). Cock's foot is not demanding to the soil mechanical composition, but prefers soils with sufficient lime content, which are lacking in the experimental area. For the four-year study period, *Dactylis glomerata* L. demonstrated optimal realization and good distribution of the species in spring and summer grass stand. Its share in the fodder mass of the first regrowth varied from 96.2% to 98.6% and in the second from 91.7% to 96.8%.

There is a cultivar specificity in terms of the botanical composition of the grass stand of Italian ryegrass. In the foothill conditions of the Central Balkan Mountains, cv. K-29t showed better adaptability and ecological plasticity. Its weight percentage in the feed mass was higher by 0.4% (in the spring regrowth) and by 4.9% (in the summer regrowth) compared to that of cv. K-13.

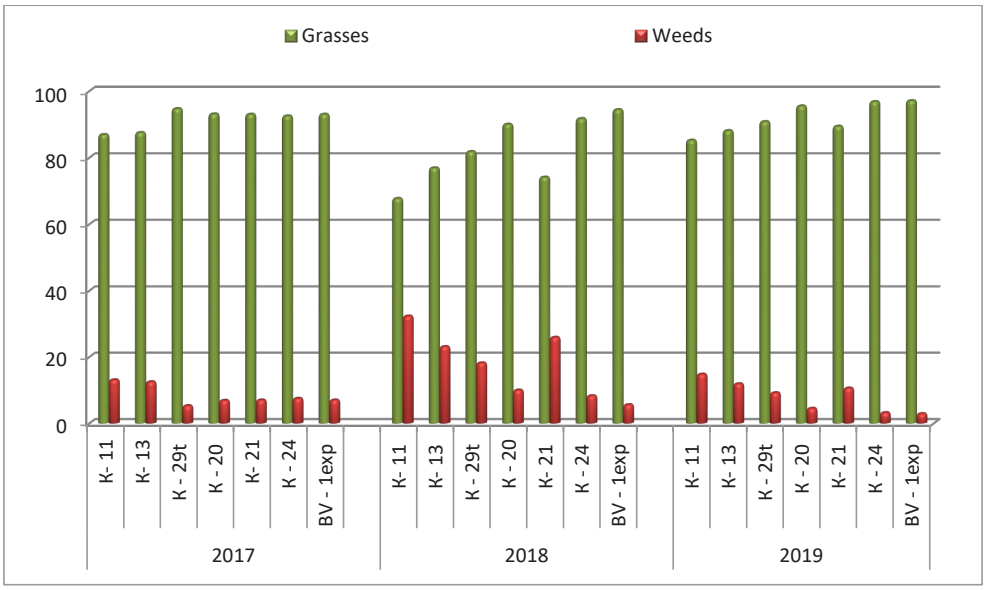

Figure 2. Botanical composition of grass stand of perennial meadow grasses by years (second regrowth, %)

The representatives of cv. K-29t showed higher aggression and competitiveness compared to weeds, as in the spring grass stand the percentage of weeds varied from 1.1 to 3.4% and in the summer from 5.3 to 18.2%.

The spring regrowths of cv. K-13 had 34.8% higher degree of weed infastation than cv. K-29t and the summer by 48.3%.

The biological characteristics and the ability of grasses to compete are important factors for maintaining the dynamic stability of the grass stand and suppressing the development of weeds. On the other hand, the dynamics of weed infestation gives a clear idea of the cleanliness of grass areas.

Spring grass stand had a lower degree of weed infestation than summer ones. In the first regrowth, smooth bromegrass, perennial ryegrass and cock's foot registered maximum values of the indicator, respectively 6.8%, 4.9% and 3.3%.

In the second regrowth, the trend was preserved only in the biomass of perennial ryegrass, where the values of the indicator varied from 13.1% to 32.3%.

Qualitative characteristics of fodder biomass from perennial meadow grasse

The biomass of perennial meadow grasses is characterized by good quality and high dry matter content (Table 2). The botanical composition of the grass stand is a major indicator influencing the quality and economic characteristics of the feed (Woodward et al., 2013). The high percentage of smooth bromegrass combined with a high share of leaves in the grass stand, implies the formation of biomass rich in protein and high dry matter digestibility. On average for the period, the data from the analysis show the highest content of dry matter (911.7 g kg^{-1}) and crude protein (145.2 g kg^{-1} DM) in the grass stand of *Bromus inermis* Leyss, followed by those of *Dactylis glomerata* L. (DM - 910.1 g kg^{-1} and CP - 138.7 g kg^{-1} DM). The values of these characteristics exceed the average by 0.5 and 16.7%, respectively. According to Babić et al. (2017) the ripening phase of cock's foot (cv. K-24) occurs later, which favours the yield of crude protein (1322 kg ha^{-1}) and increases the quality of the dry matter in the grass stand.

In the mountainous conditions of the Central Balkan Mountains the dry matter in the biomass of Italian ryegrass varied from 905.5 to 905.8 g kg^{-1}, and the crude protein content from 96.0 to 110.1 g kg^{-1} DM. The protein concentration prevailed with 14.7% in the dry feed mass of the tetraploid cultivar (K-29t) compared to the diploid (cv. K-13).

In the representatives of genus *Festuca* the difference in the values of dry matter is minimal (0.3%). Meadow fescue (cv. K-21) is characterized by high quality of dry matter, in the composition of which the average value of crude protein and crude fiber reached 124.8 and 290.7 g kg^{-1} DM, respectively (Ignjatović et al., 2004). The data obtained in the present study showed lower average values regarding the amount of crude protein (122.7 g kg^{-1} DM) and higher regarding the amount of fiber fraction (352.2 g kg^{-1} DM). Compared with tall fescue (the species with the lowest amount of fiber fraction, average for the period), *Festuca pratensis* Huds. had a higher content of crude protein (by 3.1%) and crude fiber (by 10.6%).

The aboveground matter of perennial ryegrass had the least amount of dry matter (901.1 g kg^{-1}), but with a good content of crude protein (131.7 g kg^{-1} DM).

Agroecological characteristics in the habitat area, as well as the concentration of micro and macronutrients in the soil composition, have a significant effect on the mineral composition of the grass cover (Baryła et al., 2009; Pawluczuk & Grabowski, 2014). The content of mineral and nitrogen-free extracts in the dry fodder varied respectively from 60.1 g kg^{-1} DM (Italian ryegrass - cv. K-13) to 66.7 g kg^{-1} DM (tall fescue) and from 386.5 g kg^{-1} DM (cock's foot) to 442.0 g kg^{-1} DM (Italian ryegrass - cv. K-13).

Table 2. Basic chemical composition of dry mass of perennial grasses on average for the period 2017-2019 (g kg^{-1} DM)

Variant	DM	CP	CFr	CF	Ash	NFE	Ca	P
				2017				
K-11	905.6	172.5	341.5	23.5	65.8	396.6	10.0	0.5
K-13	908.0	131.6	409.1	26.7	63.3	369.3	8.0	0.3
K-29t	906.7	88.3	386.9	18.8	60.8	445.2	6.0	0.6
K-20	901.8	152.6	363.4	15.9	72.6	395.5	8.0	0.3
K-21	910.1	130.4	366.7	18.4	71.8	412.8	9.0	0.7
K-24	909.3	150.4	418.1	31.1	54.1	346.2	10.0	0.2
BV-1	914.3	152.7	412.3	23.1	56.7	355.2	9.0	0.6
				2018				
K-11	899.5	125.2	380.0	26.3	58.0	410.3	16.3	0.6
K-13	898.6	75.2	360.1	15.1	57.8	491.8	15.1	1.4
K-29t	900.1	153.1	382.7	10.3	61.7	392.1	17.6	1.8
K-20	913.1	117.0	320.6	14.9	63.7	483.8	15.9	1.7
K-21	897.3	134.7	368.6	23.3	70.9	402.7	16.4	2.3
K-24	905.8	133.6	361.4	25.4	64.6	415.1	11.3	1.6
BV-1	907.1	150.4	343.0	21.7	67.1	417.8	13.6	1.9
				2019				
K-11	898.1	97.2	365.2	19.8	60.3	457.5	23.8	1.2
K-13	910.8	81.0	379.9	14.4	59.3	465.4	23.2	1.6
K-29t	909.6	89.3	370.5	19.5	61.8	458.9	18.4	0.9
K-20	911.9	98.9	372.7	24.0	63.9	440.4	23.1	1.5
K-21	910.6	114.5	433.3	20.4	52.4	379.3	23.2	1.2
K-24	915.2	132.2	384.8	15.3	69.4	398.2	32.5	3.0
BV-1	913.6	132.6	371.3	22.1	58.7	415.5	27.8	2.1
				2017-2019				
K-11	901.1	131.7	362.2	23.2	61.4	421.4	17.1	0.8
K-13	905.8	96.0	383.1	18.7	60.1	442.0	15.7	1.1
K-29t	905.5	110.1	380.0	16.2	61.4	432.2	14.2	1.1
K-20	908.9	122.7	352.2	18.3	66.7	440.1	16.0	1.2
K-21	906.0	126.5	389.6	20.7	65.0	398.2	16.5	1.4
K-24	910.1	138.7	388.2	23.9	62.7	386.5	18.3	1.6
BV-1	911.7	145.2	375.6	22.3	60.8	396.1	17.1	1.5
Mean±Sx	***907.0±1.3***	***124.4±6.4***	***375.8±5.3***	***20.5±1.1***	***62.6±0.9***	***416.7±8.6***	***16.4±0.5***	***1.3±0.1***
SD	***3.5***	***16.9***	***13.9***	***2.9***	***2.4***	***22.8***	***1.3***	***0.3***

The content of calcium and phosphorus affects the biological value of the feed mass (Wyłupek et al., 2014). Cock's foot is extremely adapted for growing in mountain conditions (Babić et al., 2017). The present studies show that the grass stand of *Dactylis glomerata* L. had the

highest content of Ca (18.3 g kg^{-1} DM) and P (1.6 g kg^{-1} DM). The quantitative ratio of both macroelements (Ca/P) in the dry matter composition was 11.4/1, which positively affected the quality and nutritional value of feed, as well as the health of ruminants.

The content of calcium in the grass stand of smooth brome and perennial ryegrass was 17.1 g kg^{-1} DM. The values of the indicator exceeded genus *Festuca* from 3.6 to 6.9% and the cultivars of Italian ryegrass from 8.9 to 20.4%.

Crude fat improves the taste of feed and is a major source of energy for ruminants. For the period 2017-2019 the highest content was found in cock's foot (23.9 g kg^{-1} DM), perennial ryegrass (23.2 g kg^{-1} DM) and smooth brome (22.3 g kg^{-1} DM). The values of the trait exceeded the average for the period (20.5 g kg^{-1} DM) by 16.6%, 13.1% and 8.8%, respectively.

Dependencies between indicators of botanical and chemical composition of grass stand

A high correlation was found (r = 0.92) between the amount of dry matter (as a main indicator in the selection programs of meadow grasses) and the percentage share of the species in the formed biomass (Table 3).

Table 3. Correlation dependences between percentage share of meadow grasses, dry matter and some basic quality indicators

	Grasses %	DM g kg^{-1}	CP g kg^{-1}	CFr g kg^{-1}	CF g kg^{-1}	NFE g kg^{-1}	Ca g kg^{-1}	GE MJ/kg	EE MJ/kg	FUM	FUG
Grasses	1										
DM	**0.92**	1									
CP	0.36	0.44	1								
CFr	0.05	0.25	-0.03	1							
CF	-0.06	0.15	**0.77**	0.14	1						
NFE	-0.18	-0.37	-0.79	-0.55	-0.77	1					
Ca	0.15	0.35	**0.76**	0.14	**0.95**	-0.74	1				
GE	0.13	0.32	**0.84**	0.38	**0.89**	-0.93	**0.81**	1			
EE	0.00	-0.13	0.31	-0.89	0.19	0.29	0.13	0.00	1		
FUM	-0.02	-0.17	0.16	-0.94	0.04	0.44	0.00	-0.17	**0.99**	1	
FUG	0.11	0.24	**0.89**	-0.01	**0.90**	-0.73	**0.80**	**0.92**	0.40	0.24	1

P <0.05; FUM - Feed Units for Milk (number in kg DM); FUG - Feed units for growth (number in kg DM).

Crude protein is positively correlated with the amount of crude fat (r = 0.77), calcium content (r = 0.76), gross energy of grass stand (r = 0.84) and the number of feed units for growth (r = 0.89), and in contrast with a high negative correlation with the amount of nitrogen-free extracts (r = -0.79).

A strong negative correlation was found between the values of the fiber fraction with the amount of metabolic energy (r = -0.89) and the number of feed units for milk (r = -0.94). The variable values of nitrogen-free extracts maintained a negative correlation with calcium content (r = -0.74), the total energy value of the feed (r = -0.93) and the number of feed units for growth (r = -0.73).

Among the indicators characterizing the nutritional value of perennial forage grasses, feed units for milk show a dependence on the exchange energy expressed by a high correlation coefficient (r = 0.99 - the highest compared to all other indicators), and feed units for growth with a gross energy value (r = 0.92). The balanced mineral composition of the grass stand is one of the prerequisites for good feed quality. Calcium amount (preferred in the rations of growing animals) strongly correlates with the gross energy (r = 0.81) and the number of feed units for growth (r = 0.80) in the dry matter of the harvested biomass.

Crude fats had a high negative correlation with the amount of nitrogen-free extracts (r = -0.77) and a very high positive correlation with calcium concentration (r = 0.95), the amount of gross energy (r = 0.89) and the number of feed units for growth (r = 0.90).

CONCLUSIONS

On average for the period, tall fescue provided the highest share of the main crop (98.3%) in **spring grass stand** and respectively the lowest degree of weed infestation (1.7%) compared to the other perennial grasses included in the experiment. Smooth brome had the highest (94.8%) share in the biomass of **summer regrowths**. In contrast, meadow fescue and Italian ryegrass (cv. K-13) had the lowest share in the first and second regrowth, respectively.

With the highest dry matter content (911.7 g kg^{-1}) and crude protein (145.2 g kg^{-1} DM) were the grass stand of smooth brome and cock's foot (DM - 910.1 g kg^{-1} and CP - 138.7 g kg^{-1} DM). In the mountainous conditions of the Central Balkan Mountains the dry matter in the biomass of Italian ryegrass varied from 905.5 to 905.8 g kg^{-1}, and the crude protein content from 96.0 to 110.1 g kg^{-1} DM. There was cultivar specificity in In Italian ryegrass in terms of protein concentration in the dry feed mass. The values of the trait are 14.7% higher at cv. K-29t compared to those of cv. K-13. Meadow fescue formed an aboveground mass with higher content of crude protein (by 3.1%) and crude fiber (by 10.6%) compared to tall fescue.

The percentage share of the species affects the amount of dry matter expressed with a high correlation (r = 0.92). Crude protein content correlated positively with the amount of crude fat (r = 0.77), calcium (r = 0.76), gross feed energy (r = 0.84) and the number of feed units for growth (r = 0.89).

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