Effect of forage species and supplementation on the volatile fatty acids in the rumen of cows

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Introduction

Livestock production is a concern due to its global-warming potential considered higher than carbon dioxide. Ruminants rely on the activity of a dense and diverse microbial community present in the rumen for their growth and maintenance. Ruminal volatile fatty acids (VFA) are the most important energy source to ruminants. Forages with higher digestibility and when associated with supplements may change the VFA proportions, reducing energy loss, becoming more efficient. Utilizing stockpiled forages as a heifer development management approach may result in the development or selection of animals that are matched to the production environment, thus reducing the need for harvested feed. The objective of this research was to determine the effect of stockpiled winter forage species on VFA's gases, in yearling beef heifers.

Materials and Methods

The experiment was conducted during the winter 2014 at the University of Tennessee in Spring Hill, TN. Heifers from the Middle Tennessee Research and Education Center were utilized for this study. Prior to initiation of forage treatments, heifer body weight and body corporal score was recorded. Heifers were then stratified by initial BW to 1 of 3 forage type pastures: 1) Tall fescue, 2) Big bluestem/Indian grass, or 3) Switchgrass. Were utilized two supplements, designed to provide similar amounts of CP/d (0.181 kg of crude protein (CP)/day): dried distiller grains (DDG) and blood fish meal (BF), with 29 and 80% of CP, 88 and 70% total digestible nutrients (respectively). Pastures contained 2 heifers per experimental unit during the winter grazing period. Animals were ruminally sampled with an oral lavage every 28 d with approximately 20 mL of ruminal fluid collected. All samples were stored in 15 mL polypropylene conical tubes at -20ºC until analysis of VFA.

Was utilized completely randomized design with 6 treatments and four replications per treatment (paddock). VFA concentration was determined by gas chromatography. The MIXED procedure and Tukey test analysis of SAS were used to estimate VFA's gases concentrations in the ruminal fluid ($P < 0.05$).

Results and Discussion

Forage nutritive value and supplementation source could alter the microbial population in the rumen (Russel and Wilson, 1996), possibly altering concentration and ratio of VFA's. An increase on propionate rate may be related with energy efficiency, being the main precursor of glucose. No differences ($P<0.05$) were observed among treatments, for VFA's concentration (Table 1) (Figure 1).

Table1. Concentration of volatile fatty acids (mMol/mL) in cows ruminal fluid , grazing different forage species and supplementation supply.

VFA	Big Bluestem		Tall Fescue		Switchgrass		CV (%)	P value
	BF	DDG	BF	DDG	BF	DDG		
Acetic	44.17[a]	39.12[a]	44.11[a]	50.94[a]	43.22[a]	47.95[a]	20.68	0.6940
Propionic	9.76[a]	9.32[a]	9.74[a]	11.65[a]	10.25[a]	11.25[a]	21.12	0.6977
Isobutyric	0.53[a]	0.50[a]	0.51[a]	0.56[a]	0.61[a]	0.54[a]	19.85	0.7380
Butyric	5.12[a]	4.18[a]	9.87[a]	7.02[a]	4.20[a]	5.34[a]	7.94	0.3997

Average followed by same letter in the same row, do not differ by the Tukey test ($P < 0.05$).

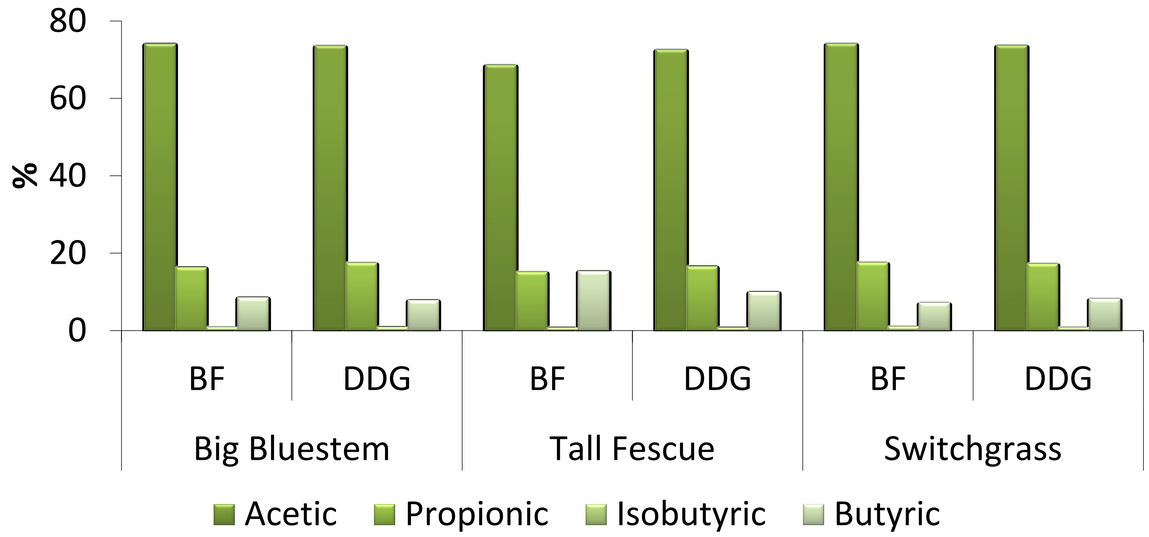

Figure 1. Proportion of the volatile fatty acids in cows ruminal fluid, grazing different forage species and supplements supply.

Conclusion

The concentration of the VFA's was not affected by the treatments studied.

References

Russel J, Wilson DB (1996) Why are ruminal cellulolytic bacteria unable to digest cellulose at low pH? Journal of Dairy Science 79, 1503-1509.

ASA, CSSA and SSSA International Annual Meetings
November 2-5, 2014 Long Beach, CA