Effects of Pasture Quality and Feeding Management on Carcass Quality in Lambs

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Abstract
Current research aimed to evaluate the effects of pasture quality and feeding management on carcass quality in fattening lambs in pasture based finishing systems. Turcana lambs and F1 German Blackheaded x Turcana cross-breds were used in 8 experimental groups, on two divergent production systems, conventional versus organic, respectively. On each type of pasture, two sub-variants were included, with and without concentrate feeding. Under conventional system, commercial yield of the carcasses ranged from 54.8±0.37 to 52.6±0.28 %, with both genotype and concentrates feeding influencing significantly (p≤0.05) the carcass yields. Under organic production, concentrates allowance did not influenced (p>0.05) the carcass yields of the lambs within the genotypes, being registered significant (p≤0.05) differences between the two genotypes. It was concluded that both pasture quality and concentrates allowance have a strong influence in lambs finished conventionally, and that under organic production the genotype is the main factor to influence carcass yields.

Keywords: carcass quality, finishing lambs, genotype, production system

1. Introduction
A great number of factors affect lambs carcass and meat quality, out of most prominent are the genotype, age at slaughter, sex and feeding management. Estimates of heritability for meat and carcass traits in lambs were found to have from low to moderate heritability, ranging from 0.18 to 0.36 in Sabi and Merino breeds, respectively [1, 2]. With dressing of carcasses yield having a higher heritability, ranging from 0.39 to 0.53 in Merino and INRA401 genotypes, respectively [3, 4].

As a result, carcass quality in sheep, and dressing yields could be improved throughout direct selection. In Romania, un-improved indigenous breeds are reared predominantly, for instance Turcana breed, which represents over 70% of the sheep national flock. Aldo the breed enjoys a growing popularity among breeders, due to its outstanding organic resistance and versatility (meat-milk productions). The carcass qualities of the breed are considered to me low, with most of the lambs after slaughter being ranked in the “O” and “P”quality classes based on the EUROP classification standard [5]. Breeders are generally interested in improving the carcass quality of their lambs by means of cross-breeding rather than selection, given that using terminal sires from the meat specialized breeds its
a fast and reliable method of improving both growth rates and carcass yields, taking advantage of the heterosis effects as well. Current research aimed to evaluate the effects of pasture quality and feeding management on carcass quality in fattening lambs in pasture based finishing systems.

2. Materials and methods

The study was carried out at the Research and Development Station for Sheep and Goats of the from Caransebes, during 2013. The following experimental design was applied:
- 2 production divergent systems (organic and conventional);
- 2 genotypes (F1 German Blackheaded Mutton x Turcana crossbred and Turcana purebred lambs);
- 2 management strategies for each production system (with and without concentrates allowance). Resulting in 8 experimental variants, of 10 lambs each.

Fenced, rotational grazing was practiced, with all animals having access to a water source and shade during the day.

Organic lamb meat production system being replicated based on the regulations stipulated by the Council Regulations of the European Commission (2092/91 EEC and 1804/99 EEC) and national laws and regulations.

Lambs at age of 5 months were introduced into the study for 30 days, in order to be finished on pasture, based on the experimental design described above.

Body weight was evaluated at the start of the experiments and at 7 days intervals after. From each experimental variant, 5 lambs at the age of 6 months, were slaughtered and carcass measurement and assessments were extrapolated per experimental group.

The following carcass traits were studies immediately after slaughter:
- i) commercial yield of the carcasses (carcass+head+internal organs/live body weight);
- ii) carcass yield (carcass/live body weight);
- iii) dressing yield of the carcass (meat/weight of the carcass).

Both Turcana and the F1 German Blackheaded Mutton x Turcana crossbreds lambs were sired by 2 half-sib rams / genotype, in order to minimize the effects that individuality and “sire effect” might have.

Data were statistically using MiniTab14 software and differences between groups were analyzed by non-parametric Mann–Whitney–Wilcoxon test. All decisions about the acceptance or rejection of statistical hypothesis have been made at the 0.05 level of significance.

The study was performed in accordance with the EU Directive 2010/63/EU for animal experimentation.

3. Results and discussion

In Tables 1 and 2 are being presented the commercial yield (%), carcass yield (%) and dressing percentage (%) in F1 German Blackheaded Mutton x Turcana (F1 GBxTA) crossbreds and Turcana purebred lambs reared under organic pasture based production and conventionally reared conditions.

In all lambs finished on pasture from both rearing systems, commercial yields of the crossbred lambs was significantly higher (p ≤ 0.05) compared with those registered by Turcana breed, regardless of the experimental variant applied.

Carcass yield was influenced significantly (p ≤ 0.05) by the experimental variant (with or without concentrates allowance) only if crossbred lambs. Turcana breed lambs allocation concentrate ration did not significantly affect (p> 0.05) carcass yield.

Carcass dressing percentage was not significantly influenced (p > 0.05) by the experimental variants (additionally feeding with concentrates), significant differences being recorded between the two genotypes studied (p ≤ 0.05).

Current findings are in agreement with those previously reported by Sauer et al., (2011) [6], concerning carcass quality in Turcana lambs and crossbreds of the breed with meat specialized breeds.

Carcass yields registered in the current study ranged between 52.6% and 54.8%, results similar compared to those presented by Pascal et al. (2009) [7], for F1 Texel x Tsigai crossbred lambs, and significantly higher than those reported in the same study for the Turcana and Tsigai purebred finished lambs, of 38% and 48%, respectively.

As suggested by Borton et al., (2005) [8], the carcass yield increase for lambs fed with concentrates could be attributed to the grater fat
deposits. However, greater fat deposits are an undesirable trait for the European markets, given the consumers' tastes and requirements for moderately fat sheep meat.

As a result, the combination of feeding system and carcass weights enables the production of various lamb types, resulting in different carcass quality, meat appearance, texture, dietetic properties, chemical composition and thus flavor [9].

### Table 1. Commercial yield (carcass+head+internal organs), carcass yield and dressing yield in lambs finished on organic rearing pasture based conditions

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Commercial yield (%)</th>
<th>Carcass yield (%)</th>
<th>Dressing yield(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&lt;sub&gt;1&lt;/sub&gt;GBxTA [A]</td>
<td>52.91±0.319</td>
<td>41.12±0.130</td>
<td>66.17±0.327</td>
</tr>
<tr>
<td>F&lt;sub&gt;1&lt;/sub&gt;GBxTA + concentrates [B]</td>
<td>54.84±0.375</td>
<td>45.21±0.205</td>
<td>64.40±0.289</td>
</tr>
<tr>
<td>Turcana [C]</td>
<td>52.60±0.289</td>
<td>40.26±0.176</td>
<td>59.83±0.318</td>
</tr>
<tr>
<td>Turcana + concentrates [D]</td>
<td>54.10±2.950</td>
<td>40.80±0.346</td>
<td>60.06±0.433</td>
</tr>
</tbody>
</table>

| A vs. B                         | -1.93 *              | -4.09 *           | 1.77 NS           |
| C vs. D                         | -1.50 NS             | -0.54 NS          | -0.23 NS          |
| A vs. C                         | 0.31 *               | 0.86 NS           | 6.34 *            |
| B vs. D                         | 0.74 *               | 4.41 *            | 4.34 *            |

NS p≥0.05; * p≤0.05; ** p≤0.01; *** p≤0.001

### Table 2. Commercial yield (carcass+head+internal organs), carcass yield and dressing yield in lambs finished on conventional rearing pasture based conditions

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Commercial yield (%)</th>
<th>Carcass yield (%)</th>
<th>Dressing yield(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&lt;sub&gt;1&lt;/sub&gt;GBxTA [E]</td>
<td>54.35±0.318</td>
<td>43.17±0.176</td>
<td>62.31±0.580</td>
</tr>
<tr>
<td>F&lt;sub&gt;1&lt;/sub&gt;GBxTA + concentrates [F]</td>
<td>54.41±0.375</td>
<td>43.80±0.404</td>
<td>62.31±0.230</td>
</tr>
<tr>
<td>Turcana [G]</td>
<td>52.60±0.395</td>
<td>41.43±0.485</td>
<td>60.36±0.176</td>
</tr>
<tr>
<td>Turcana + concentrates [H]</td>
<td>52.90±0.493</td>
<td>41.80±0.551</td>
<td>61.83±0.433</td>
</tr>
</tbody>
</table>

| E vs. F                         | -0.06 NS             | -0.63 NS          | 0.00 NS           |
| G vs. H                         | -0.30 NS             | -0.37 NS          | -1.47 NS          |
| E vs. G                         | 1.75 *               | 1.74 *            | 1.95 *            |
| F vs. H                         | 1.51 *               | 2.00 *            | 0.48 NS           |

### 4. Conclusions

Results suggest that both production systems and allowance of concentrates to finishing lambs on pastures have limited influence on carcass traits. Moreover, the main influencing factor on carcass quality was the lambs' genotype. Within all 8 experimental groups, F<sub>1</sub> GBxTA lambs had superior carcasses compared to purebred Turcana lambs.

### Acknowledgements

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