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E.S. Vanzant

A.A. Beharka

R.C. Cochran

See next page for additional authors

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Influence of sorghum grain supplementation on forage utilization by beef steers consuming immature bluestem

Abstract

Supplementing beef steers consuming immature bluestem with 0, 1, 2, or 4 lbs of sorghum grain daily did not affect forage intake. Thus, total intake increased as level of grain increased. Total dry matter, cell wall, and starch digestibilities were mildly depressed with increasing grain. Rumen fill and rates of passage were similar for all treatments, and differences in rumen fermentation characteristics were minimal.

Keywords

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Authors

E.S. Vanzant, A.A. Beharka, R.C. Cochran, T.B. Avery, and K.A. Jacques

Influence of Sorghum Grain Supplementation on Forage Utilization by Beef Steers Consuming Immature Bluestem[1]

E.S. Vanzant, A.A. Beharka, R.C. Cochran, T.B. Avery,[2] and K.A. Jacques

Summary

Supplementing beef steers consuming immature bluestem with 0, 1, 2, or 4 lbs of sorghum grain daily did not affect forage intake. Thus, total intake increased as level of grain increased. Total dry matter, cell wall, and starch digestibilities were mildly depressed with increasing grain. Rumen fill and rates of passage were similar for all treatments, and differences in rumen fermentation characteristics were minimal.

Introduction

Intensive range utilization systems such as intensive-early stocking (IES), are being used increasingly by Flint Hills livestock producers. Limited research at the Fort Hays Branch Station has shown that supplementing steers with grain under IES increases gain per head and beef per acre. However, other research indicates that grain supplementation may reduce forage utilization. Information is limited on the influence of grain supplementation on immature bluestem utilization. We designed this study to evaluate how various levels of sorghum grain (milo) affect utilization of immature bluestem by beef steers.

Experimental Procedures

Sixteen ruminally cannulated Hereford x Angus steers (avg. wt., 600 lbs.) were assigned to one of four treatments: 1) control (no supplement), 2) 1 lb, 3) 2 lb, or 4) 4 lb of supplemental milo per head per day. Animals were kept under shelter in individual pens. Fresh bluestem range grass, cut and chopped daily, was fed at 15% over each animal's previous 7-day average intake from June 10 to July 9, 1986. Forage and grain offered and forage refusals were weighed and subsampled daily, analyzed for dry matter, and stored for future analyses. A 14-day adaptation period beginning June 10 was followed by 7 days of intake measurement and 7 days of total fecal collection. Cobalt EDTA, used to monitor liquid flow rates and rumen volume, was given intraruminally on the last day of fecal collection. Rumen fluid samples were taken at 0, 3, 5, 7, 9, 12, and 24 hours postdosing. Ruminal fill of solid digesta was determined by complete ruminal evacuation immediately after the last fecal collection. Solid ruminal contents were subsampled and analyzed for indigestible acid detergent fiber.

[1]The authors wish to thank Mr. Gary Ritter and Mr. Wayne Adolph for their invaluable assistance in conducting this trial.
[2]Dept. of Surgery and Medicine.

Results and Discussion

Since there were no differences (P>.10) in forage intake across treatments, total diet intake increased (P<.05) with additional grain (Table 27.1). In contrast, total dry matter, cell wall, and starch digestibilities decreased (P<.05) with increasing grain level. Digestibility decreases were not due to changes in liquid or solid passage rates, since neither varied (P>.10) with grain addition (Table 27.2). Ruminal liquid volume and indigestible fiber were also similar (P>.10) across treatments.

Increasing milo supplementation had minimal effect on most rumen fermentation characteristics. Ruminal propionate level and acetate:propionate ratio, as well as ruminal NH_3-N and total volatile fatty acids (VFA) concentrations, were similar (P>.10) among treatments (Table 27.2). However, ruminal acetate and pH decreased (P<.01), whereas butyrate increased (P<.10) with grain addition. Some changes were noted for minor VFA's. However, patterns were not consistent.

According to this study, cattle consuming immature bluestem may be supplemented with up to 4 lb milo per day with only a minimal decrease in forage utilization. Therefore, additional research is needed to monitor performance response to early season grain supplementation and to determine levels of supplementation that optimize economic returns.

Table 27.1. Influence of Sorghum Grain Supplementation on Dry Matter (DM) Intake and Digestibility in Beef Steers Consuming Immature Bluestem Range Grasses

Item	Grain Sorghum Per Day				
	No Supplement	1 lb	2 lb	4 lb	SE[a]
Forage DM intake (lb/d)	12.4	13.1	13.4	13.5	0.59
Grain DM intake (lb/d)	0	0.9	1.9	3.7	--
Total DM intake (lb/d)[b]	12.4	14.0	15.3	17.2	0.59
Forage DM intake (% body wt.)	2.12	2.21	2.16	2.23	0.10
Total DM intake (% body wt.)[b]	2.12	2.36	2.47	2.85	0.10
Total tract DM digestibility (%)[b]	55.3	55.8	53.2	53.5	0.61
Cell wall digestibility (%)[b]	55.5	54.7	51.7	52.0	1.02
Starch digestibility (%)[b]	88.2	87.9	84.1	80.0	1.26

[a]SE = standard error (n=4).

[b]Linear response to increasing grain level (P<.05).

Table 27.2. Effect of Sorghum Grain Supplementation on Digesta Flow and Rumen Fermentation Characteristics in Beef Steers Consuming Immature Bluestem Range Grasses

Item	Grain Sorghum Per Day				SE[a]
	No Supplement	1 lb	2 lb	4 lb	
Liquid volume (liters)	50.67	43.16	47.97	47.94	4.25
Liquid passage (%/h)	6.88	7.36	7.75	8.15	0.61
Indigestible fiber fill (lb)	3.68	3.26	3.98	4.11	0.38
Indigestible fiber fill (% BW)	0.62	0.54	0.64	0.69	0.06
Indigestible fiber passage (%/h)	2.44	2.56	2.41	2.40	0.25
pH[b]	6.63	6.56	6.47	6.46	.07
NH_3-N (mM)	3.44	2.34	1.54	3.37	1.17
Total VFA (mM)	79.98	85.59	80.86	87.98	2.70
VFA molar percentages:					
Acetate[b]	77.98	76.82	75.88	75.53	0.38
Propionate	12.73	12.74	12.83	12.66	0.28
Butyrate[b]	7.79	8.94	9.83	10.14	0.27
Isobutyrate	0.58	0.57	0.55	0.57	0.03
Valerate[b]	0.37	0.42	0.42	0.52	0.04
Isovalerate[c]	0.55	0.51	0.48	0.59	0.02
Acetate:Propionate	6.17	6.04	5.93	6.00	0.16

[a]SE = standard error (n=4).

[b]Linear response to increasing grain level ($P<.10$).

[c]Quadratic response to increasing grain level ($P<.01$).