Production and milk composition of Istrian sheep

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Abstract

Istrian sheep is Croatian autochthonous sheep breed recognizable due her fleece colour and body frame that stands her out. Among nine Croatian autochthonous sheep breed Istrian sheep has the highest milk production of about 1 kg per day. Traditionally is bred in semi-intensive production system in which the main breeding goal is milk production. Most of the ewes are lambed from November till March, with highest lambing frequency in January. Average lactation length is 184 day with 52 day of suckling and 132 day of milking period. During milking period ewes produce 131.5 kg of milk, while during suckling period lambs consume 56.8 kg of milk. Average chemical composition of Istrian sheep milk contains 5.9% of protein, 7.1% fat and 4.3% of lactose.

Introduction

Sheep breeding is traditionally represented in Croatia, especially in the coastal area were sheep are bred for centuries. According to Croatian Agriculture Agency (CAA) in Croatia under selection control are 16 sheep breeds, and half of them are Croatian autochthonous breeds. Estimated sheep population size in 2015 was around 600,000 from which 385,170 individuals (64.20%) were autochthonous, while 214,830 (35.80%) were allochthonous sheep breeds (CAA, 2016). Therefore, nine autochthonous sheep breeds form the basis of sheep production in Croatia. On the other hand, under selection control in Croatia are 39,883 individuals and more than 80% make autochthonous sheep breeds (CCA, 2016). The main production goal in sheep breeding in Croatia is meat, while for the milk production 10 to 12% of sheep flocks are intended (MIOČ et al., 2007b). Except allochthonous East Friesian and Travnik sheep, only two autochthonous sheep breeds are primary bred for milk production in Croatia. One of them is Pag Island sheep, relatively small, island breed with modest milk production, and the other is Istrian sheep, large breed with average milk production above 1 kg per day.

Istrian sheep was shaped in the wider area of Istrian peninsula where almost entire population is located. It is one of the most recognizable sheep breed due her fleece colour which can be black or white with white or black, brown or grey spots of different shapes (MIOČ et al., 2007a). It is a physically developed breed with average body weight of ewes and rams of 67 kg and 77 kg. Withers height of ewes is 73.5 cm and rams 78 cm (MIOČ et al., 2007a; MIKULEC et al., 2007). According to CAA (2016) population of Istrian sheep consist of 1,943 individuals of which 1,357 are sheep, 516 are yearlings and 70 are rams. In last ten years were evident mayor fluctuations in size of Istrian sheep population (CAA, 2009; 2012; 2016). Population size from 2005 to 2011 was relatively stable (between 2,100 and 2,300 individuals), than from 2012 to 2014 population was increased (between 2,500 and 2,900 individuals), while in 2015 population size of Istrian sheep under selection was decreased below 2,000 individuals. Similar fluctuations were observed in the number of Istrian sheep breeders (CAA, 2009; 2012; 2016).
The aim of this study was to investigate milk production in autochthonous Istrian sheep and average chemical milk composition.

Material and methods

For the purposes of the present paper lactation records of Istrian sheep breed ewes were obtained from Croatian Agriculture Agency (CAA). A total of 5,423 lactation records obtained from 2,629 lactating ewes were included in the statistical analysis. Lactation length in days was defined as time from lambing to dry period and it was divided in two periods: suckling period and milking period. Suckling period was from lambing till weaning of lambs and in that period ewes were not milked, therefore all produced milk was consumed by lambs. During suckling period lambs were with ewes and consumed mother milk at free will. Milking period lasts from weaning till dry period in which ewes were milked twice per day. In both lactation periods milk production was measured according to AT method (ICAR, 1992), once a month (morning or evening milking) every 28 to 34 days. Also, with measuring daily milk production, milk samples were taken for chemical analysis. Chemical analysis of proteins, fat and lactose were made in the reference laboratory of CAA in Križevci. On the basis of the lambing date, lambing frequencies in each month were calculated. All manipulations with the original records (such as binding few months of lambing with very few records to adjacent ones, setting parities greater than six on category six +, and excluding from the data set some records below Q1-3*(Q3-Q1) or above Q3+3*(Q3-Q1)), calculations, and plotting were performed within R programming environment (R CORE TEAM, 2016).

Results and discussion

Descriptive statistics of lactation length and milk production are shown in table 1. Average length of lactation in Istrian sheep was 184.36 days or around six months. Slightly less than two months makes suckling period, while milking period is around four months and during this time Istrian sheep produce 131.51 kg of milk. In overall lactation period (suckling + milking period) ewes produced 188.32 kg of milk. Similar results for the same breed were reported by PLIŠKO et al. (2016). Overall milk production in Istrian sheep was notably higher than in Pag sheep (PANDEK et al., 2005) which is primarily bred for milk production.

Table 1. Descriptive statistics of lactation length and milk production in Istrian sheep

<table>
<thead>
<tr>
<th>Trait</th>
<th>Mean</th>
<th>Sd</th>
<th>Min</th>
<th>Max</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of suckling period (days)</td>
<td>52.03</td>
<td>23.55</td>
<td>5.00</td>
<td>149.00</td>
<td>45.26</td>
</tr>
<tr>
<td>Length of milking period (days)</td>
<td>132.33</td>
<td>30.39</td>
<td>76.00</td>
<td>231.00</td>
<td>22.97</td>
</tr>
<tr>
<td>Lactation length (days)</td>
<td>184.36</td>
<td>36.60</td>
<td>82.00</td>
<td>307.00</td>
<td>19.85</td>
</tr>
<tr>
<td>Milk yield in suckling period (kg)</td>
<td>56.80</td>
<td>32.35</td>
<td>1.04</td>
<td>207.20</td>
<td>56.96</td>
</tr>
<tr>
<td>Milk yield in milking period (kg)</td>
<td>131.51</td>
<td>61.98</td>
<td>20.93</td>
<td>388.91</td>
<td>47.13</td>
</tr>
<tr>
<td>Total milk yield in lactation (kg)</td>
<td>188.31</td>
<td>78.72</td>
<td>31.29</td>
<td>528.40</td>
<td>41.80</td>
</tr>
<tr>
<td>Daily milk production (kg)</td>
<td>0.99</td>
<td>0.38</td>
<td>0.21</td>
<td>2.64</td>
<td>38.26</td>
</tr>
</tbody>
</table>

Watching the minimum and maximum length of suckling period it is evident that in some ewes this period is longer than average milking period determined in investigated population. Therefore, with extended suckling period breeders lost large amounts of milk which could be processed in high quality cheese. On the other hand in Pag Island sheep suckling period is
considerably shorter and is 28 days (PANDEK et al., 2005) or 39 days (CAA, 2016). One of the reasons why breeders prolong suckling period could be faster lambs growth, given that the breeders will achieve significant income by selling milk feed lambs. Therefore, lambs are usually slaughtered with age from 60-80 days and between 20-25 kg of slaughter weight (VNUČEC et al., 2014).

With average daily production of around 1 kg of milk Istrian sheep is Croatian autochthonous breed with highest milk production. Daily milk production in Pag Island sheep was 0.75 kg (PANDEK et al., 2005) or 0.72 kg (CAA, 2016).

All ewes included in this research started lambing in late autumn, through winter till very beginning of the spring, from November to March, respectively (Figure 1). In the remaining months of the year there were not recorded lambing’s in Istrian sheep population. The highest frequency of lambing was in January, while the lowest frequency was in March. Given lambing distribution was the result of breeding management where the main objective is to maximize the use of pastures during lactation period, but before summer drought.

![Figure 1. Lambing frequency of Istrian sheep](image)

Descriptive statistics of milk composition of Istrian sheep is presented in table 2. Average content of proteins in Istrian sheep milk was 5.9% which is similar to the Pag Island sheep (CAA, 2016). Higher protein content (6.36%) in Istrian sheep milk was previously reported by PANDEK et al. (2005). Fat was the most variable milk component and varied from 2.83% to 12%, but average value was lower than previously reported for the same breed (PANDEK et al., 2005). On the other hand lactose was the most stable milk content with an average value of 4.3%.

Table 2 Descriptive statistics of Istrian sheep milk composition

<table>
<thead>
<tr>
<th>Milk component</th>
<th>Mean</th>
<th>Sd</th>
<th>Min</th>
<th>Max</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proteins (%)</td>
<td>5.93</td>
<td>0.45</td>
<td>4.36</td>
<td>7.83</td>
<td>7.59</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>7.16</td>
<td>1.16</td>
<td>2.83</td>
<td>12.01</td>
<td>16.13</td>
</tr>
<tr>
<td>Lactose (%)</td>
<td>4.30</td>
<td>0.25</td>
<td>3.24</td>
<td>5.05</td>
<td>5.90</td>
</tr>
</tbody>
</table>

Conclusions and recommendations
Istrian sheep as autochthonous breed of combined production traits has suitable milk production of around 190 kg in lactation of six months. Considering that all breeders use ewes for milk production it would be recommendable to reduce suckling period in order to increase amount of milk which could be potentially used for cheese production. Also, higher milk production could be achieved with better feeding and farm management given that some ewes had potential to produce more than 500 kg of milk.

References