

COMPARATIVE STUDY ON FITNESS TRAITS AND REPRODUCTIVE EFFICIENCY IN TURCANA AND TSIGAI EWES

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Abstract

Aim of the current comparative study was to evaluate health, reproductive rates and fitness indicators in Tsigai and Turcana sheep breeds reared under semi-intensive production system conditions. The project herd is consisted of 203 Tsigai (Szombor ecotype) and 226 Turcana (Sibiu ecotype) breeding ewes. The Tsigai ewes were more affected ($p \leq 0.01$) by clinical mastitis compared to Turcana ewes, with an incidence of $10.8 \pm 0.21\%$ and $3.11 \pm 1.16\%$, respectively. The Tsigai ewes produced significantly higher litters ($p \leq 0.001$) compared to Turcana breed, $1.45 \pm 0.04\%$ compared to $1.17 \pm 0.02\%$. Lambs weaning rates were not influenced by the genotype ($p > 0.05$). This comparative study was the first attempt to provide information on the reproductive efficiency and health traits in Tsigai and Turcana breeds under temperate climate conditions found in Eastern Europe. For the selected specialized Sombor Tsigai ecotype it would be advisable to include fitness traits into the breeding selection schemes in order to improve animal welfare and overall productivity.

Key words: Tsigai, Turcana, sheep welfare, reproductive efficiency.

INTRODUCTION

Zackel and Tsigai sheep are widely dispersed throughout Central, Eastern and Southern Europe, being considered as the two main indigenous breed groups found in this area (Papageorgiou 2011; Draganescu and Grosu 2010; Kusza et al., 2008). Moreover, Lawson-Handley et al. (2007) have recently stated that the Tsigai group is strongly influenced by Zackel, and merged the two groups in their studies regarding the genetic structure of European sheep breeds. Zackel (mountain) and Tsigai (lowland) sheep are usually dual-purpose breeds, being reared for meat and milk. Romania has a national flock of 9.508.293 sheep and 1.282.011 goats, with numbers increasing by 5 to 8% each year for both species in the last 5 years (Padeanu, 2014). Also, our country has a pasture surface of 4.9 million ha, which could sustain a flock of up to 16 million small ruminants (Dragomir, 2009). Over 85% of sheep and goats are being reared under extensive 'low-input' production systems (Belibasaki et al., 2012), with the breed

structure being dominated by indigenous rustic breeds, such as the dual-purpose Turcana (Zackel group) and Tsigai sheep (Ilisiu et al., 2013), representing 52.4% and 24.3% from the breed structure, respectively.

Selection schemes practiced in Romania for sheep are focused solely on production levels (milk yield, growth rates and prolificacy), with no selection traits for fitness.

Moreover, the incidence and implications of technopaties such as mastitis and lameness have not been studied in the Romanian flocks. To the best of our knowledge, no other comparative study concerning the reproduction and health traits of Tsigai and Turcana sheep breeds under semi-intensive European rearing conditions exists up to this moment. Furthermore, this is the first attempt to define fitness traits in the indigenous Turcana breed.

Aim of the current comparative study was to evaluate health, reproductive rates and fitness indicators in Tsigai and Turcana sheep breeds reared under semi-intensive production system conditions.

MATERIALS AND METHODS

Location and flock management

The study was carried out in a commercial farm from Sanpetru Mare - Timis county, western Romania (46°3'N/20°40'E). Tsigai and Turcana purebred ewes were included in the study and were managed semi-intensively under identical rearing conditions for a period of one production year (Table 1).

Ewes were between 1.5 and 8 years old, with age and parity balanced across breeds and representing a diverse sampling of genetic lines within each breed. The project herd in consisted of 203 Tsigai (Szombor ecotype) and 226 Turcana (Sibiu ecotype) breeding ewes. No external ewes were included in the experimental herd. All replacement ewes for the two breeds were produced and added to the breeding herd at the age of 1.5 years. The production year started at 1st of September 2014, when the ewes were put to ram (for 3 consecutive oestrous cycles, roughly 55 days) and ended in late August 2015.

Sanpetru Mare region has a typical Central European humid continental climate, with the farm being located at an elevation of 85 m above sea level and a total annual precipitation of 536.3 mm, with a mean annual temperature of 10.8°C.

Table 1. Number of ewes in the study-herd and data on the general rearing conditions

Tsigai ewes	203	Turcana ewes	226
Location	46°3'N/20°40'E	Annual temp.	10.8°C
Altitude	85 m	Precipitation	536.3 mm
Housing	90 days/year	System	Semi-intensive
Weaning	60 days	Creep feeding	<i>ad libitum</i>

Both ewes and their lambs were kept confined on deep straw bedding for a period of 90 days during winter (mid December - mid March), with a space allowance of 1.2 m² and 1 m², respectively. Ewes received high-quality alfalfa and lolium hays *ad libitum*, with an additional 300 g concentrate in late gestation and during lactation period. Lambs were creep fed (*ad libitum*, 16% crude protein) and weaned at 60 days of age. Nutritional flushing was not practiced. And grazed on a natural fenced pastures for the rest of the year (stoking rates of 5-7 sheep/ha). In addition, all animals had free

access to potable water twice per day and mineral blocks year around.

The research activities were performed in accordance with the European Union's Directive for animal experimentation (Directive 2010/63/EU).

Data and statistical analysis

Occurrence rates of the following health disorders were recorded by the veterinarian: mastitis, lameness, pneumonia and abortion. Annual attrition rates were determined by identifying ewes in the herd at the start of the production year not present in the herd at the end of the production year. Death and culling because of all reasons were included when evaluating attrition rates. Data on the reproductive performance of ewes (conception rate, litter size and survival rates of un-weaned lambs) were recorded for both breeds.

In order to assess the effect of the genotype (breed) on the above-mentioned health disorders, as well as on the reproduction performance of the ewes, the STATISTICA software was used (Hill and Lewicki, 2007). The Main Effect ANOVA analysis of variance was applied. The model used for statistical analysis is presented below:

$$y_{ijk} = \mu + g_j + e_{ijk}$$

where y_{ijk} is the studied reproduction or health trait; μ is the overall mean; g_j represents the random effect of the genotype with two levels: Tsigai and Turcana; and e_{ijk} is the residual effect. When significant effects of the genotype were observed, the comparison between breeds was tested by performing contrast analysis, using Tukey test.

RESULTS AND DISCUSSIONS

Taking into account the clinical mastitis occurrence rate, the Tsigai ewes were more affected ($p \leq 0.01$) compared to Turcana ewes, with an incidence of 10.8% and 3.11%, respectively (Table 2). Results for the Tsigai breed are consistent with estimates of Giadinis et al. (2011), which report occurrence rates for mastitis of over 10% in commercial sheep flocks. Mastitis has a negative impact on ewe stay ability, milk yield, lambs growth and survival, veterinary costs and represents a major concern for animal welfare. Moreover, the importance of mastitis in Europe was

outlined by Ligda et al. (2003), who found mastitis to be the main cause for culling in the Greek dairy sheep industry, accounting for 46% of the attrition cases.

Table 2. Means (\pm SE) for occurrence rates of mastitis, lameness, pneumonia and abortions in Tsigai and Turcana ewes

Genotype	Mastitis (%)	Lameness (%)	Pneumonia (%)	Abortion (%)
Tsigai	10.8 \pm 0.21	6.4 \pm 1.72	5.4 \pm 1.59	3.4 \pm 1.28
Turcana	3.11 \pm 1.16	2.6 \pm 1.08	1.3 \pm 0.76	1.7 \pm 0.88
<i>Differences</i>	**	*	*	*

^{NS} $p>0.05$; * $p\leq 0.05$; ** $p\leq 0.01$; *** $p\leq 0.001$

Current study highlights the low resistance to clinical mastitis of the Sombor Tsigai. As a result, measures such as including the genetic resistance to mastitis as a trait into the breed's selection scheme should be undertaken. The incidence of clinical mastitis in small ruminants is generally lower than 5% (Arranz and Gutierrez, 2012), whereas the prevalence of sub-clinical mastitis ranges from 10% to 50% in dairy flocks (Sechi et al., 2009).

Lameness occurrence rates were of 6.4% and 2.6% in Tsigai and Turcana ewes, respectively. Significant differences ($p\leq 0.05$) were observed between the two breeds.

Pneumonia incidence in sheep flocks is of concern to both breeders and veterinarians, especially in Tsigai sheep, a lowland semi-fine wool breed. Differences ($p\leq 0.05$) being registered between the Tsigai and Turcana breeds. Higher pneumonia incidence in the Sombor Tsigai (5.4%) could be attributed to the upgrading of the breed with Italian Mediterranean Bergamasca breed (Cinkulov et al., 2008), which is not adapted to the lower climate during winter found in Central and Eastern Europe.

Occurrence rate of the abortions was influenced by genotype ($p\leq 0.05$) in the two studied breeds. According to previous reports, in healthy flocks abortion accounts for less than 2%, with 5% occurrence rate being considered as an alarm threshold (Menzies, 2011).

Tsigai and Turcana ewes expressed similar ($p>0.05$) conception rates (Table 3). Conception rates for the Tsigai ewes are consistent with those estimated by Krupova et al. (2009) for the breed, and those for Turcana

are in agreement with reports of Padeanu (2014).

The Tsigai ewes produced significantly higher litters ($p\leq 0.001$) compared to Turcana breed. Considerable lower values for litter size in Tsigai are reported by Krupova et al. (2009) and Padeanu et al. (2012). Higher litter size in the Tsigai ewes during current trial might be attributed to the good feeding and management conditions, this aspects might have led to a better body condition of ewes during mating season and thus to higher ovulation rates. For the Turcana breed, the litter size is similar to reports of Budai et al. (2013).

Table 3. Means (\pm SE) for reproductive performance and attrition rates in Tsigai and Turcana ewes

Genotype	Conception rate (%)	Litter size (lambs)	Weaning rates (%)	Attrition rate (%)
Tsigai	96.0 \pm 1.37	1.45 \pm 0.04	95.5 \pm 1.20	21.1 \pm 2.87
Turcana	97.7 \pm 0.98	1.17 \pm 0.02	96.9 \pm 1.06	14.2 \pm 2.33
<i>Differences</i>	NS	***	NS	*

Lambs weaning rates were not influenced by ewes genotype ($p>0.05$). These findings are consistent with reports of Padeanu et al. (2012) and Gavojdian et al. (2013) for Tsigai and Turcana lambs, reared under European temperate conditions.

Differences in attrition rates between Tsigai and Turcana breeds were not significant ($p>0.05$), although there is a statistical tendency for significance ($p=0.0590$). The genotype disparities in attrition rates (21.1% compared to 14.2%) could be explained by the considerable lower selection pressure applied for the Turcana ewes, and as a result, decisions on voluntary culling of ewes were made only in extreme cases for the genotype. While in Tsigai flock the voluntary culling of ewes occurred especially based on traits such as milk yield, fertility, weaning ability, age, body condition and health disorders. Data on attrition rates for the Tsigai and Turcana breeds are consistent with estimates reported by Mekki et al. (2009) and Gavojdian et al. (2015).

CONCLUSIONS

This comparative study was the first attempt to provide information on the reproductive efficiency and health traits in Tsigai and

Turcana breeds under temperate climate conditions found in Eastern Europe.

For the selected specialized Sombor Tsigai ecotype it would be advisable to include fitness traits into the breeding selection schemes (with special focus on mastitis genetic resistance and ewe stayability) in order to improve animal welfare and overall productivity.

ACKNOWLEDGEMENTS

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS – UEFISCDI, project number PN-II-RU-TE-2014-4-0005.

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