THE QUALITY OF THE GREEN MASS AND HAY FROM *VICIA TENUIFOLIA* IN THE REPUBLIC OF MOLDOVA

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Abstract

The goal of this research was to determine the quality indices of harvested green mass and hay from the local ecotype of the perennial leguminous species, fine-leaf vetch (*Vicia tenuifolia*), maintained in monoculture in the experimental plot of the NBGI MSU Chişinău. The biochemical composition and nutritive value of the dry matter of the harvested green mass were as follows: 200 g/kg CP, 118 g/kg ash, 305 g/kg CF, 313 g/kg ADF, 488 g/kg NDF, 44 g/kg ADL, and 95 g/kg TSS, with 65.1% DMD, 12.79 MJ/kg DE, 10.50 MJ/kg ME, and 6.52 MJ/kg NEl. The studied fine-leaf vetch hay contained: 195 g/kg CP, 121 g/kg ash, 309 g/kg CF, 331 g/kg ADF, 505 g/kg NDF, 48 g/kg ADL, and 78 g/kg TSS, with 63.1% DMD, 12.43 MJ/kg DE, 10.21 MJ/kg ME, and 6.22 MJ/kg NEl. The studied substrates for biogas production had a favourable carbon-to-nitrogen ratio (C/N = 14–18), and the estimated biomethane potential varied from 343 to 350 l/kg organic dry matter. The results indicate the potential use of the harvested green mass and prepared hay from the local ecotype of *Vicia tenuifolia* as feed for livestock, as well as substrates in biogas reactors for biomethane production as a renewable energy source.

Keywords: biochemical composition, biomethane potential, feed value, green mass, hay, *Vicia tenuifolia*

The interest in agricultural systems based on leguminous species increased significantly over the recent decades due to economic and environmental reasons (European Parliament resolution 2011, 2018). The diversification of leguminous crop production may be achieved and by mobilizing ecotypes from the local flora and other regions.

The genus *Vicia* L. belongs to the tribe *Vicieae* of the *Fabaceae* family and consists of approximately 230 species distributed throughout the temperate regions of Europe, Asia, North America and South America. These species include food and fodder crops, medicinal and honey plants, soil nitrogen fixers, dune stabilizers etc. In the spontaneous flora of Basarabia, the genus *Vicia* is represented by 19 annual and perennial species (Izverscaia T., 2020).

The fine-leaved or bramble vetch – *Vicia tenuifolia* Roth. (syn. *V. antiqua* Grossh., *V. boissieri* Freyn, *V. brachytropis* Kar. & Kir. *V. cracca* subsp. *tenuifolia* (Roth) Gaudin, *V. tenuifolia* subsp. boissieri (Freyn) Radzhi, *V. variabilis* (Freyn & Sint.) Dinsm., *Cracca tenuifolia* (Roth) Gren. & Godr., *Ervum tenuifolium* (Roth) Trautv.) is a perennial herb with well-branched, numerous, rigid, slightly pubescent, and almost upright stems, reaching 50-90 cm in height. Its leaves are compound pinnate, with 8-12 pairs of opposite leaflets, each 2.5-3.0 cm long and 2-3 mm wide. The leaflets are lanceolate, covered with hairs on both sides, and greenish-grey in colour. The racemes are laxiflorous, bearing 15-20 pale blue or violet flowers, each 14-15 mm long. The plant produces elongated pods, 20-30 mm long and 5-7 mm wide, containing 3-5 brown seeds. It is a cross-pollinated species, primarily pollinated by bees. Flowering occurs in May-June, and seed ripening takes place in July-August. The chromosome number is 2n = 24. This species typically grows on open dry slopes, in meadows, shrub lands, along the edges of woods, rivers, and roads, and in mountainous areas up to the mid-altitude zone. In terms of xerophilicity, it is comparable to sainfoin. However, it does not tolerate flooding or excessive soil moisture. *Vicia tenuifolia* is currently being studied in several universities and scientific research centres (Koeva R. *et al.* 2002; Maevsky V.V. *et al.* 2003, 2013; Dzyubenko N.I.& Dzyubenko E.A., 2008; Vishnyakova M.A. *et al.* 2014; Fort F. *et al.* 2015; Coulot, P. & Rabaute P. 2020).

The goal of this research was to evaluate the quality indices of harvested green mass and prepared hay from fine-leaf vetch (*Vicia tenuifolia*) and the prospects of its use as fodder for farm animals or as substrates for biomethane production.

MATERIAL AND METHOD

The local ecotype of the perennial leguminous species fine-leaf vetch (*Vicia tenuifolia*), grown in monoculture on the

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experimental land of the National Botanical Garden (Institute), MSU Chişinău, served as the subject of this research. Traditional leguminous fodder crops – alfalfa (*Medicago sativa*), common sainfoin (*Onobrychis viciifolia*), and red clover (*Trifolium pratense*) – were used as control variants. The experiment was set up as a randomized complete block design with four replications. Each experimental plot measured 10 m². The leaf/stem ratio was determined by manually separating the leaves from the stems, weighing them individually, and calculating the ratio of leaf to stem mass. The hay was prepared by drying the green mass directly in the field. The dry matter (DM) content was determined by drying samples to a constant weight at 105°C. For biochemical analyses, plant samples were dried in a forced-air oven at 60°C and then milled using a beater mill equipped with a 1 mm sieve. Several key biochemical parameters were assessed, including: crude protein (CP), ash, acid detergent fibre (ADF), neutral detergent fibre (NDF), acid detergent lignin (ADL), total soluble sugars (TSS), digestible dry matter (DDM) has been determined by using near infrared spectroscopy (NIRS) technique PERTEN DA 7200. The concentration of hemicellulose (HC), cellulose (Cel), digestible energy (DE), metabolizable energy (ME), net energy for lactation (NEl) and relative feed value (RFV) were calculated according to standard procedures.

The carbon content of the substrates was determined using an empirical equation according to Badger C.M. *et al.* (1979). The biochemical methane potential (BMP) was estimated following the method described by Dandikas V. *et al.* (2015).

RESULTS AND DISCUSSIONS

Analyzing the results of the agro-biological assessment of the studied local ecotypes of fine-leaf vetch (*Vicia tenuifolia*) over seven growing seasons, it can be noted that during the flowering period, when the green mass was harvested, the semi-erect shoots reached a height of 119-127 cm. The green mass yield averaged 4.48 kg/m², with a dry matter content of 22.1%.

The nutrient content and fodder value of the green mass from fine-leaf vetch (*Vicia tenuifolia*) are presented in Table 1. A comparative analysis of the biochemical composition revealed that the fresh forage from fine-leaf vetch had a higher crude protein and mineral content as compared to traditional leguminous fodder crops. The concentration of crude fibre in fine-leaf vetch forage was lower than in alfalfa but higher than in common sainfoin and red clover. The cell wall content in fine-leaf vetch was higher than in common sainfoin and red clover, but lower than in alfalfa. The acid detergent lignin content in fine-leaf vetch forage was lower than in alfalfa and common sainfoin but higher than in red clover. The total soluble sugar content in fine-leaf vetch fresh forage was higher than in alfalfa but much lower than in red clover. The cellulose content in fine-leaf vetch was comparable to that of common sainfoin and higher than that of corn forage. The hemicellulose content in fine-leaf vetch forage reached 175 g/kg dry matter, significantly higher than in the control leguminous fodder crops. As compared to alfalfa, fine-leaf vetch showed favourable values for dry matter digestibility, relative feed value, metabolizable energy, and net energy for lactation, although these values were lower than those observed in red clover forage.

Table 1

The biochemical composition and the fodder value of the green mass from *Vicia tenuifolia*

Indices	*Vicia tenuifolia*	*Medicago sativa*	*Onobrychis viciifolia*	*Trifolium pratense*
Crude protein, g/kg DM	*200*	172	177	169
Crude fibre, g/kg DM	*305*	*331*	*293*	*231*
Minerals, g/kg DM	118	*91*	*96*	*89*
Acid detergent fibre, g/kg DM	*313*	*347*	*309*	*252*
Neutral detergent fibre, g/kg DM	*488*	*510*	*447*	*422*
Acid detergent lignin, g/kg DM	*44*	*58*	*49*	*31*
Total soluble sugars, g/kg DM	*95*	*72*	*114*	*222*
Cellulose, g/kg DM	*269*	*289*	*260*	*221*
Hemicellulose, g/kg DM	*175*	*163*	*138*	*170*
Digestible dry matter, g/kg DM	*651*	*619*	*648*	*692*
Relative feed value	*124*	*113*	*135*	*153*
Digestible energy, MJ/ kg	*12.79*	*12.21*	*12.73*	*13.52*
Metabolizable energy, MJ/ kg	*10.50*	*10.02*	*10.45*	*11.10*
Net energy for lactation, MJ/ kg	*6.52*	*6.04*	*6.48*	*7.12*

Some authors have reported various findings regarding the productivity and dry matter nutrient concentration of the green mass from *Vicia* species. According to Larin Y.V. (1951), the nutrient content in *Vicia tenuifolia* ranged from 18.7 to 22.3% CP, 2.4 to 4.2% EE, 24.2 to 32.6% CF, 35.5 to 42.9% NFE, and 6.9 to 9.1% ash. Burlacu G. *et al.* (2002) reported that *Vicia sativa* harvested during the flowering period contained 170 g/kg DM, 10.5% ash, 18.4% CP, 28.2% CF, 58.2% DOM, 18.24 MJ/kg GE, 11.13 MJ/kg DE, and 8.94 MJ/kg ME. Maevsky V.V. et al. (2003) mentioned that *Vicia tenuifolia* achieved a green mass yield of 55.0 t/ha, with 20.7% CP and 3.9% EE. Hoffmann R. & Kovács B. (2011) found that the productivity of *Vicia pannonica* was 20.3 t/ha green mass or 3.35 t/ha dry matter, with 23.9% CP and 24.3% CP. Ates S. *et al.* (2013) presented quality characteristics of grazing dry herbage from three *Vicia* species and found that *Vicia ervilia* contained 21.5% CP, 28% NDF, 19.5% ADF and 72% IVDMD; *Vicia sativa* contained 21.5% CP, 31% NDF, 22% ADF and 60% IVDMD; and *Vicia villosa* ssp. *dasycarpa* contained 16.5% CP, 40% NDF, 31% ADF, and 46% IVDMD. Maevsky V.V. *et al.* (2013) found that *Vicia tenuifolia* harvested in the small pod stage contained 20.97% CP, 1.48% EE, 31.19% CF, 39.50% NFE, 6.86% ash and 51.83 mg/kg carotene. Vishnyakova M.A. e*t al.* (2014) reported that *Vicia* samples collected from different habitats had the following protein content in green mass: 20.4-21.9% for *Vicia sativa*, 18.1-20.6% for *Vicia amoena*, 18.4-22.3% for *Vicia cracca*, 19.5% for *Vicia tenuifolia* and 20.60-23.38% for *Vicia villosa*. Heuzé V. *et al.* (2015) mentioned that the average feed value of *Vicia sativa* was 193 g/kg DM, 23.0% CP, 2.5% EE, 25.4% CF, 36.7% NDF, 28.9% ADF, 6.1% lignin, 9.8% ash, 69.8% DOM, 18.6 MJ/kg GE, 12.4 MJ/kg DE and 9.8 MJ/kg ME. Georgieva N. *et al.* (2016) reported that the chemical composition and feeding value of forage from studied *Vicia sativa* cultivars ranged as follows: 182.4-197.0 g/kg CP, 254.0-264.8 g/kg CF, 316.2-396.9 g/kg ADF, 380.3-446.7 g/kg NDF, 51.7-93.2 g/kg ADL, 264.5-303.6 g/kg Cel and 29.6–82.0 g/kg HC, with 57.7-66.2% IVDMD and 57.5-66.9% IVDOM. For *Vicia villosa* cultivars, the values were 211.3-211.5 g/kg CP, 228.2-232.7 g/kg CF, 374.4-382.5 g/kg ADF, 451.2-452.6 g/kg NDF, 70.6-77.4 g/kg ADL, 303.8-305.1 g/kg Cel, and 70.1-76.8 g/kg HC, with 50.8-55.0% IVDMD and 51.9-60.2% IVDOM. Ţîţei V.&Coşman S. (2018) reported that the productivity of *Vicia tenuifolia*, cut at the budding-flowering stage, was 4.18 kg/m² green mass or 0.76 kg/m² dry matter, with 23.50% CP, 3.65% EE, 29.08% CF, 37.53% NFE, 8.10% ash, and 192 g DP per nutritive unit. In comparison, the productivity of *Medicago sativa* was 3.44 kg/m² green mass or 0.68 kg/m² dry matter, with 16.50% CP, 2.59% EE, 34.48% CF, 37.95% NFE, 8.48% ash and 142 g DP per nutritive unit. Parissi Z. *et al.* (2022) noted that dry matter from common vetch forage contained 170.4-229.2 g/kg CP, 221.3-243.5 g/kg ADF, 328.7-368.1 g/kg NDF, and 50.7-60.2 g/kg ADL. Ţîţei V. & Cozari S. (2023) found that the biochemical composition and fodder value of green mass from studied *Vicia* species ranged as follows: 17.2-20.8% CP, 9.6-11.3% ash, 29.7-32.5% CF, 32.6-34.6% ADF, 51.9-53.6% NDF, 4.8-6.4% ADL, and 17.4-19.0% TSS, with 620-635 g/kg DMD, RFV = 108-113, 12.06-12.50 MJ/kg DE, 9.90-10.26 MJ/kg ME, and 6.05-6.28 MJ/kg NEl. Belete S. *et al*. (2024) found that *Vicia* sp. green mass forage contained 9.1% ash, 21.4% CP, 45.9% NDF, 33.6% ADF, 9.3% ADL, 705 g/kg DMD, and 11.0 MJ/kg ME; another sample contained 12.9% ash, 17.0% CP, 47.6% NDF, 27.8% ADF, and 6.5% ADL. In comparison, *Medicago sativa* contained 11.7% ash, 20.8% CP, 45.9% NDF, 31.8% ADF, and 7.3% ADL.

Fodder conservation is essential worldwide to ensure livestock have a consistent feed supply, especially during periods such as late autumn, winter, and early spring when grazing is scarce. Several methods of fodder conservation exist, each with its own advantages and considerations. The two most common methods are haymaking and silage making. Natural drying of mown herbage by sun and wind remains the most widespread method of conserving fodder. Hay is particularly suitable for small-scale producers, as it requires minimal equipment and cost, and once properly cured, it is easy to transport and store – usually baled in the recent decades. Hay can be produced from natural herbage or from sown grasses and leguminous crops. According to research results presented in Table 2, fine-leaf vetch hay is characterized by an optimal nutrient concentration. Hay prepared from fine-leaf vetch contains higher levels of crude protein and minerals, along with lower amounts of cell wall components, resulting in greater digestibility and energy value compared to hays from alfalfa and common sainfoin. Compared to red clover hay, fine-leaf vetch hay has a higher concentration of structural carbohydrates and a lower content of total soluble sugars, which negatively impacts its digestibility, relative feed value and energy concentration.

Several literature sources describe the biochemical composition and nutritional performance of hay from *Vicia* species. According to Gonean G.G. (1961), *Vicia variabilis* (syn. *Vicia tenuifolia*) hay was characterized by 18.26-24.72% CP, 1.95-2.40% EE, 33.23-35.41% CF, 30.71-37.31% NFE and 6.49-8.16% ash, including 1.75-2.5% Ca and 0.43-0.70% P. Hadjipanayiotou M. *et al.* (1983) reported that the hay from *Vicia tenuifolia* contained 890 g/kg dry matter with 9.7% CP, 2.1% EE, 40.7% CF, 62% NDF, 48% ADF, 11.7% lignin, 7.4% ash, 550 g/kg DDM, 430 g/kg DOM and 8.2 MJ/kg energy content. Burlacu G. *et* *al.* (2002) mentioned that *Vicia sativa* hay contained 850 g/kg DM, 10.0% ash, 16.5% CP, 2.6% EE, 32.0% CF, 54.0% DOM, 18.22 MJ/kg GE, 10.39 MJ/kg DE and 8.35 MJ/kg ME. Kitaw G. *et al.* (2010) remarked that the forage value of hay from *Vicia dasycarpa* was 19.9% CP, 37.7% ADF, 54.5% NDF, 10.8% ADL, 68.0% IVOMD, 8.0% ash and 10.97 MJ/kg ME. Larbi A. et al. (2011 abc) studied *Vicia* species and found that hay from *Vicia sativa* contained 141–188 g/kg CP, 262–287 g/kg ADFom, 364–435 g/kg aNDFom, and 752–782 g/kg IVOMD. Hay from *Vicia villosa* ssp. *dasycarpa* contained 174–183 g/kg CP, 264–278 g/kg ADFom, 417–433 g/kg aNDFom and 683–708 g/kg IVOMD. Hay from *Vicia ervilia* had 146–178 g/kg CP, 200–230 g/kg ADFom, 335–395 g/kg aNDFom and 742–777 g/kg IVOMD. Heuzé V. *et al.* (2015) mentioned that hay made from *Vicia sativa* contained 16.9–22.5% CP, 0.7–2.4% EE, 20.4–28.5% CF, 27.1–47.8% NDF, 20.6–35.2% ADF, 4.4–8.5% lignin, 9.0–12.3% ash, 11.1–17.91 g/kg Ca, 0.9–7.0 g/kg P, 64.4–72.9% DOM, 18.1 MJ/kg GE, 11.0 MJ/kg DE and 8.7 MJ/kg ME. Ţîţei V. & Coşman S. (2018) reported that hay from *Vicia tenuifolia* contained 21.94% CP, 1.49% EE, 31.78% CF, 36.71% NFE, 8.08% ash, 0.76 nutritive units/kg, 8.27 MJ/kg ME for cattle, and 189.0 g DP/nutritive unit. In comparison, hay from *Medicago sativa* contained 15.10% CP, 1.57% EE, 36.26% CF, 37.77% NFE, 9.30% ash, 0.73 nutritive units/kg, 7.94 MJ/kg ME for cattle, and 153.00 g DP/nutritive unit. Abera M. *et al.* (2021) noted that the quality indices of hay from *Vicia dasycarpa* were 915 g/kg OM, 100 g/kg ash, 135 g/kg CP, 552 g/kg NDF, 406 g/kg ADF, 63 g/kg ADL, and 667 g/kg IVOMD. Hay from *Vicia villosa* had 915 g/kg OM, 108 g/kg ash, 163 g/kg CP, 502 g/kg NDF, 395 g/kg ADF, 62 g/kg ADL and 686 g/kg IVOMD. *Vicia sativa* hay contained 913 g/kg OM, 88 g/kg ash, 104 g/kg CP, 519 g/kg NDF, 460 g/kg ADF, 69 g/kg ADL, and 646 g/kg IVOMD. Ciftci B. *et al.* (2021) mentioned that the chemical composition of *Vicia cracca* hay was 1.62–2.97% EE, 14.11–19.50% CP, 6.12–8.74% ash, 26.90–39.09% ADF, and 39.74–46.49% NDF. Kaya E. (2021), evaluating the forage quality of *Vicia* species grown in native pasture in Turkey, reported that hay from *Vicia sativa* had 17.5% CP, 0.7% EE, 26.0% ADF, 48.6% NDF, 7.6% ash, 71.0% DOM and 9.5 MJ/kg ME, while hay from *Vicia tenuifolia* contained 17.2% CP, 1.2% EE, 39.2% ADF, 61.5% NDF, 6.3% ash, 60.2% DOM and 7.8 MJ/kg ME. Ţîţei V.&Cozari S. (2023) remarked that quality indices of hay from *Vicia* species ranged as follows: 17.4–18.9% CP, 9.9–11.0% ash, 32.2–35.6% CF, 34.5–39.3% ADF, 51.0–60.6% NDF, 5.0–6.5% ADL, 0.6–8.3% TSS, 29.5–32.8% Cel, and 16.5–21.3% HC, with 593–620 g/kg DMD, RFV = 90–113, 11.57–12.24 MJ/kg DE, 9.50–10.26 MJ/kg ME and 5.51–6.05 MJ/kg NEl. Belete S. *et al.* (2024) reported that hay from *Vicia* sp. contained 10.2% ash, 18.6% CP, 48.2% NDF, 36.6% ADF, 7.9% ADL, 663 g/kg DDM, and 10.6 MJ/kg ME. In comparison, hay from *Medicago sativa* contained 12.9% ash, 17.0% CP, 47.6% NDF, 27.8% ADF and 6.5% ADL.

Table 2

The biochemical composition and the fodder value of the hay from *Vicia tenuifolia*

Indices	*Vicia tenuifolia*	*Medicago sativa*	*Onobrychis viciifolia*	*Trifolium pratense*
Crude protein, g/kg DM	*195*	164	163	183
Crude fibre, g/kg DM	*309*	*349*	*338*	*244*
Minerals, g/kg DM	121	*113*	*99*	*95*
Acid detergent fibre, g/kg DM	*331*	*365*	*350*	*265*
Neutral detergent fibre, g/kg DM	*505*	*540*	*496*	*415*
Acid detergent lignin, g/kg DM	*48*	*59*	*52*	*34*
Total soluble sugars, g/kg DM	*78*	*56*	*64*	*161*
Cellulose, g/kg DM	*283*	*306*	*298*	*231*
Hemicellulose, g/kg DM	*174*	*175*	*146*	*150*
Digestible dry matter, g/kg DM	*631*	*605*	*616*	*683*
Relative feed value	*116*	*104*	*116*	*153*
Digestible energy, MJ/ kg	*12.43*	*11.96*	*12.16*	*13.36*
Metabolizable energy, MJ/ kg	*10.21*	*9.82*	*9.98*	*10.97*
Net energy for lactation, MJ/ kg	*6.22*	*5.83*	*6.01*	*5.98*

The biomethane produced from phytomass has a great importance and can successfully replace natural gas to obtain electric power and heat, can be compressed and used as transport fuel. The nutrient concentration of the phytomass substrate and its biodegradability influence the stability and the productivity of biogas reactors. The quality indices of the substrates from the investigated *Vicia tenuifolia* and their biochemical methane potential are shown in Table 3. The carbon to nitrogen ratio in the investigated leguminous phytomass substrates varied from 15.31 to 18.35, therefore, it met the established standards. The calculated biochemical biomethane potential of investigated substrates varied from

318 l/kg to 362 L/kg VS. The best biomethane potential was achieved in red clover substrates due to the lower concentration of structural carbohydrates. The biochemical biomethane potential of fine-leaf vetch phytomass substrates was 343-349 l/kg to 362 L/kg VS, exceeding the biomethane potential of substrates from alfalfa and common sainfoin.

Table 3

The biochemical biomethane production potential of the studied substrates from *Vicia tenuifolia*

Indices	Vicia tenuifolia		*Medicago sativa*		*Onobrychis viciifolia*		*Trifolium pratense*	
	green mass	*hay*	*green mass*	*hay*	*green mass*	*hay*	*green mass*	*hay*
Organic matter, g/kg DM	*882.00*	*879.00*	*909.00*	*887.00*	*904.00*	*901.00*	*911.00*	*905.00*
Minerals, g/kg DM	*118.00*	*121.00*	*91.00*	*113.00*	*96.00*	*99.00*	*89.00*	*95.00*
Carbon, g/kg DM	*490.00*	*488.00*	*505.00*	*492.00*	*502.00*	*500.55*	*506.11*	*502.77*
Crude protein, g/kg DM	*200.00*	*195.00*	*172.00*	*164.00*	*177.00*	*163.00*	*169.00*	*183.00*
Nitrogen, g/kg DM	*32.00*	*31.20*	*27.52*	*26.24*	*28.32*	*26.08*	*27.04*	*29.28*
Ratio carbon/nitrogen	*15.31*	*15.64*	*18.35*	*18.75*	*17.72*	*19.19*	*18.71*	*17.17*
Acid detergent lignin, g/kg DM	*44.00*	*48.00*	*58.00*	*59.00*	*49.00*	*52.00*	*31.00*	*34.00*
Hemicellulose, g/kg DM	*175.00*	*174.00*	*163.00*	*175.00*	*138.00*	*146.00*	*153.00*	*150.00*
Biomethane potential, L/kg VS	*349.00*	*343.00*	*321.00*	*318.00*	*335.00*	*327.00*	*362.00*	*360.00*
Biomethane potential, L/kg VS	*308.00*	*301.00*	*292.00*	*282.00*	*303.00*	*295.00*	*330.00*	*326.00*

Several publications have documented the biomethane potential of *Vicia* species substrates. According to Oleskowicz-Popiel P. (2010) the *Vicia villosa* substrate achieved a methane yield of 279 L/kg VS. Pakarinen A. *et al.* (2011) mentioned that the whole crop substrate from *Vicia faba* had and 387 L/kg VS methane yield. Molinuevo-Salces B. *et al.* (2014) found that after 57 days of anaerobic digestion the specific methane yield of *Vicia sativa* substrate was 186 L/kg VS, but in *Trifolium pratense* substrate and 195 L/kg VS. Ahlberg and Nilsson (2015) reported that methane yield of *Vicia villosa* biomass substrates varied from 305 to 343 L/kg VS. Ţîţei V. & Coşman S. (2018) remarked that the gas-producing potential of fermentable organic matter from *Vicia tenuifolia* substrates reached 235-284 L/kg methane, while *Medicago sativa* substrates 217-244 l/kg methane. Hunady I. *et al.* (2021) reported that the methane yield of the biomass from *Onobrychis viciifolia*, *Astragalus cicer*, *Dorycnium germanicum* and *Vicia sylvatica* ranged from 0.141 to 0.160 m^3/kg VS. In our previous research (Ţîţei V. and Cozari S. 2023), we found that the biochemical methane yield of *Vicia* species substrates was 320-343 L/kg VS and *Lathyrus* species substrates 322-378 L/kg VS.

CONCLUSIONS

The studied local ecotype of *Vicia tenuifolia* is of great interest for expanding the range of leguminous crops. It can serve as starting material for breeding and developing new cultivars of leguminous species for the production of protein-rich forages, as well as substrates for biomethane production as a renewable energy source.

ACKNOWLEDGEMENTS

This study has been financially supported by the subprogram no. 01.01.02 *"Identification of valuable forms of plant resources with multiple uses for the circular economy"*.

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