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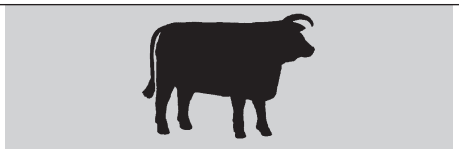

# Case Study: Distillers grains supplementation in a forage system with spayed heifers

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## ABSTRACT

*A 2-yr beef systems study evaluated winter and summer modified distillers grains plus solubles (MDGS) supplementation in a forage system. Treatments were arranged in a completely randomized design as a 2 × 2 factorial. Each year, 229 spayed heifers (215 ± 26 kg of BW) grazed corn residue 144 d, bromegrass 32 d (winter), and native range 120 d (summer) and were followed through the feedlot. Treatments included 0.91 kg of DM MDGS (LO) or 2.3 kg of DM MDGS (HI) supplement while grazing corn residue, and MDGS fed at 0.6% of BW daily (SUP) or no MDGS (NO SUP) during the summer. Winter ADG was 0.24 kg greater ($P < 0.01$) for HI than LO across both years. Summer ADG was 0.21 kg greater for SUP compared with NO SUP across both years ($P < 0.01$). Gains throughout the entire growing system were greatest for HI SUP, intermediate for HI NO SUP and LO SUP, and least for LO NO SUP. There were no interactions between winter and summer supplementation on ADG throughout the entire growing system ($P \geq 0.12$). At the end of the feedlot phase, HCW was greater ($P \leq 0.03$) by 23 and 15 kg (yr 1 and 2, respectively) for HI than LO. Summer SUP decreased finishing ADG by 0.21 kg ($P = 0.02$) in yr 1 and decreased G:F ($P \leq 0.07$) both years. Across both years, profit was greater for HI than LO cattle ($P \leq 0.02$), but summer supplementation did not affect profit ($P = 0.15$).*

**Key words:** backgrounding, beef cattle, distillers grains, supplement, winter

## INTRODUCTION

Backgrounding systems often use grazed forages to create yearlings, target different marketing windows, and create a year-round beef supply. In a yearling system, growing calves backgrounded on corn residue through the winter are commonly supplemented to meet protein requirements (Fernandez-Rivera and Klopfenstein, 1989), but summer supplementation is a relatively recent development that has arisen as a result of distillers grains plus solubles (**DGS**) supply and cost compared with other protein sources (Griffin et al., 2012).

Supplementing cattle with DGS from the corn milling industry works well in forage-based systems because the starch source has been removed, thus there is little interference with fiber digestion (Stalker et al., 2010). The DGS are high in CP, energy, and phosphorus and have been shown to increase ADG and BW with increasing levels of supplementation (Griffin et al., 2012). Providing DGS supplement to grazing cattle also reduces forage intake, perhaps by as much as 0.79 kg for each kilogram of DGS fed (Watson et al., 2012). Supplementing cattle with DGS during the summer can also result in greater final BW after a finishing period or require fewer days on feed (**DOF**) to reach a similar fat endpoint (Rolfe, 2011).

The objectives of this experiment were to evaluate the effects of level of modified distillers grains plus solubles (**MDGS**) supplementation during the winter and summer and examine interactions between level and season of supplementation within a forage-based system using spayed yearling heifers.

## MATERIALS AND METHODS

All procedures and facilities used were approved by the University of Nebraska–Lincoln Institutional Animal Care and Use Committee. Each year of a 2-yr study, 240 crossbred heifers (initial BW = 215 kg; SD = 26 kg) were used in a completely randomized design with a 2 × 2

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factorial arrangement of treatments. Eleven heifers were removed each year because of illness, giving a total of 229 heifers completing the system each year. Factors included winter supplement level and summer supplement level. At the beginning of the winter backgrounding phase, heifers were stratified by initial BW and assigned randomly to 1 of 8 groups (replicates) of 30 heifers. There were 2 replicates per treatment each year. Replicates were randomly assigned to winter supplementation level: (1) 0.91 kg of DM MDGS (**LO**) or (2) 2.3 kg of DM MDGS (**HI**) and a summer supplementation level: (1) MDGS fed at 0.6% of BW daily (**SUP)** or (2) no MDGS supplementation (**NO SUP**). At the end of the feedlot phase, each experimental unit (28 to 29 heifers) was divided into an early and late group for serial slaughter to adjust carcass measurements to a common fat thickness (1.32 cm). There were 2 feedlot pens within year for each combination of winter and summer supplementation level treatment.

## *Winter*

Each fall at receiving, calves were processed within 24 h of arrival at the University of Nebraska Agricultural Research and Development Center (**ARDC**) feedlot near Mead, Nebraska. Heifers were purchased through the sale barn in Ogallala, Nebraska. Receiving BW was collected (assumed as a shrunk BW), and calves were vaccinated according to University of Nebraska health protocols. Calves were individually tagged with a panel tag, electronic identification tag, and metal clip tag.

In yr 1, calves were vaccinated for prevention of infectious bovine rhinotracheitis virus, bovine viral diarrhea, parainfluenza ($PI_3$), bovine respiratory syncytial virus (BoviShield Gold 5; Zoetis Inc., Kalamazoo, MI), and *Haemophilus somnus* (Ultrabac 7/Somubac; Zoetis Inc.). A parasiticide was injected (Dectomax; Zoetis Inc.), and a parasiticide was orally administered (Safeguard; Merck Animal Health, Summit, NJ). Cattle were revaccinated approximately 2 wk later with a second dose of viral, bacterial, and clostridial vaccines (BoviShield Gold 5, Ultrabac 7/Somubac; Zoetis Inc.) and dosed with Piliguard Pinkeye-1 (Merck Animal Health).

In yr 2, initial processing methods were similar but with the use of One Shot (*Pasteurella*; Zoetis Inc.) and no Safeguard administration. The revaccination protocol used BoviShield Gold 5 and Vision 7/Somnus (Merck Animal Health) and a Piliguard (Merck Animal Health) vaccination for pinkeye protection.

In both years, heifers grazed cool-season pastures as a common group after initial processing. Before revaccination, heifers were limit fed a diet of 50% alfalfa hay and 50% Sweet Bran (Cargill, Blair, NE) at 1.8% of BW daily (DM basis) for 5 d to minimize differences in gut fill (Watson et al., 2013). Initial BW was then collected over 2 d and the mean weight used as the initial weight for the winter phase and growing system. This same weighing protocol was used to measure BW of heifers after the winter and summer grazing periods to accurately measure ADG of each period. At this time (approximately December 1 each year), heifers were stratified by BW, assigned randomly to treatment, and sorted into winter treatment groups, HI or LO, and winter phase of the system was initiated.

Heifers then grazed corn residue in winter treatment groups at the ARDC from late fall until early spring. Corn fields were irrigated and produced approximately 12,500 kg/ha of corn grain. The LO supplement level was formulated to meet metabolizable protein requirements (NRC, 1996), whereas the HI level was provided to meet metabolizable protein requirements (0.91 kg of MDGS/d) and the additional 1.39 kg of MDGS supplied additional energy. In addition to MDGS, a daily supplement was provided at 0.11 kg per heifer, to provide 200 mg of monensin (Rumensin; Elanco Animal Health, Indianapolis, IN). Supplements were fed in metal bunks allowing approximately 46 cm of bunk space per animal. Heifers within each treatment were fed as a single group.

At the conclusion of grazing corn residue (approximately April 20 each year), heifers were placed in a dry lot for 24 h and then surgically spayed by a DVM using the Kimberling-Rupp procedure (Rupp and Kimberling, 1982). Heifers were immediately placed on smooth bromegrass pasture where they grazed an average of 31 d. This 1-mo grazing period had 2 purposes: allow heifers time to heal after the spaying procedure and give warm-season pastures time to have adequate growth before initiating grazing. Winter supplementation treatment was discontinued at the start of bromegrass grazing; heifers grazed as a single group for each winter treatment (114 to 115 per pasture). Heifers within each treatment were rotated through 3 smooth bromegrass pastures of approximately 12 ha each during the grazing period. The winter phase (corn stalk grazing with winter supplement treatment and smooth bromegrass grazing) averaged 175 d.

## *Summer*

Upon removal from bromegrass pasture, heifers were limit fed 5 d (using the same diet as used for the start of the winter phase) and weighed 2 consecutive days, and the average weight was used as heifers' ending BW from the winter phase of the system and beginning BW of summer phase. This winter phase ending BW was used to equally allocate heifers from each winter treatment group into 1 of 2 summer treatment groups.

Heifers were then processed for summer grazing, implanted with a Revalor-G implant (40 mg of trenbolone acetate and 8 mg of estradiol; Merck Animal Health), and hot iron branded. Heifers were given an insecticide pour-on (Saber; Merck Animal Health) in yr 1 or Phonectin (Teva Animal Health, St. Joseph, MO) in yr 2. In yr 2, heifers were given a Piliguard (Merck Animal Health) vaccination for pinkeye protection and received a Python MAGNUM insec-