

References

- Spain JM and Gualdron R 1988. Degradación and rehabilitación de pasturas. In Establecimiento and renovación de pasturas (eds C. Lascano and J. Spain), pp. 269–283. RIEPT. Sexta Reunión del Comité Asesor. CIAT, Cali, Colombia.
- Villarreal CM 1992. Evaluación comparativa de Ratana (*Ischaemum indicum*) como especie forrajera. *Agronomía Costarricense* 16, 37–44.
- Villarreal CM and Bustamante L 1996. Respuesta del pasto Ratana (*Ischaemum indicum*) a la fertilización nitrogenada. Memoria X Congreso Nacional Agronómico and de Recursos Naturales, III Congreso Nacional de Fitopatología, II Congreso Nacional de Suelos. Vol. 3. San José, Costa Rica. EUNED, EUNA. pp. 165.

doi:10.1017/S2040470010000713

Effect of the volatile fraction from sugarcane silage and forage inclusion on the ruminal pH, redox potential, temperature, and partial pressure of H₂ on beef cattle diets

João Luiz Pratti Daniel, Luiz Gustavo Nussio[†], Vanessa Pilon Santos, Janaína Rosolem Lima, Adir de Sá Neto, Gisele Bonato Muraro and Bruna Cortes Queiroz

University of São Paulo, ESALQ, Dept of Animal Science, Brazil

Introduction

Ensiling sugarcane leads to the conversion of water soluble carbohydrates to fermentation products, which are well characterized by high levels of volatile organic compounds, such as ethanol. Some ruminal parameters of bovine fed sugarcane silages are found in the literature (Schmidt *et al.*, 2007), nevertheless, there is a poor understanding of how the fermentation products from sugarcane silage may affect physico-chemical aspects of the rumen fluid. The main goal of this study was to determine whether volatile fermentation end products from silage and the forage:concentrate ratio may affect the ruminal pH, redox potential (E_h), temperature, and partial pressure of H₂ (PH₂) in beef cattle diets.

Material and methods

Six Nellore beef steers were randomly assigned to a replicated 3 × 3 Latin square design with 14-d period. Steers were housed in a tie-stall barn, and individually fed ad libitum daily at 0800 h. Dietary treatments were balanced to reach isonitrogen content: 75D (dry) – 75% sugarcane silage without volatile fraction (dried at 60°C and re-hydrated) and 25% concentrate, 75W(wet) – 75% wet sugarcane silage and 25% concentrate, and 40W(wet) – 40% wet sugarcane silage and 60% concentrate (DM basis). On day 11 of each period, before feeding time, data loggers (temperature sensors) were placed into the ventral sac of the rumen to record the temperature every 30 minutes over 24 h. Rumen pH and redox potential were measured every two hours on day 13 in anaerobic conditions. The redox potential was calculated as $E_h = E_0 + 199$, where E_0 is the potential of the platinum electrode (mV). The PH₂ (atm) was calculated based on Nernst's equation using pH and E_h values (Marden *et al.*, 2009). Data were compared as repeated measurements over time using the MIXED procedure of SAS. Orthogonal contrasts were used for specific comparisons: 75D versus 75W to test the volatile fraction effect, and 75W vs 40W to test the forage:concentrate ratio effect. Pearson correlations among variables were performed by using the CORR procedure.

Results

The volatile fraction from sugarcane silages (mean value of 19% DM from wet silages) did not alter the ruminal parameters studied. However, changes in forage:concentrate ratio affected all the studied variables. The lower forage inclusion (75W vs 40W) increased rumen E_h (–97 vs –64 mV; $P < 0.01$) and temperature (38.7 vs 39.5°C; $P < 0.01$), and reduced PH₂ (4.6 vs 1.9×10^{10} atm; $P = 0.08$). However, the 40W diet led to a higher ($P < 0.01$) DM intake (not shown). There was interaction between Diet and Time for rumen pH ($P < 0.01$) although rumen pH has been lower for diets with less forage. E_h showed a significant correlation with all of the variables and pH was not correlated with PH₂.

Table 1 Pearson correlation coefficients and probability for slope among rumen pH, E_h , PH₂, and temperature

	E_h	PH ₂	Temperature
Ph	–0.63 ($P < 0.01$)	0.05 ($P = 0.44$)	–0.51 ($P < 0.01$)
E_h		–0.58 ($P < 0.01$)	0.47 ($P < 0.01$)
PH ₂			–0.20 ($P < 0.01$)

[†] E-mail: nussio@esalq.usp.br

Conclusions

The volatile fraction from sugarcane silage (75W) was considered high but not enough of a challenge to the ruminal buffering capacity. The clearance of volatile compounds in the rumen might be an explanation for the mild impact on the measured parameters. As expected, the energy supply from a higher inclusion of concentrate in the diets including sugarcane silage led to a more intensive change on the physico-chemical balance in the rumen.

References

- Marden JP, Ungerfeld E, Kohn RA, Julien C, Auclair E, Moncoulon R and Bayourthe C 2009. *Journal of Dairy Science* 92 (E-Suppl. 1), 518.
Schmidt P, Nussio LG, Zopollatto M, Ribeiro JL, Santos VP and Pires AV 2007. *Brazilian Journal of Animal Science* 36, 1676–1684.

doi:10.1017/S2040470010000725

Effects of protein supplementation during the dry season on the feed intake and performances of Borgou cows in the sudanian zone of Benin

Ibrahim Alkoiret Traore^{1†}, Guénoilé C. Akouedegni¹, Severin Babatounde² and Roel H. Bosma³

¹University of Parakou, Faculty of Agronomy, P.O. Box 123 Parakou, Benin; ²University of Abomey-Calavi, Faculty of Agriculture, 01 P.O. Box 526 Cotonou, Benin; ³Wagenigen University, Chairgroup aquaculture & Fisheries, Animal Science Group, Netherlands

Introduction

Dairy production in Benin relies on native cattle breeds such as Borgou cattle. The production system is a traditional low input system involving extensive grazing on natural pasture without supplementation. Natural forage is not sufficient to satisfy animal requirements in the dry season when the quantity decreases by 25 to 50% of peak biomass with nitrogen content falling well below 1% (Ayantunde, 1998). The aim of the present study was to assess the effects of dry season protein supplementation on feed intake, milk production, and body weight of Borgou cows. An economic evaluation of the results was also done.

Materials and methods

The experiment was conducted at Fana Fulani camp, located in Gogounou district (long. E 2°85' and lat. N 9°43'), on 24 cows in early lactation. Animals were divided into three groups each of 8 animals which were homogeneous with respect to body weight, age and the number of calving. Animals were all given a basal diet of straw bush *ad libitum*. Groups of animals were supplemented with a concentrate C1 (50% dried brewers grains, 30% cassava chips, 15% dried cassava leaves, 2.5% dicalcium phosphate, 1.5% sodium chloride and 1% premix), or with concentrates C2 (20% of the cassava chips replaced with cottonseed cake) and C3 (20% of the cassava replaced with soybean cake). The experimental period lasted for 90 days. The first 20 days of the experiment were for adaptation of the cows to the new diets, and the recording period of each treatment was 70 days. The cows had free access to clean water all the time. The feed intake was determined by weighing daily feed offered and refused. Samples of bush straw, concentrates (C1, C2, C3) and refusals were analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) and ash using procedures described by AOAC (1990). Net energy content in Mega-Joules (MJ) of bush straw was determined using the Netherlands tables (Rivière, 1991). Determination of net energy (MJ) content of concentrates (C1, C2 and C3) was based on the equation fitted by Rivière (1991) for concentrate mixture. The age of cows was determined by dental timing and body weight was estimated using a weight-band at the beginning and the end of the experimental trial. Milk production records began 20 days after calving and hand milking was done twice a day (8.00 a.m. and 6.00 p.m.). Calves were allowed to suck for about one minute in order to stimulate milk let down. Partial milking was done in order to reserve milk for sucking calves which were prevented from sucking the dams. The evaluation of milk production was carried out each 10 days and chemical analysis of milk was conducted on samples from 3 cows per group. Estimated milk yield was calculated from the sum of the milk offtake and calf's growth $\times 9$. Calf weight was determined at the beginning and the end of the recording period and at the age of 1, 2 and 3 months by means of spring balances of 10 to 100 kg load capacity. Data collected on dry matter intake, milk yield, milk compositions, cow weight and calf growth rate were subjected to statistical analysis using the ANOVA procedure. Means were separated using the Least Significant Difference (LSD) method.

Results

Bush straw had a low net energy and CP contents (1.89 MJ/ kg DM and 1.8% of DM respectively), offset by high CF content (44.3% of DM). The three concentrates had similar net energy content: 5.36, 4.96 and 5.12 MJ/ kg DM, for C1, C2 and C3 respectively. However, their CP

† E-mail: alkoarit@gmail.com