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Growth potential of autochthonous wether lambs on natural pasture between May and October

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Abstract

The year 2026 has been declared the International Year of Rangelands and Pastoralists by the UNESCO. To understand the exact capabilities, this study examines the growing and fattening ability of sheep under extensive conditions during the primary plant-growing season (between mid-May and mid-October). The investigation included wether lambs of Hungarian native sheep breeds with German Mutton Merino (GM) control individuals (5 per breed). To ensure reliable comparison, the values of live weight and daily gain were adjusted for the assigned days of life then a one-way ANOVA was performed on them with the fixed effect of breed. Data preparation and processing were done with the software Statistica (version 14, TIBCO). The effect of the age of the individuals was not significant, which means that lambs of similar age participated in the fattening period. However, differences between breeds were already evident in the initial weight (as a result of the growth during pre-weaning period and the weight at maturity): the Tsigai, Merino, Racka and GM started the study with a significantly higher weight than the Black Racka and the Dairy Tsigai. The lambs gained weight in the first and last fattening months, but lost weight overall during the intervening three months. The extensive, pasture-based fattening showed that the acclimatization and mid-summer weight losses were regained in accordance with the compensatory capacity of the young animals. The initial difference between breeds remained in the final weight, and this is also reflected in the average daily gain during fattening.

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Keywords: native sheep breeds, whether fattening, pasture-based feeding system, compensatory growth.

Introduction

Local sheep breeds are increasingly valued not only as components of agricultural heritage, but also as reservoirs of genetic diversity that may support resilience, adaptation and product differentiation in changing production systems.
In Hungary, several sheep breeds that were historically important from the Middle Ages to the nineteenth century have lost their former economic dominance and are now maintained mainly as gene reserves and elements of cultural heritage (HANKÓ, 1937; BÖKÖNYI, 1974). Among the traditional Hungarian sheep populations, the Hungarian Sheep (Racka) and the Tsigai occupy a particularly important historical position. The Hungarian Sheep belongs to the Zackel-type sheep of Eastern and Central Europe and is morphologically distinguished by the long, twisted V-shaped horns present in both sexes (MATOLCSI, 1975; GAÁL, 1986; DUNKA and JÁVOR, 1991; DUNKA, 2006). The Tsigai is another long-established breed of major regional importance. Ac-cording to the available breed descriptions, it originated in Asia Minor and reached the Carpathian Basin from the thirteenth century onward (SCHANDL, 1955; FÉSÜS, 1991). The Milking Tsigai represents a dairy-oriented Tsigai type maintained under Hungarian conditions. It is also of Balkan origin and established in Hungary by the end of the eighteenth century (GÁSPÁRDY et al., 2016). In contrast to these traditional populations, the Hungarian Merino represents the improved breed type that progressively displaced several indigenous and long-established sheep populations in Hungary. The modern Hungarian Merino was formed during the twentieth century from fine-wool Merino populations and local breeds, followed later by meat-oriented improvement (SZABÓ et al., 2016). The year 2026 has been declared the International Year of Rangelands and Pastoralists by the UNESCO.

To understand the exact capabilities, this study examines the growing and fattening ability of Hungarian autochthonous sheep breeds under extensive conditions during the primary plant-growing season (between mid-May and mid-October).

Material and methods

The investigation included wether lambs (5 per breed) of Hungarian native sheep breeds (Tsigai, Dairy Tsigai (DT), Hungarian Merino, as well as White and Black Rackas) with German Mutton Merino (GM) control individuals. The lambs had identifiers with the same unique individual life number in accordance with the EU

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regulations (Council Regulation (EC) No 21/2004) and additionally tattoos in the auricles. They were born in seed stocks with known origin. When selecting lambs, it was important that they were born from at least three rams of each breed. Bloodless castration with pliers Burdizzo style (VF301N, Aesculap, Inc., 3773 Corporate Parkway Center Valley, 18034 PA, USA) was performed in the first month after birth. For a competent farmer, to use this procedure without professional anaesthesia under 3 months of age (up to 90 days) is permitted in Europe. Therefore, no statement on animal ethics or welfare approval was requested for the castration.

The extensive fattening of the weaned wethers on pasture was carried out in the area of the Körös-Maros National Park (KMNP, in Dévaványa). After a short (9-day-long) acclimatization in their own barn on hey ad libitum, the lambs lived in natural environment, in an old-growth grassland, grazing freely during the day and spending the night in a sheep barn. One of the DT died after delivery with a diagnosis of pneumonia. They were not given any feed supplements. Lick salt and drinking water were always available to them. The pasture grass yield in the year of the study was about 1.8-1.9 tonnes per hectare (t/ha). This was considered exceptionally favourable in the area dominated by 80% of the alkaline meadow plant community. Here the most characteristic plant was the meadow foxtail (*Alopecurus pratensis*), but creeping bentgrass (*Agrostis stolonifera*), wand loosestrife (*Lythrum virgatum*) and birdsfoot deervetch (*Lotus corniculatus*) were also found in smaller quantities.

In addition to the delivery (May 10), initial (May 19) and final (October 14) weights of the lambs, their monthly live weights were also determined using a portable digital scale (SN: 206XM018, Iconix FX1, Iconix New Zealand Ltd., Oamaru, New Zealand) with an accuracy of 0.1 kg. The average daily gain was calculated by knowing the age and the weight gained per period between two consecutive weighting and during the entire fattening period.

To ensure reliable comparison, the values of live weight and daily gain were first adjusted for the assigned days of life. Then, to reveal breed differences a one-way ANOVA completed with Tukey HSD (Honestly Significant Difference) post-hoc test was used where the breed was considered as a fixed effect. Data preparation and processing were done with the software Statistica (version 14, TIBCO, 4980 Great America Parkway Santa Clara, CA 95054, USA).

Results and discussion

The effect of the age of the individuals in almost all the cases (per weight measurement) was not significant, which means that lambs of similar age participated in the fattening period. However, differences between breeds were already evident in the delivery weight as a result of the growth during pre-weaning period. The Tsigai, Merino, Racka and GM started the study with a significantly higher weight than the Black Racka and the Dairy Tsigai. During the acclimatization

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period, weight decreased, so daily gain took on negative values (Table 1). The average daily loss was 103 g. The only exception was Dairy Tsigai, which was able to maintain its gain during the acclimatization period.

Table 1: Delivery weight adjusted for 97 days of age (age p=0.192) and daily gain during acclimatization (age p=0.584) according to the studied sheep breeds

Breeds	n	Delivery weight, kg p<0.001	Std. Err.	Daily gain during acclimatization (between day 97 and 106), g p=0.001	Std. Err.
Tsigai	5	31.6^{a}	2.73	-237^{b}	155.6
Dairy Tsigai	5	21.4^{bc}	2.83	78^{a}	50.3
Hung. Merino	5	24.0^{bc}	2.03	-101^{ab}	97.3
White Racka	5	24.5^{b}	1.77	-52^{ab}	116.5
Black Racka	5	19.3^{c}	2.97	-145^{b}	46.8
Mutton Merino	5	31.2^{a}	2.15	-160^{b}	97.4
mean	30	25.3	5.20	-103	136.1

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

As shown in Table 2, the lambs gained weight in the first grazing period (from mid-May to mid-June). The pasture-based fattening showed that the acclimatization weight loss was regained in accordance with the compensatory capacity of the young animals. The average daily gain was 199 grams (between days 106 and 138). This suggests that two and a half weeks (half of this age range) were sufficient to replace the lost weight before true growth began. Highest compensatory gain was shown by Dairy Tsigai.

Table 2: Initial weight adjusted for 106 days of age (age p=0.254) and subsequent daily gain (age p=0.758) according to the studied sheep breeds

Breeds	n	Initial weight, kg p<0.001	Std. Err.	Daily gain after beginning of grazing (between day 106 and 138), g p<0.001	Std. Err.
Tsigai	5	29.4^{a}	2.81	157^{b}	44.7
Dairy Tsigai	4	22.1^{bc}	3.14	307^{a}	33.4
Hung. Merino	5	23.1^{b}	1.92	240^{ab}	29.3
White Racka	5	24.1^{b}	1.29	144^{c}	22.9
Black Racka	5	18.0^{c}	2.58	154^{bc}	11.2
Mutton Merino	5	29.8^{a}	1.98	213^{b}	69.3
mean	30	24.4	4.72	199	67.2

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

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Tables 3 and 4 illustrate that between the next two weighing periods, the lambs also lost live weight, which was also characterized by negative daily gain. These prove that the overall intervening 60 days were hindering the live weight growth. The average daily gain was -16 and -28 grams between days 138 and 165 and between days 165 and 197, respectively.

Table 3: Weight adjusted for 138 days of age (age p=0.393) and subsequent daily gain (age p=0.503) according to the studied sheep breeds

Breeds	n	Weight, kg p<0.001	Std. Err.	Daily gain during grazing (between day 138 and 165), g p=0.019	Std. Err.
Tsigai	5	34.3^{a}	3.36	14^{ab}	49.6
Dairy Tsigai	4	30.6^{ab}	3.52	-11^{ab}	51.0
Hung. Merino	5	30.5^{ab}	2.79	35^{a}	18.3
White Racka	5	28.6^{b}	1.26	-44^{ab}	54.5
Black Racka	5	22.8^{c}	2.65	-39^{ab}	18.5
Mutton Merino	5	36.4^{a}	2.87	-50^{b}	44.2
mean	29	30.5	5.15	-16	49.8

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

In the latter phase (Table 4), we found no significant (p=0.183) differences between breeds, so the summer weight loss can be determined uniformly for our wether lambs under the given grazing conditions. We observed that the rate of summer weight loss was smaller than during acclimatization, so we can speak more of stagnation.

Table 4: Weight adjusted for 165 days of age (age p=0.592) and subsequent daily gain (age p=0.869) according to the studied sheep breeds

Breeds	n	Weight, kg p<0.001	Std. Err.	Daily gain in most detrimental period (between day 165 and 197), g p=0.183	Std. Err.
Tsigai	5	34.7^{a}	3.74	5	23.1
Dairy Tsigai	4	30.4^{ab}	2.19	-81	40.7
Hung. Merino	5	31.4^{ab}	2.88	-73	139.4
White Racka	5	27.4^{bc}	2.08	-8	17.0
Black Racka	5	21.7^{c}	2.27	4	23.5
Mutton Merino	5	35.0^{a}	3.74	-24	35.1
mean	29	30.1	5.41	-28	67.3

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

As presented in Tables 5 and 6, the lambs also gained their weights in the last two (from mid-August to mid-October) fattening periods. The mid-summer weight losses were regained during early autumn. The average daily gain was 107 and 99 grams

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between days 197 and 228 and between days 228 and 255, respectively. In neither period did we find significant (p=0.275 and p=0.352, respectively) differences in daily growth between breeds. Thus, here too we can observe the general response of sheep. Regarding the autumn compensation, we can state that its extent is the same as that of the grazing period after acclimatization.

Table 5: Weight adjusted for 197 days of age (age p=0.095) and subsequent daily gain (age p<0.009) according to the studied sheep breeds

Breeds	n	Weight, kg p<0.001	Std. Err.	Daily gain after most detrimental period (between day197 and 228), g p=0.275	Std. Err.
Tsigai	5	34.8[a]	3.69	155	109.4
Dairy Tsigai	4	27.8[ab]	3.42	74	17.2
Hung. Merino	5	29.1[ab]	5.59	164	160.1
White Racka	5	27.1[bc]	2.00	106	24.9
Black Racka	5	21.9[c]	1.84	74	19.3
Mutton Merino	5	34.3[a]	3.01	65	21.2
mean	29	29.2	5.56	107	85.2

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

Table 6: Weight adjusted for 228 days of age (age p=0.534) and subsequent daily gain (age p=0.089) according to the studied sheep breeds

Breeds	n	Weight, kg p<0.001	Std. Err.	Daily gain during grazing (between day 228 and 255), g p=0.352	Std. Err.
Tsigai	5	39.6[a]	2.96	54	124.9
Dairy Tsigai	4	30.1[bc]	3.30	89	34.8
Hung. Merino	5	34.2[ab]	3.66	103	30.9
White Racka	5	30.4[b]	2.66	96	27.9
Black Racka	5	24.1[c]	2.20	105	13.8
Mutton Merino	5	36.3[a]	2.98	149	64.0
mean	29	32.5	5.79	99	63.6

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

Compensatory gain, known as catch-up growth and compensatory growth, is an accelerated growth of an individual following a detrimental period of slower or even stunted development. Our study revealed that the grazing animals were affected by periods that hindered their development on two occasions: the acclimatization period following delivery and the middle of summer. At the same time, our study also revealed that the animals responded satisfactorily after both detrimental periods.

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The initial difference between breeds remained in the final weight, and this is also reflected in the average daily gain during fattening (Table 7). The animals gained on average from weight of 25.3 kg at delivery (Table 1) to a final weight of 35.2 kg. An average daily gain of 73 grams was achieved during a 149-day grazing period. This performance was largely due to castration and fattening on old-growth grassland.

In our study, castrated lambs were used in pasture-based fattening exclusively, so the results can be interpreted in this context. Castration for the purpose of extensive fattening was typically performed in the past, not only in sheep, but also in other grazers, such as goats (KOYUNCU et al., 2007) and cattle (SCHMUTZ et al., 2013; SENTURKLU et al., 2023; SZABÓ and HOLLÓ, 2026). Later, it became more typical to raise castrated lambs on pasture and then their finishing in a short intensive period (GRAVADOR et al., 2018). However, there are also examples of grazing with concentrates supplementation (AMAD et al., 2023).

Table 7: Final weight adjusted for 255 days of age (age p=0.919) and subsequent daily gain (age p=0.314) according to the studied sheep breeds

Breeds	n	Final weight, kg p<0.001	Std. Err.	Daily gain during the entire grazing (between day 106 and 255), g p=0.020	Std. Err.
Tsigai	5	41.1^{a}	3.59	79^{ab}	12.5
Dairy Tsigai	4	32.5^{bc}	2.59	77^{ab}	3.3
Hung. Merino	5	37.0^{ab}	4.23	94^{a}	16.3
White Racka	5	33.0^{bc}	2.53	60^{b}	15.4
Black Racka	5	27.0^{c}	2.27	61^{b}	9.2
Mutton Merino	5	40.3^{a}	3.80	71^{ab}	24.8
mean	29	35.2	5.85	73	18.4

a, b, c – different superscript letters show significant differences (Tukey HSD test p<0.05)

LINDSAY et al. (2007) found the lowest liveweight gain in pasture fattening, where the pasture was a newly established perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) one. McGRATH et al. (2015) compared the growth rates and final weights of lambs grazing six novel irrigated pastures. They stated that final liveweights were highest (43.7 kg) for lambs (White Dorper) grazing the arrowleaf clover + chicory pasture.

Conclusion and recommendation

In our study, finishing lambs achieved low results in final weight and average daily gain during fattening. However, it must be admitted that under given conditions

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(castrated animals grazing) these are realistic values. During the study, weight loss occurred twice (during the acclimatization and in the middle of summer), which the animals made up for as a result of their compensatory ability and continued to grow under favourable conditions. We found that growth rates of lambs following a detrimental period are more efficient than average growth rates, in agreement with the findings of GASCOIGNE and LOVATT (2015).

Other conditions may have contributed to the poor results. For example, not only the grazing, but also the old-growth grassland itself, since the length of the grass blade here is unfavourably longer for the sheep. On the other hand, the available grass mass represents a low-to-moderate pasture cover. But we can think of the unfavourable effect of grazing without a shepherd, according to which under such conditions the animals migrate more and consume less grass.

In a more complex assessment of the economic efficiency of extensive wether fattening, other factors must also be taken into account. Traditionally, the wethers were not primarily used for meat production but were kept together with the ewes for years to shear fine wool (finer than that of rams). The wethers were intensively finished (conditioned) in late autumn to build up a strong tallow reserve for soap making in winter. Due to the close-to-nature keeping of indigenous animals, food products are highly seasonal, while other products (wool, leather, corneous material) are less so. The production and sale of the latter is therefore more balanced throughout the year. Efforts should be made to use the animals in as many ways as possible, and the income from curious - probably innovative (CILIBERTI et al., 2021) - products made from them should exceed the income from meat alone. The local animals are also an attraction for tourists with their uniqueness. Among the complementary benefits of traditional animal husbandry, we cannot forget about environmental protection. The extensive keeping of native animals is aided by the technical elements of precision livestock farming (PLF), which can be adopted from intensive farming and developed for extensive farming (HERLIN et al., 2021; SILVA et al., 2022).

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