Supplementing Various Phases of Beef Cattle Production With a Heat Processed Molasses Supplement

By

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Heat processed molasses blocks (HPM block) are a unique blend of molasses solids, supplemental protein, vitamins and minerals designed for self-feeding as energy/protein supplements to beef cattle in a variety of situations.

Since no animal performance data has been reported in the literature to document the merits of this type of supplement, an initial investigation was conducted during the 1988-89 wintering period. Pregnant unsupplemented control cows were compared to cows that either received the 12% crude protein HPM block or dry rolled barley. Cows supplemented with dry rolled barley gained more ($P<.01$) than cows that were fed a control diet. When performance between the two supplements was compared, animal response was nearly equal, but the cost of supplementation with the 12% HPM block was substantially higher (Landblom, 1990).

After completion of the initial study, three additional studies were conducted in 1989, to further evaluate the HPM block supplement. In this trial one, the focus was to determine if self-fed molasses block energy would improve reproductive performance under spring and mid summer grazing conditions. Trial two, on the other hand, focused on the supplements impact on animal performance during fall grazing period before and after calves were weaned. In trial three, a specifically fortified molasses block was fed immediately after weaning and during a short backgrounding period to determine if the supplement would help fresh weaned calves get started on feed faster, aid in reducing total dry matter intake, and improve overall postweaning performance.

A detailed summary of each trial follows.

TRIAL ONE

Reproductive Performance of Lactating Beef Cows Supplemented With a 12% Crude Protein Heat Processed Molasses Supplement

Introduction: Economics of beef cattle production clearly show that a cow must produce a calf every year and calve within a short calving season. Thus, the goal of every cow-calf producer should be to have every cow conceive early and calve within a short calving interval of 45-50 days. While this is an attainable goal, cows must be in breeding condition and cycling before the breeding season begins if the goal is to be reached. When energy intake is restricted, the postpartum interval between calving and the return to regular estrus cyclicity will be lengthened, resulting in impaired first service conception rates (Dunn et al. 1969, Roberts et al. 1970, and Wiltbank et al. 1962, 1964, 1965 and 1970). Early spring pasture is highly nutritious, but contains high levels of water with the dry matter available to the grazing animal ranging from approximately 28% in very young plant to 45-55% as the plant matures (NRC, 1984). Although the period of high water content is relatively short, the timing is critical when a cow herd is being prepared for rebreeding. It is during the critical early spring grazing period that supplemental energy has been shown to be beneficial in shortening the postpartum interval. Grain supplements (range cake, blocks, etc.) have proven to be effective in replenishing the energy shortage that commonly occurs on early spring pasture, however, their use requires daily or alternate day feeding. Heat processed molasses supplements provide an alternative to the chore of daily feeding, since they are designed to release from .5 to 1 pound of supplement per head daily. The product is marketed as a supplement that will aid in replenishing the energy debt associated with grazing early spring pastures without the expense of daily feeding.

The purpose of trial one is to evaluate a 12% crude protein heat processed molasses supplement with respect to consumption, cow and calf body weight change on spring pasture, and to determine whether intake from the slow release system is adequate to effectively shorten calving intervals and thereby increase first service conception rates when compared to unsupplemented control cows.

Procedure: Sixty-nine Angus x Hereford cows ranging in age from 3-9 years were randomly assigned as they calve to either a unsupplemented control group or a treated group that received 12% crude protein heat processed molasses blocks free choice. After 40.1 days in drylot it became apparent, because of the lingering drought, that our original projected pasture stocking rate would have to be reduced by twenty percent. Therefore, on May 2, 1989, the number of cows was reduced to 28 head per treatment. While in drylot the cows were fed the complete mixed rations shown in table 1. We found the level of dry matter fed during the first 40.1 days after calving was not sufficient to maintain body weight. Therefore, when the cows were reallotted on May 2nd, the level of daily dry matter was increased approximately 3 pounds in each treatment. After reallottment, the cows and calves were kept confined for an additional 24 days until the mixed grass pastures assigned to this study had attained suitable grazing height. On May 26th the cows and calves were weighed and moved to pastures that contained both improved and native grass species common to the area. The major grasses present included the following: crested wheatgrass (Agropyron cristatum), western wheatgrass (Agropyron smithii), needle and thread (Stipa comata), green needle (Stipa viridula), plains reedgrass (Calamagrostis montanensis), threadleaf sedge (Carex filifolia) and blue grama (Bouteloua gracilis). The grazing period was 82 days long and ended on August 16th.

Using mature Charolais bulls, breeding began on June 1st and ended August 16th, a period of 76 days. The bulls were fertility tested within two days of being placed in each pasture, and had average to above average semen quality scores. One tub of HPM supplement was available to the supplemented group at all times during the study. When the tubs were nearly empty, they were replaced with a full tub so that the animals were never out of supplement. Each tub was weighed when it was put out and the empty tub was weighted back.

Evaluation of the supplement’s effect on animal and reproductive performance was based on the following criteria: cow and calf body weight change, supplement consumption, calving interval (number of days between calves), postpartum interval (number of days between calving and pregnancy) and the calculated first service pregnancy rate based on actual calving date.

Results: Animal performance, supplement intake, reproductive performance and supplementation economics were evaluated from calving to August 16th, 1989, and are shown in table 2. During the first 40.1 days after calving in drylot, control cows were fed 24.8 pounds of dry matter and supplemented cows were fed 24.4 pounds plus 1.25 pounds of 12% HPM supplement that was fed free choice. This level of intake provided the control cows with 25.1 Mcal. and the supplemented cows with 26.5 Mcal. of metabolizable energy per day, which was not sufficient to maintain body weight. Control cows lost more weight (-130 pounds) ($P<.01$) than the supplemented cows (-84 pounds). During the remaining 24 days in drylot, a compensatory gain response occurred when the dry matter feed intake was increased from 24.8 pounds to 28.1 pounds in the control group and from 26.5 pounds to 28.4 pounds in the supplemented group. Daily gains during this short period before turnout on grass were 4.58 and 5.0 pounds per head, respectively, for the control and supplemented groups, and are shown in table 2.

Supplement intake during the drylot phase is also shown in table 2. Free choice preference for the molasses block fluctuated with the level of dry matter being fed. When intake was insufficient, preference for the free choice supplement was elevated, but following reallottment and feed increase, preference dropped .71 pounds per head daily from 1.25 pounds to .54 pounds.

Cow and calf gains on pasture are shown in table 2 as well. In the 82 day grazing period, control cows gained better ($P<.05$) than those cows with access to molasses blocks. Calf gains for the control calves were slightly better, but the difference was not great enough to be significant. 12% HPM Block consumption was approximately .18 pounds per day during a June and July when forage quality was good to excellent, but increased sharply to 1.47 pounds per day towards the end of the grazing period when grasses were more mature.

Reproductive performance is summarized in table 3. Supplementation had a slight , but positive effect on first service pregnancy rate, and calving and postpartum intervals. First service pregnancy rate was 6.3% higher, and the calving and postpartum intervals were both 6.1 days shorter. While a positive trend existed, the differences were small and nonsignificant. Pregnancy testing 60 days after bulls were removed on August 16th revealed that 3 cows out of 28 were open (10.7%) in the supplemented group.

The economics of supplementation were summarized by combining the HPM block consumed in drylot and during grazing. A total of 83.5 pounds was eaten per cow-calf pair and cost $16.01.

Summary: Feeding a 12% crude protein HPM supplement did not significantly improve animal or reproductive performance, but did increase the cost of operation by $16.01 per cow-calf pair.

TRIAL TWO

Supplementing Cows and Calves on Native Range Before and After Weaning With a 20% Crude Protein Heat Processed Molasses Supplement

Introduction: Heat processed molasses supplements are also recommended for improving the nutritional status of cows and calves grazing late fall pasture. Grass quality changes occur rapidly with the advancing season. Native range plants contain from 13% to 16% crude protein, and TDN levels of 65% to 70% during the immature stages of growth. As the plants mature and become increasingly more lignified in the fall of the year, their crude protein content falls within a range of 46% to 56% (Enzminger and Olentine, 1978). Normally, cows nursing calves and grazing mature fall pastures lose weight while their calves continue to gain (Manske et al. 1988), but not to their full genetic potential.

Several supplements and methods of supplementation have been tried over the years to improve animal performance on dry mature ranges (Shirley, 1986). The objective of this investigation was to determine if supplementation with a 20% HPM supplement would curtail the cow weight loss documented by Manske and co-workers, and increase calf weaning weight. A second objective was to determine of the supplement would aid in maintaining cow body weight into the early winter grazing period after weaning.

Procedure: Trial two was conducted using the same 28 cow-calf pairs that had been previously allotted to the control and supplemented groups in trial one. The grazing period was divided into two phases. Phase one was the period before weaning, and ran from August 16th to October 18, 1990. Phase two was the period after weaning from October 19th to December 12th. Cow-calf pairs grazed native range at the Dickinson Research Centers's Pyramid Park grazing area located south of Fryburg, North Dakota, which is crossfenced into two equal sized pastures. Water for both pastures is available from a well and spring fed dugout. The two herds exchanged pastures every two weeks to minimize pasture variability. The 20% HPM supplement was fed throughout the investigation period, in a number of locations that varied from one-fourth to one-third of a mile from the two water sources. One tub served the 28 head allotment. Animal weights were taken at the beginning and end of each phase, and at 28 day intervals.

Results: The results of phases one and two have been summarized in table 4. In phase one, which was the 63 day period before weaning, cows were gaining weight during August and September, but with advancing pasture maturity weight loss was evident by mid October. Average gains for the phase were .48 pounds daily for the control cows, and -.06 pounds daily for the HPM supplemented cows. During phase one, supplemented cow-calf pairs consumed .57 pounds/pair daily for a total of 36.1 pounds for the period. After weaning, grazing continued for an additional 55 days, at which time weather conditions dictated that the cows be brought back to Dickinson. Both groups continued to lose nearly the same amount of weight. The control cows lost an average -.65 pounds, and an average loss of -.60 pounds was recorded for the supplemented group. For the 55 day period, a total of 50.6 pounds of 20% HPM supplement was eaten per cow.

Combining the two phases for the period from August 16th to December 12th, the average daily body weight loss/head was -.05 pounds for the control cows, and -.31 pounds for the supplemented cows. Supplement consumption for the 118 day grazing period was 86.7 pounds/head, and cost $16.65.

Summary: Free choice supplementation of cows and calves before weaning and cows only after weaning with a 20% HPM supplement did not curtail cow body weight loss or increase calf weight gains, but did add an additional $16.65 to the cost of the operation.

TRIAL THREE

Estimating Weaning and Short Term Backgrounding Performance of Calves
Supplemented With and Without a Fortified 12% Crude Protein
Heat Processed Molasses Supplement

Introduction: A fortified 12% crude protein heat processed molasses supplement has been specifically formulated for feeding to stressed cattle, and is promoted to help calves get started on feed faster, and to reduce dry matter intake making calf feeding more economical. As a specialized supplement with a specific application, the product contains a number of additional ingredients not included in the products used in trials one and two. The additional ingredients include elevated levels of vitamins A (200,000 IU/lb.), D (20,000 IU/lb.), E (40 IU/lb.), and thiamine (100 mg/lb.). Also included, but not guaranteed on the label, are yeast culture, Bacillus Subtillis, vitamin B_{12}, niacin, vitamin K, calcium pantothenate, riboflavin, and EDDI for footrot.

The first objective of the investigation was to determine if previous exposure to a conventional unfortified 20% HPM supplement on pasture would help calves get started eating the fortified supplement sooner after weaning, which reportedly would help calves keep their resistance up during the stressful first week after weaning, and subsequently, to help stressed calves find feed bunks faster thereby making the transition from grazing to a drylot environment in less time. Our second objective, once weaning was completed, was to evaluate backgrounding performance using the fortified supplement, and our final two objectives were to monitor the impact of special fortification on the incidence of upper respiratory disease, and to document backgrounding economics.

Procedure: Eighty-one crossbred Charolais steers and heifers averaging approximately 625 pounds that were either exposed or non-exposed to a 20% conventional HPM supplement during the grazing season were assigned to one of the following three treatments that were replicated three times using nine animals per pen. Treatments included: (1) an unsupplemented control, (2) a 12% fortified HPM supplement with previous exposure on pasture, and (3) a 12% fortified HPM supplement, but without prior exposure.

Surface area of the supplement tubs were approximately twice the size recommended by the manufacturer. During the first week in drylot after weaning, calves had access to the entire surface area, but after the first week each tub was affixed with a lid that cut the exposed area in half. This provided 190 sq. in. of licking area for the nine calves in each lot, or 21.1 sq. in. per calf.

On the day the calves were weaned they were fed long alfalfa hay. After the initial feeding of long hay, the calves were fed the succession of complete mixed rations shown in table 5. Dry matter intake was closely monitored during the first 8 days after weaning, and then weekly for the remainder of the 62 day feeding period. Dry matter intake was obtained by weighing back the supplement tubs and complete mixed ration in each bunk on the alternate days or weekly depending on the stage of the trial, and then computing dry matter based on moisture content. Moisture content was obtained by oven drying bunkline samples that were collected as each ration was unloaded.

Initially, the calves were weighed at weaning and agin twenty-four hours later to determine their twenty-four hour weight loss, and then weekly during the first twenty-eight days of the study. Following the twenty-eight day weight, the calves were not handled for weighing until the trials completion. Upon completion the calves were weighed on two consecutive days (December 18th and 19th), and the average of the two weighings became the final weight.

Results: Results of this investigation have been summarized in tables 6, 7 and 8. Table 6 summarizes dry matter intake and daily gains at selected intervals. Our first objective was to measure the effects of feeding a 12% fortified HPM supplement to newly weaned calves, and to determine if previous exposure to a conventional 20% HPM supplement would help the newly weaned calves find the supplement faster once in drylot. Dry matter intake was monitored every other day during the first 8 days after weaning. Supplementation during the first two days improved dry matter intake (P<.05), but there was no added advantage for previous exposure. Further measurements for dry matter intake, over the next two weeks, tended to favor the supplemented calves, but intake for the entire study tended to be greater for the control calves. Neither of the differences were statistically significant, however. Body weight fluctuated dramatically during the sixteen day period after weaning. Twenty-four hour weight loss was nearly identical across treatments, and averaged -36.4 pounds. Calves given the control ration, without supplement, regained their weaning shrink loss more rapidly (P<.05) than the supplemented calves.

Our second objective was to determine how supplementation with the 12% fortified HPM supplement would influence backgrounding performance. Weight gains, feed consumption, feed costs, and a marketing summary are shown in table 7. For the 62 days on feed, control calves gained more (P<.05) weight than calves from either of the supplemented groups. Average daily gains were 2.03, 1.56, and 1.53 pounds/head/day for the control, the previously exposed group, and those exposed at weaning, respectively. Supplement intake was strongly influenced by previous exposure. Calves that had access to the 20% conventional HPM supplement on pasture before weaning consumed 2.3 times more (P<.01) supplement during the entire trial than those calves whose initial access occurred at weaning. Calves that had previous exposure consumed .86 pound of supplement daily, and the unexposed calves consumed .37 pound of supplement daily. When conventional and supplement dry matter intake were combined, the control calves consumed more total dry matter than either of the supplemented groups, but the differences were not significant. The combined dry matter intakes were 15.2, 14.9 and 14.0 pounds/head daily for the control, previously exposed, and those exposed at weaning, respectively.

Feed costs were directly effected by the level of supplement consumed, since the fortified HPM supplement that cost $.232/pound replaced conventional feed that cost $.0513/pound. Previous access before weaning, therefore, resulted in the highest feed cost/hundredweight of gain $58.65. Feed cost/hundredweight of gain for the control group was $38.25, and was $51.04 for the group with initial access to the fortified supplement at weaning.

In our marketing analysis, we determined net return to management by deducting expenses for feeder calves, direct feed and supplement costs, and interest at 12% from our gross return when the calves were marketed. Values for each treatment are shown in table 7. Net returns were $20.91/head for the control, $8.75/head for the group initially exposed to the fortified supplement at weaning, and $1.83/head for the group that had access to the 20% HPM supplement on pasture before weaning.

Health problems were relatively high in all treatments. One of the primary promotional features for the fortified supplement was that the built-in fortification would help enhance resistance against disease in stressed calves. Based on the incidence of respiratory disease complex, as shown in table 8, there does not appear to be any particular advantage for feeding the fortified 12% HPM supplement to abate the problems associated with respiratory disease complex.

Summary: A fortified 12% crude protein HPM supplement was evaluated in a 62 day backgrounding study using crossbred Charolais steer and heifer calves. Calves had either access to a 20% conventional HPM supplement before weaning, or no prior access when weaned on to a 12% fortified HPM supplement, and were compared to unsupplemented control calves. Twenty-four hour weaning shrink was uniform across treatments. Total dry matter intake was slightly higher for the supplemented calves during the first sixteen days of the trial, but intake for the entire study favored the control calves slightly. The differences were nonsignificant in both cases, however.

Compensatory gain following weaning shrink, and gains for the entire 62 day study were greater ($P<.05$) for the control calves, which gained nearly one-half pound/day more than either of the supplemented groups. Faster gains for the control calves translated into poorer feed efficiencies for the supplemented calves. Control calves converted 7.49 pounds of feed/pound of gain ($P<.05$), where as the calves that had prior access on pasture required 9.55 pounds, and the calves without prior access required 9.15 pounds of feed/pound of gain.

Economically, feed costs/hundred pounds of gain were substantially higher among the two supplemented groups, and were $38.25, $58.65 and $51.04 for the control, calves with prior access before weaning, and calves that did not have prior access before weaning, respectively. Net returns for the 62 day backgrounding favored the control calves also. Control calves returned $19.08 more than calves that had access to supplement before weaning, and $12.16 more than the calves whose first exposure was at weaning.

Inclusion of vitamins A, D, & E, B-complex vitamins and fermentation by-products in the fortified 12% HPM supplement did not reduce the incidence, morbidity, or the number of treatments necessary to stabilize calves

diagnosed as having respiratory disease complex.

In the final analysis, there was no advantage for using a fortified 12% HPM block for newly weaned calves.

Table 1. Trial one rations fed during drylot phase after calving. 1989.					
Ingredients	Int'l. Feed Number	Control		12% HPM Block	
		DM%	Lbs./Hd	DM%	Lbs./Hd
Fed From: 3-10 to 5-1-89					
Corn Silage	3-02-820	66.4	16.5	67.5	16.5
Alfalfa Cubes	1-00-063	32.0	8.0	31.8	7.8
Soybean Meal	5-20-637	.86	.20	---	---
Sod. Phos. (XP-4)	6-04-287	.35	.087	.29	.073
TM Salt	---	.40	.098	.41	.098
Vit. A, D & E[1]	---	.037	4.2 gms.	---	---
Totals		100.0%	24.9 Lbs.	100.0%	24.5 Lbs.
Calculated Metab. Energy, Mcal.			25.1 Mcal.		24.7 Mcal.
Estimated Energy From Supp., Mcal.					1.8 Mcal.
Fed From: 5-2 to 5-26-89					

Corn Silage	3-02-820	67.1	18.8	68.9	18.9
Alfalfa Cubes	1-00-063	32.0	9.0	30.4	8.3
Soybean Meal	5-20-637	.18	.05	---	---
Sod. Phos. (XP-4)	6-04-287	.32	.09	.29	.078
TM Salt	---	.37	.10	.36	.098
Vit. A, D & E[1]	---	.041	5.3 gms.	---	---
Totals		100.0%	28.1 Lbs.	100.0%	27.4 Lbs.
Calculated Metab. Energy, Mcal.			28.4 Mcal.		27.7 Mcal.
Estimated Energy From Supp., Mcal.					.68 Mcal.
1Provided 46,255 IU of vit. A, 9,248 IU of vit. D, and 4.6 IU of vit. E per head per day. [2]Provided 58,369 IU of vit. A, 11,670 IU of vit. D, and 5.8 IU of vit. E per head per day.					

Table 2. Trial one drylot gains, HPM block consumption, feed , and supplement cost after calving for control and supplemented cows and calves. 1989.

	Control		12% HPM Block	
	Cows	Calves	Cows	Calves
Gains:				

Calving to May 2nd:				
No. Head	35	35	34	34
Days Fed	40.1	40.1	38.9	38.9
Calving Wt., Lbs.	1191.0		1234.0	
Birth Wt., Lbs.		96.0		94.0
May 2nd Wt., Lbs.	1061.0	182.0	1150.0	185.0
Gain, Lbs. Cow SE Mean 9.203 Calf SE Mean 6.237	-130.0[b]	86.0[a]	-84.0[a]	91.0[a]
ADG, Lbs.	-3.24	2.14	-2.16	2.34
May 2nd to May 26:				
No. Head	28	28	28	28
Days Fed	24	24	24	24
Weight May 2nd, Lbs.	1064.0	180.0	1156.0	179.0
Weight May 26th, Lbs.	1174.0	235.0	1276.0	236.0
Gain, Lbs. Cow SE Mean 5.063 Calf SE Mean 2.071	110.0[a]	55.0[a]	120.0[a]	57.0[a]
ADG, Lbs.	4.58	2.29	5.0	2.38
12% HPM Block Consumption:				
Calving to May 2nd				

Lbs./Cow-calf pair	---	48.7
Lbs./Cow-calf pair/day	---	1.25
Cost/Cow-calf pair @ $.192/Lb.	---	$9.34
May 2nd to May 26th		
Lbs./Cow-calf pair	---	12.9
Lbs./Cow-calf pair/day	---	.54
Cost/Cow-calf pair @ $.192/Lb.	---	$2.47
Dry Matter Feed Consumed:		
March 10th to May 2nd		
Feed/Head, Lbs.	996.7	951.5
Feed/Head/day, Lbs.	24.8	24.4
Metabolizable Energy/Hd/Day	25.1 Mcal.	24.7 Mcal.
HPM Block Metabol. Energy/Hd/Day	---	1.8 Mcal.
May 2nd to May 26th		
Feed/Head, Lbs.	674.0	951.5
Feed/Head/day, Lbs.	28.1	24.4
Metabolizable Energy/Hd/Day	28.4 Mcal	24.7 Mcal.
HPM Block Metabol. Energy/Hd/Day	---	.68 Mcal.
Feed Cost:		

March 10 to May 2nd		
Feed Cost/Head, $	$59.27	$55.70
Feed Cost/Head/Day, $	$1.48	$1.43
May 2nd to May 26		
Feed Cost/Head, $	$39.73	$38.31
Feed Cost/Head/Day, $	$1.66	$1.60

Table 3. Trial one grazing gains, HPM block consumption, reproductive performance and supplement cost for control and supplemented cows and calves. 1989.

	Control		12% HPM Block	
	Cows	Calves	Cows	Calves
Gains:				
May 26 to Aug. 16th				
No. Head	28	28	28	28
Days Fed	82	82	82	82
Turnout Wt., Lbs.	1173.0	233.0	1280.0	237.0
Final Wt., Lbs.	1260.0	465.0	1324.0	463.0
Gain, Lbs. Cow SE Mean 7.979 Calf SE Mean 5.838	87.0[a]	232.0[a]	44.0[b]	226.0[a]

ADG, Lbs.	1.06	2.83	.54	2.76
HPM Block Consumption:				
Lbs./cow-calf pair	---		21.9	
Lbs./cow-calf pair/day	---		.27	
Cost/cow-calf pair @ $.192/lb.	---		$4.20	
Reproductive Performance:				
No. Cycling Before Breeding	9/28 (32.1%)		9/28 (32.1%)	
No. Open Cows	0/28 (0%)		3/28 (10.7)	
Pregnancy Rate				
Cycle Pregnancy Occurred[1]				
1st	19/28 (67.8%)[a]		20/27 (74.1%)[a]	
2nd	4/28 (14.3%)		2/27 (7.4%)	
3rd	5/28 (17.9%)		1/27 (3.7%)	
Calving Interval, Days SE Mean 4.072 Standard Deviation, Days	370.2[a] 21.7		364.1[a] 19.6	
Postpartum, Days SE Mean 4.083 Standard Deviation, Days	88.5[a] 21.9		82.4[a] 19.5	
1One cow in the HPM block group died from compaction.				

Table 4. Trial two gains, 20% HPM consumption, and economics for cows and calves supplemented before weaning and cows after weaning that grazed fall and early winter native pasture.

	Control		12% HPM Block	
	Cows	Calves	Cows	Calves
Phase I Before Weaning (Aug. 16 to Oct. 18):				
No. Head	28	28	28	28
Days Grazed	63	63	63	63
Initial wt., lbs.	1260.0	465.0	1324.0	463.0
Final wt., lbs.	1290.0	635.0	1320.0	623.0
Gain, lbs.	30.0	170.0	-4.0	160.0
ADG, lbs.	.48	2.70	-.06	2.54
Supplement fed before weaning:				
Pounds/cow-calf pair	---		36.1	
Pounds/cow-calf pair/day	---		.57	
Cost/cow-calf pair @ $.192/lb., $	---		$6.93	
Phase II After Weaning (Oct. 18 to Dec. 12):				
No. Head	28		28	
Days Grazed	55		55	

Initial wt., lbs.	1290.0		1320.0	
Final wt., lbs.	1254.0		1287.0	
Gain, lbs.	-36.0		-33.0	
ADG, lbs.	-.65		-.60	
Supplement fed after weaning:				
Pounds/cow	---		50.6	
Pounds/cow/day	---		.92	
Cost/cow @ $.192/lb., $	---		$9.72	
Combined Phases:				
No. Head	28	28	28	28
Days Grazed	118	63	118	63
Initial wt., lbs.	1260.0	465.0	1324.0	463.0
Final wt., lbs.	1254.0	635.0	1287.0	623.0
Gain, lbs.	-6.0	170.0	-37.0	160.0
ADG, lbs.	-.05	2.70	-.32	2.54
Combined Supplement Consumption:				
Pounds/cow-calf pair	---		86.7	
Pounds/cow-calf pair/day	---		.73	
Cost cow-calf pair, $	---		$16.65	

Table 5. Trial three rations fed during the 62 day backgrounding period in percent of diet.

Ingredient	Int'l. Feed Number	Starter	1st Change	2nd Change	3rd Change	Final
Corn Silage	3-02-820	58.2	54.7	47.6	47.0	46.3
Mixed Hay	---	39.0	33.7	30.9	22.5	18.0
D. Rolled Bly	4-00-535	---	5.0	17.1	25.5	31.4
Soybean Meal	5-20-637	2.24	6.1	3.9	4.45	3.7
Dical[1]	6-00-080	.29	.27	.28	.26	.17
Cal. Carbonate	6-02-632	---	---	---	.036	.17
TM Salt	06-04-152	.29	.27	.28	.28	.29
Vitamin AD&E, 2	------	.01 100.0%	.01 100.0%	.01 100.0%	.01 100.0%	.01 100.0%

1A blend of dicalcium and monocalcium phosphates.

2Provided 500 IU of Vitamin A, 100 IU of Vitamin D and 5 IU of Vitamin E per pound of finished feed.

Table 6. Trial three dry matter feed intake and daily gains measured at selected intervals for calves supplemented with a fortified 12% HPM supplement after weaning. 1989

	Control	Exposed/12% Fortified HPM[1]		12% Fortified HPM[2]		Mean SE
	Conventional Feed	Conventional Feed	12% HPM	Conventional Feed	12% HPM	
Intervals:						

Oct. 18-20th Combined DM	4.6[a]	4.5	4.8[ab]	.26	6.0	6.1[b]	.09	.4277
Oct. 20-22 Combined DM	7.7[a]	7.4	8.2[a]	.76	7.8	8.0[a]	.24	.8206
Oct. 22-24 Combined DM	11.3[a]	9.1	10.4[a]	1.33	10.2	10.7[a]	.46	.3730
Oct. 24-26 Combined DM	12.5[a]	12.1	13.2[a]	1.13	12.9	13.3[a]	.44	.2986
Oct. 26-Nov. 3 Combined DM	12.4[a]	11.9	13.3[a]	1.42	12.7	13.4[a]	.69	.3450
Entire Trial:								
Oct 18 to Dec. 19	15.2[a]	14.0	14.9[a]	.86	13.6	14.0[a]	.37	.3541
Average Daily Gain:								
Oct. 18-19 (24 Hr. Loss)	-37.0[a]	-36.3[a]			-35.9[a]			2.148
Oct. 19-26	6.6[b]	4.3[a]			4.3[a]			.3548
Oct 26-Nov. 3	2.5[a]	2.3[a]			2.3[a]			.3798
Entire Trial								
Oct. 18 to Dec 19	2.03[a]	1.56[a]			1.53[a]			.1213

1The 20% HPM/12% fortified HPM group had access to a 20% HPM supplement on pasture before weaning followed by the 12% fortified HPM supplement after weaning.

2This group received the 12% fortified HPM supplement after

Table 7. Trial three weaning and short term backgrounding performance of calves supplemented with a 12% fortified HPM supplement after weaning that had been either exposed or non-exposed to a 20% HPM supplement before weaning. 1989

	Control	Exposed/12% Fortified HPM	12% Fortified HPM	Mean SE
Gains:				
No. Head	27	27	26[1]	
Days Fed	62	62	62	
Initial Wt., lbs.	622.0	628.0	624.0	
Final Wt., lbs.	748.0	725.0	719.0	
Gain, lbs.	126.0	97.0	95.0	
ADG, lbs.	2.03[b]	1.56[a]	1.53[a]	.1213
Feed Summary:				
Conventional Feed				
DM Fd./Hd., lbs.	939.5	868.8	844.1	
DM Fd/Hd./Day, lbs.	15.2[a]	14.0[ab]	13.6[b]	.3383
DM Fd./Lb. of gain, lbs.	7.49	8.97	8.89	
12% HPM Consumption				

Pounds/Head	---	53.1	22.7	
Pounds/day	---	.86[a]	.37[b]	$.7161^{-01}$
Combined Conventional & 12% HPM DM Intake:				
DM/Hd./Day, lbs.	15.2[a]	14.9[a]	14.0[a]	.3541
DM Feed/Lb. of gain	7.49[a]	9.55[b]	9.15[ab]	.5462
Economics:				
Conv. Feed Cost/Hd., $	48.20	44.58	43.23	
12% HPM Cost/Hd. @ $.232/lb., $	---	12.3	5.27	
Total Feed Cost/Hd., $	48.20	56.90	48.49	
Marketing Summary:				
Gross Ret./Hd. based on final weight, $[2]	634.95	630.49	625.18	
Expenses:				
Feeder calf @ $.89/lb., $	- 553.58	- 559.19	- 555.63	
Feed Cost, $	- 48.20	- 56.90	- 48.49	
Interest @ 12%, $	- 12.26	- 12.57	- 12.31	
Net Return, $	$20.91	$1.83	$8.75	

1One calf died of pneumonia.

2Market value for the heavier weight control calves was $85.00, and the lighter weight 12% fortified HPM calves brought $87.00/cwt.

Table 8. Distribution of calves diagnosed with respiratory disease complex and treated. 1989			
	Control	Exposed/12% Fortified HPM	12% Fortified HPM
No. and (%) Treated	7 (25.9%)	9 (33.3%)	11 (40.7%) 1 calf died

Literature Cited

Dunn, T. G., J. E. Ingalls, D. R. Zimmerman, and J. N. Wiltbank. 1969. Reproductive performance of 2-yr.-old Hereford and Angus heifers as influenced by pre and postcalving energy intake. J. An. Sci. 29:719.

Ensminger, M. E. and C. G. Olentine, Jr. 1978. Feeds and Nutrition - Complete. The Ensminger Publishing Company, 3699 E. Sierra Ave., Clovis, CA 93612.

Landblom, D. G., J. L. Nelson, J. S. Caton and S. L. Boyles. 1990. Drylot wintering of pregnant beef cows supplemented with either a 12 percent crude protein heat processed molasses block or dry rolled barley. North Dakota Farm Research, Vol. 47, No. 4, pp 19-21.

Lund, R. E. 1988. MSUSTAT Statistical Analysis Package, microcomputer version 4.10. Research and Development Institute, Inc., Montana State University, Bozeman, Montana 59717-0002.

Mankse. L. L., M. E. Biondini, D. R. Kirby, J. L. Nelson, D. G. Landblom and P. J. Sjursen. 1988. Cow and calf performance on seasonlong and twice over rotation grazing treatments in western North Dakota. North Dakota Cow/Calf Conference Proceedings, pp 5-17.

NRC. 1984. Nutrient Requirements of Beef Cattle. National Academy of Science, National Research Council, 6th Rev. Ed.

Roberts, S. J., D. G. LeFever and J. N. Wiltbank. 1970. Increasing reproductive efficiency in a cow herd. Proc. West. Sec. Soc. An. Sci. Vol. 21.

Shirley, R. L. 1986. Nitrogen and Energy Nutrition of Ruminants. Academic Press, Inc., N. Y., N. Y. pp 194.

Wiltbank, J. N., W. W. Rowden, J. E. Ingalls, K. E. Gregory and R. M. Koch. 1962. Effect of energy level on reproduction of mature Hereford cows.. J. An. Sci. 21:219.

Wiltbank, J. N. W. W. Rowden, J. E. Ingalls, and D. R. Zimmerman. 1964. Influence of postpartum energy level on reproductive performance of Hereford cows restricted in energy intake prior to calving. J. An. Sci. 21:658.

Wiltbank, J. N., E. J. Warwick, R. E. Davis, A. C. Cook, W. L. Reynolds and M. W. Hazen. 1965. Influence of total feed and protein intake on reproductive performance in the beef female through second calving. USDA Technical Bull. 1314.

Wiltbank, J. N. 1970 Research needs in beef cattle reproduction. J. An. Sci. 31:755.