Drylot Wintering of Pregnant Beef Cows Supplemented With Either a 12 Percent Crude Protein Heat Processed Molasses Block or Dry Rolled Barley

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Beef cows wintered in North Dakota are commonly fed a limited amount of locally grown roughage and grain to reduce wintering feed costs, which are one of the major expenses in a cow-calf enterprise.

When good quality feed is adequte, cows can usually be wintered without additional energy or protein supplementation. However, when forage supplies are short due to drought or other natural disasters, or when straw and other low quality feeds are used in the ration, it generally becomes necessary to feed supplemental protein and/or energy to meet the nutrient requirements of the cow and growing fetus. When supplementation is necessary, the livestock producer has a wide array of supplements to select from. These include feed grains processed on the farm, commercial fortified grain-based range cake, feed blocks, liquid molasses supplements, and large controlled-release heat-processed molasses blocks, which have recently become popular among livestock producers.

Beet molasses, a by-product of sugar beet processing, contains more TDN than cane molasses (79 versus 72 percent for ruminants) and more crude protein (8.5 versus 5.8 percent) (NRC, 1984). The crude protein difference is due in part to processing additives used in sugar extraction from sugar beets, but the invert sugar levels of beet and cane molasses are very comparable, making the feeding value of cane and beet molasses essentially the same (Shirley, 1986).

Molasses is used extensively in the feed manufacturing industry. It is most commonly used as an energy source, as a flavoring agent, as a pelleting binder, for dust control, and to enhance rumen microbial activity. Plain molasses has been fed in open troughs to ruminants, but it is most frequently used as a liquid feed carrier for protein, vitamins, and minerals. Liquid feeding requires specialized equipment for transporting, unloading, and feeding. The crystalline blend of molasses sugars found in the 12 percent protein heat-processed molasses block (12 percent HPM Block) have been developed through a dehydration process that produces a fortified molasses supplement that is high in dry matter, weather resistant, and convenient to feed without specialized equipment.

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The 12 percent HPM Block being evaluated in this study is a blend of beet molasses solids, all natural protein, minerals and vitamins. It is designed to be self fed to beef cattle and is promoted to improve roughage utilization, produce stronger, healthier calves, improve hair coats, and requires minimum labor to feed.

In the present investigation, the 12 percent HPM Block was evaluated under drylot wintering conditions where nutrient intake was restricted to NRC recommendations (NRC, 1984) plus a 10 percent increase to compensate for North Dakota winters. Objectives of the study are to document the nutritional value of the 12 percent HPM Block based on body weight and condition score changes during the wintering period. In addition, dry matter intake, calf birth weight, calf survival, and economics of supplementation were compared to unsupplemented control cows and cows supplemented with dry rolled barley.

PROCEDURE

Ninety crossbred Angus x Hereford and Hereford cows averaging 1,230 pounds were randomly allotted in a completely randomized design to evaluate two types of protein/energy supplements. Treatment one served as a non-supplemented control group. Treatment two received the 12 percent HPM Block free choice and treatment three received dry rolled barley. The cows were divided within treatments into five replicates of six cows each making a total of 30 cows in each treatment. Allottment criteria included each cows age, weight, condition score, and meat probable producing ability (MPPA) value.

Cows in each treatment were fed corn silage, wheat straw, alfalfa, phosphorus supplement from sodium phosphate, trace mineral salt and vitamins A, D and E (Table 1). To measure the nutritional value of each supplement type, the rations were formulated to contain the same nutrient density as the basal ration plus the added energy and protein available from each of the supplements. The complete mixed rations used were blended with a tractor driven feedlot mixing wagon equipped with an electronic scale. The 12 percent HPM Blocks were weighed before placement into each lot and the empty containers were weighed back. The blocks were weighed weekly to monitor consumption.

It was found that free choice access to the block by cows that were on a limited intake ration resulted in consumption way above the .5 to 1 pound per day level that is recommended. Therefore, access to the block was restricted to

Table 1. Ingredient cost/pound and ration percent dry matter composition.

	Int'l. Feed No.	Ingred. Cost/lb.	Control	12% HPM Block	Barley
Corn silage	3-02-819	.0400	52.4	49.5	49.4
Wheat straw	1-05-175	.0250	15.2	14.4	14.3
Alfalfa hay	1-00-071	.0550	20.4	19.2	19.5
Alfalfa cubes	1-00-059	.0550	11.1	10.3	10.4
12% HPM Block		.1990		5.8	
Barley	4-00-549	.0479			5.4
Sodium phosphate	6-04-287	.4306	.50	.41	.48
T. Min. Salt[1]		.0650	.4	.41	.41
Vit. A, D & E[2]		.4534	.028		.026
Processing		.0125			

[1]Trace mineral salt contained: NaCl, 98.6%; Mg, .35%; Zn, .35%; Mn, .026%; Fe, .21%; Cu, .03%; I, .011%; Co, .011%.

[2]Vitamin A, D & E additive contained: vitamin A, 5,000,000 USP units/lb.; vitamin D_3, 1,000,000 USP units/lb.; vitamin E, 500 USP units/lb.

four hours per day. Then, based on the amount of molasses block dry matter consumed, the amount of barley supplement fed was adjusted to equal the intake of the 12 percent HPM Block.

Body weight change due to supplement type was obtained by measuring the difference between each cow's starting weight and her weight 12 to 16 hours after calving. After weighing and processing of the calf was completed, the cow-calf pair was transferred to post calving pastures.

Body condition score was used to estimate changes in external fat cover. Each cow was scored twice during the study. The first score was taken at the start of the study, and the second was made as each cow and calf were processed after calving using a scoring system of 1 to 9, where a cow scoring "1" was considered to be emaciated, "5" average, and "9" obsese.

RESULTS AND DISCUSSION

The percent dry matter composition of the control and experimental diets are shown in Table 1, and mean weights, gains, condition score, calf birth weight, dry matter intake and partial feeding economics are shown in Table 2.

To document differences in nutritional value of the two supplements, daily dry matter intake of the 12 percent HPM Block and dry rolled barley were held nearly constant at 1.35 and 1.32 pounds per head, respectively. Total dry matter intake was not affected by either supplement type. Normally, feeding the 12 percent HPM Block results in lower dry matter intake when the total amount of dry matter being fed is not restricted. However, under the conditions of this study in which dry matter intake was restricted to NRC recommendations plus a 10 percent increase to compensate for North Dakota winters, dry matter intake for the 12 percent HPM Block and barley supplemented cows was equal. Cows supplemented with the 12 percent HPM Block consumed 24.31 pounds of dry matter per head daily and the daily dry matter intake for cows receiving dry rolled barley was 24.27 pounds.

Table 2. Mean weights, gains, condition score, calf birth weight, feed consumption and feeding economics for cows supplemented during wintering with either a 12 percent HPM Block or dry rolled barley.

Treatments:	Control	12% HPM Block	Dry Rolled Barley
Gains:			
No. head	30	30	30
Days fed	85.3	86.6	87.7
Starting wt., lbs.	1231.2	1232.0	1226.0
Post calving wt., lbs.	1196.5	1230.5	1241.6
Net gain or loss, lbs.[1]	-34.7[a]	-1.5[ab]	15.6[b]
SE mean 10.55[2]			
LSD: 45.6 lbs.			
Condition Score:			
Initial score	5.28	5.38	5.22
Postcalving score	4.75	5.38	5.38
Score change[1]	-.53[a]	0.0[b]	.16[b]
SE mean .44[2]			
LSD: .30			
Birth Weight:	96.8	94.2	96.2
SE mean 2.2[2]			
LSD: 9.6 lbs.			
Daily Feed Consumption/Head:			
Corn silage	11.9	12.06	12.00
Wheat straw	3.5	3.51	3.48
Alfalfa	4.65	4.69	4.74
Alfalfa cubes	2.52	2.50	2.51
12% H-P-M Block		1.35	
Barley			1.32
Sod. tripoly phosphate	.114	.10	.118
Trace min. salt	.099	.10	.10
Vitamin A, D & E	.006		.006
Total feed/hd./da., lbs.	22.79	24.31	24.27
Feeding Economics/Head:			
Feed/hd., lbs.	1947.0	2108.0	2130.0
Feed cost/cwt., $	5.712	6.466	5.738
Feed cost/hd., $	111.21	136.30	122.21
Feed cost/hd./da., $	1.30	1.57	1.39

[1]Values with unlike superscripts differ significantly ($P < .01$)

[2]Standard error for mean.

Body weight change and condition score were used to document the nutritional value of the 12 percent HPM Block and dry rolled barley as wintering supplements. When compared to control cows, which lost an average 34.7 pounds per head during the wintering period, cows supplemented with the 12 percent HPM Block lost 1.5 pounds per head. Those cows that received dry rolled barley gained 15.6 pounds per head. Cows supplemented with dry rolled barley gained more than cows receiving the control diet. However, when cow gains between the 12 percent HPM Block and dry rolled barley supplemented groups were analyzed, no statistical difference was measured. Therefore, supplementation with the 12 percent HPM Block resulted in gains that were equal to both the barley supplemented and control cows.

Condition score, measured at the start of the study and as each cow calved, fluctuated as body weight changed as shown in Table 2. External fat cover in the unsupplemented control cows was significantly less than either of the supplemented groups. Cows supplemented with barley processed slightly better condition than those cows receiving the 12 percent HPM Block but the difference was not significant, indicating that the effective change on external fat cover was similar for both supplements.

There was no difference in calf birth weight or survival between treatments.

Wintering economics was evaluated for each of the supplemental types. Feed ingredient costs used per unit of dry matter and the processing charge are shown in Table 1. Daily feed consumption and feeding economics are shown in Table 2. When compared to the control cows, supplementing with dry rolled barley cost an additional $11.00 per cows, while supplementing with the 12 percent HPM Block cost an additional $25.09 per cow. When compared to the barley-supplemented cows, using the 12 percent HPM Block cost an additional $14.09 per cow.

In conclusion, supplementation with the 12 percent HPM Blocks resulted in nearly equal animal response when compared to supplementation with dry rolled barley but cost substantially more. Whether animal performance would be improved by continuous access, instead of limited access, to the 12 percent HPM Block was not addressed in this trial, but remains a question for further study.

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in the right place at the right time. How long will we have adequate food? Most animal scientists believe we need to continue research on the efficiency of food production.

When food is in short supply and people need more calories, then animal fat is very valuable as a source of additional calories. When people are physically very active, animal products are nutrient dense and are very important. Today our less active society in the United States consumes excess calories, but consumers are much more diet conscious. There appears to be a need for animals with different compositions. Animal scientists feel that we need the basic knowledge of how to change composition of animal products as the needs or desires of society change. Many of our current research projects focus on this need.

We are now in what some people call the age of biology, moving from the age of chemistry. This is not only true for recent research advances such as growth hormones which will be useful for more efficient meat and animal product production, but also in biopesticides and other areas of concern. Agriculture has been using biological approaches for a long time, but some of the modern biological tools allow us to be much more precise or allow us to do some things faster. Biotechnology has give us new sources of products such as insulin and growth hormones for humans. The same techniques applied to bacteria will given us new protein and peptides to cause animals to produce more protein and less fat or to change the nature of the fat in animal products. New biological products such as vaccines will allow us to control animal diseases better. Animal scientists are also looking at genetic engineering approaches that will change the animals' genetic makeup whereby they will better serve human needs through improved products, prevention or improved treatment of diseases, and hopefully improved reproductive efficiency.

Biotechnology is a step in the continuum of learning about nature and applying it to man and animals. It is anticipated that biotechnology products will not persist in the environment as other agents have in the past. This relates to the new movement in agriculture on sustainability, calling for less emphasis on production and more on the optimization of production balanced with other concerns.

Animal research has adapted to a different approach as we look at new products for use in animal production. Areas of study are not only on how well the product works but also on product safety, economics, ethics and the impact of the technology on social parameters. I expect there will be honest differences in opinion between animal scientists and consumer activists, because of our different perspectives and the way we look at things. We need to identify these differences to each other. Dialogue will be necessary between people with different concerns and animal scientists so that the industry may use the technology available today and others which will be developed in the years ahead to better serve the animal industry in producing highly nutritious products for human consumption.