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Short communication

Effect of dried distillers grains with solubles or corn in growing cattle diets, followed by a corn-based finishing diet, on performance of feedlot cattle

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ABSTRACT

The experiment was conducted to evaluate growth performance of cattle fed a dried distillers grains with solubles (DDGS)-based diet during the growing phase followed by a corn-based finishing diet in comparison with cattle fed a corn-based diet throughout the entire feeding period. Seventy Angus × Simmental cattle (42 steers and 28 heifers; 351 ± 6.8 kg average initial BW) were blocked by BW and sex and allotted to 2 dietary treatments in a randomized complete block design. Treatments were: (1) corn-based diet fed for 126 days (control), and (2) 60% DDGS diet fed for 70 days followed by the corn-based control diet fed until day 126 (DDGS/Corn treatment). Average daily gain, DMI, G:F, and dietary NE_m and NE_g were determined from day 0 to 70 (period 1; growing phase), day 71 to 126 (period 2; finishing phase), and day 0 to 126 (overall). Statistical analyses were conducted using the MIXED procedure of SAS. Average daily gain and G:F were greater ($P \leq 0.01$) for the control than for the DDGS/Corn treatment in period 1, but greater ($P < 0.01$) for the DDGS/Corn treatment in period 2 when compared to the control treatment. However, there were no differences ($P \geq 0.44$) in ADG and G:F between treatments over the entire feeding period. Animals from the control treatment had greater ($P \leq 0.01$) DMI in period 1 and overall. Calculated dietary NE_m and NE_g were greater ($P < 0.01$) for the DDGS/Corn treatment when compared to the control treatment only in period 2. However, the observed-to-expected ratios of NE_m and NE_g were greater ($P \leq 0.01$) for the DDGS/Corn group in all periods. Moreover, total corn intake was decreased ($P < 0.01$) for the DDGS/Corn group in period 1 and overall, although no differences ($P = 0.50$) were observed between treatments in period 2. In conclusion, feeding DDGS-based diets to growing cattle negatively affects performance during the initial feedlot period, but when cattle are switched to a corn-based diet in the finishing phase, those negative effects are overcome due to compensatory growth, and overall performance is similar to that of cattle fed corn for the entire feeding period (126 days). Thus, increasing DDGS in the diets of growing cattle and then switching to a corn-based finishing diet is a nutritional strategy that can be used to decrease feed costs and reduce beef producers' reliance on corn grain when corn prices are elevated.

Abbreviations: ADF, acid detergent fiber expressed inclusive of residual ash; aNDF, neutral detergent fiber assayed with a heat stable amylase and expressed inclusive of residual ash; DDGS, dried distillers grains with solubles; WDGS, wet distillers grains with solubles.

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1. Introduction

For over 40 years, corn grain has been the most cost effective and readily available energy source used by beef producers in the U.S., but, at times, competition from the ethanol industry results in an unprecedented increase in feed costs (McNew and Griffith, 2005). Previous approaches to reduce ration costs have focused on increasing dietary inclusions of alternative feeds, such as DDGS, forages, or other fiber-based by-products in finishing (greater than 450 kg) cattle diets (Ham et al., 1994; Klopfenstein et al., 2008). Although DDGS is a logical substitute for corn, the inclusion of ethanol by-products in finishing cattle diets is limited by seasonal availability and the negative impacts of excess N and sulfuric acid on animal performance, carcass quality, and the environment (Schoonmaker et al., 2010; Felix and Loerch, 2011). Furthermore, the dietary inclusion of fiber-based by-products and forage decreases the energy content of the diets, increases the cost per unit of energy, and presents storage and handling challenges (Brown et al., 2006).

An alternative approach to decrease feed costs is to increase DDGS in the diets of growing (250–450 kg) cattle, which have greater protein requirements and increased efficiency of nutrient utilization in comparison with finishing cattle (NRC, 2000), and to phase out DDGS, and subsequently protein, as cattle mature. This strategy has the potential to match animal protein requirements with the increased protein content in DDGS as was demonstrated in early-weaned cattle (Schoonmaker et al., 2013), as well as increase growth efficiency in cattle fed DDGS (Felix et al., 2011). Because there is an energy cost associated with metabolizing excess protein in the diet as animals mature, it might also be possible to observe a compensatory growth response once heavier cattle are transitioned to a lower protein corn-based finishing diet. Therefore, performance would not be negatively affected during the entire feeding period. It has been demonstrated that phase feeding protein to finishing feedlot cattle in order to more closely match animal requirements decreased nitrogen excretion without negatively affecting cattle performance (Cole et al., 2006; Vasconcelos et al., 2006). The use of this phase-feeding strategy has not been previously reported for DDGS in normal-weaned finishing cattle, but it would allow for a more efficient feed utilization without the negative effects of excessive nitrogen excretion, which has been demonstrated for ruminants fed high DDGS diets throughout the feeding period (Felix et al., 2012; Salim et al., 2012). Moreover, it would allow reducing the number of days a corn-based diet is fed, thus reducing beef producers' reliance on corn grain. In this regard, our objective was to evaluate growth performance of cattle fed a DDGS-based diet during the growing phase followed by a corn-based diet during the finishing phase in comparison with cattle fed a corn-based diet throughout the entire feeding period.

2. Materials and methods

All research protocols using animals followed guidelines in the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS, 2010) and were approved by the Institutional Animal Care and Use Committee of The Ohio State University.

2.1. Animals, experimental design, and diets

Seventy Angus × Simmental cattle (42 steers and 28 heifers; 351 ± 6.8 kg average initial BW) were used at the Ohio Agricultural Research and Development Center beef feedlot from The Ohio State University, Wooster, OH from June through October 2013. Animals were weighed on 2 consecutive days to determine initial BW, then blocked by BW and sex, and allotted within block to 12 pens, with 5 or 6 animals per pen and 6 pens per treatment, in a randomized complete block design. Pens (5.4 m × 5.4 m) are constructed of metal gates and cables on concrete slatted floors in an open-sided barn and provided at least 90 cm of bunk space per animal. Steers and heifers were implanted at the start of the trial with Synovex S (Zoetis, Florham Park, NJ, USA) and Synovex H (Zoetis, Florham Park, NJ, USA), respectively.

Each pen was assigned to 1 of 2 dietary treatments as follows: (1) corn-based diet fed for 126 days (control treatment), and (2) 60% DDGS diet fed for 70 days followed by the corn-based control diet fed until day 126 (DDGS/Corn treatment). Experimental diets (Table 1) were formulated to meet or exceed NRC (2000) requirements for crude protein, energy, vitamins, and minerals. All animals had an 11-day initial adaptation period, when dietary inclusions of corn and DDGS for the control and DDGS/Corn treatment, respectively, were gradually increased. Forage (hay) was maintained at 10% of the diet DM during the entire feeding period and during the DDGS to corn transition period. Cattle from each treatment received their respective diets until day 70, when animals from the DDGS/Corn treatment were gradually switched to the corn-based control diet over an 11-d period and both groups were fed the same diet until the end of the experiment (day 126). Feed delivery was adjusted daily by using the South Dakota State University 4-point bunk scoring system (Pritchard, 1993) to allow for ad libitum intake with little or no feed refusals. Feed delivery was recorded daily for each pen and any feed refusals were weighed, recorded, and discarded. Feed samples were collected every 4 weeks, oven-dried at 55 °C for 3 days, ground using a standard Wiley laboratory mill (1-mm screen; Arthur H. Thomas, Philadelphia, PA), and composited at the end of the experiment for later analysis of DM (AOAC, 2012; method 930.15), crude protein (AOAC, 2012; method 990.03), aNDF and ADF (using Ankom Technology Methods 5 and 6, respectively), ether extract (AOAC, 2012; method 2003.05), and minerals (Ca, P, Mg, K, and S; AOAC, 2012; method 989.03).