The Professional Animal Scientist 28 (2012):612–617

Dried distillers grains as a substitute for grazed forage

L. A. Stalker,*[1] T. J. Klopfenstein,† W. H. Schacht,‡ and J. D. Volesky*
*West Central Research and Extension Center, University of Nebraska, North Platte 69101; and †Department of Animal Science, and ‡Department of Agronomy and Horticulture, University of Nebraska–Lincoln, Lincoln 68583

ABSTRACT

A 2-yr study evaluated effects of feeding dried distillers grains (DDG) to yearlings grazing native range at greater-than-recommended stocking rates on BW gain, grazed forage quality, and forage disappearance. Thirty-six paddocks were assigned randomly to 1 of 3 treatments: 1) control, stocked at a moderate stocking rate (1.48 animal unit months/ha in yr 1, 1.06 animal unit months/ha in yr 2) with no DDG; 2) double stocked, in which stocking rate was exactly twice the control with no DDG; and 3) double stocked with 2.27 kg/d (DM) of DDG per animal. Six paddocks per treatment replication were grazed in rotation. A total of 42 yearlings (242 ± 15 kg of BW) in yr 1 and 24 yearlings (229 ± 17 kg of BW) in yr 2 were stratified by BW and assigned randomly to treatment. Diet quality was assessed using esophageally fistulated cattle, and forage disappearance and standing crop were determined by clipping twenty 0.25-m² quadrats pre- and postgrazing. There was no difference (P = 0.52) in ADG between control and double-stocked-without-DDG yearlings (0.50 and 0.45 kg/d, respectively); however, those fed DDG gained more BW (1.14 kg/d; P < 0.01) than did yearlings not fed DDG. Forage disappearance was lower (P < 0.01) for the control treatment compared with the double-stocked treatments but was not different (P > 0.05) between the 2 double-stocked treatments. Diet in vitro OM disappearance did not differ (P = 0.53) among treatments. Feeding DDG was an effective means of increasing ADG of grazing yearlings when stocking rate was doubled but did not replace sufficient grazed forage to increase stocking rate 2-fold.

Key words: dried distillers grains, grazing, stocking rate, forage substitution

INTRODUCTION

Grazed forages have traditionally been considered the least expensive feedstuff in both cow-calf and backgrounding operations. However, ethanol production from corn grain has made dried distillers grains (**DDG**) an available feedstuff that improves growth rate of grazing cattle (Griffin et al., 2012). In addition to demonstrating an increase in animal performance, previous research has demonstrated a substitution effect on forage intake when DDG is fed in forage-based diets (Loy et al., 2007; MacDonald et al., 2007; Griffin et al., 2012). If the cost of DDG is less than the cost of replaced grazed forage on a per unit of energy basis, then cost of production could be decreased by feeding DDG. And if DDG acts as a substitute for grazed forage, then feeding DDG would allow increased stocking rates and greater production per unit of land. Potentially, this could be achieved without negatively affecting the forage resource because forage removal would be the same as at the lower stocking rate. Because measuring grazed forage intake is challenging, the NRC (1996) energetic equations have been used in several instances to estimate, rather than directly measure, grazed forage intake (MacDonald et al., 2007). This approach has indicated DDG may replace up to 1.6 kg of grazed forage for each kilogram of DDG fed (Morris et al., 2006). Increasing the stocking rate would allow a producer to realize an economic benefit from the substitution effects of DDG on grazed forage intake in addition to decreased cost per unit energy. The objective of this experiment was to evaluate the effect of feeding DDG in combination with greater-than-recommended stocking rates on BW gain, diet quality, and forage disappearance of cattle grazing native Sandhills range.

MATERIALS AND METHODS

This experiment was conducted at the University of Nebraska Gudmundsen Sandhills Laboratory near Whitman, Nebraska, (elevation of 1,073 m, lat 42°05′N, long 101°26′W) according to protocol approved by the University of Nebraska–Lincoln Animal Care and Use Committee. Precipita-

[1] Corresponding author: astalker3@unl.edu

Table 1. Monthly and long-term average precipitation (mm) at the Gudmundsen Sandhills Laboratory

Item	January–April	May	June	July	August
Yr 1	139.2	99.1	111.0	22.1	68.3
Yr 2	73.2	18.8	82.0	21.8	64.8
30-yr average	65.8	73.7	85.9	67.3	49.8

tion during the experiment and 30-yr average precipitation are shown in Table 1. Twelve 1-ha paddocks and twenty-four 0.5-ha paddocks were separated into 2 blocks because of minor differences in species composition and topography (Table 2). Six 1-ha paddocks and twelve 0.5-ha paddocks were included in each block. Before the start of the experiment, there were twelve 1-ha paddocks per block. Six paddocks per block were selected at random and divided in half, creating twelve 0.5-ha paddocks per block. Six paddocks of the same size within the same block were assigned randomly to 1 of 3 treatments: 1) control, stocked at a moderate stocking rate [1.48 animal unit months/ha in yr 1 and 1.06 animal unit months/ha in yr 2] with no DDG; 2) double stocked, in which stocking rate was exactly twice that of control with no DDG; and 3) double stocked with DDG, in which stocking rate was exactly twice that of control with 2.27 kg/d (DM) per animal of DDG. Number of animals, average initial BW, and grazing days were kept constant among treatments, and differences in stocking rate were achieved by providing exactly 50% less area to cattle in the double-stocked treatments. Six paddocks per treatment within each block were grazed in sequence once each year for 60 d from mid-June to mid-August, with grazing days per paddock adjusted for stage of plant growth (Table 3). The sequence in which pastures were grazed was altered between years to maximize recovery. The recommended stocking rate for the paddocks used in this experiment was 1.5 animal unit months/ha (Stubbendieck and Reece, 1992). Because of below-average spring precipitation in yr 2, stocking rate was reduced and put-and-take of yearlings was used to maintain constant percentage forage disappearance (Wheeler et al., 1973) between yr 1 and yr 2 in the control paddocks.

In yr 1, 42 summer-born yearling heifers (242 ± 15 kg of initial BW) that had been spayed and in yr 2, 24 summer-born yearlings (14 spayed heifers and 10 steers; 229 ± 17 kg of initial BW) were stratified by BW and assigned randomly to treatment paddocks. In addition, 6 similar yearlings were maintained in yr 2 for put-and-take. Yearlings were limit-fed grass hay at 2% of BW for 5 d and weighed on each of the last 3 d of the limit-feeding period at both the beginning and end of the experiment.

Paddock species composition was determined before grazing each year in all paddocks using step-point analysis (Owensby, 1973), and basal data are presented in Table 3. Standing crop and forage disappearance were determined by clipping twenty 0.25-m^2 quadrats per paddock pre- and postgrazing in late June, mid-July, and early August in 3 paddocks per treatment replication (the second, fourth, and sixth paddocks, respectively, in a 6-paddock rotation). Clipped samples were sorted into 4 categories: 1) live grass, 2) standing dead grass, 3) forbs, and 4) litter. These samples were dried in a forced-air oven for 48 h at 60°C and weighed. Forage disappearance was calculated by subtracting postgrazing forage (live grass, standing dead grass, and forbs) from pregrazing forage and then dividing the difference by pregrazing forage. In yr 1, all quadrat locations were selected randomly. In yr 2, contiguous pre- and postgrazing quadrat locations were selected randomly. The location of the selected postgrazing site was marked with a stake and subsequently located using GPS technology for postgrazing sampling. Nutrient content of clipped samples from yr 1 was evaluated from a composite of 6 randomly selected quadrats per pasture.

In yr 1, grazed-forage IVDMD and CP were determined from masticate samples obtained from 2 esophageally fistulated cattle that were not part of the experiment. Masticate samples were collected in the same paddocks selected for standing crop and forage disappearance measures (the second, fourth, and sixth paddocks) halfway through the grazing period. Surgeries were performed on the 2 cows 2 yr before the beginning of the experiment. Fistulated cattle were held with access to water but not feed for 12 h, fitted with screen-bottom bags after removal of the esophageal plug, and then introduced to the paddock and allowed to graze for about 20 min. Samples collected from the bags were immediately frozen and stored at −20°C. They were then lyophilized, ground to pass a 1-mm screen in a Wiley Mill (Model-4, Thomas Scientific, Swedesboro, NJ), and composited by collection date within paddock. Compositing was accomplished by combining the material obtained from each of the 2 cows on an equal weight basis. Composited samples were analyzed for DM and ash following AOAC (1996) procedures.

Table 2. Grazing days and sequence for the 6 paddocks (A–F)

Item	Mid-June	Late June	Early July	Mid-July	Late July	Early August
Grazing days	7	9	11	11	11	11
Yr 1 sequence	A	B	C	D	E	F
Yr 2 sequence	E	F	A	B	C	D