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THE CHEMICAL COMPOSITION AND NUTRITIONAL VALUE OF THE PLANT MASS OF THE NEW HYBRID OF SORGHUM - SUDAN GRASS 'SAȘM-4' GROWN UNDER THE CONDITIONS OF MOLDOVA

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Abstract

To establish a fodder base under the conditions of climate change, it is necessary to use new plants species, cultivars and hybrids, which are more resistant to droughts and high temperatures. One of these plants is the new sorghum - Sudan grass hybrid 'SAȘM 4'. The goal of our research was to determine the dynamics of the chemical composition and nutritional value of these plants harvested in different developmental periods: stem elongation, tasselling, milk-wax and wax stage of grains, as well as the capacity of being processed into silage. It was determined that the dry matter content in the harvested green mass varied depending on the harvest time from 130.0 g/kg in the stem elongation period to 340.1 g/kg in the wax stage of grains, its chemical composition and nutritional value were: 6.53-18.40% crude protein, 2.05-3.86% crude fats, 28.62-37.61% crude cellulose, 38.90-54.84% nitrogen free extract, 7.71-10.56 % sugars, 1.43-11.94% starch, 5.25-10.22 % ash, 0.20-0.30% calcium, 0.13-0.26% phosphorus, 31.85-53.00 mg/kg carotene, 0.12-0.26 nutritive units/kg natural fodder and 1.29-2.96 MJ/kg natural fodder metabolizable energy. The fermentation quality and fodder value of silage prepared from the sorghum- Sudan grass hybrid 'SAȘM-4' were: pH = 4.06, 19.8 g/kg lactic acid, 6.9 g/kg acetic acid, butyric acid was not detected, 334.8 g/kg DM, 7.05% crude protein, 2.55% crude fats, 34.05% crude cellulose, 51.12% nitrogen free extract, 1.03% soluble sugars, 9.96% starch, 5.22% ash, 0.22% calcium, 0.15-0.27% phosphorus, 23.75 mg/kg carotene, 0.26 nutritive units/kg silage and 2.99 MJ/kg silage metabolizable energy.

Key words: *chemical composition, green mass, nutritional value, silage, sorghum - Sudan grass hybrid 'SAȘM-4'*

INTRODUCTION

Milk and meat are some of the most valued products for human beings produced by ruminant livestock. Adequate animal nutrition is one of the most important factors which determine not only the quantity but the quality of the milk and meat produced.

The diversification of fodder sources for the animal husbandry sector of the Republic of Moldova is a necessity dictated by several factors, but primarily by climate change, which imposes the need to use new, lesser-known fodder plants that are more resistant to high temperatures and insufficient rainfall.

The plants with C_4 carbon fixation have a particular leaf structure, the so-called Kranz anatomy, with 2 types of assimilatory cells: a layer of mesophyll cells surrounding a inner layer of bundle sheath cells enclosing like a ring the vascular bundle, the process of photosynthesis takes place inside the cells and is faster than in C_3 plants under conditions of intense light and high temperatures because CO_2 is supplied directly to ribulose bisphosphate carboxylase (RUBISCO), not allowing the assimilation of O_2 and photorespiration, they have a better water use efficiency because phosphoenolpyruvate carboxylase (PEP Carboxylase) quickly transports CO_2 and there is no need for the stomata to be open for too long (thus reducing water loss through transpiration) for the same amount of CO_2 gained for photosynthesis (Petcu, 2008).

Among C_4 plants, the genus *Sorghum* Moench is of particular interest. It belongs to the tribe *Andropogoneae,* subfamily *Panicoideae,* family *Poaceae*, which includes 31 species, native to Europe, Asia, North and South

America, as well as Australia. *Sorghum* species have recently gained popularity due to their numerous advantages, such as heat and drought tolerance, resistance to specific diseases and pests, being able to exploit the salty soils where the cultivation of cereals is more difficult. The adaptive nature of *Sorghum* species as C_4 plants and the better water use efficiency, their potential to produce higher yields of grains or green forage and their diverse uses make them a valuable "tool" and one of the best choices for forage growers and dairy farmers demanding high quality feed stocks, also for food and other industrial uses, production of cellulose or renewable energy (Moraru, 2008; Voicu et al., 2013; Herrmann et al., 2016; Roman et al., 2016; Wannasek et al., 2017; Zhang et al., 2021). *Sorghum* grains can be used to produce gluten-free foods, can be given to sheep, pigs and even poultry, but are usually ground for cattle (Marin et al., 2016).

In our region, in the 17th century, sorghum was introduced to make brooms - *Sorghum technicum* (Körn.) Trab., and during the last century, other species were also introduced: for grains - *Sorghum bicolor*, for fodder - *Sorghum sudanense*, and for the food industry *Sorghum bicolor* var. *saccharatum* and *Sorghum bicolor* var. *oryzoidum,* as well as *Sorghum* × *almum* - also for the production of fodder (Moraru, 2008; Ţîţei et al., 2019).

Sorghum bicolor (sorghum) has been widely used for the production of forage and silage to feed animals, besides being used as a grain and energy crop. Its leaves are broad, have high palatability and provide green fodder over a longer period, but *Sorghum bicolor* is not a multi-tillering and multicut. On the other hand, *Sorghum sudanense* (Sudan grass) is a multicut and multi-tillering fodder plant but its leaves are narrow, having low palatability. Therefore, it became needed to converge the favorable characters of sorghum and Sudan grass to develop a multicut and multi-tillering plant producing palatable green fodder. The sorghum-sudangrass hybrids obtained when crossing *Sorghum bicolor* (L.) Moench and *Sorghum sudanense* (Piper) Stapf, have been well accepted by cattle farmers because they have flexible planting times and high production potential, and are an option for intensifying animal production, especially at times of feed shortage. The importance of sorghum-Sudan grass hybrids as annual forage in the composition of diversified feeding systems has combined with the increasing demand for forages of greater nutritional value. Hybrids between sorghum and Sudan grass take the positive parts of both species: from sorghum - the capacity to grow taller and a higher sugar content, from Sudan grass - the ability to regenerate quickly after mowing, which gives the possibility to cut the plants up to three times per year. Sorghum - Sudan grass hybrids offer a solution to producing forage when other fodder crops are not available and emergency occurs. In comparison with maize, sorghum - Sudan grass hybrids can generate dry matter in similar quantities for silage, has equivalent yield potential and has greater water use efficiency and drought resistance (Getachew et al., 2016).

In the Republic of Moldova, for several years, research has been carried out in order to obtain hybrids between sorghum and Sudan grass (Moraru, 1989; 2008; Chisnicean, 1995). One of these hybrids, recently obtained at the Institute of Genetics, Physiology and Plant Protection, is the SAȘM-4 hybrid (BOPI 11/2022), which, as claimed the authors, can be used to obtain green mass, produce silage, haylage and hay, but in-depth research in this regard has not been carried out yet. The main goal of the research carried out by us was to determine the chemical composition and the nutritional value of the plant mass of this hybrid, harvested in various stages of development, as well as its capacity to be ensiled.

MATERIALS AND METHODS

The sorghum - Sudan grass hybrid 'SAȘM-4' which was cultivated in the experimental plot of the Plant Resources Laboratory of the National Botanical Garden (Institute), N 46°58′25.7″ latitude and E 28°52′57.8″ longitude, served as subject of the research.

The plant samples were collected in 4 periods: stem elongation, tasselling, milk-wax stage of grains and wax stage of grains. The harvested plants were chopped into 1.5-2.0 cm small pieces, with a laboratory forage chopper, the dry matter content was detected by drying samples up to constant weight at 105°C. The chopped mass samples were dehydrated in an oven with forced ventilation at a temperature of 60°C; at the end of the fixation, the biological material was finely ground in a laboratory ball mill. The preparation of silage and the evaluation of its quality were carried in accordance with the methodological indications and the requirements of the **Moldavian standard SM 108. The chopped green mass was compressed in well sealed glass containers, stored at ambient temperature (18-20°C) for 45 days, to allow complete fermentation to occur. Following the 45-day fermentation period, each glass container was opened and the content was visually examined, the colour and the aroma were recorded. The pH of the samples of silage was measured immediately after removal from the containers. At the same time, samples were taken to determine the content of organic acids (lactic, acetic and butyric) in free and fixed state. The evaluation of chemical composition: crude protein (CP), crude fat (EE), crude cellulose (CF), nitrogen-free extract (NFE), soluble sugars (SS), starch, ash, calcium (Ca), phosphorus (P), carotene, content of organic acids in silage were carried out in the Laboratory of Nutrition and Forage Technology of the Scientific-Practical Institute of Biotechnology in Animal Husbandry and Veterinary Medicine, in accordance with the methodological indications. The nutritive units and metabolizable energy were calculated according to standard procedures (Kalashnikov et al., 2003).

RESULTS AND DISCUSSIONS

The adequacy of nutrients supplied by feed is an essential factor for animal performance. Feed should contain a satisfactory concentration of proteins and nonfibrous carbohydrates (starch and soluble sugars), the latter being the most important source of energy produced in the rumen. This concentration stimulates the growth of bacteria and increases the production of microbial protein and volatile fatty acids necessary to induce an optimal productivity of milk or meat in livestock. To provide animals with high quality forage, practical methods are needed to estimate nutritive value to optimize harvest timing.

Table 1. The chemical composition and nutritional value of the green mass of depending on the harvest time of sorghum - Sudan grass hybrid 'SAȘM-4'

Indices	Sorghum - Sudan grass hybrid 'SAȘM-4'				Corn hybrid 'Porumbeni 374' wax stage of grains
	stem elongation stage	tasseling stage	milk-wax stage of grains	wax stage of grains	
Dry matter, g/kg GM	130.0	226.3	321.4	340.1	320.2
Crude protein, % DM	18.40	8.47	6.16	6.53	7.26
Crude fats, % DM	3.86	2.75	2.05	2.19	2.83
Crude cellulose, % DM	28.62	37.61	32.83	30.94	18.40
Nitrogen free extract, % DM	38.90	45.19	53.71	54.84	67.92
Soluble sugars, % DM	7.91	10.56	9.43	7.71	7.55
Starch, % DM	1.43	1.50	8.23	11.94	22.79
Ash, % DM	10.22	5.99	5.25	5.49	3.59
Nutritive units/ kg GM	0.12	0.23	0.24	0.26	0.32
Metabolizable energy, MJ/kg GM	1.29	2.33	2.82	2.96	3.33
Calcium, % DM	0.31	0.20	0.24	0.30	0.24
Phosphorus, % DM	0.26	0.13	0.14	0.14	0.22
Carotene mg/ kg	53.00	32.96	35.00	31.85	14.30

The data on the chemical composition of the green mass of the sorghum x Sudan grass 'SAȘM-4' plants (Table 1) harvested in the stem elongation stage, when the plants were about 1.25 m tall, show that it is characterized by a low content of dry matter, but very high - of crude protein (18.40%), crude fat (3.86%), carotene (53.00 mg/kg), ash (10.22%), calcium (0.31%) and phosphorous (0.26%). The energy load of the plant in this stage of development is only 0.12 nutritive units/kg or 1.29 MJ/kg, but relatively to the dry matter content, the

nutritional value is very high: 0.92 nutritive units/kg and 9.53 MJ/kg metabolizable energy.
In a more advanced stage of development - the tasselling stage, the plants of this hybrid had a lower moisture content of 77.37%, the content of crude protein and crude fat decreased sharply, and the amount of crude cellulose and Nitrogen free extract increased essentially as compared with the previous plant development stage. The sugar content increased and reached 10.56%, while the starch content varied insignificantly. The content of mineral substances, phosphorus and calcium decreased sharply, and the amount of carotene decreased even more significantly. The energy load of the natural feed harvested in this development stage increased up to 0.23 nutritive units/kg and 2.33 MJ/kg metabolizable energy.
The determination of the content of dry matter and its chemical composition in the fodder harvested in the milk-wax stage of grains demonstrated an essential increase in the dry matter content and a decrease in the content of crude protein, crude fat and crude cellulose. A significant increase in nitrogen free extract and starch content was found in comparison with the previous harvest period. The energy load of the natural feed harvested in this development stage reached 0.24 nutritive units/kg and 2.82 MJ/kg metabolizable energy.
The sorghum x Sudan grass plants harvested in the wax stage of grains are characterized by a higher content of dry matter, and especially of starch and calcium, a decrease in the content of crude cellulose and soluble sugars as compared with the previous harvest stage. The sorghum x Sudan grass natural forage harvested in the wax stage of grains has a higher content of dry matter than maize. The content of nutrients differs essentially; the sorghum x Sudan grass fodder has a higher content of crude cellulose, ash, phosphorus and carotene and - lower of nitrogen free extract and starch, which has a negative impact on the energy input of the feed.
Several literature sources describe the productivity and nutritional value of sorghum - Sudan grass hybrids. According to Chisnicean (1995), the best sorghum - Sudan grass lines produce more than 19-20 t/ha dry matter with 13-15 % protein. Burlacu et al. (2002) revealed that *Sorghum bicolor x sudanense* green forage harvested in the tasseling period contained 200 g/kg DM, 16.3% CP, 4.2% EE, 26.6% CF, 41.8% NFE, 11.1% ash and 18.3 MJ/kg GE, in flowering period - 300 g/kg DM, 9.4% CP, 3.1% EE, 29.7% CF, 47.8% NFE, 10.0% ash and 17.8 MJ/kg GE, but in milk stage of grains - 332 g/kg DM, 4.8% CP, 2.4% EE, 36.5% CF, 48.2% NFE, 8.1% ash and 17.9 MJ/kg GE. Pospišil et al. (2009) remarked that forage sorghum, hybrid Grazer N (*Sorghum bicolor* x *S. sudanense*), harvested in the period when plants were 100 cm tall, contained 13.5-14.6% CP, 9.4-9.8% DP, 3.3-3.4% EE, 23.3-27.2% CF, 57.6-63.4% NDF, 28.9-33.7% ADF; the forage harvested when the plants were 150 cm tall contained 9.6-12.8% CP, 6.6-8.2% DP, 2.0-2.8% EE, 25.8-31.2% CF, 63.6-69.3% NDF, 30.2-38.5% ADF, but forage harvested in the tasselling stage - 6.4-9.1% CP, 4.3-6.5% DP, 1.9-2.1% EE, 29.5-32.2% CF, 63.7-65.9% NDF, 35.2-38.9% ADF, respectively. Uzun et al. (2009) mentioned that total fresh herbage yields of eight sorghum x Sudan grass hybrid cultivars grow under the ecological conditions of Samsun, Turkey, varied from 50.04 t/ha to 97.41 t/ha, the nutritional and chemical properties of first-harvest dry matter were 6.82-9.03% CP, 6.12-7.76% ash, 66.04-74.89% NDF, 40.24-48.32% ADF, RFV=63.78-81.53, 0.40-0.67% Ca, 0.21-0.30% P, 1.37-1.51% K, 0.14-0.20% Mg. Glamoclija et al. (2011) found that the chemical compositions of dry biomass samples of sorghum - Sudan grass harvested in stem elongation period was 11.13-13.48% CP, 5.56-6.74% DP, 2.13-2.24% EE, 29.07-30.88% CF, 43.01-45.24% NFE, 10.58-11.32% ash, but the sorghum - Sudan grass plants harvested in tasseling period contained 10.04-11.26% CP, 5.02-5.64% DP, 2.14-2.32% EE, 30.65-32.67% CF, 43.48-45.33% NFE, 10.36-10.48% ash. Kerckhoffs et al. (2011) revealed that the dry matter content and biomass composition of sorghum cultivars were 250-350 g/kg DM, 4.2-6.4% CP, 1.2 % EE, 6.6-13.2 % sugars, 1.1-1.3% starch, 28.7-31.5% cellulose, 23.0-24.0% hemicellulose, 31.2-33.2% CF, 57.1-60.6% NDF, 34.0-36.7% ADF, 5.2-5.3% lignin, 4.8-6.2% ash. Mahmood et al. (2013) reported that the dry matter content and the chemical composition of green mass of the cultivar 'Bovital' of sorghum - Sudan grass was 205-265 g/kg DM, 8.0-11.1% CP, 51.1-59.5% NDF, 4.4-5.2%

ADL, 7.2-11.5% sugar and 8.3-9.8% ash, but the sorghum cultivar 'Goliath' contained 165-243 g/kg DM, 7.5-10.4% CP, 53.1-61.5% NDF, 4.1-5.4% ADL, 6.9-15.5% sugar and 8.4-9.4% ash, respectively. Ferreira et al. (2015) reported that the dry matter content and nutritional quality of sorghum - Sudan grass whole plants during the growth stages from 51 to 74 days after seeding changed: 8.14-18.80% DM, 8.67-14.16% CP, 63.6-70.7% NDF, 35.3-44.4% ADF, 2.33-4.68% lignin and 540-613g/kg IVDDM. Gelley et al. (2016) found that the concentrations of nutrients in sorghum - Sudan grass harvested at 4 weeks post monthly initiation was 9.30-12.21% CP, 60.47-66.52% NDF, 39.64-44.29% ADF and 520.9-597.7 g/kg NDFD, but in the plants harvested at 8 weeks post monthly initiation, there was 7.00-9.78% CP, 69.67-70.18% NDF, 45.39-46.45% ADF and 475.3-521.5 g/kg NDFD, respectively. Temel et al. (2017) mentioned that the chemical composition, energy and nutritional value of the green mass of sorghum - Sudan grass hybrids were: 8.74-8.88% CP, 64.97-65.64% NDF, 37.60-37.95% ADF, 5.53-6.39% ADL, 59.33-59.60% DDM, 2.80-2.82 Mcal/kg DE, 2.30-2.31 Mcal/kg ME, RFV = 84.38-85.32, but a Sudan grass variety contained 6.66% CP, 65.26% NDF, 40.44% ADF, 7.07% ADL, 57.39% DDM, 2.72 Mcal/kg DE, 2.23 Mcal/kg ME, RFV = 81.82. Ferreira et al. (2018) revealed that sorghum - Sudan grass hybrids obtained by conventional breeding were characterized by 7.97-8.27% DM, 13.4-14.0% CP, 61.6-64.8% NDF, 38.8-41.9%ADF, 3.52-4.12% lignin, 56.74-58.10% TDN, but brown-midrib sorghum - Sudan grass hybrids – 7.10-7.69% DM, 15.2-18.2% CP, 54.0-59.6% NDF, 33.3-38.1%ADF, 3.39-3.61% lignin, 58.94-61.28% TDN. Nohong & Islamiyati (2018) mentioned that hybrid Sudan grass reached 196.39 cm in height and produced 13.74 t/ha dry matter forage with 6.97% CP, 38.72% ADF, 69.46% NDF, 5.56% ADL, 56.08% IVDMD and 56.27% IVOMD. Machicek et al (2019), revealed that the dry matter yield and herbage quality of a sorghum - Sudan grass cultivar, harvested in 30 days after emergence, was 1.06-1.83t/ha DM with 10.6-11.0% CP, 34.7-35.8% ADF, 58.3-62.1% NDF, 62.6-63.5% TDN, RFV= 92.8-97.3; the plants harvested in 45 days contained 2.65-4.59 t/ha DM, 5.8-9.9% CP, 38.9% ADF, 62.1-63.9% NDF, 59.0% TDN, RFV= 85.3-87.8, but in 90 days - 6.29-9.87 t/ha DM, 4.3-5.1% CP, 38.0-39.3% ADF, 59.9-64.5% NDF, 58.6-59.8% TDN, RFV= 85.5-90.8, respectively. Paradhipta et al. (2019) reported that the dry matter content, the chemical composition and *in vitro* digestibility of sorghum - Sudan grass forages were: 228-233 g/kg DM, 11.2-11.8% CP, 2.80-3.41% EE, 8.64-9.13% ash, 37.3-37.9% ADF, 67.3-67.5% NDF, 57.4-58.4% IVDMD and 52.9-53.8% IVNDFD. Rihacek et al. (2020), mentioned that studied Sudan grass hybrids were characterized by 9.7-11.2% CP, 50.1-55.6% NDF, 29.1-35.0% ADF, 45.0-55.3% IVDDM and 39.3-50.0% IVDOM, but sorghum grains varieties 11.1-11.3% CP, 48.0-50.5% NDF, 27.3-29.8% ADF, 52.8-55.0% IVDDM and 47.2-50.0% IVDOM.

The proportion of conserved forages significantly increased in relation to the total yearly feed production, and the feed quality has markedly improved during the last 50 years. During times of plentiful growth, fodders can be stored as silage or hay. Currently, silage is the most common source of preserved feed for ruminant animals. Silage, when formed properly, provides the same or even higher value as ensiled fodder. Because of its relished consumption, good quality silage can increase animal health and. Silage plays an important role in the nutrition, wellbeing and productivity of animals. It can help solving some problems in the livestock sector by providing a balanced diet for animals with an appropriate amount of protein and fibre. As for the organoleptic properties, the silage prepared from sorghum - Sudan grass hybrid 'SAȘM-4' had yellowish-green colour with pleasant smell of pickled vegetables; the texture of the plants stored as silage was preserved well, without mold and mucus. The fermentation quality and fodder values of silage prepared from the sorghum - Sudan grass hybrid 'SAȘM-4' and the maize hybrid 'Porumbeni 374' are shown in Table 2. It has been determined that pH values 3.92-4.06 and the amounts of organic acids in the prepared silage reached 26.7-36.7 g/kg, most organic acids were in fixed form, butyric acid not was detected and lactic acids constituted 74-76%. The sorghum - Sudan grass silage was characterized by low content of organic acids, in comparison with the maize silage. The dry matter content in the prepared silages varied from 319.5 g/kg in maize silage to 334.8 g/kg in sorghum - Sudan grass silage, its nutrient content was: 7.05-7.28% CP, 2.55-3.94% EE, 19.02-34.05% CF, 51.12-66.22% NFE, 0.91-1.03% soluble sugars, 9.96-24.54% starch, 3.55-5.22% ash, 0.22-0.27% Ca, 0.15-0.27% P, 23.75-28.02 mg/kg carotene. In comparison with the initial mass, in the prepared silages the level of soluble sugars decreased substantially, but crude protein, crude fats, crude cellulose, nitrogen free extract and ash did not change essentially. The dry matter of sorghum - Sudan grass silage contained a low amount of crude fats, starch and a high amount of crude cellulose as compared with the traditional silage crop - maize. It has been calculated that 100 kg of silage prepared from sorghum - Sudan grass hybrid contained 26 nutritive units, 2.36 kg crude protein and 299 MJ metabolizable energy, but maize silage - 30 nutritive units, 2.33 kg crude protein and 325 MJ metabolizable energy.

Table 2. The fermentation quality, chemical composition and nutritional value of the of the investigated silage

Indices	Sorghum - Sudan grass hybrid 'SAȘM-4' wax stage of grains	Corn hybrid Porumbeni 374 wax stage of grains
pH index	4.06	3.92
Total organic acids, g/kg DM	26.7	36.7
Free acetic acid, g/kg DM	3.3	4.3
Free butyric acid, g/kg DM	0	0
Free lactic acid, g/kg DM	7.9	12.9
Fixed acetic acid, g/kg DM	3.6	4.6
Fixed butyric acid, g/kg DM	0	0
Fixed lactic acid, g/kg DM	11.9	14.9
Total acetic acid, g/kg DM	6.9	8.9
Total butyric acid, g/kg DM	0	0
Total lactic acid, g/kg DM	19.8	27.8
Acetic acid, % total acids	25.84	24.25
Butyric acid, % total acids	0	0
Lactic acid, % total acids	74.16	75.75
Dry matter, g/kg silage	334.8	319.5
Crude protein, % DM	7.05	7.28
Crude fats, % DM	2.55	3.94
Crude cellulose, % DM	34.05	19.02
Nitrogen free extract, % DM	51.12	66.22
Soluble sugars, % DM	1.03	0.91
Starch, % DM	9.96	24.54
Ash, % DM	5.22	3.55
Nutritive units/ kg silage	0.26	0.32
Metabolizable energy, MJ/kg silage	2.99	3.25
Calcium, % DM	0.22	0.27
Phosphorus, % DM	0.15	0.27
Carotene mg/ kg	23.75	28.02

Some authors mentioned various findings about the quality of silage from *Sorghum* species. Voicu et al. (2013) reported that the silage prepared from the sorghum cultivars F436 and F465, harvested in the milk-dough stage contained 6.39-6.74% CP, 1.23-1.38% EE, 36.8-39.3% CF, 45.1-48.4% NFE, 7.03-7.58% ash, 0.34-0.39% Ca, 0.14-0.21% P, 55.50-56.90% DDM, but maize silage - 6.57-6.63% CP, 2.91-3.16% EE, 17.26-17.62% CF, 5.89-6.70% ash, 0.23-0.26% Ca, 0.13-0.22% P, 66.35-68.18% DDM. Herrmann et al. (2016) mentioned that the silage from sorghum - Sudan grass hybrid was characterized by 245 g/kg DM, pH = 3.8, 6.7% lactic acid, 1.5% acetic acid, 8.9% CP, 1.8% EE, 52.2% NFE, 58.0% NDF, 36.6% ADF, 5.5% ADL and 5.7% ash, but forage sorghum silage 243 g/kg DM, pH 3.7, 6.7% lactic acid, 1.5% acetic acid,

8.0% CP, 1.5% EE, 52.3% NFE, 60% NDF, 38.6% ADF, 5.7% ADL and 5.7% ash. Oliveira et al. (2018) found that sorghum - Sudan grass silages had pH = 3.7-3.9 and contained 262.9-289.5 g/kg DM, 3.58-4.33% lactic acid, 0.75-0.1.14% acetic acid, 0.16-0.26% butyric acid, 4.72-5.14% ash, 2.08-3.21% EE, 43.39-58.73% NDF, 24.80-43.01% ADF, 32.40-43.39% NFC, 2.10-4.09% lignin, 54.19-74.88% TDN, 53.2-78.5% IVDMD. Paradhipta et al. (2019) determined that sorghum - Sudan grass silages had 172-186 g/kg DM, pH = 4.25-4.32, 1.89-2.08% lactic acid, 0.68-0.69% acetic acid, 0.81-0.89% butyric acid, 11.5-12.5% CP, 2.50-2.66% EE, 9.08-9.14% ash, 39.5-40.4% ADF, 68.3-68.6% NDF, 49.3-54.4% IVDMD and 56.4-56.8% IVNDFD. Ozkan (2022) revealed that pure silage from sorghum - Sudan grass harvested during at the mid-dough stage was characterized by 33.04% DM, pH = 3.99, 7.62% CP, 55.46% NDF, 37.75% ADF, 8.18% ash, 61.05% DDM, 9.34 MJ/kg ME and RFV = 107.42, but the silages made from different mixtures of sorghum - Sudan grass and sunn hemp contained 29.07-31.98% DM, pH = 4.07-4.32, 9.37-15.12% CP, 56.60-60.17% NDF, 37.12-42.56% ADF, 7.22-8.03% ash, 55.75-59.99% DDM, 8.32-9.13 MJ/kg ME and RFV = 86.20-98.60. Ramzan et al. (2022) reported that the dry matter content, the chemical composition and the nutritive value of silages from sorghum - Sudan grass were characterized by the following indices 232.5 g/kg DM, pH = 4.38, 7.89% CP, 7.51% ash, 61.33% NDF, 33.62% ADF, 4.22% lignin, 29.40% CEL, 27.72% HC, 63.02% DDM, 2.71 Mcal/kg DE, 2.33 Mcal/kg ME and RFV = 96.

CONCLUSIONS

The results of the conducted research allow us to conclude that the hybrid sorghum x Sudan grass SAȘM 4 has adapted to the arid climatic conditions of the Republic of Moldova, it is characterized by an optimal content of crude protein, in certain stages of development, a constantly increasing amount of sugar and starch and relatively high carotene content.

The downside of this crop is the comparatively high crude cellulose content.

Thus, in order to reduce the negative influence of droughts on the formation of the fodder base, widening the spectrum of fodder crops used in the diets of farm animals, we recommend the use of the new sorghum x Sudan grass hybrid 'SAȘM-4' as green as well as preserved fodder.

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