Effects of crossbreeding Hungarian Merino sheep with Suffolk and Ile de France on carcass traits

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Abstract

In this examination, Hungarian Merino (ram n=30, ewe n=30), Hungarian Merino × Ile de France F₁, and Hungarian Merino × Suffolk F₁ (ram n=15, ewe n=15) lambs were used to evaluate the effect of crossbreeding on carcass characteristics and composition. We examined fattening performances and the following carcass traits: dressing percentage, weight of valuable carcass cuts, percentage of valuable meat, bone to meat ratio, and as well as meat conformation and fat cover (S/EUROP grading). In the present investigation, the weight at slaughter was fixed between 31-32 kg approximately, thus ensuring, weight would not affect carcass composition. Standardizing carcass weight allowed us to spot differences due to genotype and gender. The best results of fattening performance showed the Hungarian Merino × Ile de France F₁ lambs (358 g/day). The tested crossed genotypes had not greatly influence dressing percentage and warm carcass weight, but the best percentage valuable carcass cuts had Hungarian Merino × Suffolk F₁ (83.37 %). The best percentage of valuable meat presented (77.76 %) the Hungarian Merino × Ile de France F₁ lambs. The best meat conformation and fat covered showed the Hungarian Merino × Suffolk F₁ lambs. Hungarian Merinos showed less favourable results. To the summarising, the Suffolk and Ile de France improved the Hungarian Merino's fattening performance, slaughter value and ability of market over 30 kg live weight, therefore there were both breeds suggest with crossing.

Keywords: sheep, crossing, fattening, slaughter performance, S/EUROP qualifications, Hungarian Merino, Suffolk, Ile de France

Zusammenfassung

Mast und Schlachtleistungen von Lämmern aus der Kreuzung Ungarischer Merino mit Suffolk und Ile de France Schafen


Schlüsselwörter: Schaf, Kreuzung, Mast, Schlachtleistung, S/EUROP Klassifizierung, Ungarische Merino, Suffolk, Ile de France

Introduction
The slaughter performances of lambs are known to vary by genotype, sex, the fattening conditions, and slaughter weight and age (KORMAN 2001, MARTYNIUK et al. 2001, POMPA-ROBORZYNSKI and KEDZIOR 2006). Sheep carcass has conventionally been qualified by boning and meat quality scores. This objective method has been implemented with the S/EUROP classification system based on visual (subjective) grading of carcass some years ago. By now, a good deal of experience has accumulated with the use of the S/EUROP system concerned lamb carcass-quality (LENGYEL et al. 1999, LIPECKA et al. 2001, PARAPONIAK and ROBORZYNSKI 2001). Reliability of the S/EUROP system for evaluation of lamb carcass quality has been investigated by TOLDI et al. (1999) and more recently by FREUDENREICH et al. (2001).

In Hungary, 90 % of the income of sheep business is originated from lamb sales. Most of the lambs are exported at Easter, Christmas and at Ferragosto (15th August). In accordance to the strengthening market conditions the Hungarian sheep breeding is in a challenging environment where the competitiveness is sharper and difficult to sale.

Maintaining the level of revenues of Hungarian lamb export requires the competitiveness of this product, as well. Its realisation essentially takes improvement of meat production parameters (weight gain, body weight, slaughtering parameters). Increasing the revenues it is recommended to use meat type terminal breeds in commercial crossing with the marketing Hungarian Merino livestock (LENGYEL et al. 1999).

The performance of lamb and the quality of carcass are mainly determined by the breed itself (KEFELEGN et al. 1998). Pure breeds and crossings have significant role in production. Crossing from one generation to the other makes more and also heavier slaughtering lambs in comparison with pure breed production (ZUPP 2003). From the combination of simple crossing of two breeds all lambs should be fattened for slaughter, when heterosis is utilized (SUESS et al. 2000, ZUPP 2003). From the experiment of OSIKOWSKI and BORYS (1976), those lambs which originated from different meat type rams crossing with Merino ewes had better gain; Merino × Ile de France F1 had shown 6.2%, Merino × German Blackheaded F1 had shown 7.8% and Merino × Texel F1 had shown 8.8% extras in comparison with the pure-bred Merino lambs. Similar results received BROSTOWSKI and TANSKI (2006) and BRZOSTOWSKI et al. (2004).
The aim of our experiment was to evaluate the Hungarian Merino breed and determine whether the Suffolk and Ile de France breeds can exert a positive effect on the carcass characteristics and carcass S/EUROP qualification of Hungarian Merino lambs.

**Material and methods**

Within our experiment Hungarian Merino \( (n=30) \) ram and ewe lambs, age at the start: 60±2.95 day, Hungarian Merino × Ile de France F \(_1\) \((n=15)\) ram and ewe lambs, age at the start: 51.8±8.73 day and Hungarian Merino × Suffolk F \(_1\) \((n=15)\) ram and ewe lambs, age at the start: 55.5±7.12 day genotype lambs were examined. It was part of a long-term scientific program (2003-2005) focusing to meat production system in sheep husbandry. The experiments got executed at the Central Sheep Performance Station of Atkár, Hungary. The lambs were separated by sex and genotype. Littering was made with plenty of straw. Lambs were fed fattening feed, *ad libitum*. Feed contents were: 48% corn, 20% of wheat, 10% of lucerne meal, 10.5% soy meal, 4% sunflower meal, 4% bran and 3.5% of premix (KP9302). The crude content of feed is also present in Table 1.

<table>
<thead>
<tr>
<th>Component</th>
<th>894 g/kg forage</th>
<th>58 g/kg dry matter</th>
<th>143 g/kg dry matter</th>
<th>26 g/kg dry matter</th>
<th>59 g/kg dry matter</th>
<th>608 g/kg dry matter</th>
<th>12.4 MJ</th>
<th>1.1 %</th>
<th>0.4 %</th>
<th>0.3 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>
\[ Y_{ijk} = \mu + B_i + G_j + (B+G)k + e_{ijk} \]  

where is \( Y_{ijk} \) the value of the dependent variable, \( \mu \) the overall mean, \( B_i \) the effect of the genotype, \( G_j \) the effect of gender, \( (B+G)k \) the interaction genotype \( \times \) gender and \( e_{ijk} \) the random error.

## Results and discussion

In the present investigation, the weight at slaughter was fixed between 31-32 kg approximately, thus ensuring, weight would not affect carcass composition. Standardizing carcass weight allowed us to spot differences due to genotype and gender. GUTIERREZ et al. (2005) standardized the carcass weight for evaluate the effect of crossbreeding on carcass characteristics and composition.

Among the examined genotypes of all, the weight gain of Hungarian Merino \( \times \) Suffolk F\(_1\)'s and the Hungarian Merino \( \times \) Ile de France F\(_1\) lambs were the biggest (352.06 g/day vs. 358.24 g/day), and the Hungarian Merino as last in the order (323.01 g/day). The Hungarian Merino \( \times \) Suffolk crossed lambs weight gain corresponded with data published by SCHWULST, (1986) where found 346 g/day similar crossed lambs.

Concerning the average daily weight gain, Hungarian Merino lambs were 11% overdone by Hungarian Merino \( \times \) Ile de France F\(_1\), 9% by Hungarian Merino \( \times \) Suffolk F\(_1\).

The crossed genotypes tested did not greatly influence dressing percentage and warm carcass weight. These are in agreement with the findings of OSIKOWSKI and BORYS (1976), GUTIERREZ et al. (2004) and CLOETE et al. (2005).

Gender influenced the average weight gain. Ram groups had bigger average weight gain than ewe groups. Gender not influenced the dressing percentage and weight of warm carcass (Table 2).

### Table 2

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Average daily weight gains, g/day</th>
<th>Dressing percentage, %</th>
<th>Warm carcass, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungarian Merino (n=60)</td>
<td>323.01±4.82(^c)</td>
<td>50.74±0.27</td>
<td>16.01±0.18</td>
</tr>
<tr>
<td>Hungarian Merino ( \times ) Suffolk F(_1) (n=30)</td>
<td>352.06±6.99(^c)</td>
<td>51.59±0.38</td>
<td>16.34±0.27</td>
</tr>
<tr>
<td>Hungarian Merino ( \times ) Ile de France F(_1) (n=30)</td>
<td>358.24±6.76(^c)</td>
<td>51.34±0.38</td>
<td>16.12±0.26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Average daily weight gains, g/day</th>
<th>Dressing percentage, %</th>
<th>Warm carcass, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ram (n=60)</td>
<td>351.10±4.99(^a)</td>
<td>50.91±0.27</td>
<td>16.24±0.19</td>
</tr>
<tr>
<td>Ewe (n=60)</td>
<td>337.78±4.97(^a)</td>
<td>51.57±0.27</td>
<td>16.07±0.18</td>
</tr>
</tbody>
</table>

\(^a\) \( P<0.05\), \(^c\) \( P<0.001\)

Table 3 presents the collection of data of valuable carcass cuts from the right half (shoulders, round and cutlets). Out of the examined genotypes the total weight of all valuable carcass cuts of the Hungarian Merino \( \times \) Suffolk F\(_1\) lambs had shown significantly higher rates in comparison with the rates of the others genotypes (Hungarian Merino \( \times \) Ile de France F\(_1\): \( P<0.001\); Hungarian Merino: \( P<0.001\)). The proportion of the valuable
carcass cuts had shown similar trends, where the biggest proportion was in Hungarian Merino × Suffolk F₁ lambs compared Hungarian Merino lambs (P<0.001). Similar results established NAGY and DOMANOVSZKY (2006).

Concerning Hungarian Merino × Suffolk F₁ lambs had the heaviest shoulders (1.79 kg). It followed by Hungarian Merino × Ile de France F₁ and finally the Hungarian Merino.

Focusing on the weight of round, Hungarian Merino × Suffolk F₁ (3.29 kg) lambs were the bests. It was followed by the Hungarian Merino × Ile de France F₁ (3.04 kg) lambs and the Hungarian Merino lambs (2.84 kg).

The cutlet weight were similar between Hungarian Merino × Suffolk F₁ (1.75 kg) and Hungarian Merino × Ile de France F₁ (1.77 kg) lambs, the smallest cutlets were in Hungarian Merino lambs (1.66 kg).

Gender not influenced the commercial carcass cuts (Table 3).

Table 3
LS means ± standard error of lamb carcass cuts according to genotype and gender

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Shoulder, kg</th>
<th>Round, kg</th>
<th>Cutlet, kg</th>
<th>Valuable carcass cuts, kg</th>
<th>Valuable carcass cuts, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungarian Merino (n=60)</td>
<td>1.65±0.02c</td>
<td>2.84±0.05cc</td>
<td>1.66±0.03a</td>
<td>6.15±0.07c</td>
<td>77.14±0.76c</td>
</tr>
<tr>
<td>Hungarian Merino × Suffolk F₁ (n=30)</td>
<td>1.79±0.03c</td>
<td>3.29±0.07cc</td>
<td>1.75±0.04</td>
<td>6.84±0.09c</td>
<td>83.37±0.91c</td>
</tr>
<tr>
<td>Hungarian Merino × Ile de France F₁ (n=30)</td>
<td>1.68±0.03c</td>
<td>3.04±0.07a</td>
<td>1.77±0.04a</td>
<td>6.48±0.09c</td>
<td>81.06±0.88c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Shoulder, kg</th>
<th>Round, kg</th>
<th>Cutlet, kg</th>
<th>Valuable carcass cuts, kg</th>
<th>Valuable carcass cuts, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ram(n=60)</td>
<td>1.72±0.02</td>
<td>3.11±0.05</td>
<td>1.75±0.03</td>
<td>6.57±0.07</td>
<td>80.82±0.79</td>
</tr>
<tr>
<td>ewe(n=60)</td>
<td>1.70±0.02</td>
<td>3.01±0.05</td>
<td>1.71±0.03</td>
<td>6.41±0.07</td>
<td>80.22±0.78</td>
</tr>
</tbody>
</table>

The bone to meat ratio of the valuable carcass cuts (shoulder, round and cutlet) is collected into Table 4. Considering data it is appointed that Hungarian Merino × Suffolk F₁ and Hungarian Merino × Ile de France F₁ lambs produced significantly more valuable meat in comparison with Hungarian Merinos (P<0.001). The proportions of valuable members related to F₁’s were 75.4 %-77.7 %. The valuable meat ratio of Hungarian Merino × Ile de France F₁ was 77.7 %, significantly higher (P<0.05) than the results belonging to Hungarian Merino (76.5 %) and Hungarian Merino × Suffolk F₁ (75.5 %).

Gender influenced the bone to meat ration in shoulder, round and percent of valuable meat of carcass (Table 4). The ram carcasses had bigger percentage of bone to meat ration in shoulder and round and smaller percent of valuable meat than ewe. This observation corresponded with data published by GUTIERREZ et al. 2005.

Examining the conformation of slaughtered bodies (Figure 1) it’s concluded that 22 % of Hungarian Merino lambs are classified »U« type, 65 % of »R« and finally 13 % of »O« category. 50 % of Hungarian Merino × Suffolk F₁ lambs was classified »U«, and 50 % was »R«. 20 % of lambs were »U«, the rest of 80 % was »R« of lambs of Hungarian Merino × Ile de France F₁. Furthermore, 32 % of rams and 22 % of ewes were »U«, 62 % of rams and 68 % of ewes of lambs were classified as »R« the rest of 6 % of rams and 10 % of ewe lambs did »O«.
Table 4
LS means ± standard error of lamb bone-meat ratio according to genotype and gender

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Shoulder, %</th>
<th>Round, %</th>
<th>Cutlet, %</th>
<th>Valuable meat, kg</th>
<th>Valuable meat, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungarian Merino (n=60)</td>
<td>24.72±0.42a</td>
<td>22.33±0.42c</td>
<td>24.32±0.42a</td>
<td>4.71±0.05c</td>
<td>76.49±0.30a</td>
</tr>
<tr>
<td>Hungarian Merino × Suffolk F1 (n=30)</td>
<td>22.97±0.60a</td>
<td>25.15±0.61c</td>
<td>26.17±0.61a</td>
<td>5.08±0.08c</td>
<td>75.43±0.42ac</td>
</tr>
<tr>
<td>Hungarian Merino × Ile de France F1 (n=30)</td>
<td>21.21±0.59ac</td>
<td>21.51±0.58c</td>
<td>24.50±0.59</td>
<td>5.06±0.08c</td>
<td>77.76±0.41ac</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ram (n=60)</td>
<td>24.37±0.43c</td>
<td>23.64±0.43a</td>
<td>24.96±0.44</td>
<td>4.97±0.06c</td>
<td>75.87±0.31c</td>
</tr>
<tr>
<td>ewe (n=60)</td>
<td>21.56±0.43c</td>
<td>22.35±0.42a</td>
<td>25.03±0.43</td>
<td>4.92±0.06c</td>
<td>77.25±0.30c</td>
</tr>
</tbody>
</table>

a P<0.05,  c P<0.001

# Figure 1
Percentage of genotypes and genders by S/EUROP conformation scores

From the evaluation of the fat cover indices (Figure 2) 28% of Hungarian Merino lamb were ranked 2, while the rest of this breed was enrolled into class 3 (72%). 65% of Hungarian Merino × Suffolk F1 lambs were 2, 35% of them got 3 class. 50% of Hungarian Merino × Ile de France F1 lambs received 2 and 3. 46% of rams got into 2, 54% into 3 and 34% of ewes got 2, till the rest of 66% made 3. Gender influenced the S/EUROP conformation and fat covered. The ram carcasses had higher muscularity and lower fat covered than ewe lambs. These are in agreement with the findings of TOLDI et al. (1999); PAJOR et al. (2004) and NAGY et al. (2006).
The results suggested that the crossed genotypes were shown better muscularity (S/EUROP) conformation than pure Hungarian Merino. Above results are confirmed by others authors’ reported where Merino was the initial breed and Suffolk, German Merino, German Blackheaded were the meat breeds (MOLNÁR et al. 1999, LIPECZKA et al. 2001, ZUPP 2003, NAGY et al. 2006). The crossed genotypes were characterized with the most beneficial parameters of meat performance.

Summarising the results, both cross breed genotypes overdone the pure breed Hungarian Merino concerning weight gain. The slaughter performance and the S/EUROP conformation were the highest in Hungarian Merino × Suffolk F1. Presently, the results are shown in Hungarian practice, that Hungarian Merino lambs is not eligible fattening to great live body weight (30kg). Meat type breeds, their F1 lambs respectively, are recommended to be raised 30 kg live weight above, utilizing their advantageous gain capacities better.

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