Alternate Low and High Winter Feed Levels on Growth and Performance of Beef Heifers

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Experiments conducted at this station since 1948 have shown repeatedly that spring-calving cows, under good range conditions, can tolerate low levels of supplemental feed and rather severe winter weight loss, provided they can recover on summer grass. With young replacement heifers, the effects of winter treatment are more severe. In experiments conducted to date, beef females have been continued on the same low, moderate or high planes of nutrition each winter until they reached mature size in order to study accumulative effects.

Such data fail to answer the following questions: What is the optimum plane of nutrition to two years of age if heifers are well-fed thereafter? Which is most damaging, a low plane of nutrition the first winter as a weaner calf or the second winter as a bred yearling? Can larger amounts of feed be used more effectively by the weaner calf, or is it more important to feed liberally the following winter as a bred yearling? In other words, what is the optimum growth pattern for beef heifers during the critical years of growth and development. If feed levels can be reduced during either the first or second winters without affecting mature size and reproduction, a considerable saving in feed cost may be realized.

The effects of Low vs. High planes of nutrition during the first winter (7 to 12 months of age) or second winter (19 to 25 months of age) were investigated in two trials at the Ft. Reno station. As in previous experiments, the heifers grazed native range grass, year-long. A basic concept in these studies has been that the first step toward profitable cow-calf operations is to provide plenty of grass, both summer and winter, supplemented as cheaply and effectively as possible during the dormant periods. Data are now available on the growth and production of heifers to 2.5 years of age. The heifers used in Trial II will be continued on test at the Moderate level to study subsequent performance.

Procedure

In each of two trials, 75 weaner Hereford heifer calves from the experiment station herd were started on test at approximately 8 months of age. The calves were allotted to treatment according to age, sire, previous treatment of their dams, shrunk weight and grade. The heifers were divided into five uniform lots of 15 head each. The feeding plan for the first two winters, number of heifers started on test, and number successfully weaning calves at 2.5 years of age are shown in Table 1.

All heifers grazed native grass pastures at 8 acres per head, year-long. The grasses were predominantly big and little bluestem, Indian,

Table 1.—Design of Experiment and Number of Heifers Completing Test

Lot Number	1st winter as calves	2nd winter as breed yearlings
1	Low — 30	Low — 18
2	Low — 30	High — 20
3	Moderate — 30	Moderate — 21
4	High — 30	High — 22
5	High — 30	Low — 20

switch, grama and less desirable annual grasses. The heifers were fed their respective supplements daily, by lots, from approximately November 1st to April 15th. The amount and kind of supplement fed each lot was varied to provide the desired gain or loss of body weight during the winter. Ample summer grazing was available so that recovery could be made from the effects of poor winter treatment if possible.

In the overall plan of the experiment, two lots were started on a Low plane of nutrition during the first winter, one on a Moderate and two on a High plane. Following a summer grazing season on good native grass, one lot on each of the Low or High planes were reverted to the opposite level during the second winter. The gain or loss patterns which were followed the first and second winters were:

I. First Winter—Weaner Calves

Low—No gain from fall to spring.
Moderate—Approximately 0.5 lb. per head daily gain (Nov. to mid-April).
High level—1 lb. or more per head daily gain.

II. Second Winter—Bred Yearlings

Low level—Loss of 20% or more of fall body weight (including calving loss) to spring.
Medium level—Approximately 10 to 12% loss from fall to spring.
High level—Less than 5% loss from fall to spring.

The above levels of wintering were achieved by frequent adjustments in the amount and kind of supplement offered. Low-level heifers were placed in drylot on wheat straw, with no supplemental feed for approximately 3 to 4 weeks at the beginning of each winter period to initiate an early weight loss. Following this, they returned to dry grass pasture, with no supplement until approximately mid-January. This was followed by 1.0 lb. of cottonseed meal per head daily until late March, with a small amount of grain as necessary to prevent excessive loss.

The Moderate regime required an average daily feed intake of approximately 2 lbs. of cottonseed meal and 1 lb. of ground milo throughout the winter. The High level required 2 lbs. of cottonseed meal and from 5 to 7 lbs. of ground milo per head daily throughout the winter period.

Where heifers were reversed in treatment from Low to High, or High to Low, the feeding pattern followed was the same as practiced for the continuously treated group (Low-Low or High-High). A mineral mix of 2 parts salt and 1 part steamed bone meal was available throughout the year.

All heifers were exposed as yearlings (approximately 15 months of age) to purebred bulls. The breeding period lasted from approximately May 1 to August 15th; hence, the first calves were dropped in early February.

A routine yearly vaccination for Leptospirosis has been necessary at Fort Reno for some years. Due to an oversight, this was omitted with the first group of heifers. A large "storm" of abortions among bred yearling heifers occurred during November and December in Trial 1. Vaccination of remaining heifers at this time halted the spread of the disease, but the abortions in each treatment made it necessary to eliminate data on all affected heifers beyond 18 months of age.

Results and Discussion

The average results of the two trials in terms of body weight change, and calf and milk production, are summarized in Table 2. As planned, the winter change in body weight of beef heifers was directly related to the feed levels. Low levels of supplemental feed significantly affected growth and development of beef heifers to 13 months of age, although remarkable recovery was made on summer pasture as yearlings.

Winter gain of the Moderate and High groups were a direct reflection of higher feed levels. The overall pattern of winter-summer gains for the reversed groups (Low-High and High-Low) are shown graphically in Figure 1.

Note that the switchover in treatment during the second winter resulted in some gain for the Low-High group, but a marked weight loss for the High level heifers reverted to Low treatment. Despite these changes, average body weights at 2.5 years were quite similar.

Although heifers wintered each year at the Low level showed remarkable recovery of body weight, and to some extent in skeletal size, they did not approach the High level at either 18 or 30 months of age. A continual winter treatment at the Low, Moderate or High levels caused a marked spread in weights during the second winter, while the heifers were bearing their first calves. At 2½ years of age, after weaning their first calves, there was a difference of 128 lbs. in body weight between Low-Low and High-High wintered heifers, with Moderate-level heifers intermediate. Two summers on good grass were not sufficient, therefore, to recover the weight disadvantage from the preceeding winters. Judging from the results of other studies, however, this difference can be recovered to a great extent at 5½ years of age.

Differences in skeletal size due to treatment were quite small, considering height and length measurements at 2.5 years of age. The re-

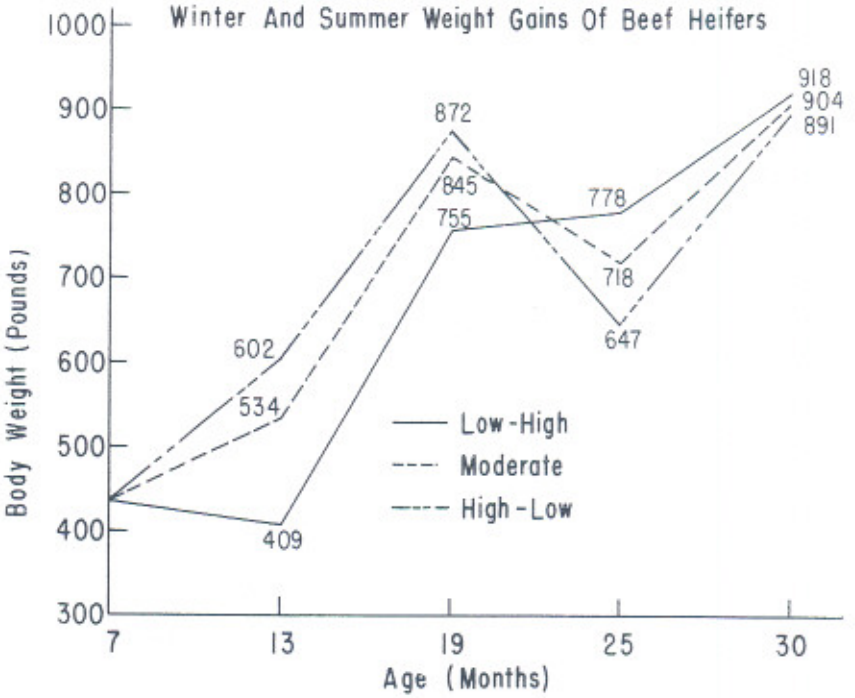

Figure 1.

sults are shown graphically in Figure 2. Both height and length were retarded by the Low-Low regime, and were greatest for heifers carried at the High level at least one winter during the trial. Other measures of skeletal size, such as width and heart girth, tended to show a similar pattern.

Data on reproductive performance and milk production have been summarized in Table 2. The most severe effect of a Low plane of nutrition the first winter was to delay conception and retard calving date. Yearling heifers, coming out of the winter in poor condition, are slow to initiate a normal estrual cycle. This delays conception and strings out the subsequent calf crop. Approximately 4 weeks difference in average calving date was apparent between the Low-Low and High-High groups. From data obtained on the second calf crop in Trial 1, a reversal pattern for this adverse effect can be seen for Low-High and High-Low groups. Heifers wintered at a High level tended to calve early the subsequent year, regardless of the first winter's treatment.

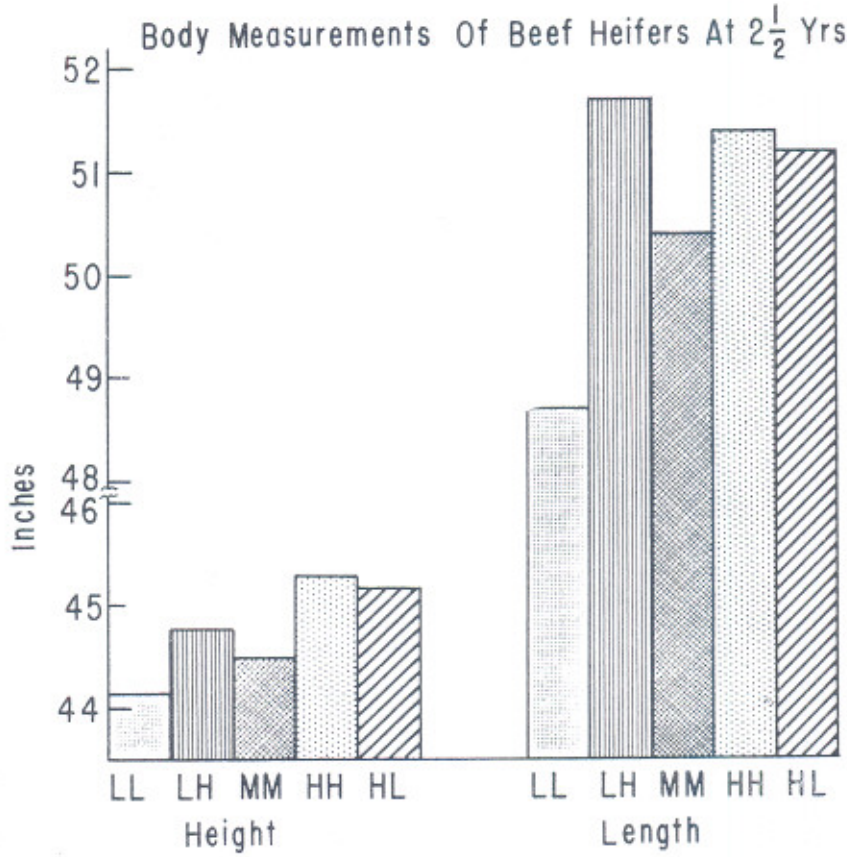

Figure 2.

An opposite pattern was evident for the Low treatment. Heifers wintered on High level as calves conceived early, but were delayed in rebreeding the following year if changed to a Low level. Thus, the winter feed level immediately preceeding the breeding season, particularly the protein and energy intake during the later winter and early spring, is the most important factor in initiating estrus and early conception. The later calving date of the Low-Low heifers was primarily responsible for the lighter weaning weights of their calves.

The percentage calf crop weaned, based on number of heifers exposed in each group and after removing heifers that aborted due to Leptospirosis, was disappointing in all treatments. Average results for 5 previous trials at Ft. Reno show that we can expect about an 80% calf crop from 2-year-old heifers. There is a tendency in these trials

Table 2.—Effect of Alternate Winter Treatment (Low-High and High-Low) on Growth and Reproductive-Performance of Two-Year Old Heifers.

Lot No. 1st winter treatment 2nd winter treatment	1 Low Low	2 Low High	3 Mod. Mod.	4 High High	5 High Low
Average weight change lbs.					
8 to 18 months of age					
Winter gain	— 26	—28	97	147	164
Summer gain	355	346	314	277	270
Net yearly change	329	318	411	424	434
18 to 30 months of age					
Winter gain	—193	9	—128	—67	—230
Summer gain	237	153	187	141	243
Net yearly change	44	162	59	74	13
Fall wt. at 30 months of age,* lbs.	831	918	904	959	891
Winter supplement/head (lbs.)					
1st winter					
C.S. meal	92	92	240	289	289
Grd. milo	79	79	384	949	949
2nd winter					
C.S. meal	89	289	211	289	89
Grd. milo	30	823	126	823	30
Av. winter supplemental feed cost/head, ($)	8.52	34.38	25.99	52.17	33.81
Calf production data:					
Av. calving date					
First calf	4/3	3/27	3/19	3/12	3/8
Second calf**	3/28	3/2	3/13	2/28	3/20
% calf crop	65	73	70	72	78
Av. birth weight, (lbs.)	65	72	71	72	67
Av. weaning weights, (lbs.)	388	409	408	412	383
Av. daily gain of calves	1.56	1.62	1.61	1.65	1.50
Av. daily milk production,*** lbs.	7.62	7.84	7.40	7.33	6.41

*Includes only heifers calving and raising a calf.

**Data for second trial only.

***Determined by weight changes of calves at two, 12-hour periods at 3-4 samplings, during lactation.

for the continual low level of wintering (Low-Low) to be more severe than any other treatment. Heifers on the High-Low treatment conceived early, but did not lactate as well, as indicated by the milk production data. This reduced the average daily gain of their calves. The reverse treatment, Low-High, resulted in heifers calving later and closer to spring grass, which did not adversely affect milk flow.

Data on average daily gain of the calves from birth to weaning was similar, except for the High-Low treatment. Such heifers, calving in

late winter, were in poor nutritional shape for lactation. The opposite regime, Low-High, gave results comparable to the High-High level.

Average weaning weights differed significantly only for the Low-Low treatment. Calves from High-Low heifers were as heavy as those from other treatments, due to their greater age at weaning. The "lb. of calf turned off" per heifer bred, as shown in Figure 3, differed significantly for the Low-Low or High-Low regimes only. Heifers carried on Moderate and High levels, or those reverted from Low to High, were best in performance.

The most severe effect of plane of nutrition was apparently during the second winter, as it then affected both lactation and rebreeding.

All heifers in the second trial will be continued at the Moderate level until they have weaned two more calf crops. Any effect of a carryover from the first or second winter on mature body size and performance will be apparent at that time.

Summary

Results of two trials in which heifers were wintered at Low, Moderate or High levels for the first winter as calves, and in which two lots were reversed from Low to High, or vice versus, during the second winter have been obtained.

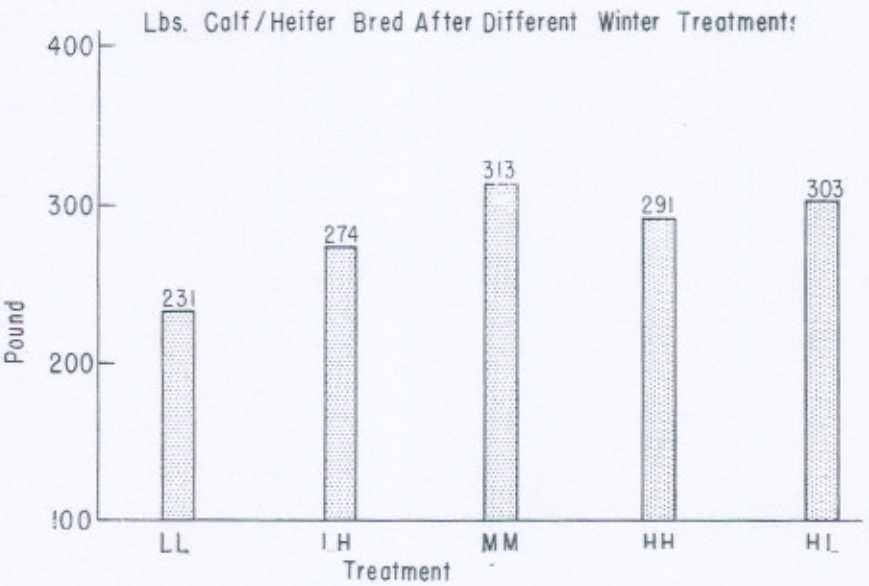

Figure 3.

The plane of nutrition during the first winter as a weaner calf is most severe on the growing heifer in retarding body and skeletal development, and in delaying the appearance of heat and conception. Adverse effects in terms of body weight and skeletal development, however, can be largely recovered on good summer pasture, or by a High plane of nutrition during the second winter. A continual Low or Moderate plane of nutrition during the winter still apparent in terms of body weight and skeletal size at 2.5 years.

A reversal in plane of nutrition from High to Low appears to be more severe on the young heifer than the opposite treatment. Although heifers on the High regime make good gains as calves and conceive early, they have little body reserve for milk production if fed poorly the second winter, and gains of their calves from birth to weaning have been disappointing. In addition, they are slow to rebreed for the following calf crop.

Of the programs studied, the pattern appeared most beneficial for the young heifer. Neither of the alternate planes of nutrition studied in these experiments were more advantageous than the Moderate level each winter.

Feeding Protein Supplements to Range Beef Cows at 2, 4 or 6-Day Intervals

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Cattle wintering on native range in Oklahoma and most parts of the Southwest need additional protein from November to mid-April. It is common practice to feed a protein supplement either daily or every other day, at twice the daily allowance. In an attempt to reduce labor, or where cattle are wintered in rough range areas, and it is difficult to "cake" them uniformly, self-limiting supplements such as those containing salt are commonly used.

Theoretically, it is desirable that the protein (or nitrogen) necessary for the rumen bacteria to break down fibrous feeds be provided each 24-hour period. This would assure an even source and amount of protein or nitrogen for the rumen bacteria. Tests at several stations have failed to show a significant difference between feeding the protein supplement every day or on alternate days.

More recent tests in west Texas, at the Woodward station, and at Nebraska have shown that under certain conditions it may be possible to lengthen the feeding interval. Such a procedure was tested under