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Practical Lessons in Feeding Bison Bulls for Meat

Dr. Vern Anderson and Bryan Miller
Carrington Research Extension Center, North Dakota State University
and Double MM Bison Ranch, Carrington, ND

Note: Experiment 1 was deleted from this paper. A complete description of Exp.1 can be found in *Bison Exp1.pdf* located in this folder. This manuscript was edited for length by Beth Burritt.

Abstract

We conducted three bison feeding trials using a 4 x 4 Latin square design with 80-day feeding periods and 20 bison bulls per cell. Objectives of the trials were to 1) evaluate alternative feeds, 2) compare effects of energy level, corn type, and grain processing, and 3) study feed delivery methods for bison. Effects of season on feedlot performance were evaluated in Exp. 1 and 2. In Exp. 2, treatment diets were wheat screenings, rolled corn, rolled waxy corn, or whole waxy corn with grass hay offered free choice. Bison bulls (BW 602 lbs.) gained fastest on the rolled corn diets (1.65 lb/hd/day), followed by whole corn diets (1.45 lb/hd/day), and wheat screenings (1.43 lb/hd/day). DM intake was similar for all treatments (69% concentrate). Daily gains during the winter (.99 lb/hd/day) were less than the other three seasons (1.72 lb/hd/day). In Exp. 3, we compared four feed delivery systems. The same concentrate (wheat screenings pellets) was fed in a self-feeder; in fence line bunks; or in a programmable feeder. The fourth treatment was chopped hay and concentrate fed as a TMR in a fence line bunk. Concentrate and DM intake was greatest for the TMR diet. We found no differences in gain or feed efficiency. Bison gains were modest throughout these trials but appear to be influenced both by diet and feed delivery system.

Introduction

Bison production is increasing in the northern plains. Bison are highly adapted to the region's climate and plant communities. Little is known about the nutrient requirements of bison and optimum bison feeding systems. Privately owned bison cow herds are currently managed for commercial production using modern grazing practices developed for beef. Finishing bison for meat poses unique challenges due to several behavioral factors that are specific to the species. Few commercial feed yards feed bison. Most producers feed their own bulls using anecdotal information and trial and error practices. A formal bison research program is being developed at the North Dakota State University Carrington Research Extension Center to provide both basic and practical information to bison producers throughout the continent. In the meantime, practical feeding studies are being conducted with cooperating bison producers. Three studies reported here focus on alternative feeds, energy levels, corn type and processing, and feed delivery systems for bison bulls fed for meat.

Materials and Methods

Three on-farm bison feeding trials were conducted at the Double MM Bison Ranch, Carrington ND, in successive years starting in 1994. The trials were conducted using a 4 x 4 Latin Square experimental design. Approximately 80-day feeding periods closely associated with season were used in Exp. 1 and 2. There were approximately 20 bison bulls assigned per pen. Bulls were managed together for at least 60 days prior to the start of each trial. Bison were weighed at the start of each trial and assigned to initial treatment/pen by order through the chute. Pens were identical in size (50 x 100 ft), fence construction, waterer type and orientation, drainage pattern, and wind protection. At the end of each feeding period, bison were weighed and moved to a new treatment/pen based on pre-planned random assignment. Feed consumption and gains were summarized for each period.

Experiment 1: for a complete description of Exp.1 see *Bison Exp1.pdf* in this folder.

Experiment 2

Energy level, corn type, and corn processing were evaluated using four different diets (Table 3). Treatments were: 1) 85% wheat screenings with 15% corn pelleted as an homogenous product (screenings); 2) 75% rolled dent corn and 25% pelleted screenings supplement (rolleddent); 3) 75% rolled waxy corn and 25% pelleted screenings supplement (rolledwxy); and 4) 75% whole waxy corn and 25% pelleted screenings supplement (wholewxy). Bison bulls (BW 604 lbs) were placed on trial June 21, 1995.

Table 3. Nutrient analyses of ration ingredients

Item	Wheat Screenings	Waxy Corn	Dent Corn	Commercial Pellet	Grass Hay
		---------- Percent, DM basis ----------			
Dry Matter	89.83	86.04	85.35	90.82	90.10
Crude Protein	14.95	10.20	9.62	20.88	10.97
Acid Detergent Fiber	14.59	2.85	3.39	8.78	50.98
Neutral Detergent Fiber	22.97	15.19	15.87	22.32	73.94
Fat	4.43	4.74	4.25	3.84	1.21
Calcium	.76	.07	.18	2.89	.41
Phosphorous	.37	.18	.17	.34	.13

Experiment 3

Treatments were methods of delivering feed to bison bulls (BW 653 lbs) fed for meat. They were: 1) totally mixed ration (TMR) (75% pelleted concentrate and 25 % chopped grass hay fed once daily to appetite in a fence line bunk; 2) separate feeding of pelleted concentrate (fed daily to appetite in a fence line bunk) and grass hay (SEP); 3) pelleted concentrate fed in an automatic feeder (AUTO) with grass hay available, and 4) pelleted concentrate offered free choice in a self feeder (SELF) with grass hay available. The self-feeder was a conventional calf creep feeder mounted on wheels. The commercially manufactured pelleted bison ration 75% wheat screenings, 15% corn grain, 5% dried

molasses and 5% salt and mineral supplement and averaged 90% DM, 15% crude protein, 15% ADF and 29% NDF, and 8% ash. Grass hay was 89% DM, 7.6% protein, 43% ADF, 73% NDF, and 10% ash. It was fed chopped or in large round bales in ring feeders depending on treatment. The trial started August 6, 1996 and animals were rotated to a new feeding system in a pre-planned random order every 49 days.

The TMR and SEP were fed to appetite based on daily bunk readings. The AUTO feed was delivered 5 times/day to bunks placed under discharge spouts. Sheyenne Advanced Feeding Systems, Cooperstown, ND, manufactured the "Chuck Wagon" self-feeders. It is a conventional rectangular calf creep feeder accessible from both sides.

Statistical Analysis

Data were analyzed using general linear model procedures according to SAS. Pen was the experimental unit and period the replicate for dietary comparison. All periods were used as replicates in Exp. 2 and 3. In Exp. 2, data were pooled across dietary treatments to compare effects of season.

RESULTS

Experiment 1 – for a complete description of Exp 1 see *Bison Exp1.pdf* in this folder.

Experiment 2

In dietary evaluations (Table 6), hay intake was higher for screenings than rolledwxy and wholewxy. DM intake was similar for all treatments. While not significant, DM/Gain was 27% more efficient for the rolled corn diets compared to screenings. Gains increased but not to a significant level with 75% rolled corn in the diet. The sensitivity of this experimental design may be questioned but trends are useful in early work with bison.

Table 6. Effect of energy level, corn type and processing on performance.

	Treatment				
Item	Pelleted Screenings	Rolled Dent Corn	Rolled Waxy Corn	Whole Waxy Corn	S.E.
Initial Wt, lb	611	617	608	578	7.10
Conc. Intake, lb/hd/day	13.01	13.01	13.58	13.97	1.08
Hay Intake, lb/hd/day	6.68[a]	6.44[ab]	5.82[b]	5.69[b]	.53
Total DM Intake lb/hd/day	16.96	19.45	19.40	19.65	1.50
DM Intake, % Body Wt	2.32	2.30	2.29	2.35	3.21
ADG, lb/hd/day	1.35	1.63	1.68	1.46	.29
DM/Gain	16.46	12.21	11.87	15.03	1.44

a, b - values with different superscripts are significantly different, (P<.10)

Differences were observed due to season with better performance during summer and fall vs. winter and spring (Table 7). DM intake expressed as percent of BW was greater for summer and fall vs. winter and spring (2.91 and 2.74 vs. 1.84 and 1.76, respectively). Average daily gains were greater during the summer and fall (1.85 and 1.94 lb/hd/day) vs. winter (.99 lb/hd/day).

Table 7. Bison feedlot performance during the year (Exp. 2)

	---------- Season ----------				
Item	Summer	Fall	Winter	Spring	S.E.
Initial Wt, lb	472	752	908	986	--
Conc. Intake, lb/hd/day	13.76[a]	17.11[b]	10.50[c]	12.22[a]	.66
Hay Intake, lb/hd/day	5.95[ab]	5.60[a]	6.90[b]	6.23[ab]	.23
Total Intake, lb/hd/day	19.71[a]	22.71[b]	17.42[c]	18.37[ac]	.61
DM Intake, % B.W.	2.91[a]	2.74[a]	1.84[b]	1.76[b]	.03
ADG, lb/hd/day	1.85[a]	1.94[a]	.99[b]	1.32[ab]	.19
DM/Gain	10.80[a]	11.99[a]	18.71[b]	14.05[ab]	1.26

a, b, c - values with different superscripts are significantly different, (P<.05)

Experiment 3

The results of this study (Table 8) suggest feeding system has some impact on feed intake but less on bison performance. DM intake was less for TMR at 24.26 lb/hd/day compared to the other three treatments averaging 26.9 lbs. This may be due to differences in hay intake. Hay was wasted in the rings feeder but the TMR diet was eaten with virtually no waste. The TMR hay level was 25% of the ration. Much lower than the amount of hay consumed by animals fed hay free choice in the other three treatments. No estimate of hay consumption vs. waste was made in this study. Hay consumption from hay feeders averaged 13.3 vs. 6.8 lb/hd/day for the TMR. Animals receiving hay free choice compensated for the apparent increased hay intake by reducing intake of concentrates. Comparing the three free choice hay treatments, pelleted concentrate intake was lowest for the SELF (15.83 lb/hd/day) and highest for SEP (17.64 lb/hd/day).

Table 8. Effect of feeding system on bison feedlot performance

	---------- Feeding System ----------				
Item	TMR	Separate Grain/Hay	Automatic Feeder	Self Feeder	S.E.
Initial Wt, lb	648	648	657	653	9.92
Conc. Intake, lb/hd/day	20.37[a]	17.64[b]	17.00[b,c]	15.83[c]	1.08
Hay Intake, lb/hd/day	6.79[a]	11.82[b]	12.88[b]	15.10[c]	0.72
DM Intake, lb/hd/day	24.26[a]	26.35[b]	26.70[b]	27.65[b]	1.06
DM Intake, % Body Wt	3.01[a]	3.28[b]	3.32[b]	3.38[b]	0.15
ADG, lb/hd/day	1.39	1.37	1.50	1.50	0.33
DM/Gain	17.46	19.27	17.81	18.43	---

DM intake was 2.65 lbs. less for the TMR vs. the other three diets. The higher level of concentrates in the TMR should have produce improved daily gains, which it did not.

Bison exposed to the AUTO feeder became conditioned to the sound of the auger motor, and readily came to eat when it started. The delivery system worked well throughout the feeding trial and was a convenient method of delivering concentrate.

Discussion

Bison feeders currently prefer to use large amounts of relatively inexpensive high fiber feeds, such as wheat screenings, prior to the inclusion of other feeds in the ration. Bison digest high fiber feeds more thoroughly than cattle. However, in Exp. 2 and a Colorado study, bison gained faster and more economically using higher energy diets (70 and 90% concentrate vs. 30 and 50% concentrate). The modest energy levels in many commercial bison diets may limit growth rate and feed efficiency, and increase cost of gain. Higher energy diets are recommended.

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