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Effect of Distillers Grains Plus Solubles and Monensin Supplementation on Grazing Steers

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Summary

Yearling steers rotationally grazing smooth bromegrass were individually supplemented monensin at 0 or 200 mg with modified distillers grains plus solubles (MDGS) at .05, 0.4, 0.6, and 0.8% BW. Cannulated steers continuously grazing smooth bromegrass were assigned randomly to one of two treatments: 0.4% BW MDGS supplementation with 0 or 200 mg monensin. Monensin did not affect ADG of steers supplemented MDGS \geq 0.4% BW. Steers supplemented with monensin had a decrease in estimated average forage intake from 16.16 lb to 14.75 lb/OM daily.

Introduction

Efficient beef production becomes more and more imperative as the national cattle herd remains at historical lows, the threat of forage shortages continues, and the global demand for protein continues to rise. The supplementation of distiller grains plus solubles (DGS), a byproduct of the dry milling industry, has significantly improved producers' ability to increase grazing efficiency by economically providing ruminally undegradable protein (RUP). The supplementation of DGS lowers forage DMI and increases ADG of cattle on grass (2010 Nebraska Beef Cattle Report, pp. 34-35). Supplementing MDGS to steers on grass increases profitability when cattle ownership is retained through the feeding period (2014 Nebraska Beef Cattle Report, pp. 46-47). Monensin, a feed additive, also has been shown to increase ADG when supplemented to grazing cattle. Therefore, the objective of this study was to determine how monensin and

MDGS supplementation affected ADG and forage intake of steers grazing smooth bromegrass.

Procedure

Experimental Design and Animal Performance

Crossbred yearling steers ($n = 60$, BW = 736 ± 71 lb) were utilized in a 2 x 4 factorial design. The first factor was supplementation of 0 or 200 mg monensin. The second factor was increasing levels of MDGS (dry matter) at .05, 0.4, 0.6, and 0.8% of BW. Daily, each steer was individually supplemented MDGS with 0 or 200 mg of monensin in an individual feeding barn. Steers were allowed three hours to consume supplement, and that not consumed was weighed. The remainder of the day cattle grazed smooth bromegrass pasture. Cattle were managed in an intensive rotational grazing system from April 27, 2012, through July 20, 2012. The dry summer conditions forced the cattle to be relocated to an extra pasture from July 20 to Aug. 24. Total grazing days were 119.

Prior to the trial and following the last day of grazing, steers were limited a common diet at 2% BW for five days to minimize gut fill variation. The steers were then weighed three consecutive days to determine initial and ending body weight. Animal ADG and actual MDGS intakes were calculated.

Performance and actual MDGS intake were analyzed using the SAS MIXED procedure (SAS Institute, Inc., Cary, N.C.). Steer was the experimental unit and MDGS intake was the covariate to determine linear and quadratic trends.

Experimental Design and Forage Intake

Ruminally cannulated steers ($n = 6$; BW = 868 lb) were assigned randomly in a switchback designed experiment to one of two treatments: 0.4% BW MDGS supplementation

with 0 or 200 mg monensin. The steers continuously grazed a smooth bromegrass monoculture pasture from May 3, 2013, to Sept. 13, 2013. Daily, steers were individually supplemented 3 lb MDGS DM at 0700 hours. This was accomplished in the pasture using a custom pen structure with one alley and six individual pens. While the steers were consuming the MDGS supplement, a bolus with 10 g titanium dioxide (TiO_2) with 0 or 200 mg of monensin was inserted through the cannula. The bolus method was used to ensure that all monensin and TiO_2 were dosed.

The switchback designed experiment consisted of six, 21-day periods. Immediately following the end of each period, steers were administered the opposite treatment of what they were receiving in the previous period. On day one of each period, dosing of TiO_2 and monensin began.

Forage Intake Sampling and Analysis

Diet samples were taken at the end of each period by the same six cannulated steers that were on trial. Organic matter (OM), crude protein (CP), neutral detergent fiber (NDF), and *in vitro* organic matter digestibility (IVOMD) were determined. Neutral detergent fiber digestibility (NDFD) by *in situ* technique was also determined to observe monensin's effects on fiber digestibility.

Fecal output was estimated using TiO_2 as an external marker. Fecal samples were collected at 0700 hours for five consecutive days. Fecal TiO_2 concentration was determined and was then used to calculate the estimated fecal output per day.

Once total fecal output was estimated, feces from the MDGS were subtracted. Using the period appropriate forage IVOMD, forage organic matter intake (FOMI) was calculated by the following equation: fecal output / $1 - \text{IVOMD} = \text{FOMI}$. Forage organic

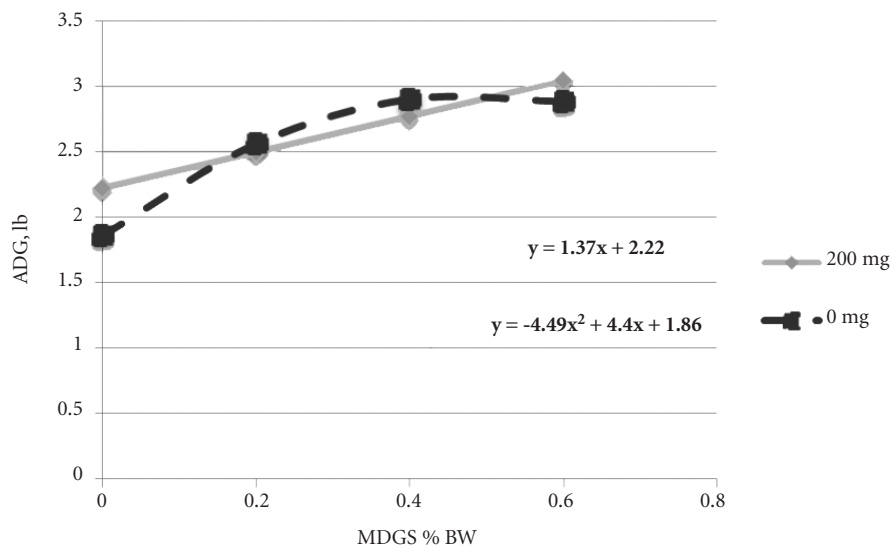


Figure 1. Interaction of monensin and MDGS supplementation on ADG of grazing steers.

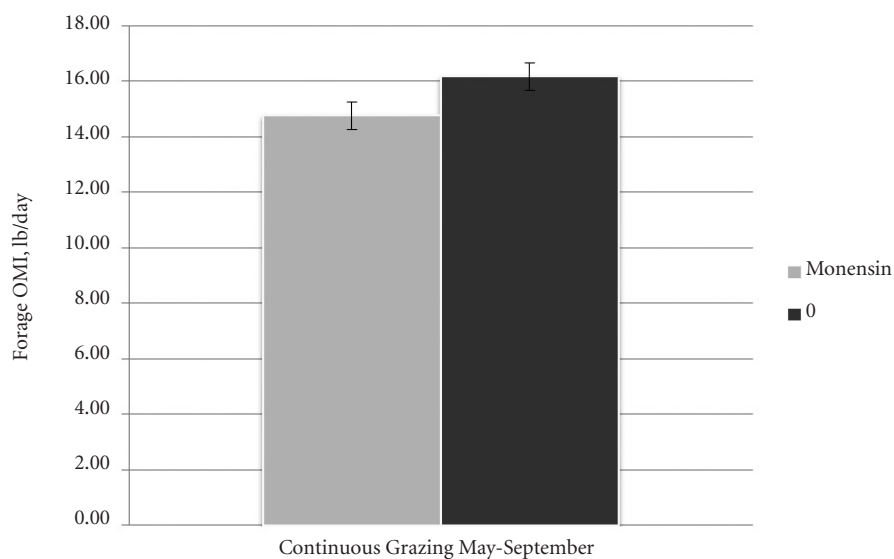


Figure 2. The effect of monensin (200 mg/day) on forage organic matter intake.

matter intake and diet sample components were analyzed using the MIXED procedure of SAS. Model effects included period, steer, and treatment. Probabilities of linear and quadratic trends were determined using orthogonal polynomial contrasts.

Results

Steers supplemented MDGS with 0 mg monensin had a quadratic increase ($P < 0.01$; Figure 1) in ADG as MDGS intake increased. The equation of the quadratic regression line was $y = -4.49 (\pm 1.50) x^2 + 4.4 (\pm 0.96) x + 1.86 (\pm 0.13)$ where $y = \text{ADG}$ and $x = \text{level}$

of MDGS. Steers supplemented MDGS with 200 mg monensin increased in ADG linearly ($P < 0.01$; Figure 1) as MDGS increased. The equation of the linear regression was $y = 1.37 (\pm 0.26) x + 2.22 (\pm 0.09)$ where $y = \text{ADG}$ and $x = \text{level of MDGS}$. The intercept of the 0 mg monensin equation of 1.86 compared to the 200 mg monensin equation of 2.22 illustrates the interaction tendency ($P = 0.12$) between monensin and MDGS intake. When feeding MDGS at 0.05% BW, monensin increased ($P = 0.04$, Figure 1) ADG by 0.33 lb/day. The gain increase observed at 0.05% BW MDGS due to monensin reveals the advantage monensin

provides through the protein sparing effect. However, performance was not affected by monensin as MDGS supplementation intake increased (Figure 1). Monensin did not effect ADG when supplemented with MDGS $\geq 0.4\%$ BW ($P = 0.53$). Speculatively, there is no improvement in gain from monensin when fed with MDGS because the benefits of monensin are small relative to the response from RUP and energy of MDGS.

When steers were supplemented monensin with MDGS at 0.4% BW, estimated FOMI decreased 9% ($P = 0.10$, Figure 2). Cattle consumed 14.8 lb forage organic matter daily when supplemented monensin and 16.2 lb forage organic matter when monensin was not supplemented (Figure 2). Total consumption decreased from 2.12% BW to 1.99% BW when cattle were given 200 mg monensin. As has been shown in the literature previously, *in situ* fiber digestion was unaffected by monensin ($P = 0.73$).

Implications

The common belief is cattle on finishing diets and cattle on forage diets respond differently to monensin. The response to monensin in a finishing diet is a decrease in DMI without decreasing ADG, while cattle on forage diets respond with no change in DMI but increase in ADG. However, when monensin is supplemented along with DGS in a forage diet, the animal may respond similarly to an animal on a finishing diet. When cattle grazed smooth bromegrass, the addition of monensin to MDGS supplementation did not increase ADG. Instead, when monensin was supplemented with MDGS, forage intake decreased 9%. Supplementing monensin and MDGS may be an effective way to decrease forage intake and increase stocking rate and grazing efficiency.

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