Scientific Papers. Series D. Animal Science. Vol. LXV, No. 1, 2022
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE FORAGE QUALITY OF TIMOTHY GRASS, *PHLEUM PRETENSE,* CULTIVAR 'TIROM' GROWN UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

Victor ŢÎŢEI [1], Andreea ANDREOIU [2], Vasile BLAJ [2], Adrian NAZARE[3], Teodor MARUŞCA[2], Serghei COZARI [1], Mihai STAVARACHE[3], Natalia MOCANU[1], Ana GUŢU[1], Sergiu COŞMAN[1]

[1]"Alexandru Ciubotaru" National Botanical Garden (Institute),
18 Padurii str., MD 2002, Chişinău, Republic of Moldova.
[2]Research-Development Institute for rassland, 5 Cucului str., 500128, Brasov, Romania
[3]"Ion Ionescu de la Brad" Iasi University of Life Sciences,
3, Mihail Sadoveanu Alley, 700490, Iasi, Romania

Corresponding author email: vic.titei@gmail.com

Abstract

Timothy grass, Phleum pratense, belongs to Poaceae family and is one of the most cultivated forage and pasture grasses in temperate regions. The aim of this study was to evaluate the forage quality of green mass and hay, silage and haylage prepared from timothy grass, Phleum pretense cv. 'Tirom', created at the Research-Development Institute for Grasslands, Braşov, and cultivated in the experimental plot of the "Alexandru Ciubotaru" National Botanical Garden (Institute), Chisinau. It has been determined that the dry matter of harvested timothy grass green mass contained 10.4-12.4% CP, 28.9-35.1% CF, 7.5-8.5 % ash, 31.4-36.8 % ADF, 49.5-58.9 % NDF, 3.6-4.1 % ADL, 27.8-37.4 % Cel, 18.1-27.7 % HC, 170-27.3 g/kg TSS, 56.9-61.4% DMD, 54.9-60.0% OMD, RFV=95-121, 11.91-12.60 MJ/kg DE, 9.78-10.38 MJ/kg ME, 5.81-6.42 MJ/kg NEl. The biochemical composition and nutritive value of prepared hay was: 9.3-12.2 % CP, 30.1-36.7% CF, 7.1-9.6 % ash, 33.6-38.4 % ADF, 54.1-62.1 % NDF, 3.7-4.3 % ADL, 29.9-38.3 % Cel, 20.5-26.3 % HC, 165-181 g/kg TSS, 52.8-56.9% DMD, 50.0-53.5% OMD, RFV=88-108, 11.69-12.36 MJ/kg DE, 9.60-10.18/kg ME, 5.62-61.7 MJ/kg NEl. The ensiled timothy grass fodder (silage, haylage) had pleasant color and smell, pH = 4.07-5.61, 1.6-6.9 g/kg acetic acid, 12.9-27.7g/kg lactic acid and free of butyric acid, 9.0-9.5 % CP, 6.7-8.4 % ash, 40.8-41.6 % ADF, 68.1-71.6 % NDF, 2.9-3.8 % ADL, 37.0-38.3 % Cel, 27.3-30.0 % HC, 65-131 g/kg TSS, 51.7-56.0% DMD, 46.7-46.9% OMD, 11.24-11.36 MJ/kg DE, 9.23-9.33 MJ/kg ME, 5.25-5.34 MJ/kg NEl.

Key words*: biochemical composition, cv. 'Tirom', green mass, hay, haylage, nutritive value, Phleum pretense, silage, timothy grass.*

INTRODUCTION

The human population on Earth is steadily growing, which leads to an increase in food and energy demands and aggravates the environmental challenges.

Grasslands have a wide range of ecological functions and are home to highly diverse, specialized ecosystems. *Poaceae* family has economic and ecologic importance. Grasses are represented in almost all ecosystems and are an important part of the natural food chain.

Grasslands are essential for feeding livestock, which then supply milk and meat to human populations. Meat and milk from domestic herbivores provide 16% and 8% of the global protein and kilocalorie consumption, respectively. They also provide a variety of essential micronutrients but can contribute to overweight and obesity when consumed in excess. Domestic herbivores also make significant contribution to food security through the production of manure, draught power and transport and the generation of income at household and national level. They have a key role to play in women's empowerment and gender equality, both in rural and urban areas (Mottet et al., 2018).

Livestock production has traditionally been based on forages as the primary feed, either as grazed grass or as conserved silage or hay. The forage quality is important for animal health, meat and milk production, its quality indices (Coşman et al., 2018).

The Plant List includes 154 scientific plant names of species rank for the genus *Phleum,* 18 of these are accepted species names, native to Europe, Asia, North Africa, North and South America. In the spontaneous flora of the Republic of Moldova, there are 4 species.

Phleum pratense L. (syn. *Phleum nodosum* L., *Phleum parnassicum* Boiss. & Heldr. ex Nyman*, Phleum praecox* Jord., *Plantinia pratensis* (L.) Bubani, *Stelephuros pratensis* (L.) Lunell) a cool-season hexaploid perennial, known as Timothy grass, is native to the Eurasian area. It is a plant of C_3 metabolic pathway for carbon fixation. It forms sperse tufts, grows 48-150 cm tall, the culms are erect and thicker at the base, the leaves are flat, 25-40 cm long and 6-10 mm wide, gradually narrowed, the ligule 3-7 mm long, slightly toothed, with three larger teeth; the sheaths – smooth, glabrous, with transverse striations. The inflorescence is a spike-like, cylindrical, dense panicle, 7-15 cm long, greenish in color, with spikelets containing a single flower, glumes 2-3 mm long, linearly elongated, truncated, with a long, rigidly ciliated keel, ending in an 1-2 mm long awn, the lower palea half as long as the glumes, translucent, truncated and slightly denticulated at the tip. It blooms in May-June, bears fruit in July-August. The seed – oval or convex caryopsis, covered by the lower palea, colorless, truncated at the tip and slightly dentate, finely porous on the veins, whitish-silver, the caryopsis is often glabrous. The seed is 1.5-2.0 mm long and 0.4-0.6 mm wide. The weight of 1000 seeds is 0.30-0.52 g. The seed yield is 600-800 kg/ha. The chromosome number 2n = 42. (Esser, 1993; Tran & Lebas, 2015; Țîței & Roșca, 2021).

It has been cultivated since the beginning of the 18th century and is one of the most important forage grasses in the temperate regions of the world. It is used in pasture mixtures on wetlands and for erosion control. *Phleum pratense* has the largest resistance to low temperatures compared to the other blades-grass. It has a high freezing resistance (Lemežine et al., 2004). It is sensitive on strong and prolonged drought and high temperatures, because of its root system's poor suction power.

It is well known that timothy (*Phleum pratense* L.), which is one of the most winter-hardy grasses (Nissinen, 1998), produces highly digestible forage with good conservation characteristics under cold and temperate conditions (Deinum et al., 1981). Under good management and soil conditions, the yield of timothy grass is comparable to other cool season grasses, although 70% of it is usually obtained in the first cutting (Lacefield et al., 1980).

In the Catalogue of Plant Varieties of the Republic of Moldova there are no registered varieties of *Timothy grass, Phleum pratense.*

The aim of this study was to evaluate the forage quality of green mass, prepared hay, silage and haylage from timothy grass, *Phleum pratense* cv. 'Tirom' grown under the conditions of the Republic of Moldova.

MATERIALS AND METHODS

The cultivar 'Tirom' of timothy grass, *Phleum pratense* created in the Research-Development Institute for Grassland Brasov, Romania, and grown in monoculture on the experimental land of National Botanical Garden (Institute) Chişinău, N 46°58′25.7″ latitude and E 28°52′57.8″ longitude, served as subject of the research. The samples were collected in the second and third growing seasons, the first cut of timothy grass plants was done manually in May (flowering stage) and the second cut – in August. The prepared hay was dried directly in the field. The haylage was prepared from wilted biomass. For ensiling, the green and the wilted biomass was chopped into 1.5-2.0 cm pieces by using a forage chopping unit, shredded and compressed in well-sealed glass containers. The dry matter content was detected by drying samples up to constant weight at 105°C. After 45 days, the containers were opened, and the sensorial and fermented indices of conserved forage were determined in accordance with standard laboratory procedures, the Moldavian standard SM 108 for forage quality analysis. Some assessments of the main biochemical parameters: protein, ash, acid detergent fibre (ADF), neutral detergent fibre (NDF), acid detergent lignin (ADL), total soluble sugars (TSS), digestible dry matter (DDM), digestible organic matter (DOM) have been evaluated using the near infrared spectroscopy (NIRS) technique PERTEN DA 7200 at the Research-Development Institute for Grassland Brasov, Romania. The concentration of hemicellulose

(HC) and cellulose (Cel), relative feed value (RFV), digestible energy (DE), metabolizable energy (ME), net energy for lactation (NEl) were calculated according to standard procedures.

RESULTS AND DISCUSSIONS

The seedlings of the cultivar 'Tirom' of timothy grass emerged at the soil surface 8-10 days after sowing, showing a high resistance to the frosts that occured in March and April. The young plants, during the period May-June, were characterized by optimal growth and development rates, they formed a tuft of vegetative shoots, and in the second half of July, in some plants, the appearance of generative shoots was also observed, and until the end of the growing season 10-15% of plants produced viable seeds. It was established that the fresh mass yield in the first season reached 2.88 kg/m^2, with a content of 16% dry matter and foliage of 64%.

In the second and following years, it starts growing in early spring, when the average temperature is above +5 °C. It is more vulnerable to soil moisture fluctuations, to conditions of atmospheric drought and prolonged heat as compared with other perennial grasses.

In the spring of the third year of growth, the weather conditions, characterized by high amount of rainfall and optimal air temperatures as compared with the previous year, helped the plants produce more shoots and were favorable for their growth, development and biomass production. We would like to mention that the cultivar 'Tirom' of timothy grass, in second growing season, at the first cut, reached 95.1 cm in height, but after regrowing, at the second cut – 54.3 cm in height. In the third growing season, the timothy grass plants at the first cut were taller – 108.9 cm. In the harvested biomass, in the second growing season, the leaf content was 47.3-66.7%, the amount of dry matter – 30.0-37.0%. In the third growing season, the first cut biomass contained 41.8% leaves and 35.3% dry matter. The green mass yield in the second growing season, reached 3.10 kg/m^2 at the first cut and 1.23 kg/m^2 at the second cut, but in the third growing season – 3.90 kg/m^2.

Several literature sources have described the productivity of timothy grass. According to Maruşca et al. (2011), the productivity of timothy grass cultivar 'Tirom' in Romania was 55-60 t/ha green mass or 14-15 t/ha dry matter and 600 kg/ha seeds. Esser (1993) mentioned that green mass of timothy grass, cut in the full bloom stage, was 4.0 tons/acre DM. Virkajärvi (2006) reported that, in Finland, the pastures of timothy grass yielded green mass containing 2000-3500 kg/ha dry mass and the proportion of leaves was 0.46-0.68. According to Berzins et al. (2015), under the agro-climatic conditions of Latvia, the annual dry matter yield of perennial grasses was: 6.72-8.07 t/ha *Phleum pratense,* 5.37-6.20 t/ha *Dactylis glomerata*, 4.86-5.98 t/ha *Lolium perenne*, 4.42-5.08 t/ha *Festuca pratensis* and 6.81-7.19 t/ha *Lolium*×*Festuca* hybrids.

The biochemical composition, nutritive and energy value of the green mass and hay from timothy grass*, Phleum pratense* cv. 'Tirom' in second growing season are presented in Table 1. Analysing the results of the biochemical composition of green mass, we found that the dry matter contained 113-124 g/kg CP, 289-315 g/kg CF, 75-85 g/kg ash, 314-338 g/kg ADF, 495-550 g/kg NDF, 36-39 g/kg ADL, 278-299 g/kg Cel, 181-212 g/kg HC. The dry matter obtained at the second cut had a high concentration of crude protein and ash, but a low concentration of cellulose, hemicellulose and lignin in green mass. Digestibility is the most important factor influencing nutritive and energy value, animal welfare and its productivity. The green mass of timothy grass harvested in the second growing season was characterized by 60.1-61.4% DMD, 59.3-60.0% DOM, RFV=106-121, 12.33-12.60 MJ/kg DE, 10.13-10.39 MJ/kg ME and 6.14-6.42 MJ/kg NEl. The nutritive and energy value were significantly higher in the green mass obtained at the second cut.

Analyzing the results regarding the quality of green mass from *Phleum pratense* cv. 'Tirom', in the third growing season, Table 2, we would like to mention that dry matter contained a low amount of crude protein and high amount of structural carbohydrates, lignin, which contributed to the reduction of digestibility, relative feed value and energy concentration as compared to the green mass harvested in the second growing season.

Table 1. The biochemical composition and nutritive value of green mass and hay from timothy grass, *Phleum pratense* cv. 'Tirom' in the second growing season

Indices	First cut		Second cut	
	green mass	hay	green mass	hay
Crude protein, g/kg DM	113	98	124	122
Crude fibre, g/kg DM	315	354	289	301
Ash, g/kg DM	75	75	85	96
Acid detergent fibre, g/kg DM	338	376	314	336
Neutral detergent fibre, g/kg DM	550	612	495	541
Acid detergent lignin, g/kg DM	39	42	36	37
Total soluble sugars, g/kg DM	-	-	273	186
Cellulose, g/kg DM	299	334	278	299
Hemicellulose, g/kg DM	212	236	181	205
Digestible dry matter, g/kg DM	601	560	614	569
Digestible organic matter, g/kg DM	593	530	600	535
Relative feed value	106	91	121	108
Digestible energy, MJ/kg	12.33	11.80	12.66	12.36
Metabolizable energy, MJ/kg	10.13	9.69	10.39	10.18
Net energy for lactation, MJ/kg	6.14	5.71	6.42	6.17

Literature sources indicate considerable variation in the chemical composition and nutritional value of harvested *Phleum pratense* plants. Tingle& Elliott (1975) compared the yield and quality of several grass species and mentioned that *Phleum pratense* yielded 4.6 t/ha DM with 10.9% CP and 64.1% DMD, *Phleum bertolonii* 3.7 t/ha DM with 11.6% CP and 67.9% DMD, *Festuca rubra* 2.9 t/ha DM with 12.7% CP and 59.7% DMD, *Dactylis glomerata* 2.2 t/ha DM with 12.0 % CP and 65.3% DMD, *Phalaris arundinacea* 4.1 t/ha DM with 13.1 % CP and 61.8% DMD. Mason& Flipot (1988) mentioned that timothy grass cultivars harvested for the first time in the flowering stage contained 84-99 g/kg CP, 401-423 g/kg ADF, 662-695 g/kg NDF, 53-59 g/kg ADL with 50.8-53.2 % IVDMD, but the regrown forage – 125-184 g/kg CP, 319-351 g/kg ADF, 568-607 g/kg NDF, 38-45 g/kg ADL, 62.2-64.9 % IVDMD, respectively. According to Burlacu et al. (2002), the nutritive composition of first cut timothy grass was 200-260 g/kg DM, 7.0-7.8% ash, 10.5-11.3% CP, 3.0-3.5 % fats, 29.5-29.6% CF, 47.0-47.8% NFE, 3.0% ADL, 30.2% Cel, 20.2% HC, 18.4 MJ/kg GE, but second and third cut – 190-270 g/kg DM, 8.0-1.1% ash, 10.0-160% CP, 3.5-4.5 % fats, 24.5-31.5% CF, 44.0-47.0% NFE, 18.2-18.3 MJ/kg GE. Esser (1993) mentioned that the green mass of timothy grass contained 7.2% CP, 2.57% EE, 28.3% CF, 5.13% ash, 0.37% Ca, 0.20% P and 29.8 mg/kg carotene. Wang et al. (2014), reported that the dry matter content and the nutritive value of harvested mass of *Phleum pratense* were: 124-133 g/kg DM, 136-174 g/kg CP, 35-46 g/kg fat, 323-360 g/kg ADF, 581 g/kg NDF, 61-83 g/kg WSC, 20.2-20.3 MJ/kg GE. Hetta et al. (2003) remarked that the forage quality of pure timothy first-cut green mass was 182 g/kg DM, 12.4% CP, 54.5% NDF, 9.2% WSC and 11 MJ/kg ME, but – of second-cut green mass – 219 g/kg DM, 13.7% CP, 52.0% NDF, 9.2% WSC and 11 MJ/kg ME, respectively. Tran & Lebas (2015) revealed that *Phleum pratense* fresh aerial part contained 27 % DM, 13.89% CP, 2.2 % EE, 31.8 % CF, 62.2 % NDF, 34.2 % ADF, 4.6 % lignin, 8.0 % ash, 1.4 g/kg Ca and 2.1 g/kg P, 66.7% ODM, 18.2 MJ/kg GE, 11.6 MJ/kg DE, 9.6 MJ/kg ME. Janković et al. (2018) found that the tested timothy grass population grown under the climatic conditions of Serbia contained 13.20-14.52% CP and 24.30-26.98% CF, and are available to us for a successful selection process in order to obtain new varieties of *Phleum pratense*. Karbivska et al. (2020) reported that *Phleum pratense* plants without fertilizers contained 10.7% CP, 2.8 % fats, 28.8% CF, 51.35% NFE, 7.4 % ash, 0.40% Ca, 0.25% P, 58% DMD, 0.7 fodder units/kg DM, 8.1 MJ/kg ME and 109 g digestible protein/fodder unit, but *Phleum pratense* fodders when applying $N_{90}P_{60}K_{60}$ contained 14.2% CP, 2.9 % fats, 29.0% CF, 45.9% NFE, 7.4 % ash, 0.45% Ca, 0.27% P, 59% DMD, 0.71 fodder units/kg DM, 8.3 MJ/kg ME and 144 g digestible protein/fodder unit.

Hay represents a low-cost and abundant source of nutrients, remains one of the main fodders in the diets of animals, as it helps the normal functioning of the stomach and intestines. It is the only roughage containing vitamin D, which regulates mineral metabolism in animal organism, and is vital to keep animals healthy and performance. We would like to mention that the hay prepared from timothy grass, *Phleum pratense* cv. 'Tirom' (Tables 1, 2) contained 93-122 g/kg CP, 301-367 g/kg CF, 71-96 g/kg ash, 336-384 g/kg ADF, 541-621g/kg NDF, 37-43 g/kg ADL, 299-383 g/kg Cel, 205-263 g/kg HC and 165-181 g/kg TSS. The digestibility, nutritive value and the energy value of the timothy hay were 52.8-56.9% DMD, 50.0-53.5% DOM, RFV=88-108, 11.69-12.36 MJ/kg DE, 9.60-10.1 MJ/kg ME and 5.62-6.17 MJ/kg NEl. During the process of preparing hay, we observed an increase in the concentration of structural carbohydrates, lignin, ash and a decrease in the crude protein and total soluble sugar content, dry matter digestibility and relative feed value and energy concentration as compared to harvested green mass. The timothy hay prepared from second cut green mass is characterized by high content of crude protein and ash, but optimal cell wall concentration, nutritive and energy value. The amounts of crude fibre, cellulose, hemicellulose and lignin increased significantly in the hay obtained in the third year, which had a negative effect on relative feed value and energy concentration.

Some authors mentioned various findings about the quality of timothy hay. According to Udén & Soest (1982), the chemical composition of timothy (*Phleum pratense*) hay was: 12 g/kg nitrogen, 671 g/kg cell walls, 291 g/kg cellulose, 292 g/kg hemicellulose, 84 g/kg lignin. Petit et al. (1985) revealed that the biochemical composition of timothy hay prepared from herbage harvested during head emergence stage were 6.2% ash, 10.4% CP, 2.90% EE, 33.2% CF, 47.3% NFE, 62.7% NDF, 39.4% ADF, 4.4% ADL, 23.3% HC, 35.0% Cel. Maeta et al. (1992) mentioned that first cut timothy hays prepred in June contained 5.4-8.2% ash, 5.4-10.2% CP, 66.2-75.6 % NDF, 35.1-43.3% ADF, 4.40-4.50 kcal/g, but hays prepred in July contained 5.3-5.6 % ash, 5.4-5.9% CP, 69.4-75.6 % NDF, 39.1-44.2% ADF, 4.21-4.53 kcal/g. Burlacu et al. (2002) reported that first cut *Phleum pratense* hay contained 6.8-7.8% ash, 8.6-10.5% CP, 2.5-2.8% EE, 32.8-34.8% CF, 46.1-47.3% NFE, 32.9-42.1% ADF, 30.6-32.3% Cel, 3.6-8.1% ADL, 18.3-18.5 MJ/kg GE, but second and third cut hay – 6.8-7.8% ash, 7.5-10.5% CP, 2.5-3.5 % EE, 27.5-34.5% CF, 44.0-46.5% NFE, 40.2 % ADF, 33.9% Cel, 6.1% ADL, 18.2 MJ/kg GE.

Table 2. The biochemical composition and nutritive value of green mass and hay from timothy grass, *Phleum pratense* cv. 'Tirom' in the third growing season

Indices	First cut	
	green mass	hay
Crude protein, g/kg DM	104	93
Crude fibre, g/kg DM	351	367
Ash, g/kg DM	75	71
Acid detergent fibre, g/kg DM	368	384
Neutral detergent fibre, g/kg DM	589	621
Acid detergent lignin, g/kg DM	41	43
Total soluble sugars, g/kg DM	170	165
Cellulose, g/kg DM	374	383
Hemicellulose, g/kg DM	277	263
Digestible dry matter, g/kg DM Digestible organic	569	528
matter, g/kg DM	549	500
Relative feed value	95	88
Digestible energy, MJ/kg	11.91	11.69
Metabolizable energy, MJ/kg	9.78	9.60
Net energy for lactation, MJ/kg	5.81	5.62

Table 3. The fermentation quality, biochemical composition and nutritive value of silage and haylage from timothy grass, *Phleum pratense* cv. *'Tirom'* in the third growing season

Indices	Silage	Haylage
pH index	4.07	5.61
Content of organic acids, g/kg	42.5	17.7
Free acetic acid, g/kg	1.7	0
Free butyric acid, g/kg	0	0
Free lactic acid, g/kg	6.2	3.2
Fixed acetic acid, g/kg	6.9	1.6
Fixed butyric acid, g/kg	0	0
Fixed lactic acid, g/kg	27.7	12.9
Crude protein, g/kg DM	90	95
Crude fibre, g/kg DM	394	391
Ash, g/kg DM	84	67
Acid detergent fibre, g/kg DM	416	408
Neutral detergent fibre, g/kg DM	716	681
Acid detergent lignin, g/kg DM	29	38
Total soluble sugars, g/kg DM	65	131
Cellulose, g/kg DM	387	370
Hemicellulose, g/kg DM	300	273
Digestible dry matter, g/kg DM Digestible	560	517
organic matter, g/kg DM	469	467
Relative feed value	73	78
Digestible energy, MJ/kg	11.24	11.36
Metabolizable energy, MJ/kg	9.23	9.33
Net energy for lactation, MJ/kg	5.25	5.34

Muller & Uden (2007) mentioned that the herbage from a permanent grassland consisting of timothy grass, *Phleum pratense*, meadow fescue, *Festuca pratensis*, and a small proportion (0.1) of couch grass, *Agropyron repens* contained: 352 g/kg DM, 5.9% ash, 10.8% CP, 7.0% DP, 59.0% NDF, 12.4% WSC, 74.6 % DOM and 10.1 MJ/kg ME for horses, but the prepared hay – 884 g/kg DM, 6.4% ash, 10.8% CP, 7.0% DP, 60.5% NDF, 10.1% WSC, 77.0 % DOM and 9.8 MJ/kg ME for horses, respectively. Tran& Lebas (2015) revealed that *Phleum pratense* hay contained 88 % DM, 9.1% CP, 2.3 % EE, 35.6% CF, 65.4 % NDF, 37.8 % ADF, 4.4 % lignin, 6.6 % ash, 1.6% starch, 11.5% TS, 7.5%WSC, 58.5% ODM, 18.1 MJ/kg gross energy, 10.0 MJ/kg DE, 8.0 MJ/kg ME

The management of forage as silage provides the opportunity to harvest the crop at a desired level of digestibility for subsequent feeding. Silage production minimizes the risk associated with field losses, which can be incurred under rainy conditions during hay making. Wilting herbage prior to ensiling has many advantages including reducing effluent production and fuel consumption, improved characteristics of ensiling, reduced quantities of silage for transport during feed out and reduced straw requirement for bedding livestock. Grass, when harvested and stored as silage and haylage, is an important source of nutrients for livestock, is a great way of preserving nutrients for autumn - middle spring, a period when grasslands are less productive. When opening the glass vessels with fermented fodder, silage and haylages, prepared from first cut timothy grass, *Phleum pratense* cv. 'Tirom', in the third growing season, there was no gas or juice leakage from the preserved mass. The ensiled fodder had pleasant colour and smell, the consistency was retained, in comparison with the initial green mass, without any mould and mucus. During the sensorial assessment, it was found that the prepared timothy silage had homogeneous yellow colour with pleasant smell, like pickled vegetables, but haylage – was light brown leaves and yellow stems with pleasant specific smell of pickled fruits.

The fermentation quality, biochemical composition and nutritive value of silage and haylage from timothy grass, *Phleum pratense* cv. 'Tirom' are shown in Table 3. It has been determined that the pH index was 4.07-5.61, the concentrations of organic acids reached 17.2-42.5 g/kg, and most amounts of organic acids were in fixed form. Butyric acid was not detected in the fermented fodder. The high content of organic acids, inclusive lactic acid

was in silage. Analyzing the results regarding the quality of fermented timothy forage in the third growing season, we found that the dry matter was characterized by 90-95 g/kg CP, 391-394 g/kg CF, 67-84 g/kg ash, 408-416 g/kg ADF, 681-716 g/kg NDF, 29-38 g/kg ADL, 65-131 g/kg TSS, 370-387 g/kg Cel, 273-300 g/kg HC, with digestibility, nutritive and energy value 51.7-56.0% DMD, 46.7-46.9% DOM, RFV=73-78, 11.24-11.36 MJ/kg DE, 9.23-9.33 MJ/kg ME and 5.25-5.34 MJ/kg NEl. There was a significantly higher content of crude protein, total soluble sugars and low concentration of ash and structural carbohydrates in the prepared timothy haylage. According to Petit et al. (1985), the nutrient concentration and fermentation characteristics of timothy silage were 419 g/kg DM, 6.6% ash, 12.7% CP, 3.48% EE, 42.7% NFE, 59.8% NDF, 39.8% ADF, 3.9% ADL, 20.0% HC, 35.9 % Cel with pH=4.7, 1.8 % lactic acid, 0.36 % acetic acid, 0.18% butyric acid. Narasimalu et al. (1989) mentioned that the dry matter content and chemical composition of timothy first cut silage were 319-337 g/kg DM, 16-21 N g/kg, 599-629 g/kg NDF, 368-371g/kg ADF, 38-39 g/kg ADL. Burlacu et al. (2002), reported that timothy silages contained: 200-220 g/kg DM, 7.3-8.0% ash, 10.0-11.2% CP, 3.3-4.0 % EE, 25.4-32.4% CF, 47.0-51.4% NFE, 18.4-18.8 MJ/kg GE, but haylage (wilting silage) 35.0% DM, 7.5-8.6% ash, 10.1-11.5% CP, 3.2-3.3% EE, 26.0-31.7% CF, 47.5-49.2% NFE, 18.3-18.4 MJ/kg GE. Hetta et al. (2003) mentioned that ensiled timothy first-cut fresh mass contained 168 g/kg DM, 12.4% CP, 52.7% NDF, 0.5% WSC, pH=4.64, 3.17% lactic acid, 2.88% acetic acid, 2.34% butyric acid, but ensiled timothy with lactic acid bacteria and molasses contained 187 g/kg DM, 14.1% CP, 39.6% NDF, 2.8% WSC, pH=3.92, 12.8% lactic acid, 0.9% acetic acid, 0.1% butyric acid. Muller & Uden (2007) compared the quality of conserved grass from permanent grassland consisting of timothy grass, *Phleum pratense*, meadow fescue, *Festuca pratensis*, and a small proportion (0.1) of couch grass, *Agropyron repens*, and found that the prepared silage had pH=4.94, 31.8 g/kg lactic acid, 6.6 g/kg acetic acid, 1.1 g/kg butyric acid, 309 g/kg DM, 11.3% CP, 7.4%DP, 6.6% ash, 58.5% NDF, 2.6% WSC, 77% DOM, 9.7 MJ/kg ME for horses; the haylage had pH=5.63 and contained 2.6 g/kg lactic acid, 1.4 g/kg acetic acid, 0.4 g/kg butyric acid, 577 g/kg DM, 10.8% CP, 7.2%DP, 6.4% ash, 60.8% NDF, 6.9% WSC, 74% DOM, 9.4 MJ/kg ME for horses. Ragnarsson & Lindberg (2008) reported that the dry matter content and the chemical composition of early-cut timothy haylage (stem elongation to flowering) were 469 g/kg DM, pH=5.6, 42 g/kg lactic acid, 1.1 g/kg acetic acid, 0.1 g/kg butyric acid, 17.5% CP, 25.6% CF, 8.2% ash, 4.1% EE, 6.2% sugars, 50.3.8% NDF, 29.9% ADF, 2.0% ADL, 19.3 MJ/kg GE. Kuoppala et al. (2010) remarked that the chemical composition and the feed value of silage prepared from primary growth cut timothy grass (*Phleum pratense*) and meadow fescue (*Festuca pratensis*) were: 283 g/kg DM, 6.8-8.2% ash, 12.7-15.5% CP, 49.8-58.9% NDF, 5.0-9.7% iNDF, 44.8-49.2 pdNDF, 2.3-2.7% lignin, 3.09-15.0% WSC, pH=3.97-4.22, 6.84% lactic acid, 1.31-1.74% acetic acid, 0.13-0.48% butyric acid with 64.4-70.4% DOM and 10.3-11.3 MJ/kg ME, but the silage prepared from regrown plants 227-334 g/kg DM, 9.0-9.82% ash, 11.6-15.7% CP, 51.3-53.9% NDF, 6.0-9.3% iNDF, 44.3-45.3 pdNDF, 2.2-2.8% lignin, 3.06-8.61% WSC, pH=3.92-4.30, 3.09-6.50% lactic acid, 1.12-1.55% acetic acid, 0.04-0.09% butyric acid with 60.9-66.4% DOM and 9.7-10.6 MJ/kg ME, respectively. Wang et al. (2011) revealed that the fermentation quality and chemical composition of timothy silages were: pH=4.46-4.75, 15.9-35.3 g/kg lactic acid, 24.7-36.9 g/kg acetic acid, 0.1-0.3 g/kg butyric acid 134-138 g/kg DM, 134-171 g/kg CP, 99.6-135.1 g/kg DCP, 54-57 g/kg fat, 359-384 g/kg ADF, 564-612 g/kg NDF, 16-18 g/kg WSC, 20.2-20.3 MJ/kg GE, 13.3-15.1 MJ/kg DE. Tahir et al. (2013) mentioned that timothy silage from early-cut mass contained: 238 g/kg DM, 58 g/kg ash, 167 g/kg CP, 27 g/kg EE, 482 g/kg NDF, 3 g/kg starch, 2 g/kg WSC, 204 g/kg NFC, pH=4.0, 55 g/kg lactic acid, 16 g/kg acetic acid, 80.5% OMD, 10.3-11.3 MJ/kg ME, but the silage prepared from late-cut mass – 286 g/kg DM, 62 g/kg ash, 129 g/kg CP, 18 g/kg EE, 587 g/kg NDF, 408-410 g/kg ADF, 3 g/kg starch, 3 g/kg WSC, 286 g/kg NFC, pH=3.7, 83g/kg lactic acid, 23 g/kg acetic acid, 69.9% OMD, 10.2 MJ/kg ME. Tran & Lebas (2015) revealed that *Phleum pratense* silage contained

30.8% DM, 13.9% CP, 34.6% CF, 56.2 % NDF, 36.9% ADF, 3.7 % lignin, 8.2 % ash, 7.9% TS, 6.2%WSC, 64.2% ODM, 18.2 MJ/kg gross energy, 11.1 MJ/kg DE, 8.9 MJ/kg ME. Huuskonen&Pesonen (2017) found that the first cut timothy silage contained 222 g/kg DM with 94.5% OM and 70% DOM, 15.2% CP, 3.5% EE, 59.2% NDF, 6.5% WSC, pH=3.90, 4.9% lactic+formic acids, 11.2 MJ/kg ME; the second cut silage contained 326 g/kg DM with 93.2% OM and 68.5% DOM, 14.7% CP, 3.45% EE, 53.3% NDF, 11.5% WSC, pH=4.26, 3.7% lactic+formic acids, 11.0 MJ/kg ME; the third cut silage contained 314 g/kg DM with 91.7% OM and 74% DOM, 18.6% CP, 3.20% EE, 44.0% NDF, 14.8% WSC, pH=4.56, 3.2% lactic+formic acids, 11.0 MJ/kg ME. Müller &. Johansen (2020) remarked that the quality of haylage consisting predominantly of *Phleum pratense* with the presence of *Lolium perenne* and *Festuca pratensis*, conserved in big round bales, was as follows: 556 g/kg DM, 8.9% CP, 60.0% aNDFom, 6.3% ash, 12.0% WSC, 73.5% IVDOM, pH=5.61, 2.4% lactic acid, 1.1 % acetic acid and 9.2 MJ/kg ME for horses. Richard et al. (2020) compared the feed quality and energy value of silage and mentioned that timothy silage contained 313 g/kg DM, 916 g/kg OM, 154 g/kg CP, 583 g/kg aNDF, 385 g/kg ADF, 86.3% IVTD, 1.23 Mcal/kg NEl, but tall fescue silage – 341 g/kg DM, 903 g/kg OM, 136 g/kg CP, 543 g/kg aNDF, 353 g/kg ADF, 86.13% IVTD, 1.26 Mcal/kg NEl.

CONCLUSIONS

The harvested green mass from timothy grass, *Phleum pretense* cv. 'Tirom', contained 30.0-37.0% dry matter, with biochemical composition, nutritive and energy value: 10.4-12.4% CP, 28.9-35.1% CF, 7.5-8.5 % ash, 31.4-36.8 % ADF, 49.5-58.9 % NDF, 3.6-4.1 % ADL, 27.8-37.4 % Cel, 18.1-27.7 % HC, 170-27.3 g/kg TSS, 56.9-61.4% DMD, 54.9-60.0% OMD, RFV=95-121, 11.91-12.60 MJ/kg DE, 9.78-10.38 MJ/kg ME, 5.81-6.42 MJ/kg NEl.

The biochemical composition and the nutritive value of the prepared hay were: 9.3-12.2 % CP, 30.1-36.7% CF, 7.1-9.6 % ash, 33.6-38.4 % ADF, 54.1-62.1 % NDF, 3.7-4.3 % ADL, 29.9-38.3 % Cel, 20.5-26.3 % HC, 165-181 g/kg TSS, 52.8-56.9% DMD, 50.0-53.5% OMD, RFV=88-108, 11.69-12.36 MJ/kg DE, 9.60-10.18 kg ME, 5.62-61.7 MJ/kg NEl.

The ensiled fodder (silage, haylage) of timothy grass cv. 'Tirom' had pleasant color and smell, pH = 4.07-5.61, 1.6-6.9 g/kg acetic acid, 12.9-27.7 g/kg lactic acid and free of butyric acid, 9.0-9.5 % CP, 6.7-8.4 % ash, 40.8-41.6 % ADF, 68.1-71.6 % NDF, 2.9-3.8 % ADL, 37.0-38.3 % Cel, 27.3-30.0 % HC, 65-131 g/kg TSS, 51.7-56.0% DMD, 46.7-46.9% OMD, 11.24-11.36 MJ/kg DE, 9.23-9.33 MJ/kg ME, 5.25-5.34 MJ/kg NEl.

Under the climatic conditions of the Republic of Moldova, cv. 'Tirom' of timothy grass, *Phleum pratense,* has optimal productivity and biochemical composition, can be used to re-cultivate permanent grasslands and to establish temporary grasslands in order to help prevent soil erosion, in monoculture or associated with other grasses and forage legumes, and the harvested mass can be fed to the livestock as fresh green mass, hay, silage and haylage.

ACKNOWLEDGEMENTS

The study has been carried out in the framework of the project: 20.80009.5107.02 *"Mobilization of plant genetic resources, plant breeding and use as forage, melliferous and energy crops in bioeconomy"*

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