

THE PRODUCTIVITY AND NUTRITIVE VALUE OF FODDERS FROM THE TALL OATGRASS, *ARRHENATHERUM ELATIUS* (L.) BEAUV

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Abstract. *This article presents the results of a study on the productivity and nutritive value of fodder from a local ecotype of tall oatgrass (*Arrhenatherum elatius*) during the second and fourth growing seasons. The productivity of tall oatgrass at the first cut reached 3.46-4.47 kg/m² fresh mass or 0.84-1.01 kg/m² dry matter. The nutritive value of the harvested mass was 77-96 g/kg crude protein, 80-84 g/kg ash, 375-414 g/kg crude fibre, 399-436 g/kg ADF, 684-740 g/kg NDF, 35-40 g/kg ADL, 362-396 g/kg cellulose and 285-306 g/kg hemicellulose with 549-590 g/kg digestible dry matter, 10.96-11.48 MJ/kg digestible energy, 9.00-9.43 MJ/kg metabolizable energy and 5.02-5.67 MJ/kg net energy for lactation. The quality of ensiled mass were pH = 4.20-4.26, 24.20-29.6 g/kg organic acids, 88-109 g/kg CP, 368-405 g/kg CF, 100-102 g/kg ash, 388-420 g/kg ADF, 632-724 g/kg NDF, 26-30 g/kg ADL, 56-74 g/kg TSS, 358-394 g/kg Cel, 244-304 g/kg HC, with nutritive and energy value 56.5-58.7% DMD, 11.25-11.64 MJ/kg DE, 9.19-9.56 MJ/kg ME, 5.21-5.57 MJ/kg NEL. The hay prepared from tall oatgrass contained 77-100 g/kg CP, 393-414 g/kg CF, 80-94 g/kg ash, 418-436 g/kg ADF, 683-748 g/kg NDF, 38-40 g/kg ADL, 78-98 g/kg TSS, 380-396 g/kg Cel and 265-318 g/kg HC with nutritive and energy value 541-563 g/kg DDM, 10.97-11.21 MJ/kg DE, 9.00-9.20 MJ/kg ME and 5.02-5.23 MJ/kg NEL.*

Keywords: *Arrhenatherum elatius, biochemical composition, green mass, hay, nutritive value, productivity, silage*

INTRODUCTION

In the modern world affected by global climate change and limited natural resources, where the popularity of carbon-neutral farming is growing, forages play a key role in sustainable animal husbandry systems. Forage grasses constitute a highly diverse group of plants with a worldwide distribution, thriving in

both natural, undisturbed ecosystems and intensive grassland-based livestock farming systems. The use for breeding activity the grasses forage species ecotypes that are locally adapted to adverse conditions, such as drought, poor soil quality, and temperature fluctuations, can significantly enhance the productivity and

quality sustainability, and reducing reliance on external inputs of foreign grass cultivars (COȘMAN et al., 2023; TOD et al., 2023; 2025).

The Plant List recognizes 96 scientific names at the species rank within the genus *Arrhenatherum*, of which nine are accepted species with a Eurasian and North African distribution. In the spontaneous flora of the Republic of Moldova and Romania, a single species, *Arrhenatherum elatius* (L.) P. Beauv., commonly known as tall oat-grass, bulbous oat-grass, or false oat-grass, is present. *Arrhenatherum elatius* is a perennial, loosely caespitose plant, occasionally rhizomatous, with rhizomes reaching up to 3 mm thick. The erect culms may reach from 50 to 140 (180) cm in height, they are glabrous and unbranched, with 4-5 nodes. The basal internodes may be swollen or not, and the nodes are glabrous or occasionally puberulent to densely hairy. The young leaves are convolute; the sheaths split with overlapping margins; the ligules are membranous, 1-3 mm long, obtuse to truncate, usually ciliate. The leaf blades lack auricles, are long (up to 40 cm), widening from the base to about two-thirds of their length before tapering to an acuminate tip. The upper leaf surface is smooth and ribless, while the lower surface has a pronounced keel. The flag leaves are shorter, widest at the base, with a poorly developed keel.

The inflorescences are lax panicles, 20-30 cm long and 2-7 cm wide, initially green and shiny, later becoming stramineous and occasionally purple tinged. The inflorescence branches are 15-20 mm long, ascending to divergent, verticillate, usually bear spikelets at the base. The pedicels measure 1-10 mm. The spikelets are typically 2-flowered: the lower floret is male only and the upper one is hermaphroditic. Occasionally, a third, fourth, or even fifth floret may be present, which may be hermaphroditic or rudimentary; the lowest floret is also sometimes hermaphroditic.

The glumes are membranous and unequal, the lower glume being 1-nerved and shorter, and the upper glume 3-nerved and longer. The lower floret bears a long, twisted, geniculate awn inserted one-third from the base of the lemma; the upper floret is generally awnless, though when present, the awn is straight and inserted near the lemma tip. The flowering stage occurs from May to June, with cross-pollination and wind-pollination being specific to this plant. The fruits (caryopses) are 4-5 mm long, approximately 1.2 mm wide, ellipsoid, densely hairy and yellowish. The weight of 1,000 seeds ranges from 2.6 to 3.1 g. Chromosome counts are $2n = 14, 28, 42$. The species is propagated by sowing. *Arrhenatherum elatius* plants develop deep roots capable of accessing moisture and nutrients at greater depths than many other

grasses. The seeds germinate at temperatures as low as 3-4°C.

The seedlings tolerate temperatures from -2°C to -4°C, while adult plants can grow slowly at -3°C to -4°C but suffer considerable damage at temperature as low as -6°C. During winter, the species can withstand very low temperatures, down to -23°C. The species grows on a wide range of soils with a pH between 5 and 8 and with medium salinity and prefers full sun to partial shade. It is mesophytic to xerophytic, occurring in open habitats such as dry grasslands, woodland edges, disturbed soils, successional fields, hayfields, pastures, thickets and roadsides, occasionally becoming a dominant grass. It can colonize and stabilize limestone scree, bare calcareous cliffs, maritime shingle and coastal dunes. The species *Arrhenatherum elatius* is cultivated as a forage grass due to its rapid recovery after mowing, though it does not tolerate overgrazing. It is often sown in mixtures with other species for grassland restoration (MEDVEDEV & SMETANNIKOVA, 1981; WILLS & BEGG 1994; HATCH, 2007; MACZEY, 2015; MACMILLAN & LEE, 2025). Also, tall oatgrass species has been evaluated for its potential as feedstock for renewable energy production and papermaking (MOUDRÝ et al., 2010; RACLAVSKÁ et al., 2011; EBELING et al., 2013; BOOB et al., 2019; DANIELEWICZ et al.,

2019; JEZERSKA et al., 2019; VON COSSEL et al., 2019; WALISZEWSKA et al., 2021). Considering the above, the main objective of this research was to evaluate the productivity and nutritive value of the fodder from tall oat-grass – *Arrhenatherum elatius*.

MATERIALS AND METHODS

The local ecotype of tall oatgrass (*Arrhenatherum elatius*), grown in monoculture on an experimental plot at the “Alexandru Ciubotaru” National Botanical Garden (Institute) of Moldova State University, Central Zone, Republic of Moldova, served as the subject of the present research. The experimental design was a randomized complete block design with four replications, the experimental plots measuring 10 m². The samples were collected during the second, third and fourth growing seasons, and the first cut was performed at the pre-flowering stage. The harvested plants were chopped into 1.5-2.0 cm pieces using a laboratory forage chopper. The dry matter content was determined by drying the samples to a constant weight at 105°C. The prepared hay was dried directly in the field. For ensiling, the chopped green mass was shredded and compressed into well-sealed glass containers, which were stored at ambient temperature (18-20°C). After 45 days, the containers were opened and the sensory and

chemical characteristics of the prepared silages were determined according to standard laboratory procedures and the Moldavian standard SM 108 for forage quality analysis.

For biochemical analyses, the straw samples were milled in a beater mill equipped with a 1 mm sieve. The key biochemical parameters, such as crude protein (CP), ash, acid detergent fiber (ADF), neutral detergent fiber (NDF), and acid detergent lignin

(ADL), were assessed using near-infrared spectroscopy (NIRS) with a PERTEN DA 7200 near-infrared spectrometer at the Research and Development Institute for Grasslands in Braşov, Romania. The concentrations of hemicellulose (HC), cellulose (Cel), digestible dry matter (DDM), metabolizable energy (ME), net energy for lactation (NEL), and relative feed value (RFV) were calculated according to standard procedures.

RESULTS AND DISCUSSION

The local climatic conditions strongly influenced the growth and development of plants, as well as the productivity and quality indices of forage. Under the conditions of the Republic of Moldova, during the second year of growth, *Arrhenatherum elatius* plants resumed growth in mid-March. A more intensive growth and stem formation were observed in the second half of April. At the time of the first harvest, on May 18, plants had reached an average height of 87-93 cm. The studied species reached a green biomass yield of 3.46 kg/m² and a dry matter yield of 0.88 kg/m².

The third growing season was characterized by average temperatures above 0°C during January and February, which led to an earlier-than-usual resumption of growth. Thus, vegetative growth began in late February to early

March. Average daytime temperatures ranging from 9 to 18 °C accelerated plant growth and development, resulting in the onset of inflorescence formation 9-11 days earlier than usual. At the time of the first harvest, plants reached 105-111 cm in height, producing a green mass yield of 4.47 kg/m² and a dry matter yield of 1.01 kg/m².

In the fourth growing season, the plants emerged evenly on the soil surface between March 10 and 12, followed by stem formation in mid-April. At the time of the first harvest, on May 7, plants had reached a height of 77-83 cm. The productivity reached 3.61 kg/m² fresh mass and 0.84 kg/m² dry matter.

Various studies have reported differing results regarding the productivity of *Arrhenatherum elatius*. According to MEDVEDEV and SMETANNIKOVA (1981), tall oatgrass hay yield ranged from 4.4 to 7.2 t/ha. TOMIĆ et al. (2007)

reported that French ryegrass (*Arrhenatherum elatius*) was characterized by a plant height of 66 cm and a dry matter yield of 8.23-12.46 t/ha, English ryegrass (*Lolium perenne*) by 42.2 cm and 7.25 t/ha and Italian ryegrass (*Lolium multiflorum*) by 59.7-65.2 cm and 10.36-15.50 t/ha dry matter, respectively. NIVYOBIZI et al. (2005) noted that the first-cut dry matter yield of *Arrhenatherum elatius* reached 7.86 t/ha, *Lolium perenne* – 5.36 t/ha, *Alopecurus pratensis* – 4.05 t/ha and *Festuca rubra* – 6.13 t/ha.

SKLÁDANKA et al. (2009) found that the first-cut productivity of tall oatgrass, in early June, was 7.20 t/ha dry matter, while the second-cut yield, in late July, reached 2.49 t/ha. SVOBODOVÁ et al. (2009) reported that the average dry matter yield of the *Arrhenatherum elatius* sward was 4.3-5.0 t/ha in the third and fourth years, but in the fifth year, the total yield decreased by 48% as compared with previous years. GRYGIERZEC (2012) observed that *Arrhenatherum elatius* meadow produced 3.14-4.26 t/ha dry matter at the first cut and 1.78-2.31 t/ha at the second cut. HOLUB et al. (2012) reported that the biomass productivity of grass vegetation dominated by *Arrhenatherum elatius* ranged from 990 to 1,227 g/m².

USTAK et al. (2013) reported that the first-cut dry matter yield of tall oatgrass was 5.78 t/ha,

cocksfoot – 4.76 t/ha, meadow fescue – 3.74 t/ha and timothy grass – 5.47 t/ha. BOOB et al. (2019) noted that the dry biomass yield of a typical *Arrhenatherum elatius* community varied from 4.83 to 7.73 t/ha depending on fertilizer application. MARUȘCA (2022) reported that the productivity of main grassland habitats dominated by *Arrhenatherum elatius* in the Rarău Massif was 14.42 t/ha green mass. KONYK & IVANTSIV (2021) found that tall oatgrass meadows, under the conditions of Peredkarpattia, Ukraine, produced 35.0 t/ha green mass or 9.12 t/ha dry matter. MARUȘCA & VINTAN (2022) reported that *Arrhenatherum elatius* grasslands in the hydrographic basin of the Orăștie River yielded 23.29 t/ha green mass.

GEORGIEVA et al. (2023) found that during a nine-year experimental period, the highest yield was achieved by *Festuca rubra*, with 5.75 t/ha, followed by *Festuca arundinacea* – 5.54 t/ha and *Arrhenatherum elatius* – 5.43 t/ha. PITTARO et al. (2024) reported that the annual forage biomass accumulation of *Arrhenatherum elatius* plants was 7,863.26 kg/ha. MIRON & ȚÎȚEI (2025) found that the hay productivity of grasslands dominated by *Arrhenatherum* ranged from 4.13 to 5.63 t/ha.

The nutritional quality and diversity of forage are key factors influencing animal health, productivity and farm profitability.

The analysis of the biochemical composition of the collected fresh mass from *Arrhenatherum elatius* (Table 1) showed that the dry matter contained 77-96 g/kg crude protein (CP), 80-84 g/kg ash, 375-414 g/kg crude fibre (CF), 399-436 g/kg acid detergent fibre (ADF), 684-740 g/kg neutral detergent fibre (NDF), 35-40 g/kg acid detergent lignin (ADL), 362-396 g/kg cellulose (Cel) and 285-306 g/kg hemicellulose (HC), with 549-590 g/kg dry matter digestibility (DDM), 10.96-11.48 MJ/kg digestible energy (DE), 9.00-9.43 MJ/kg metabolizable energy (ME) and 5.02-5.67 MJ/kg net energy for lactation (NEL).

The concentrations of crude protein and total soluble sugars in the *Arrhenatherum elatius* fodder obtained during the third and fourth growing seasons were significantly higher than those found in the fodder from the second growing season. The mineral content in the fodder was the highest in the fourth growing season. The fresh fodder collected in the third growing season contained considerably lower amounts of structural carbohydrates and lignin. The concentrations of cellulose and hemicellulose in the fodder from the second and fourth growing seasons did not differ significantly. The tall oatgrass fodder obtained in the third growing season demonstrated the best values in terms of dry matter digestibility, metabolizable energy and net energy for lactation.

The specialized literature provides varying data on the green mass quality of *Arrhenatherum elatius* plants. According to D'OTTAVIO & ZILLOTTO (2003), the forage from grasslands dominated by *Arrhenatherum elatius* contained 5.08% CP, 1.54% EE, 6.09% ash, 35.66% CF, 61.34% NDF, 35.43% ADF, 6.09% ADL and 3.19 MJ/kg NEL at the first cut, while the second-cut forage contained 7.19% CP, 2.19% EE, 7.46% ash, 31.10% CF, 59.58% NDF, 31.35% ADF, 5.16-6.09% ADL and 4.60 MJ/kg NEL. NIVYOBIZI et al. (2005) reported that the dry matter of *Arrhenatherum elatius*, obtained at the first cut, contained 72 g/kg CP, 714 g/kg NDF, 599 g/kg OMD, 0.66 UFL/kg, 0.57 UFV/kg, 90 g/kg PDIE and 58 g/kg PDIN, while at the second cut, it contained 154 g/kg CP, 721 g/kg NDF, 645 g/kg OMD, 0.73 UFL/kg, 0.64 UFV/kg, 91 g/kg PDIE and 91 g/kg PDIN.

TOMIĆ et al. (2005) reported that *Arrhenatherum elatius* grown in pasture associations contained 6.28% CP, 30.07% CF and 8.11% ash. WYŁUPEK (2006) observed that *Arrhenatherum elatius* biomass from selected phytocenoses contained 11.37% CP, 1.22 g/kg P, 7.1 g/kg K, 2.04 g/kg Mg and 3.36 g/kg Ca.

SKLÁDANKA et al. (2008) reported that the forage dry matter from *Arrhenatherum elatius* contained 30.2% CF, 60.5% NDF, 35.9% ADF and 5.46 MJ/kg NEL,

while that from *Dactylis glomerata* contained 28.9% CF, 57.1% NDF, 35.1% ADF, 5.54 MJ/kg NEL and *Festulolium* – 26.9% CF, 58.9% NDF, 32.3% ADF, 5.84 MJ/kg NEL, respectively.

TOMIĆ et al. (2007) reported that French ryegrass (*Arrhenatherum elatius*) contained 13.24% CP and 31.8% CF, English ryegrass (*Lolium perenne*) 9.7-13.4% CP and 30.7% CF, and Italian ryegrass (*Lolium multiflorum*) 11.57-14.57% CP and 21.92-25.22% CF. COP et al. (2009) found that the forage dry matter from *Arrhenatherum elatius* grasslands contained 11.74-15.91% CP, 24.48-29.67% CF and 5.4-6.0 MJ/kg NEL.

AUFRÈRE et al. (2008) noted that the dry matter from *Arrhenatherum elatius* harvested for the first time in May contained 16.6% CP, 52.3% NDF, 25.4% ADF, 2.68% ADL and 786 g/kg OMD. SKLÁDANKA et al. (2010) compared the forage quality of green mass and reported that *Arrhenatherum elatius* contained 7.92-9.49% CP, 29.34-30.25% CF, 55.48-61.20% NDF and 71.80-78.0% OMD; *Dactylis glomerata* 9.00-9.17% CP, 27.52-30.33% CF, 56.59-57.79% NDF and 70.4-76.9% OMD; and *Festuca arundinacea* × *Lolium multiflorum* 7.11-7.54% CP, 25.36-29.79% CF, 56.10-61.25% NDF and 71.8-78.0% OMD, respectively. GOLÍŃSKI & GOLÍŃSKI (2013) reported that the biomass harvested from semi-

natural grasslands dominated by the *Arrhenatherion* alliance contained 308 g/kg dry matter, 10.35% CP, 6.36% ash, 50.98% NDF and 31.61% ADF.

HEJCMÁNOVÁ et al. (2015) reported that *Arrhenatherum elatius* forage contained 366 g/kg DM with 1.23% N, 6.45% ash, 65.4% NDF, 40.0% ADF, 0.13% P and 0.76% Ca, whereas *Dactylis glomerata* forage contained 284 g/kg DM with 1.26% N, 8.5% ash, 67.0% NDF, 40.4% ADF, 0.15% P and 1.06% Ca. LEE (2018) noted that *Arrhenatherum elatius* forage contained 8% CP, 61% NDF and 74% OMD. BOOB et al. (2019) reported that biomass dry matter from *Arrhenatherion* grasslands harvested before the flowering period contained 11.25% CP, 50.00% NDF, 5.37% ADL, 11.25% ash, 2.88 g/kg P, 24.9 g/kg K, 1.97 g/kg Mg, 10.00 g/kg Ca and 5.56 MJ/kg NEL. The biomass cut during the flowering period contained 7.88-8.62% CP, 52.86-55.77% NDF, 6.05-6.30% ADL, 8.92-9.50% ash, 2.88 g/kg P, 16.8-20.4 g/kg K, 1.64-1.87 g/kg Mg, 9.7-9.8 g/kg Ca and 4.52-5.22 MJ/kg NEL. VON COSSEL et al. (2019) found that first-cut biomass from *Arrhenatherion* grasslands contained 240-297 g/kg DM, 7.0-8.1% ash, 4.7-5.7% lignin, 29.3-31.9% Cel, 20.7-25.2% HC and 1.4-1.7% N.

REINÉ et al. (2020) studied the nutritional quality of meadow plant species and reported that

Arrhenatherum elatius contained 421 g/kg DM with 7.6% CP, 4.5% ash, 1.6% EE, 66.5% NDF, 35.2% ADF, 3.0% ADL, 61.5% DDM, 0.13% P and 0.50% Ca; *Lolium perenne* contained 371 g/kg DM with 6.8% CP, 5.8% ash, 1.6% EE, 63.6% NDF, 32.7% ADF, 2.8% ADL, 63.4% DDM, 0.11% P and 0.44% Ca; and *Dactylis glomerata* contained 405 g/kg DM with 8.3% CP, 4.7% ash, 2.2% EE, 69.0% NDF, 38.8% ADF, 5.0% ADL, 58.6% DDM, 0.13% P and 0.49% Ca. MESERSZMIT et al. (2021) noted that the herbage from *Arrhenatherum elatius* and *Dactylis glomerata* plant communities contained 8.00% CP, 3.17% EE, 57.30% NDF, 16.56% HC, 29.47% Cel, 11.24% lignin and 7.73% ash.

Hay is a key component of the diet of farm animals, primarily during the middle autumn to middle spring period, when there is a scarcity of fresh feed. However, it can also be fed to farm animals throughout the year, as a healthy feed containing essential nutrients, vitamins and minerals. It is particularly important for young breeding animals, pregnant females and reproductive males. Hay supports the motor functions of the rumen, including the muscular activity of the digestive system and rumination, which is indispensable for the proper utilization of feed. As a low-cost source of roughage, hay is vital for maintaining livestock health and productivity.

Table 1.

The biochemical composition and nutritional value of the *Arrhenatherum elatius* fresh mass

Indices	growing seasons		
	II	III	IV
Crude protein, g/kg DM	77.00	96.00	94.00
Minerals, g/kg DM	80.00	82.00	84.00
Crude fibre, g/kg DM	414.00	375.00	385.00
Acid detergent fibre, g/kg DM	436.00	399.00	428.00
Neutral detergent fibre, g/kg DM	740.00	684.00	734.00
Acid detergent lignin, g/kg DM	40.00	37.00	35.00
Total soluble sugars, g/kg DM	98.00	120.00	107.00
Cellulose, g/kg DM	396.00	362.00	393.00
Hemicellulose, g/kg DM	304.00	285.00	306.00
Digestible dry matter, g/kg DM	549.00	590.00	556.00
Relative feed value	68.00	77.00	70.00
Digestible energy, MJ/ kg	10.96	11.48	11.09
Metabolizable energy, MJ/ kg	9.00	9.43	9.10
Net energy for lactation, MJ/ kg	5.02	5.67	5.11

The hay prepared from tall oatgrass plants (Table 2) contained 77-100 g/kg CP, 393-414 g/kg CF, 80-94 g/kg ash, 418-436 g/kg ADF, 683-748 g/kg NDF, 38-40 g/kg ADL, 78-98 g/kg TSS, 380-396 g/kg Cel and 265-318 g/kg HC. The nutritive and energy values of the prepared hay were 549-563 g/kg DDM, 10.97-11.21 MJ/kg DE, 9.00-9.20 MJ/kg ME and 5.02-5.23 MJ/kg NEL.

The hay prepared in the third growing season was characterized by an optimal concentration of crude protein, acid detergent lignin and structural carbohydrates, which positively affected digestibility, nutritional value and energy supply. The lowest level of crude protein was observed in the hay produced in the second growing season, but the concentrations of structural carbohydrates and acid detergent lignin, as well as dry matter digestibility and energy content, did not differ significantly between hay from the second and fourth growing seasons. Several studies have evaluated the potential of *Arrhenatherum elatius* for hay production. According to MEDVEDEV & SMETANNIKOVA (1981), tall oatgrass hay contained 7.6-12.7% CP, 1.6-3.4% EE, 23.2-32.0% CF, 36.0-50.0% NFE and 7.0-10.0% ash. GRYGIERZEC (2012) reported that the hay samples from the *Arrhenatherum elatioris* typicum community meadow had quality indices of 88-148 g/kg CP, 43.6-

91.4 g/kg ash, 224-342 g/kg CF, 450-569 g/kg NFE, 245-327 g/kg EE, 418-527 g/kg NDF, 307-437 g/kg ADF, 41.8-82.5 g/kg ADL and 236-383 g/kg cellulose.

MIRON & ȚÎȚEI (2025) found that the hay obtained from *Arrhenatherum elatius* grasslands contained 107-142 g/kg CP, 343-373 g/kg CF, 93-106 g/kg ash, 373-395 g/kg ADF, 595-648 g/kg NDF, 43-44 g/kg ADL, 57-85 g/kg total soluble sugars (TSS), 330-351 g/kg cellulose and 222-253 g/kg hemicellulose (HC), while the nutritive and energy values reached 58.1-61.9% DMD, RFV = 83-97, 11.53-12.21 MJ/kg DE, 9.47-10.03 MJ/kg ME and 5.49-5.74 MJ/kg NEL.

Preserved forages, such as silage and haylage, are essential components of intensive livestock systems. The prepared tall oatgrass silages were characterized by a uniform light olive colour, a pleasant smell reminiscent of pickled watermelon. The texture remained consistent compared with the original green mass, with no signs of mould or mucus formation. The biochemical composition and nutritional value of these silages are presented in Table 3. The fermentation profile of the prepared tall oatgrass silage showed a pH of 4.20-4.26, with total organic acids ranging from 24.20 to 29.60 g/kg, of which 75.62-78.00% was lactic acid. Butyric acid was detected only in very small amounts in the silage prepared during the third growing

season. The nutrient concentrations in the silage dry matter were as follows: 88-109 g/kg CP, 368-405 g/kg CF, 100-102 g/kg ash, 388-420 g/kg ADF, 632-724 g/kg NDF, 26-30 g/kg ADL, 56-74 g/kg TSS, 358-394 g/kg Cel, 244-304 g/kg HC, with nutritive and energy value 56.5-58.7% DMD, 11.25-11.64 MJ/kg DE, 9.19-9.56 MJ/kg ME and 5.21-5.57 MJ/kg NEI. As compared with the original green

mass, the prepared silages exhibited lower concentrations of cell wall fractions (NDF, ADF, ADL) and total soluble sugars, while the crude protein, mineral content and energy value increased. Notably, the silage obtained in the third growing season had particularly high protein content and low levels of structural carbohydrates, which had a positive impact on its nutritional and energy value.

Table 2.

The biochemical composition and nutritional value of *Arrhenatherum elatius* hay

Indices	growing seasons		
	II	III	IV
Crude protein, g/kg DM	77.00	100.00	89.00
Minerals, g/kg DM	80.00	94.00	86.00
Crude fibre, g/kg DM	414.00	399.00	393.00
Acid detergent fibre, g/kg DM	436.00	418.00	430.00
Neutral detergent fibre, g/kg DM	740.00	683.00	748.00
Acid detergent lignin, g/kg DM	40.00	38.00	40.00
Total soluble sugars, g/kg DM	98.00	78.00	90.00
Cellulose, g/kg DM	396.00	380.00	390.00
Hemicellulose, g/kg DM	304.00	265.00	318.00
Digestible dry matter, g/kg DM	549.00	563.00	554.00
Relative feed value	68.00	77.00	69.00
Digestible energy, MJ/ kg	10.97	11.21	11.05
Metabolizable energy, MJ/ kg	9.00	9.20	9.07
Net energy for lactation, MJ/ kg	5.02	5.23	5.09

According to DINIĆ et al. (2008), tall oatgrass silage prepared from freshly mown mass had a pH of 4.00, dry matter content of 233.8 g/kg, with 6.83% lactic acid, 2.45% acetic acid, 0.76% butyric acid, 14.42% CP, 4.93% EE, 71.17% NDF, 32.88% ADF, 18.23% total sugars, 38.28% HC, 10.28% ash, 0.47% Ca and 0.33% P. In contrast,

the silage prepared from wilted mass had a pH of 4.50, 392.0 g/kg DM, 4.11% lactic acid, 1.58% acetic acid, 0% butyric acid, 15.00% CP, 4.89% EE, 69.10% NDF, 33.52% ADF, 15.93% total sugars, 35.58% HC, 9.92% ash, 0.56% Ca and 0.33% P, respectively.

Table 3.

The biochemical composition and nutritional value of ensiled mass from *Arrhenatherum elatius*

Indices	growing seasons	
	II	III
pH index	4.26	4.20
Organic acids, g/kg DM	24.20	29.60
Total acetic acid, g/kg DM	5.90	6.10
Total butyric acid, g/kg DM	0.00	0.40
Total lactic acid, g/kg DM	18.30	23.10
Acetic acid, % of organic acids	24.38	20.60
Butyric acid, % of organic acids	0.00	1.40
Lactic acid, % of organic acids	75.62	78.00
Crude protein, g/kg DM	88.00	109.00
Crude fibre, g/kg DM	405.00	368.00
Ash, g/kg DM	100.00	102.00
Acid detergent fibre, g/kg DM	420.00	388.00
Neutral detergent fibre, g/kg DM	724.00	632.00
Acid detergent lignin, g/kg DM	26.00	30.00
Total soluble sugars, g/kg DM	74.00	56.00
Cellulose, g/kg DM	394.00	358.00
Hemicellulose, g/kg DM	304.00	244.00
Digestible dry matter, g/kg DM	565.00	587.00
Digestible energy, MJ/kg DM	11.25	11.64
Metabolizable energy, MJ/kg DM	9.19	9.56
Net energy for lactation, MJ/kg DM	5.21	5.57
Relative feed value	73	86

CONCLUSIONS

Tall oatgrass (*Arrhenatherum elatius*) is characterized by high biomass productivity and can be used as fresh mass, hay and silage in the diet of farm animals.

The forage obtained during the third growing season exhibited optimal concentrations of crude

protein, acid detergent lignin, cellulose and hemicellulose, along with improved digestibility and energy content.

The studied local ecotype of tall oatgrass (*Arrhenatherum elatius*) could serve as a valuable genetic resource for breeding and developing new grass cultivars for the production of forages.

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