Determining Relative Bioavailability of Trace Minerals When Incorporated into Molasses-Based Block Supplements

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Introduction

- Assess impact of block process on bioavailability of trace elements when incorporated into molasses-based block supplements
- Trace minerals, including copper, manganese, and zinc

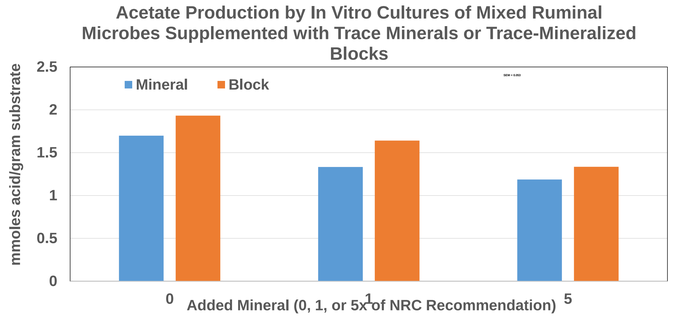
Objectives

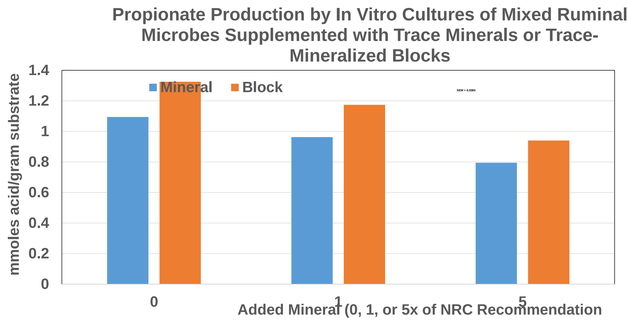
- Measure relative bioavailability of supplemental copper, manganese, and zinc when trace minerals are incorporated into molasses blocks at 0, 1, 5, and 10 times NRC recommendations.
- Measure *in vitro* gas production (indicating fermenting activity), and *in vitro* dry matter disappearance, by cultures of mixed ruminal microbes supplemented with varying concentrations of trace elements (Cu, Mn, Zn)
- Measure profiles of volatile fatty acids (VFAs) produced by cultures of mixed ruminal microbes supplanted with varying concentrations of trace elements.

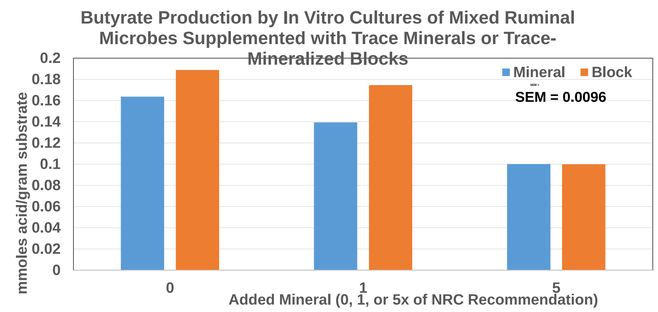
Procedure

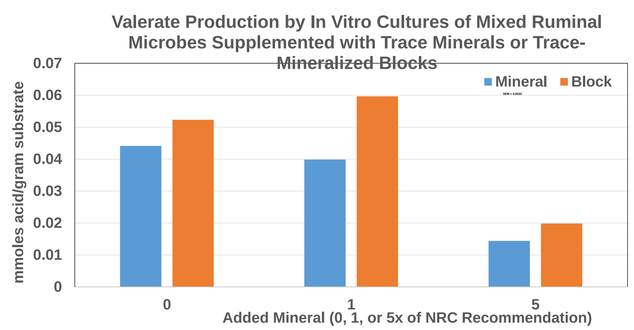
- Randomized complete block design, 2x3 factorial arrangement of treatments of 3 replicates
  - Factor 1: trace mineral concentration (0, 1, 5x NRC recommendations)
  - Factor 2: trace mineral incorporated into molasses block
- Preparation for *in vitro*, substrates (20g of prairie hay and 5g of alfalfa hay) added to 24 fermentation bottles.
- 1 gram of the proper block supplement, and 1 ml of mineral solution (diluted in H_2O), added if appropriate concentrations (0x, 1x, 5x).
- McDougall's buffer prepared the day prior (20L), then incorporated in the bottles along with the ruminal fluid taken from four ruminally-fistulated donor animals, and aloud to ferment over 24 hours
- Pressure was released using Global Pressure Release on the ATKOM RF Gas Production system.
- pH was recorded for each bottle
- Volatile Fatty Acid analysis from supernatant fraction measured using a gas chromatograph.

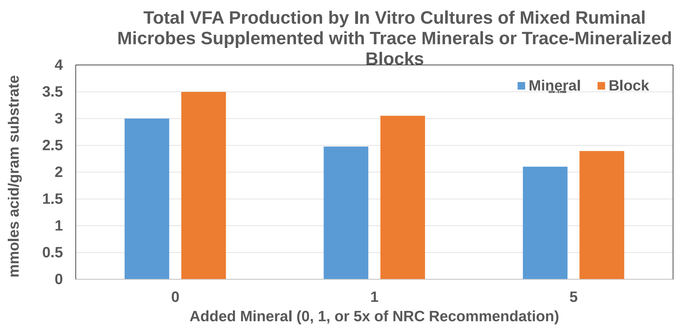
Results

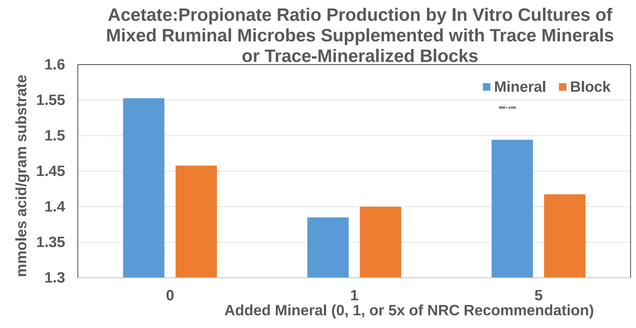












Conclusion

- The original hypothesis for the *in vitro* gas production will decrease with the increase of concentration of trace minerals; indicating an increase in bioavailability
- The results demonstrated an increase of volatile fatty acid production when incorporated in the molasses block; indicating a decrease of bioavailability of the trace elements.
- The hypothesis was correct in the fact that with increased concentration of trace elements, there would be a decrease in VFA production.
- Therefore the effect of the molasses block was not statistically significant, meaning the hypothesis was rejected.