REDUCING NEGATIVE EFFECTS OF SULFUR IN BEEF CATTLE DIETS

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A limiting factor for distillers grains (DG) inclusion in feedlot cattle diets is the high concentration of sulfur that results from the ethanol production process. We are in the process of conducting multiple experiments evaluating the effects of dietary adjustments to alleviate the negative effects of high S concentration in feedlot diets containing DG. Two experiments were conducted to evaluate effects of manganese oxide (MnO) inclusion in high-S diets on feedlot cattle performance and ruminal hydrogen sulfide concentration. In Exp. 1, 40 beef steers (606 lb initial BW) were arranged in a 2 x 2 factorial design and fed high-concentrate diets containing 0.25 or 0.65% S and 0 or 400 ppm Mn (supplied as MnO) for 56 d. Overall ADG was greater ($P < 0.001$) for steers consuming 0.25% S diets than those consuming 0.65% S diets, with the largest difference occurring during the first 14 d, when steers consuming 0.65% S diets lost 0.62 lb/d and steers consuming 0.25% S diets gained 2.12 lb/d. Similar results favoring 0.25% S diets were observed for DMI and gain:feed ($P < 0.05$). Dietary Mn concentration did not affect ($P > 0.18$) ADG, DMI, or gain:feed. Experiment 2 utilized 8 ruminally cannulated beef steers in a switchback design to determine the effect of supplementing either 0 or 1000 ppm Mn to DG diets containing high concentrations of S (0.50% of diet DM). Wireless rumen sensors were utilized for ruminal pH measurement, and ruminal gas was collected to determine hydrogen sulfide concentration at -1, 1, 2, 3, 4, and 6 h post-feeding on d 16 and 17 of each of two 17 d periods. A treatment x time interaction ($P = 0.05$) occurred for ruminal pH, with steers receiving 1000 ppm Mn having greater ruminal pH (6.05) 6 h post-feeding than control steers (5.77). There were no treatment x time interactions ($P = 0.52$) for ruminal gas hydrogen sulfide concentration; however, overall average ruminal gas hydrogen sulfide concentration was reduced ($P = 0.002$) with steers consuming the 1000 ppm MnO diet (1.50 μg/mL) compared with control steers (2.07 μg/mL). We also evaluated a yeast culture product (Diamond V XP) to determine its effect on beef cattle metabolism when supplemented to high-S diets. We utilized 32 steers (8 steers/period) in a replicated randomized complete block design and a 2 x 2 factorial arrangement of treatments. Factors evaluated were yeast culture (0 and 56 g/d Diamond V XP) and dietary S concentration (0.25 and 0.50% of diet DM). Each period was 25 d in length, with total urine and fecal collections occurring on d 22-25 to assess total diet digestibility and mineral retention. Initial data indicate no effect ($P > 0.19$) of dietary S concentration, yeast culture inclusion, or their interaction on DMI or OM digestibility. Further data analyses are underway to determine dietary S concentration and yeast culture inclusion effects on mineral, nitrogen, and energy retention and stress response. Additional experiments will be conducted evaluating both Mn and yeast culture effects on feedlot performance and carcass characteristics with steers fed high-S finishing diets. To date, our research suggests manganese oxide may attenuate negative effects of high dietary S intake on ADG and feed efficiency by improving ruminal pH and subsequently reducing ruminal hydrogen sulfide concentrations in beef cattle. Further research will be conducted to evaluate the efficacy of specific dietary adjustments to reduce negative effects of high sulfur concentrations in beef cattle feedlot diets.