Forage-Livestock
Research Progress Report

Texas A&M AgriLife Research and Extension
Center at Overton

Research Center Technical Report 2016-2

EFFECTS OF LEVEL OF DRIED DISTILLERS' GRAINS WITH SOLUBLES SUPPLEMENT AND BERMUDAGRASS CULTIVAR ON STOCKER PERFORMANCE

W. B. Smith[1], J. P. Banta[2], J. L. Foster[3], L. A. Redmon[4], C. R. Long[1], L. O. Tedeschi[5], and F. M. Rouquette, Jr.[1]

[1]Department of Soil and Crop Sciences, Texas A&M AgriLife Research, Overton, TX
[2]Department of Animal Science, Texas A&M AgriLife Extension, Overton, TX
[3]Texas A&M AgriLife Research, Beeville, TX
[4]Department of Soil and Crop Sciences, Texas A&M AgriLife Extension, College Station, TX
[5]Department of Animal Science, Texas A&M University, College Station, TX

Summary

Dried distillers' grains with solubles (DDGS) has provided opportunities for use as a supplement for stocker cattle. The objective of this 2 yr study was to evaluate DDGS supplementation level (SUPP) on performance of steers grazing each of two bermudagrass (*Cynodon dactylon* [L.] Pers.) cultivars ('Tifton 85' [TIF] or 'Coastal' [COS]) through a summer stocker phase. Steer ADG and gain per acre were greatest from stockers grazing TIF with 1.00% BW SUPP. Steers grazing COS with 0.25% BW SUPP gained the least weight due to supplementation and gain per unit area was not different from the control. Supplement to extra gain ratio for TIF ranged from 3.7:1 for 0.25% SUPP to 9:1 for 1.00% SUPP. Depending on cattle value and feed costs, supplementation of steers with DDGS in a summer stocker phase may enhance animal performance, and this effect may be greater with TIF.

Introduction

A wealth of research on the use of supplemental feed for cattle grazing pasture, especially stocker calves, was conducted in the early 1970's with the advent of monensin for increased production efficiency. Of this early work, a significant portion was conducted using bermudagrass pastures (Grigsby et al., 1989; Huston et al., 2002). Oliver (1975) established that steers grazing Coastal bermudagrass gained 0.24 lb/d more weight when supplemented with 2 lb/d corn (without monensin) than did those grazing pasture with no supplement. Gadberry et al. (2010) stated that little work has been done to address the use of DDG(S) in enhancing the nutritional benefits of stockers grazing actively-growing bermudagrasses. The objective of this 2-yr study was to evaluate DDGS supplementation level (SUPP) on gain of steers grazing TIF or COS through a summer stocker phase.

Experimental Procedures

Stocking of pastures occurred at the Texas A&M AgriLife Research and Extension Center in Overton, TX (OVT), in June of each year (2014 and 2015) and was terminated in late September or early October. Steers (TIF: n = 112, 802 ± 7.7 lb initial BW, ≈ 15 mo of age, *Bos taurus* crossbred; COS: n = 117, 756 ± 9.9 lb initial BW, approx. 15 mo of age, *Bos taurus* crossbred or purebred Brahman), sourced from OVT or McGregor (MCG), were stratified by BW and randomly allocated to pastures (TIF: n = 16, 1.7 ± 0.02 ac; COS: n = 9, 3.2 ± 0.42 ac) each year at 4 levels of SUPP (0.00, 0.25, 0.50, or 1.00% BW) for TIF, or 3 levels of SUPP (0.00, 0.25, or 1.00% BW) for COS. At initiation of the experiment, steers were weighed and BCS taken. Steers were subsequently weighed, unshrunken, every 21 d. Grazer animals were added to each pasture based on a combination of visual (forage height) and numerical (forage mass) assessments to create comparable forage conditions among pastures. Animals grazed for approximately 105 d each year.

Steers were group-fed DDGS daily at approximately 8:00 AM, and bunk space was maintained at a minimum of 12 in/hd. Granular DDGS (with 2% limestone; 27% CP, 6.5% fat) was sourced in bulk (pallets of 50 lb bags) from a local cooperative (Producers Cooperative, Bryan, TX). Limestone was added to the DDGS mixture at 2% due to the exceedingly high concentrations of P in an effort to balance Ca:P ratios. Amount of daily DDGS offered to each group was adjusted following each weigh period to represent a designated proportion of BW. Pastures were

fertilized with a 21-8-17 fertilizer blend at a rate of 325 lb/ac at the beginning of the season, and 200 lb/ac of 34-0-0 applied twice during the grazing season in each year.

Animal performance and pasture-level data were analyzed as repeated measures using PROC MIXED in SAS. For TIF, the fixed effect was SUPP (0.00, 0.25, 0.50, or 1.00%). Random effect was designated as year (2014 or 2015). For COS, the fixed effects were SUPP (0.00, 0.25, or 1.00%) and species (*Bos indicus* and *Bos taurus*). Random effects were designated as year and origin (MCG or OVT).

Results and Discussion

Performance measures from *Bos taurus* crossbred steers grazing TIF bermudagrass are presented in Table 1. Gain was greatest from steers receiving 1.00% BW SUPP (2.9 lb/d), followed by 0.50 and 0.25% BW SUPP (2.6 and 2.5 lb/d, respectively), and was least from control animals (1.9 lb/d). This resulted in a greater extra gain from supplemental feed from 1.00% BW SUPP (1.1 lb/d) than from 0.50 or 0.25% BW SUPP (0.8 and 0.7 lb/d, respectively), which did not differ. When expressed as a ratio of supplemental feed to additional BW gain, ratios of 9.0, 6.0, and 3.7 lb/lb were realized for 1.00, 0.50, and 0.25% BW SUPP, respectively. Given a DDGS cost of $214/t, this resulted in a cost of SUPP for additional pound of gain at $0.98, $0.65, and $0.40 for 1.00, 0.50, and 0.25% BW SUPP. Due to the dynamics of supplementation and cattle DM intake, pastures SUPP at 1.00% BW were stocked with the greater animal density (4600 lb/ac) than 0.00, 0.25, or 0.50% BW SUPP pastures (3800 lb/ac for all SUPP treatments). Using a 750 lb = 1 stocker steer, this resulted in 2-yr stocking rates of 5.1, 5.0, 5.1, and 6.2 hd/ac for 0.00, 0.25, 0.50, and 1.00% BW SUPP. Gain per acre was greatest from pastures supplemented at 1.00% BW (1700 lb/ac), followed by 0.50 and 0.25% BW SUPP (1200 and 1100 lb/ac, respectively). Gain per acre was least from non-SUPP control pastures (800 lb/ac). Because fertilizer cost per acre was constant across treatments, this resulted in a fertilizer cost per pound of gain of $0.19, $0.13, $0.12, and $0.09/lb from 0.00, 0.25, 0.50, and 1.00% BW SUPP pastures, respectively.

Performance measures from a mixture of *Bos taurus* and *B. indicus* steers grazing COS bermudagrass are presented in Table 2. Gain was greatest from steers receiving 1.00% BW SUPP (2.3 lb/d) and least from 0.25 and 0.00% BW SUPP (1.6 and 1.5 lb/d, respectively). This resulted in a greater extra gain from supplemental feed from 1.00% BW SUPP (0.74 lb/d) than from 0.25% BW SUPP (0.02 lb/d). When expressed as a ratio of supplemental feed to additional BW gain, ratios of 11.8 and 105 lb/lb were realized for 1.00 and 0.25% BW SUPP, respectively. This resulted in a SUPP cost for additional pound of gain at $1.29 and $11.44 for 1.00 and 0.25% BW SUPP, respectively. Pastures SUPP at 1.00% and 0.25% BW were stocked with the greater animal density (2900 and 2600 lb/ac, respectively) than 0.00 BW SUPP pastures (2000 lb/ac). Using a 750 lb = 1 stocker steer, this resulted in 2-yr stocking rates of 2.7, 3.4, and 3.9 hd/ac for 0.00, 0.25, and 1.00% BW SUPP. Gain per acre was greatest from pastures supplemented at 1.00% BW (800 lb/ac) followed by 0.25% BW SUPP (500 lb/ac). Gain per acre was least from non-SUPP control pastures (400 lb/ac). Because fertilizer cost per acre was constant across treatments, this resulted in a fertilizer cost per pound of gain of $0.37, $0.30, and $0.17/lb from 0.00, 0.25, and 1.00% BW SUPP pastures, respectively.

Performance measures from COS are presented in Table 3 for each of *Bos taurus* crossbred and *Bos indicus* species. There was no interaction of species and DDGS SUPP ($P = 0.84$). Across both *Bos indicus* and *B. taurus*, ADG was greater from 1.00% BW SUPP (2.6 and 2.0 lb/d from *B. indicus* and *B. taurus*, respectively) than 0.00 (1.9 and 1.2 lb/d from *B. indicus* and *B. taurus*, respectively), or 0.25% BW SUPP (1.9 and 1.2 lb/d from *B. indicus* and *B. taurus*, respectively). Gains were greater from *B. indicus* (2.1 lb/d) than from *B. taurus* (1.5 lb/d). Extra gain from supplemental feed was nearly negligible from 0.25% BW SUPP across species (0.04 lb/d). Extra gain was 0.7 and 0.8 lb/d from *Bos indicus* and *B. taurus*, respectively, when SUPP at 1.00% BW. When expressed as a ratio of supplemental feed to additional BW gain, ratios of 47.5 and 57.5 were observed for 0.25% BW SUPP from *B. indicus* and *B. taurus*, respectively, while the ratio at 1.00% BW SUPP was 11.4 and 12.2 from *B. indicus* and *B. taurus*, respectively. This resulted in a SUPP cost for additional gain of $1.24 and $5.18 for *B. indicus* steers SUPP

at 1.00 and 0.25% BW, respectively, and $1.33 and $6.27 for *B. taurus* steers SUPP at 1.00 and 0.25% BW, respectively.

As a summation of the described experiments, the researchers recognize that many dynamics of cattle supplementation are demonstrated. The basal hypothesis of associative or substitutive effects proposes forage intake is constant and any level of supplement provided will increase both voluntary intake and potential ADG. It is more likely, though, that animals will either substitute the supplemental feed for forage in a negative associative (or substitution) effect or amount of supplement provided will stimulate voluntary forage consumption in a positive associative effect (Huston et al., 2002). Grain supplementation at 0.6% BW has been shown to decrease hay intake by 50%; thereby, decreasing the overall intake level to 0.3% BW (Moore et al., 1991). Using a realistic assumption that cattle will consume between 2.0 and 2.5% BW grazing bermudagrass pasture, the 1.00% BW SUPP would represent up to 50% of the total daily intake. This would most likely induce a substitution of forage. The increased animal performance on TIF in relation to COS can be explained by the nutritive value of TIF forage, which is superior to that of COS across all times in the season. In the current studies, breed type played a major role in performance. Purebred Brahman steers outperformed steers with 25% Brahman influence (F1 crossbred dams). When evaluating these experiments from an economic perspective, one may see that the 1.00% BW SUPP would only be economically viable in certain merchandizing scenarios. This would likely include purebred cattle, niche marketing, or when the absolute value of cattle exceeds the increased cost of gain for a profit to be realized.

Implications

Supplementation of stocker cattle has generally been done to offset: 1) lack of forage available for grazing due to stocking rate and/or climatic conditions, or 2) to enhance ADG from low nutritive value forages. Average daily gain was improved in steers supplemented with any level of DDGS while grazing TIF; however, only with 1.00% BW while grazing COS. Likewise, stocking density was increased with the advent of supplementation on TIF. In spite of animal performance measures, gain per acre was improved with any level of supplementation on COS or TIF. Due to SUPP to extra gain ratios, the feed cost per pound of gain was optimized with about 0.25% SUPP on TIF, but was costly at 0.25% SUPP on COS. Depending on cattle and feed prices, supplementation of stocker calves with DDGS may represent a viable strategy for enhanced performance, and this increased performance may be further supported when grazing TIF.

Literature Cited

Gadberry, M. S., P. A. Beck, M. Morgan, D. S. Hubbel, III, J. Butterbaugh, and B. Rudolph. 2010. Effect of dried distillers grains supplementation on calves grazing bermudagrass pasture or fed low-quality hay. Prof. Anim. Sci. 26: 347-355. doi:10.15232/S1080-7446(15)30614-8.

Grigsby, K. N., F. M. Rouquette, Jr., W. C. Ellis, and D. P. Hutcheson. 1989. Self-limiting protein supplements for calves grazing bermudagrass pastures. J. Prod. Agric. 2: 222-227. doi:10.2134/jpa1989.0222.

Huston, J. E., F. M. Rouquette Jr, W. C. Ellis, H. Lippke, and T. D. A. Forbes. 2002. Supplementation of grazing beef cattle. Tex. Agr. Exp. Sta. Tech. Mono. 12.

Moore, J. E., W. E. Kunkle, and W. F. Brown. 1991. Forage quality and the need for protein and energy supplements. In: Proc. Flor. Beef Cattle Short Course, Gainesville, FL. p 196.

Oliver, W. 1975. Effect of monensin on gains of steers grazed on Coastal bermudagrass. J. Anim. Sci. 41: 999-1001.

Table 1. Performance measures from *Bos taurus* crossbred cattle grazing Tifton 85 (TIF) bermudagrass and supplemented with various levels of DDGS.[*]

	Level of supplementation, % BW			
Item	**0.00%**	**0.25%**	**0.50%**	**1.00%**
ADG, lb/d	1.85 c	2.46 b	2.57 b	2.88 a
Additional gain from supplement, lb/d	N/A[‡]	0.63 b	0.78 b	1.07 a
Average daily supplement fed, lb	N/A[‡]	2.3 c	4.7 b	9.6 a
Supplemental feed:extra gain ratio, lb/lb[†]	N/A[‡]	3.7	6.0	9.0
Feed cost of additional gain, $/lb[†§]	N/A[‡]	$0.40	$0.65	$0.98
Stocking density, lb BW/ac	3802 b	3746 b	3793 b	4619 a
Stocking rate, hd/ac[#]	5.1 b	5.0 b	5.1 b	6.2 a
Gain per unit area, lb/ac	756 c	1097 b	1199 b	1661 a
Fertilizer cost per acre, $/ac[†‖]	$146.79	$146.79	$146.79	$146.79
Fertilizer cost per lb of gain, $/lb[†‖]	$0.19	$0.13	$0.12	$0.09
Combined (feed and fertilizer) cost per lb of gain, $/lb[†§‖]	$0.19	$0.53	$0.77	$1.07

[*]Means within a row not followed by the same letter differ at $P < 0.05$.
[†]Response variable calculated from treatment means and not statistically analyzed.
[‡]Not applicable.
[§]Cost of additional gain based on feed cost of DDGS at $214/t ($0.109/lb). Prices obtained from the "Texas Border" delivered price of the USDA Market News Report, June 24, 2016.
[#]Based on 1 animal = 750 lb.
[‖]Calculations based on fertilizer costs of $411/t for 21-8-17 and $400/t for 34-0-0.

Table 2. Performance measures from a mixture of *Bos taurus* crossbred and purebred Brahman cattle grazing Coastal (COS) bermudagrass and supplemented with various levels of DDGS.[*]

	Level of supplementation, % BW		
Item	**0.00%**	**0.25%**	**1.00%**
ADG, lb/d	1.53 b	1.57 b	2.26 a
Additional gain from supplement, lb/d	N/A[‡]	0.02 b	0.74 a
Average daily supplement fed, lb	N/A[‡]	2.1 b	8.7 a
Supplemental feed:extra gain ratio, lb/lb[†]	N/A[‡]	105	11.8
Feed cost of additional gain, $/lb[†§]	N/A[‡]	$11.44	$1.29
Stocking density, lb BW/ac	2005 b	2553 a	2930 a
Stocking rate, hd/ac[#]	2.7 b	3.4 a	3.9 a
Gain per unit area, lb/ac	400 c	494 b	847 a
Fertilizer cost per acre, $/ac[†‖]	$146.79	$146.79	$146.79
Fertilizer cost per lb of gain, $/lb[†‖]	$0.37	$0.30	$0.17
Combined (feed and fertilizer) cost per lb of gain, $/lb[†§‖]	$0.37	$11.74	$1.46

[*]Means within a row not followed by the same letter differ at $P < 0.05$.
[†]Response variable calculated from treatment means and not statistically analyzed.
[‡]Not applicable.
[§]Cost of additional gain based on feed cost of DDGS at $214/t ($0.109/lb). Prices obtained from the "Texas Border" delivered price of the USDA Market News Report, June 24, 2016.
[#]Based on 1 animal = 750 lb.
[‖] Calculations based on fertilizer costs of $411/t for 21-8-17 and $400/t for 34-0-0.

Table 3. Performance measures from *Bos indicus* and *Bos taurus* cattle grazing Coastal (COS) bermudagrass and supplemented with various levels of DDGS.[*]

	Bos indicus			***Bos taurus***		
Item	**0.00%**	**0.25%**	**1.00%**	**0.00%**	**0.25%**	**1.00%**
ADG, lb/d	1.88 b	1.92 b	2.57 a	1.18 b	1.22 b	1.95 a
Additional gain from supplement, lb/d[†]	N/A[‡]	0.04	0.69	N/A[‡]	0.04	0.77
Average daily supplement fed, lb[†]	N/A[‡]	1.9	7.9	N/A[‡]	2.3	9.4
Supplemental feed:extra gain ratio, lb/lb[†]	N/A[‡]	47.5	11.4	N/A[‡]	57.5	12.2
Feed cost of additional gain, $/lb[†§]	N/A[‡]	$5.18	$1.24	N/A[‡]	$6.27	$1.33

[*]Due to the lack of species*treatment interaction ($P = 0.85$), means within a species not followed by the same letter differ at $P < 0.05$.

[†]Response variable calculated from treatment means and not statistically analyzed.

[‡]Not applicable.

[§]Cost of additional gain based on feed cost of DDGS at $214/t ($0.109/lb). Prices obtained from the "Texas Border" delivered price of the USDA Market News Report, June 24, 2016.