Comments in red were made by Beth Burritt

Feeding Bison

Dr. Vern Anderson Carrington Research Extension Center North Dakota State University Box 219 Carrington ND USA 58421

Abstract

Bison bulls are fed grain for a period of time prior to harvest to provide a consistent product to consumers. Little information is available on feeds, feeding systems, and optimum management of bison bulls fed for meat. Many producers are using highly variable feeds (screenings) with low cost being the primary criterion. Higher energy diets using grains up to 75% of the diet have provided more rapid and economical gains in replicated research trials. (No economic data to support this statement.) Season, particularly winter, has a detrimental effect on feed intake and gain. Bison respond negatively to stress from working the animals for weighing or vaccinating. Animal performance is also negatively affected by adding or removing animals from a feeding pen. There is a great need for more bison nutrition research to determine basic nutrient requirements as well as practical and economical approaches to feeding.

Introduction

One of the most challenging segments of the entire bison industry is the nutrition and management of bison bulls from weaning to slaughter. This segment is particularly challenging because bison produce modest gains from self-limited intake and exhibit highly variable and mediocre feed conversion. Further complicating this feeding period is the effect of season as winter decreases intake and reduces performance. We need to determine the most economical feeding regimes while maintaining an appropriate environment for bison with the goal of producing a quality meat product for repeat consumer demand.

Feeding Research

Bison producers feeding smaller numbers of animals are using self-feeders for the concentrate and hay components of the diet. They are using a variety of feeds in diets that vary widely in ingredients (Table 1) with the major criterion being price per ton (Anderson and Sexhus 1996). Little attention is being paid to nutritional content or cost per nutrient at this time. Several feeds have shown promise in improving gains based on energy concentration (Anderson and Miller 1997). While wheat screenings based diets produce highly variable gains, conventional grains such as corn and barley are consistent and generally produce lower cost of gain (Table 2). (No economic information was included in this study.) Rolling corn improved gains over whole corn (Anderson and Miller 1999). There is an upper limit to grain inclusion with data from Stanton et al. (1996). They fed grain at 30, 50, 70, and 90% of the diet, and concluded that there was no improvement in feeding grain at higher than 70% of the ration (Table 3). (No economic information was included in this study.) We have concluded that the forage component of bison diets is important to optimum rumen function.

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Table 1. Producer survey data from bison feeders in North and South Dakota

Ingredient	**Number of Producers**	**Average % of diet**	**Range of use**
Wheat screenings	14	77	25-100
Corn	8	25	10-75
Barley	7	61	25-100
Oats	5	43	25-67
Gain data	**Number of Producers**	**Average daily gain**	**Range of ADG**
Wheat screenings	6	1.54	1.0-1.9
Barley	3	1.59	1.3-2.0
Other (incl. silage)	3	1.84	1.6-2.2

Table 2. Performance of feedlot bison on two energy levels, two corn types and two processing methods

Item	**Treatment**				
	Pelleted Wheat Screenings	**Rolled Dent Corn**	**Rolled Waxy Corn**	**Whole Waxy Corn**	**S.E.**
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	0.29
DM/Gain	16.46	12.21	11.87	15.03	1.44

Table 3. Effect of concentrate level on performance of bison bulls fed for meat[z]

Item	**Concentrate Level**			
	30%	**50%**	**70%**	**90%**
Dry matter intake, lb	16.87	17.53	16.87	17.71
Avg daily gain, lb/hd/day	1.32	1.48	1.58	1.63
Feed efficiency	12.36	11.96	10.73	10.80

[z]Reprinted from (Stanton et al. 1996)

More recent data on the length of the grain feeding period for bison has been developed by Anderson and Bock (2000). They extended the forage feeding window with four treatments using cooperating producers to gather data (Fig. 1). Intake during the feeding sector increased with older bulls that had been fed forage for longer periods of time (Table 4). Gains improved during the feeding sector (Table 5) but overall gains, feed efficiency, and carcass quality tended to decrease with increasing time fed forage. Cost per pound of gain appeared to favor the intermediate treatments.

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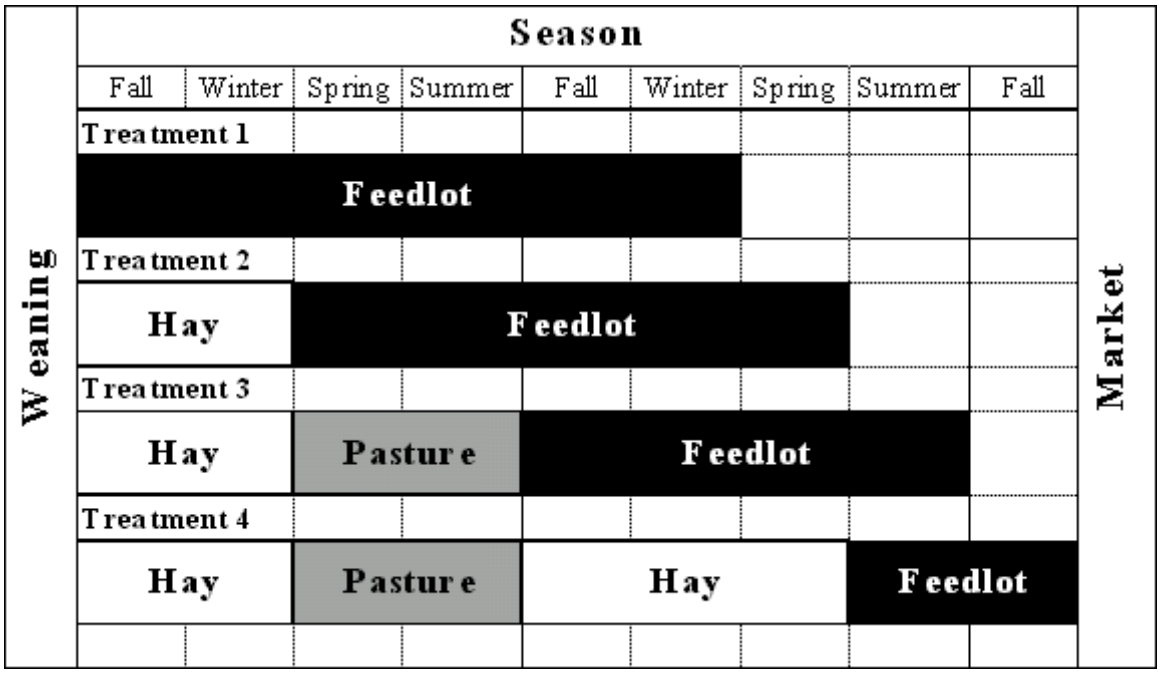

Fig. 1. Schematic diagram of seasonal treatments for maximizing forage and minimizing grain in bison fed for meat (Anderson and Bock, 2000)

Table 4. Performance of bison bulls when maximizing forage and minimizing grain intake from weaning to market[z]

Item	Treatments[y]			
	1	**2**	**3**	**4**
Dry matter intake, lb	16.84	19.04	18.18	22.37
Avg daily gain, lb/hd/day	1.22	1.23	1.11	1.12
Feed/gain	13.8	15.5	16.3	20.0
Days on feed	488	473	492	502
Days fed grain	488	401	232	139
Feed cost/lb gain. $	0.44	0.37	0.38	0.50
% #1 Carcasses	87.8	77.0	62.1	72.7

[z]Reprinted from Anderson and Bock, 2000.
[y]Treatments correspond with treatments described in above Fig. 1.

Comparisons of feed delivery systems for bison bulls were made using self feeders, timed delivery feeders, daily grain feeding in a fenceline bunk and total mixed rations (Table 6). Little difference was observed in animal performance, however feed efficiency favored the total mixed rations where no waste was observed (Anderson and Miller 1999). This feeding method requires a minimum number of animals, estimated to be 150 to 200 head, to justify labor and equipment for daily chores. (No economic data demonstrating a benefit.)

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Table 5. Average daily gain (lb) by period for bison bulls when maximizing forage and minimizing grain intake from weaning to market[z]

Item	Treatments[Y]			
	1	**2**	**3**	**4**
Period 1	Grain 1.36	Hay 0.36	Hay 0.26	Hay No data
Period 2	Grain 1.52	Grain 1.54	Pasture 1.28	Pasture 0.91
Period 3	Grain 0.80	Grain 1.34	Grain 1.39	Hay 0.44
Period 4				Grain 1.89

[z]Reprinted from Anderson and Bock, 2000.
[Y]Treatments correspond with treatments described in Fig. 1.

Table 6. Effect of feeding system on feedlot performance of bison bulls

Item	Feeding System				S.E.
	TMR	**Separate Grain/Hay**	**Automatic Feeder**	**Self Feeder**	
DM Intake, lb/hd/day	24.26[a]	26.35[b]	26.70[b]	27.65[b]	1.06
ADG, lb/hd/day	1.39	1.37	1.50	1.50	.33
DM/Gain	17.46	19.27	17.81	18.44	.99

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

Season significantly affects bison performance with winter feed intake and gain lower than the other three seasons (Stanton et al. 1996; Anderson and Miller 1997, 1999; Church et al. 1999). Altering diets during the winter may lead to lower cost of gain but what approach to take is not well understood. Research underway at the North Dakota State University (NDSU) Carrington Center is evaluating stepped grain levels during the winter and their effect on gains during the subsequent seasons. Compensatory gains during the spring and summer may be more cost effective than grain feeding throughout the winter. The severity of the winter in terms of length and severity of cold temperatures and snow may play a role in bison performance according to the Carrington study.

Future Research Needs

There is a great need for good scientific bison nutrition research. In addition to formal replicated research trials, much can be learned from the producers who have been feeding bison if the data can be summarized and interpreted. Basic nutrient requirements need to be established for protein, energy for maintenance and gain, and for minerals for animals of different ages and sex and for different seasons of the year. Practical feeding methods can be enhanced with applied studies that use available feeds and forages. A research facility for bison nutrition is under construction at the NDSU Carrington Research Extension Center.

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Summary/Recommendations

Bison bulls need to be fed a diet with energy concentration high enough to produce economical gains. More predictable performance can be achieved with conventional grains than with screenings based feeds. Diets of 75% grain are recommended for at least 100 days prior to marketing animals by most bison associations to insure uniform and palatable meat products. Rations with moist feeds such as silage appear to be more palatable. Animal movement should be limited as stress significantly decreases feed intake and gain. Handling animals during weighing or vaccinating creates stress and adding or removing animals from a pen disrupts the social structure of the pen. An "all in" "all out" pen management approach is recommended.

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