Full Length Research Paper

Effect of Breed and Method of Milking on Yield and Composition of Sheep Milk

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Eighteen lactating ewes, comprising nine each of West African Dwarf (WAD) and Yankasa, in a 2x3 factorial layout, were used in a 12- week study to estimate the yield and composition of milk obtained from these two sheep breeds. The ewes were fed from 8:00 – 12:00 h with a diet containing 16.38 % CP and 1.721 MJ/Kg GE and thereafter allowed access to paddocks of natural pasture predominantly of Andropogon tectorum. The concentrate supplement was offered at 3 % body weight per animal. Three methods: 1) hand milking, 2) lamb suckling 3) oxytocin induced milking were employed. Data obtained from this study were subjected to two-way Analysis of variance (ANOVA) using the Minitab Statistical Software (Mini-Tab, 1991). Milk production differed significantly (P < 0.05) per method of estimation among breeds. However mean overall (12 week) milk yield by suckling (39.74kg) and by oxytocin (40.35kg) did not differ significantly (P > 0.05). The result shows that WAD produced higher milk yield by the suckling method. Yankasa on the other hand gave higher milk yields by the oxytocin induced method than the hand milking and suckling methods. Milk produced by WAD and Yankasa breeds had similar nutrient composition.

Key words: Lactating ewes, suckling, milking and estimation.

INTRODUCTION

Sheep milk has been found to be of high nutritive value; it contains relatively higher concentration of important nutrients such as protein, calcium, iron, magnesium, zinc and all essential amino acids than human, cattle and goat milks (Buffano et al., 1996). In a comparative study of the constituent of cattle, sheep and goat milk, Ahamefule et al. (2003) reported that sheep milk contained higher percentage total solids than cow and goat milks. West African Dwarf sheep was reported to produce milk of significantly higher butter fat content than either of White Fulani cow or WAD goat (Oguike and Udeh, 2009). Researches with non-dairy sheep in the temperate and tropical region have assessed the variation in the milking ability of dams (Pear, 1982). Results obtained have demonstrated that the amount of milk produced by various breeds at various stages of lactation had a strong influence on Lamb growth during the pre-weaning period, with 20 to over 60% of the variation in weaning weight being as a result of the volume of milk produced (Pear, 1982). Due to the influence of milk yield on weaning weights and the large variation in milking ability among the wide ranging genotypes available in the tropics, several methods for estimating milk production, such as lamb suckling, hand-milking and hand milking after oxytocin injection, must be tested and the best selected (Steinbach, 1988). This study was conducted to assess the variation in the milking ability of WAD and Yankasa sheep and determine the best method for estimating milk production from these breeds.

MATERIALS AND METHOD

Eighteen lactating ewes, comprising nine each of West African Dwarf (WAD) and Yankasa breeds were used in a 12- week lactation study. The animals in their first parity were managed semi-intensively at the University of Agriculture, Makurdi, Livestock Teaching and Research
Table 1: Percentage Composition of the Concentrate Diet used.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Level of inclusion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava peels</td>
<td>32</td>
</tr>
<tr>
<td>Soybean</td>
<td>10</td>
</tr>
<tr>
<td>Dried Brewer’s grain</td>
<td>40</td>
</tr>
<tr>
<td>Palm kernel cake</td>
<td>12</td>
</tr>
<tr>
<td>Bone ash</td>
<td>4</td>
</tr>
<tr>
<td>Salt</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Crude Protein (%) 16.38  
Gross Energy (MJ/Kg) 1.721

Farm. The ewes were fed daily from 8:00 – 12:00 h with a diet containing 16.38 % CP and 1.721 MJ/Kg GE and thereafter allowed access to paddocks of natural pasture predominantly of *Andropogon tectorum*. The concentrate supplement was offered at 3 % body weight per animal. Three methods: 1) suckling 2) hand milking 3) oxytocin induced milking as described by Banda *et al.* (2004) were used in a 2x3 factorial layout to evaluate milk yield and composition of the breeds.

On the days of yield determination, lambs were separated from their dams for 4-hours (08:00 – 12:00 h). For the suckling method, lambs were weighed to obtain the weight of the lambs before suckling and allowed to suckle the dams for 10 min. The lambs were removed from the dams and weighed again to obtain the weight of the lambs after suckling. The amount of milk produced during the separation period (4 hours) was obtained by subtraction. For the hand milking method, animals were milked out and yield measured. The oxytocin induced method was done by milking the animals after injection of oxytocin at the beginning of each milking. Ten international units or 1 ml of oxytocin was injected intramuscularly into the right flank. After 5 minutes animals were milked out rapidly until no more milk could be withdrawn. The amount of milk obtained was multiplied by 6 to obtain daily milk production (Banda *et al.*, 2004).

**Determinant of Milk Composition**

About 50 to 100 ml of milk samples were obtained and stored in the refrigerator at - 4 °C for analysis to determine the chemical composition of the milk. All the milk samples collected were analyzed for fat by the Rose-Gottlieb’s method (Pearson, 1977). The crude protein content (N x 6.38), lactose, total solids and ash were determined by methods described by AOAC (1980). Solids not-fat (SNF) concentration was derived from total solids and fat concentrations by difference. The energy value (EV) of milk was calculated using the equation developed by Economides (1986) for sheep.

\[ Y = 1.94 + 0.43x_i \]

Where \( Y \) is the caloric value of milk in MJ/Kg and \( x_i \) is the percent fat.

**Statistical Analysis**

Data obtained from this study were subjected to a two-way Analysis of variance (ANOVA) using the Minitab Statistical Software (Mini-Tab, 1991). Milk yield estimation equation was derived using the linear model for simple regression (Little and Hills, 1975).

\[ Y = a + bX \]

Where \( Y \) = any value of the dependent variable  
\( a \) = intercept, i.e. value of \( Y \) at zero \( X \)  
\( b \) = slope, i.e. sample regression coefficient, the change in \( Y \) per unit change in \( X \).

**RESULTS AND DISCUSSION**

The mean total milk yield of WAD and Yankasa sheep in 12 weeks is shown in table 2. The total mean milk yield of WAD and Yankasa breeds were not significantly (\( P > 0.05 \)) different. However, milk production performance among the breeds differed significantly (\( P < 0.05 \)) according to the method of milk yield estimation employed. The mean of overall 12-week production estimated by the lamb suckling and oxytocin methods (39.741 and 40.352 kg, respectively), were not significantly different. This shows that WAD produced 57.88 % and 36.49 % higher milk by the suckling and oxytocin methods respectively than hand – milking method. However WAD yield more milk by suckling method (35.95 kg) compared to oxytocin induced and hand milking methods which yield 22.83 and 15.14 kg respectively. This result is similar to the findings of Banda *et al.* (2004), who reported that local Malawi ewes produced higher milk yield by the suckling method as compared to the hand – milking and oxytocin induced methods. Yankasa on the other hand gave higher milk yields by the oxytocin induced method (57.87 kg) than
Table 2: Mean Total Milk Yield of Sheep in 12 Weeks (kg).

<table>
<thead>
<tr>
<th>Breed</th>
<th>Method</th>
<th>SM</th>
<th>HMM</th>
<th>OHMM</th>
<th>MEAN</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAD</td>
<td></td>
<td>35.95</td>
<td>15.14</td>
<td>22.83</td>
<td>24.64</td>
<td>7.558</td>
</tr>
<tr>
<td>YAN</td>
<td></td>
<td>43.93</td>
<td>17.40</td>
<td>57.87</td>
<td>39.74</td>
<td>7.558</td>
</tr>
<tr>
<td>Mean</td>
<td>ab</td>
<td>39.74</td>
<td>16.27</td>
<td>40.35</td>
<td>16.27</td>
<td>40.35</td>
</tr>
</tbody>
</table>

*Means on same row with different superscripts differ significantly (P<0.05)*

WAD = West African Dwarf
YAN = Yankasa
SM = Suckling method
HMM = Hand milking method
OHMM = Oxytocin + hand milking method
SEM = Standard error of mean

Table 3: Milk Constituents of WAD and Yankasa Sheep.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>WAD</th>
<th>Yankasa</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.47</td>
<td>6.61</td>
<td>0.056</td>
</tr>
<tr>
<td>Tritratable acidity</td>
<td>0.27</td>
<td>0.24</td>
<td>0.033</td>
</tr>
<tr>
<td>Protein%</td>
<td>5.37</td>
<td>4.91</td>
<td>0.366</td>
</tr>
<tr>
<td>Fat%</td>
<td>2.67</td>
<td>3.71</td>
<td>0.592</td>
</tr>
<tr>
<td>Ash%</td>
<td>0.63</td>
<td>0.84</td>
<td>0.083</td>
</tr>
<tr>
<td>Lactose%</td>
<td>2.66</td>
<td>3.15</td>
<td>0.250</td>
</tr>
<tr>
<td>Total solids%</td>
<td>15.39</td>
<td>27.23</td>
<td>5.357</td>
</tr>
<tr>
<td>Solid not-fat%</td>
<td>18.06</td>
<td>27.23</td>
<td>5.357</td>
</tr>
<tr>
<td>EV (MJ/kg)</td>
<td>3.09</td>
<td>3.54</td>
<td>5.357</td>
</tr>
</tbody>
</table>

Not Significantly (P>0.05) different
EV= Energy value

the hand milking and suckling methods which yield 17.40 and 43.93 kg respectively. This finding is in agreement with the result of Mill and Steinbach (1984) who obtained higher estimate of milk yield when oxytocin induced method was used rather than sucking method in a similar study with Malawi local and Dorper breeds and their crossbred. Hand milking produced less milk than either of the other two methods. Similar findings had been reported by Ueckermann et al. (1974) and Banda et al. (2004). The present results suggest that the two breeds used in this study may never have been used for lactation trials hence the perceived unwillingness to let down milk which is an indication of very strong maternal instinct (Banda et al., 2004).

The hand milking method, though yielded less milk compared to the suckling and the oxytocin methods, is the most widely used method of estimation especially in developing countries. Thus milk yield estimation equations were derived regressing yield by oxytocin induced method (Y) (which gave the highest yield for Yankasa breed) on yield by hand milking method (X) for Yankasa; and regressing yield by the suckling method (Y) (which gave the highest yield for WAD breed) on yield by hand milking method (X) for WAD.

Yankasa breed: \( Y = 17.402 + 2.167X \)

WAD breed: \( Y = 21.703 + 1.429X \)

The result of the constituents of fresh milk from WAD and Yankasa breeds (Table 3) showed that WAD ewes produced milk with a lower butter fat, lactose, total solids, solid not fat and energy but had a higher level of protein compared to Yankasa ewes. However, the milk composition of the two breeds were not significantly different (P>0.05). Even though milk composition may vary with a number of non-nutritional factors such as milking technique, unequal interval between milking and diseases, particularly mastitis (McDonald et al., 2011), in a well managed herd, none of these factors should be of any importance.

CONCLUSION AND RECOMMENDATION

Yield and constituent of milk from WAD and Yankasa were not statistically significant even though Yankasa recorded higher yield. Method of milking significantly affected milk yield estimation. Suckling and oxytocin methods were not significantly different. Either of the two methods could be used to estimate milk yield of sheep. The low milk yield of the two breeds used in this study could probably be increased by both selection and
crossbreeding with high milk producing breeds such as
the Dorper.

REFERENCE


