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Scientific matters

EAAP – 50th Annual Meeting, Zurich 1999
A new lamb feeding method
Filiya, I. and A. Karabulut

Milk production

Observations on the appearance of mastitis in milked Merino ewes and in their crossbreds with prolific breeds
Pakulska, T., B. Borys and M. Osikowski

Milk fat composition in goats representing different genetic variants of αS1 casein
Rekiewska, B., Z. Ryniewicz, M. Góralczyk, A. Karaszewska and K. Zdziarski

The growth and reproductive characteristics and milk yield of Karakaş sheep in rural farm conditions
Gökadal, Ö., M. Bingöl, A. Çivi, Y. Askin and F. Cengiz

Milk protein polymorphism in Portuguese sheep breeds: αS1-casein and β-lactoglobulin

The influence of different lymphocytes subpopulations in milk on the health state of udder in sheep
Świderek, W.P., A. Winnicka, Wł Kuciński and K.M. Charon

The milk production of Finnish landrace sheep and their crosses with meat-wool breeds
Nassiry, M.R., V.P. Shekalova and E.A. Karasov

The effect of ration’s maize gluten meal-in substitution of soy bean meal- on yield and composition of ewes’ milk in early lactation
Liamidis, D. and Ch. Milis

Correlation between the udder health state, its dimensions and milk productivity in the milking hybrids ewes F₁ East Friesian x Polish Merino
Mroczkowski, S., B. Borys and D. Piwczyński

Meat production and quality aspects

Competitiveness of lamb meat quality in Hungary
Molnár, B.

A study of performance traits of Charolaise sheep imported from France to Poland
Czarniawska-Zajać, S. and W. Szczepański
SHEEP AND GOAT PRODUCTION

**Milk fat composition in goats representing different genetic variants of α S1 casein**

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The aim of the study was to compare milk fat composition in goats representing strong (S) and weak (W) genetic variants of α S1 casein. Milk protein genotypes were determined by PAGE at the beginning of lactation and two groups of 20 goats identified as S or W variants were selected from a herd. Milk samples were collected between 2nd and 7th month of lactation. Milk fat was fractionated by TLC and then fractions and fatty acid (FA) composition were quantified spectrometrically or with GC. Milk of goats representing S variants of α S1 casein contained significantly (P<0.01) more of protein and fat than W phenotypes. Besides, due to significantly lower FFA concentration, the milk fat of the S α S1 casein variants was less susceptible to lipolysis compared with the W phenotypes. The effect of genotype was highly significant (P<0.01) for saturated FAs only in case of capric acid C₁₀:₀. In MUFA strong variants of α S1 casein contained significantly more (P<0.01) palmito-oleic acid C₁₆:₁ than W variants. The most important differences occurred among PUFA. The S variants of α S1 casein were associated with a significantly higher (P<0.01) content of arachidonic acid, but considerably lower (P<0.001) content of C₂₂:₅;C₂₂:₆ and conjugated linoleic acid (CLA) than W variants.

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**The growth and reproductive characteristics and milk yield of Karakas sheep in rural farm conditions**

Ö. Gökdal*, M. Bingöl, A. Çivi, Y. Askan, F. Cengiz, Yüzyüce Yyl Üniversitesi, Ziraat Fakültesi, Zootekni Bölümü, Van, Turkey.

This research has been carried out to determine the growth and reproductive characteristics and milk yield of Karaka_ sheep, known as a variety of Akkaraman, in rural farm conditions. In general, information related to the performance of native sheep breeds of Turkey under rural farm conditions is insufficient. The means of live weights of lambs at birth, 90, 134 (at weaning) and 180 days of age were 3.69, 18.93, 27.19 and 27.33 kg, respectively. The average daily gains from birth to weaning and from birth to 180th days were 0.170 and 0.128, respectively. Infertility, abortion, parturition and twinning rates were found to be 5.26 %, 5.26 %, 89.47 % and 8.82 %, respectively. Fecundity and litter size were found to be 0.97 and 1.08, respectively. The survival rates of lambs until 7th and 134th (until weaning) days were 94.60 % and 87.84 %, respectively. The means of lactation length and lactation milk yield for ewes were 197.8 days and 54.75 l, respectively.
The Growth and Reproductive Characteristics and Milk Yield of Karakaş Sheep in Rural Farm Conditions

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INTRODUCTION

Sheep production has retained its importance for centuries in agriculture and economy as well as its role in human nutrition in Turkey. It is known that Turkey has a rich domestic animal population but has a poor animal productivity. This is mainly due to the high numbers of the native breeds having low productivity and traditional extensive production methods. Although the positive developments have been observed in sheep breeding structure, the traditional extensive production method is still a common practise for the breeders. Ninety six percent of the sheep population is of native breeds where as only 4% is pure Merino and its crosses. The 87.25 percent of the native breeds are fat-tailed whereas the thin tailed breeds are only 12.75 percent (Aşkin and Cengiz, 1993).

The Eastern Anatolia is one of the regions with the greatest density of sheep. In some cases sheep breeding is the only possible form of production. The environmental conditions are restrictive for optimum production. Karakaş sheep is a variety of Akkaraman sheep breed which found in the Van and Bitlis provinces of Eastern Anatolia. This type of sheep are kept in their shed through cold season following lambing in February-March when they depend mainly on straw for feeding. In the remaining of the year the flocks are taken out to graze on pastures and stubble. The one month before the weaning is start milking activities for once a day milking. After weaning at 3-4 months of age, the ewes are milked twice daily for two months and then once a day in the following months. The fat-tailed Karakaş sheep are known by the their white body with white head with black stain around eyes and legs or white body with black head. The rams are generally horned whereas the ewes are rarely horned. Their fleece is coarse and mixed as carpet type weighing (2.16 kg) (Altın et al., 1995). The live weight and milk yield vary with raising conditions. Karakaş sheep are favorable characterized by their adaptation to adverse weather and feeding conditions and strong flocking instinct. The Karakaş sheep is also well known to tolerate extreme temperatures, poor feeding and diseases. The shelters for all families are similar. Sheep are housed in simple and generally unhygienic sheep-sheds during winter and they are generally fed on straw. The grazing period is about 6-7 months (Karaca et al., 1993).

The structural measures of traditional extensive production systems should be well defined from stand point of the nature condition, cultural structure, native breed characteristics, management methods and traditional cooperation for all different regions. These information are necessary to create contemporary breeding organizations in Turkey. More information is needed on the sheep production structure and the performance of native sheep breeds of Turkey in rural farm conditions.

This research has been carried out to determine the growth and reproductive characteristics and milk yield of Karakaş sheep, known as a variety of Akkaraman, in rural farm conditions.

MATERIAL AND METHODS

This study was carried out in 76 Karakaş ewes (3-6 years old) and their lambs to determine the production traits. They were maintained under the rural farm conditions in
Gürpınar, Van. The ewes had lambed from mid December to mid May and they were kept under similar management conditions. Ewes and lambs received routine vaccination and parasite treatment. In winter, they were put in a barn with an outdoor lot, and fed hay, straw and a small amount of concentrate. In grazing season, animals were grazed only. The mean live weight of ewes after the parturition were 47.82 kg, and at the end of the grazing period were 49.57 kg.

The lambs were weighed within 24 h of birth and their birth weight, birth type, sex, dam and birth date recorded. Lambs were allowed to suck continuously from birth to 30 days postpartum. But after this, lambs were separated their dams at 18.00h and rejoined their dams at about 09.00 h. Lambs were allowed to suck until 18.00h. After the parturition, the ewes were not milked up to three days. Lamb body weights were recorded at two weekly intervals until average 6 months of age. The lambs were weaned at average 134 days after lambing. Ninetyth and 180th days and weaning weights were computed by linear interpolation. From the recorded weight, gain in weight at different ages were calculated.

The milk recordings of ewes were performed with an interval of 14 days throughout the lactation. In the milk yield test day, the ewes were milked by hand once a day in the morning milking. Milk production was measured in liters for individual ewes. Milk production was estimated from two weekly test day records, and the lactation was terminated when daily yield dropped below 50 ml. Lactation milk yield was computed according to the following formula;

\[
\text{Lactation milk yield (l)} = a \sum_{i=1}^{n} k_i \cdot (a/2 - A) \cdot k_i
\]

Where: \(a\) milk recording interval (day), \(k_i\) milk yield for ith test day (l), \(A\): days between lambing and the first recording (day), \(k_i\): milk yield for first test day (l) (Özcan, 1990).

Data were analysed using least-squares procedures. The statistical model included age and fertility status for milk yield. The data of lamb weights were also analysed by the least square technique for the effect of type of birth, age of dam, sex of lambs on body weight at different ages. Differences among subgroups means were tested using the Duncan’s multiple range test.

Twenty ewes suffered from diseases, death or lost their lambs before weaning, and their data were excluded from the milk yield results. And twenty lambs suffered from diseases, death or lost their dams before weaning, and their data were excluded from the growth characteristics results.

The reproductive characteristics of ewes (infertility, abortion, lambing and twinning rates and litter size and fecundity) and survival rate of lambs were determined according to the results of the lambing and weaning (Kaymakçı and Sönmez, 1992).

RESULTS AND DISCUSSION

The least square means, standard errors, tests of significance for growth characteristics and results of Duncan’s multiple range tests for lamb weights for each age of dam, sex and birth type of lamb have been presented in Table 1.

The means of live weights of lambs at birth, 90 days of age, weaning (134 days of age) and 180 days of age were 3.69, 18.93, 27.19 and 27.33 kg, respectively. Mean daily gain from birth to weaning and from birth to 180th days were 0.170 and 0.128 kg, respectively.

Effects of age of dam, sex of lamb and type of birth on lamb weights were also investigated. As it was shown Table 1, mean live weights of lambs from 3 years old dams were at the lowest and significant differences were found between this mean and the means of lambs from various aged dams (\(P<0.05\)). Mean lamb weights showing a rapid increase with the increase in the age of dam reached a maximum at around 5 and 6 years old dams lambs.
In general, male lambs were insignificantly heavier than female lambs. Differences being 0.26 kg for birth, 1.57 kg for 90-day weight, 1.9 kg for weaning weight. Statistically significant differences between single and twin born lambs were observed for birth weight. Lambs born as singles were heavier at birth, at weaning and at 90 and 180 days of age and single born lambs grew faster than the lambs born as twins from birth to weaning and birth to 180th day (Table 1). Single lambs were heavier 1.28 kg at birth, 1.63 kg at 90-day, 2.52 kg at weaning and 2.41 kg at 180-day. The effects of age of dam, lamb sex and birth type on lamb weights and daily gains were not significant except for the birth type had significant effects on birth weights (P<0.01). The birth weight had significant effects on weaning weight (P<0.05), 180 days of age (P<0.01) and daily gain to 180 days of age (P<0.05). Age at weaning had significant effects on average daily gain during the preweaning phase and weaning weight (P<0.01).

From birth to weaning and to 180 days of age growth rates were not significantly affected age of dam, birth type and sex of lambs. Single lambs were heavier at birth and also gained at faster rates to maintain the weight advantage at subsequent ages. Daily gain of male lambs were higher than that of female lambs. But, sex had no significant effect on daily gain.

From Table 1, average birth weight of male lambs was found heavier than the female lambs (3.82 vs 3.56 kg). Again at 180th days of age the female lambs were found heavier than the male lambs. In all other stages live weight of male lambs were always higher than that of the female lambs. But the differences among male and female lamb weights were not significant. At 90th days of age the average body weight were 19.72 kg in male lambs and that of female lambs were 18.15 kg. Average birth weight of single lambs were found heavier than the twin lambs (4.33 vs 3.05 kg). At all ages the single lambs were found heavier than the twin lambs. At 90th days of age single lambs weighed 19.75 kg against 18.12 kg for the twin lambs. At the weaning, single lambs weighed 28.45 kg against 25.93 kg for the twin lambs. Twin lambs gained at slower rates than singles during the suckling (134 days of age) and 180-day periods (Table 1). Higher birth weight and weight gain of single lambs may be due to better nutrition of the single lambs both at pre-natal and post-natal period. However, twin lambs are preferable than the single lambs, because twin lambs are more economical, because of higher return.

The least square means, standard errors, tests of significance and results of Duncan's multiple range tests for milk yield and lactation length for each age of ewe and fertility status have been presented in Table 2.

<table>
<thead>
<tr>
<th>Factors</th>
<th>n</th>
<th>Lactation milk yield (l)</th>
<th>Lactation length (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X±Sx</td>
<td>X±Sx</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>39.83±9.25 b</td>
<td>171.83±14.01 b</td>
</tr>
<tr>
<td>4</td>
<td>31</td>
<td>57.15±5.46 a</td>
<td>197.38±8.27 ab</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>61.78±5.92 a</td>
<td>214.70±8.97 a</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>60.26±7.52 a</td>
<td>207.31±11.39 a</td>
</tr>
<tr>
<td>Fertility status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>52</td>
<td>54.35±3.08</td>
<td>195.57±4.67</td>
</tr>
<tr>
<td>Twin</td>
<td>4</td>
<td>55.16±9.19</td>
<td>200.03±13.93</td>
</tr>
<tr>
<td>Overall</td>
<td>56</td>
<td>54.75±4.95</td>
<td>197.80±7.51</td>
</tr>
</tbody>
</table>

*: p<0.05, a, b: (p<0.05).

Overall least-squares mean for lactation milk yield and lactation length were 54.75±4.95 liters and 197.80±7.51 days, respectively.
TABLE 1. Least squares means (±se), tests of significance for lamb weights studied and results of Duncan's multiple range tests for Karakaş lambs each factor (kg).

<table>
<thead>
<tr>
<th>Factors</th>
<th>Birth weight</th>
<th>90th day</th>
<th>180th day</th>
<th>Weaning weight</th>
<th>Daily gain from birth to weaning (134th day)</th>
<th>Daily gain from birth to 180th day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>X±Sx</td>
<td>n</td>
<td>X±Sx</td>
<td>n</td>
<td>X±Sx</td>
</tr>
<tr>
<td>Age of dam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>3.51±0.23 c</td>
<td>5</td>
<td>18.63±1.68 b</td>
<td>4</td>
<td>25.95±2.24 b</td>
</tr>
<tr>
<td>4</td>
<td>31</td>
<td>3.70±0.13 b</td>
<td>30</td>
<td>17.91±1.01 b</td>
<td>22</td>
<td>27.94±1.32 a</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>3.93±0.17 a</td>
<td>11</td>
<td>18.85±1.11 b</td>
<td>8</td>
<td>27.16±1.46 ab</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>3.64±0.19 bc</td>
<td>6</td>
<td>20.35±1.29 a</td>
<td>3</td>
<td>28.29±2.21 a</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>3.82±0.15</td>
<td>20</td>
<td>19.72±1.04</td>
<td>12</td>
<td>27.18±1.36</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>3.56±0.12</td>
<td>32</td>
<td>18.15±0.99</td>
<td>25</td>
<td>27.48±1.24</td>
</tr>
<tr>
<td>Birth type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>49</td>
<td>4.33±0.08</td>
<td>48</td>
<td>19.75±0.54</td>
<td>33</td>
<td>28.54±0.88</td>
</tr>
<tr>
<td>Twin</td>
<td>5</td>
<td>3.05±0.21</td>
<td>4</td>
<td>18.12±1.78</td>
<td>4</td>
<td>26.13±2.18</td>
</tr>
<tr>
<td>Regressions (Linear)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam weight (kg)</td>
<td>0.0224±0.0098*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Birth weight (kg)</td>
<td>-</td>
<td>1.3730±0.8698</td>
<td>3.4435±1.1964**</td>
<td>2.4635±1.0387*</td>
<td>0.0122±0.0073</td>
<td>0.0135±0.0066*</td>
</tr>
<tr>
<td>Age at weaning (day)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.1379±0.0193**</td>
<td>-0.00056±0.00013**</td>
</tr>
</tbody>
</table>

Overall | 54 | 3.69±0.11 | 52 | 18.93±0.92 | 37 | 27.33±1.13 | 52 | 27.19±1.08 | 52 | 0.170±0.007 | 37 | 0.128±0.006 |

*: P<0.05, **: P<0.01, abc: (p<0.05).
Effects of age of dam and fertility status on milk yield and lactation length were also investigated. The lactation milk yield and lactation length of ewes beginning increase from the age of 3 reached a maximum at 5 years, and then decreased for 6 years old ewes. Mean lactation milk yield and lactation length were the lowest for 3 years old ewes but showed a rapid increase following ages. But, there were no significant effect of ewe age on lactation milk yield. Statistically significant differences were found between lactation length means of different aged ewes (P<0.05). Lactation milk yield was not significantly affected by age of ewe. But, according to Duncan’s multiple range test, 3 years old ewes had lowest milk yield values (39.83 l) than other ewes (P<0.05). In addition, twin-suckling ewes produced slightly more milk than ewes suckling singles. But, the differences among single- or twin-suckling ewes were not significant.

In Turkey, milk production will continue to be an important economic trait of sheep. Thus, every attempt to increase the quantity of milk sold without impeding the growth of lambs is of great importance.

Reproduction performance of ewes at lambing is summarized in Table 3.

<table>
<thead>
<tr>
<th>Reproductive characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infertility rate</td>
<td>5.26 %</td>
</tr>
<tr>
<td>Abortion rate</td>
<td>5.26 %</td>
</tr>
<tr>
<td>Lambing rate</td>
<td>89.47 %</td>
</tr>
<tr>
<td>Twinning rate</td>
<td>8.82 %</td>
</tr>
<tr>
<td>Fecundity</td>
<td>0.97</td>
</tr>
<tr>
<td>Litter size</td>
<td>1.08</td>
</tr>
<tr>
<td>First week lamb survival</td>
<td>94.60 %</td>
</tr>
<tr>
<td>Lamb survival at weaning</td>
<td>87.84 %</td>
</tr>
</tbody>
</table>

In the present study, lambing rate, fecundity and litter size of Karakaş sheep were 89.47 %, 0.97 and 1.08. Low reproductive efficiency of Karakaş sheep is the major drawback of this breed.

The structure of animal breeding is getting better recently, partly due to the application of some new techniques. These developments create some new problems such as the extinction of animal gene resources. If a national project related to the protection of animal gene resources wouldn’t be realised immediately, some sheep races such as Karakaş and Norduz (varieties of Akkaraman), Tuj and Herik could be diminished.

REFERENCES


