Feedlot Performance and Carcass Composition of Slaughter Cattle as Affected by Winter Feed Level of Their Dams

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While many experiments have been conducted on the effects of low or high planes of nutrition after weaning on the growth and development of the beef calf, limited data are available on the effects of feed level prior to weaning.

The performance of a beef calf after weaning may be critically affected by the plane of nutrition imposed from fetal stage to weaning due to poor feeding and management of the dam.

Thousands of lightweight and undernourished stocker calves from dams which have been poorly fed and managed are purchased each year for winter pasture and fattened out later in Oklahoma. To what extent their development is retarded by poor planes of nutrition prior to weaning has not been established.

In British experiments, beef calves fed poorly to approximately eight months of age failed to recover from this stunting effect until two years of age.[1] In studies at South Dakota, calves from cows on a low plane of nutrition due to heavily grazed pastures were not equal to well-fed calves at 18 months of age.[2] Hence, the effect of stunting a beef calf prior to weaning may be more severe than a low plane of nutrition imposed during the first winter after weaning at eight months of age.

Plan of Experiment

Two pilot studies have been initiated at the Oklahoma Experiment Station to study this problem. In the fall of 1960, 12 weaner heifer calves were selected from the Ft. Reno herd; six from first calf two-year-old heifers wintered at a Low Level the previous year and six from similar heifers wintered at a High level. The calves were selected to be as near alike as possible on the basis of age and sire, although an 18-day difference in age existed in favor of those out of better fed dams. Following a 158-day growing period after weaning, the calves were gradually worked up full-feed on a fattening ration and then placed on self-feeders containing 50 percent ground milo, 8 percent dehydrated alfalfa meal, 8 percent cottonseed meal, and 8 percent molasses. The remaining 26 percent consisted of cottonseed hulls, calcium carbonate, salt, and a vitamin A concentrate. A two parts salt and one part steamed bone meal mineral mix was also available, free choice. The feedlot per-

[1] Brookes and Hodges, J. Agri. Sci. Vol. 53, Part 1, p. 78.

formance of calves out of Low vs. High plane heifers was observed for an additional 160 days on this ration. Cattle in both groups were slaughtered at 17 months of age and a detailed study was made of the carcass. In addition to the many measurements taken on the carcass itself, a complete separation of one side was made into lean, fat, and bone components.

In the fall of 1961, a group of 14 steer calves out of Low or High plane dams were started on test. These calves, which differed an average of 65 lbs. at weaning, were placed on full-feed after a one month post-weaning adjustment period. The fattening ration is similar to the one described for heifers. These calves have now been on feed approximately 115 days and will be slaughtered in early summer on a weight-constant basis.

These two trials are merely exploratory studies and will be followed by more extensive tests in which the effects of pre-weaning planes of nutrition during this sensitive growth period will be investigated.

Results

The results of the first trial with heifer calves are summarized in Table 1. Note that the different planes of nutrition of their dams resulted in a difference of 121 lbs. in average weaning weights. Low level dams lost 266 lbs. or 35 percent of their fall weight to spring, whereas High level dams lost only 15 percent of their fall weight the previous winter. Other data indicates that such excessive winter weight losses of young females, as occurred on the Low level, will reduce the birth weight and subsequent milk flow of the dam, even on good summer pasture.

During a post-weaning growth phase of nearly five months, a further rate of gain advantage was shown for calves out of High level dams. In contrast, during the next phase on fattening rations, calves from Low level dams out-gained those from better wintered females, a tendency expected by most cattlemen. Nevertheless, at slaughter age (17 months of age), the effect of pre-weaning plane of nutrition was still evident among calves from Low plane females which weighed 85 lbs. less than those out of High level dams. Calves of Lot 1 were considerably more efficient during the growing-fattening phase, however, requiring only 83 percent as much feed per pound of gain after weaning.

Marked differences were evident in height, length of body, width, and heart girth at weaning between calves of the two groups. These differences were much reduced by slaughter time as evidenced by the measurements taken on the live animal. Perhaps more accurate were the measurements taken from the carcass which indicate that these differences were slight although the trend in favor of Lot 2 calves was still evident in all measurements. It is probable that if both groups had been continued on feed for a longer time, such differences might have disappeared entirely.

Table 1.—Subsequent Feedlot Performance and Carcass Composition of Beef Heifers As Affected by Pre-Weaning Treatment of Their Dams.

Winter treatment of dams	Lot 1 Low	Lot 2 High	Difference in favor of Highs
No. of heifers	6	6	
Winter wt. loss of dams, lbs.	266	88	—178
Winter wt. loss of dams as % of fall wt.	35	15	
Pre-weaning performance of calves:			
Avg. birth wt., lbs.	51	66	15
Avg. weaning wt., lbs.	287	408	121
Avg. daily gain, birth to weaning, lb.	1.21	1.56	0.35
Feedlot performance of calves:			
Avg. daily gain, lbs.			
Growing period, 158 days	1.26	1.35	0.09
Fattening period, to 17 mo. age	1.61	1.52	—0.09
Total post-weaning period	1.43	1.42	—0.01
Final slaughter wt., lbs.	701	786	85
Feed required per lb. gain, lbs.	8.93	10.71	—1.78
Live animal and carcass measurements (inches):			
Height at withers—at weaning	35.6	38.7	3.1
at slaughter	42.2	43.7	1.5
Length of body—at weaning	35.3	40.3	5.0
at slaughter	46.8	48.2	1.4
Width at hooks—at weaning	10.7	12.7	2.0
at slaughter	17.4	18.3	0.9
Hearth girth—at weaning	43.8	49.8	6.3
at slaughter	64.6	68.0	3.4
Carcass measurements (inches):			
Carcass length[1]	42.8	43.4	0.6
Length of rear leg[2]	26.8	27.4	0.6
Length of loin	22.8	23.5	0.7
Depth of body	14.2	14.5	0.3
Width of round	16.8	17.0	0.2
Carcass grade and composition data:			
Live slaughter grade[3]	7.0	6.1	—.9
Avg. carcass grade[3]	6.75	6.5	—.25
Dressing percent	63.7	65.1	1.4
Marbling score[4]	7.8	7.7	
Cut-out value[5]			
Lean, lbs.	227	255	28
Fat, lbs.	159	185	26
Bone, lbs.	61	72	11
Shear value (longissimus dorsi), lbs.	16.3	18.5	—2.2

[1]Distance from anterior part of first rib to aitch bone.
[2]Distance from aitch bone to furtherest point of metatarsal.
[3]Low choice = 6.0, top good = 7.0.
[4]Scored on basis of 1-12, 1 most abundant.
[5]Determined by complete separation of one side of carcass.

Of most interest in this pilot study was the effect on the carcass. Even though the animals had been treated similarly since weaning and were all slaughtered at 17 months of age, live slaughter grades were approximately one-third grade higher for the heifers out of the High plane cows. Carcass grades also favored the Lot 2 calves. Dressing percent and marbling scores again indicated a greater degree of fatness for Lot 2 calves.

Marked differences were apparent in the actual amount of various tissues obtained, calculated from the physical separation of one side of each carcass. An average of nearly 28 lbs. more lean, 26 lbs. more fat, and 11 lbs. more bone were recovered from Lot 2 calves. Hence, a retardation in growth and development between conception and weaning was still evident in actual yield of body tissues at 17 months of age. However, shear value results indicated that degree of tenderness favored the Lot 1 calves.

In the second trial, now in progress, steer calves from first-calf, two-year-old heifers on Low vs. High levels have been full-fed since weaning for approximately 115 days. A difference of 188 lbs. in winter weight loss of their dams (29 vs. 5 percent of fall weight to spring after calving for Low vs. High dams) resulted in 7 lb. lighter birth weights and 65 lb. lighter weaning weights for the Low plane calves. The average daily gain from birth to weaning was 0.29 lbs. less for the calves from Low as compared to High level dams. Average daily feedlot gains have favored Lot 2 calves, out of better-fed dams, by 0.10 lb., but with 5.6 percent more feed required per cwt. gain. These calves will be slaughtered on an equal-weight basis, starting in June, 1962.

Table 2.—Subsequent Feedlot Performance of Steer Calves From Dams Wintered at Low or High Nutritional Levels

Winter treatment of dams	Lot 1 Low	Lot 2 High	Difference in favor of Highs
No. of steer calves	8	6	
Winter wt. loss of dams, lbs.	227	39	—188
Winter wt. loss of dams as % of fall wt.	28.6	4.8	
Pre-weaning performance of calves:			
Avg. birth wt., lbs.	59.8	67.0	7.2
Avg. weaning wt., lbs.	361	426	65
Avg. daily gain, birth to weaning, lbs.	1.44	1.73	0.29
Feedlot performance of calves: (115 days)			
Avg. daily post-weaning gain, lbs.	2.24	2.32	0.10
Feed required per lb. gain, lbs.	7.55	7.97	—0.42

Summary

In two pilot trials, weaner calves out of two-year-old dams which had been wintered at either Low or High feed levels have been fattened out in drylot to study the effects of pre-weaning nutritional levels on subsequent gains and carcass composition.

Results from the first trial with heifer calves, which differed on the average by 121 lbs. at weaning, show a tendency for Low plane calves to recover in the 10-month post-weaning period. At 17 months of age, however, the yearling heifers still differed by 85 lbs. in body weight. Live animal and carcass measurements showed that total recovery had not been achieved. At this age cattle out of Low plane dams lacked 28 lbs. in lean, 26 lbs. in fat, and 11 lbs. in bone tissues, as compared to those from dams more liberally fed. In the first trial, the rate of gain during the fattening period favored calves out of Low Plane dams. Feed efficiency in both trials to date has been better for the Low reared calves.

To the stockman who purchases calves at weaning, a retarded plane of nutrition may not be detrimental in terms of expected gains and efficiency of feed conversion, although a long period until slaughter may be necessary. But to the producer who winters and then feeds out his own calves, the advantage of a better plane of nutrition prior to weaning in terms of carcass weight produced is obvious. Also, in the development of maximum lean in the carcass of the beef animal, it is apparent that low planes of nutrition during fetal life and prior to weaning may exert an effect far beyond the pre-weaning period.

Fattening Lambs During the Summer

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Many Oklahoma lambs, born during February and March, fail to reach market weight by the middle of June and are sold as feeder lambs. Due to the heat during the summer months, few of these lambs are fattened. Selling these lambs as feeder lambs or carrying them over until fall for feeding as quite an economic loss to the state. With the ration improvements in recent years, it was considered desirable to test the feasibility of feeding lambs in dry-lot during the summer.