Production and composition of goat milk in three grazing systems in the tropics

Present:
Francisco J Solorio

Authors:
Mónica Cardozo Herrán
Armín Ayala Burgos
Carlos Aguilar Pérez
Francisco J Solorio
Manuel Pulido Fernández
Introduction

In the world, goats are slighted.

With significant importance in:
- Dairy products of high quality
- Malnourished children
- Elderly people
- People with milk allergies and gastrointestinal disorders
Introduction

The majority grazing systems with goats, use native vegetation:

- With great plant species diversity
- Species with high forage potential
- However, the forage availability and quality varies during the year, affecting goat productivity
Objective

Assess the productivity in three grazing systems with goats:

I (MGS) Monocrop grass system
(Pennisetum purpureum)

II (ISPS) Intensive silvo-pastoral system
(High densities of Leucaena leucocephala + P. purpureum)

III (NVS) Native vegetation system
(mixture of different plant ssp)

In terms of

Availability and chemistry of forage composition

Production and milk composition
Description of the study area

- Warm sub-humid region, with rains in summer
- Humidity 66% - 89%
- Average Temperature 30°C
Experimental design

- Completely random with three treatments (three grazing systems)
  - I Monocrop Grass Syst.
  - II Intensive Silvopastoral Syst.
  - III Native Vegetation Syst.

- 8 goats per treatment (41.7± 3.8 kg LW) in their last third of lactation.

- Each goat was supplemented with 1 g of balanced feed per 3 g of milk produced.
Overview of the Monocrop grass system (MGS)

Sistema de monocultivo con gramínea *P. purpureum*

**Carga animal:**
16.7 UA ha

**Días ocupación:** 2
**Días descanso:** 24

**Área total:** 3,222 m²
**Área/potrero:** 243.8 m²

**Fertilización:** Sí
**Riego:** Sí
**Bebederos:** Sí
Overview of the ISPS

Sistema silvopastoril intensivo (Asociación de *L. leucocephala* y *P. maximum*)

Área total: 9,990 m²
Área por potrero: 820 m²
No. Plantas/ha: 33,333
Fertilización: No
Riego: Sí
Bebederos: Sí

Carga animal: 5.5 UA/ha
Días ocupación: 3
Días de descanso: 35
Overview of the native vegetation system (NVS)

Sistema de vegetación

Nativa
Área total: 6 ha.
Área por potrero: 1.2 ha.
Fertilización: No
Riego: No
Bebederos: sí
Quadrants to Measure forage availability previous grazing (Random sampling sites)
Availability forage in NVS

Paddock

Walk to determine quadrants every 30 m based on availability

1. Low availability
2. Medium availability
3. High availability

Asses the forage availability previous grazing in areas of 10 X 10 m
Total plant fodder

Sample of 500 g

1. Dry matter (DM)
2. Crude Protein (CP)
3. Neutral detergent fiber (NDF)
6. Acid detergent fiber (ADF)
7. Condensed tannins (CT)
8. Total Phenols (TP)
Production and composition of goat milk

- **Experimental variables:** in the 3 intermediate days of each week (Tuesday, Wednesday and Thursday)

- **Production:** Weighing all Milk/goat/day in each treatment

- **Composition:** Samples of 35 ml of milk/goat/day in each treatment. Getting final sample of 105 ml/goat/week in each treatment.

*Lactoscan®:* percentages of fat, lactose, total solids and protein.
Statistic analysis

- **Availability and chemistry composition of forage:** Descriptive statistics (Mean, standard deviation and standard error)

- **Milk production:** Repeated measurements over time used the PROC MIXED of SAS (2009).

- **Milk composition:** analysis of variance with PROC GLM of SAS (2009).

- **Statistical differences:** P<0.05.

- **Differences between means:** Duncan Test.
Forage availability

*Table 1.* Forage availability in the three grazing systems.

<table>
<thead>
<tr>
<th>Component</th>
<th>NVS</th>
<th>ISPS</th>
<th>MGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kg DM/Ha</td>
<td>62 (± 5)</td>
<td>1026 (± 236)</td>
<td>2174 (± 715)</td>
</tr>
<tr>
<td>Kg DM/Paddock</td>
<td>74 (± 6)</td>
<td>84 (± 19)</td>
<td>53 (± 17)</td>
</tr>
<tr>
<td>g DM/animal/day</td>
<td>824 (± 67)</td>
<td>2803 (± 644)</td>
<td>2641 (± 869)</td>
</tr>
</tbody>
</table>

*10 animals grazing per paddock*
## Chemical composition of forage

### Table 2. Forage chemical composition in the three grazing systems

<table>
<thead>
<tr>
<th>Component (%)</th>
<th>MGS</th>
<th>ISPS</th>
<th>NVS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>P. purpureum</em></td>
<td><em>P. Maximum + L. leucocephala</em></td>
<td><em>Mixture</em></td>
</tr>
<tr>
<td>CP</td>
<td>11.29</td>
<td>12.71</td>
<td>14.60</td>
</tr>
<tr>
<td>NDF</td>
<td>60.55</td>
<td>57.98</td>
<td>46.04</td>
</tr>
<tr>
<td>ADF</td>
<td>38.36</td>
<td>36.09</td>
<td>29.86</td>
</tr>
<tr>
<td>CT</td>
<td>0.22</td>
<td>0.34</td>
<td>2.06</td>
</tr>
<tr>
<td>TP</td>
<td>0.94</td>
<td>0.91</td>
<td>1.42</td>
</tr>
</tbody>
</table>

*CP*: Crude protein; *NDF*: Neutral detergent fiber; *ADF*: Acid detergent fiber; *CT*: condensed tannins; *TP*: Total phenols.
Table 3. Variables of production and milk composition in the three grazing systems

<table>
<thead>
<tr>
<th>Component</th>
<th>MGS</th>
<th>NVS</th>
<th>ISPS</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (g/goat/d)</td>
<td>905</td>
<td>937</td>
<td>824</td>
<td>0.64</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>4.57</td>
<td>5.05</td>
<td>5.03</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>2.87</td>
<td>3.02</td>
<td>3.01</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Lactose (%)</td>
<td>4.29</td>
<td>4.52</td>
<td>4.50</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Minerals (%)</td>
<td>0.64</td>
<td>0.67</td>
<td>0.67</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total solids (%)</td>
<td>12.40</td>
<td>13.29</td>
<td>13.23</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Means with different literals in the rows presented statistical differences (P <0.05)
Ruminal passage rate affecting fat composition and other components of milk.
Conclusions

• ISPS and MGS have the highest forage yield that NVS. However, the quality of the diet in the NVS is superior, because of the diversity of species and its chemical composition (low in fiber and high in CP and CT).

• Milk production per goat is similar in the three grazing systems, but the quality is better for NVS and ISPS (higher percentages of fat, protein, lactose, minerals and total solids), with respect to MGS.
Thank You