SUMMARY

A trial has been conducted during the 1960-63 May-June breeding seasons to determine if mating at night only results in any improvement in breeding efficiency as compared to continuous mating. A total of 550 ewes and 18 rams were involved in a paired design involving 9 pairs of rams and 9 paired pasture mating groups.

There was little difference in the percent of the ewes lambing. The ewes that were mated at night only lambed two days earlier and produced more twins than the ewes that were mated continuously. It is believed that resting the rams during the day caused them to be more aggressive while they were with the ewes. The increased twinning of ewes bred to rested rams could have resulted from a higher ovulation rate by the ewes or a higher fertilization and/or embryo survival rate. The data is not adequate to determine which explanation is correct, but irrespective of how it happens, the evidence is very conclusive that resting rams during the day is a beneficial practice when the breeding season is during late May and June.

Effect of Feed Level Before and After Calving on The Performance of Two-Year-Old Heifers

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The vital importance of properly developing the beef heifer intended to be a replacement in the herd has long been recognized. However, considerable differences of opinion still exist among producers in regard to the best nutritional level for this development. Extremes in levels used have ranged from the creep-fed heifer that is placed on full feed following weaning, to the poorly mothered, non-creep fed heifer that is provided a mere survival ration following weaning.

A number of experiments have been conducted at several experiment stations to study the effect of nutrition on the development and subsequent performance of beef heifers. While many of these studies are still in progress, the evidence that has been obtained shows fairly conclusively that either extreme is undesirable. Extremely high levels reduce the life span and impair the milking ability of the beef female as well as being excessively costly. Extremely low levels results in poor reproductive performance, poor milking and light weaning weights.

Extensive studies at the Ft. Reno Station have been reported in earlier Feeder's Day reports and provide some basis for making recommendations as to the proper winter feed level for developing heifers. These studies have indicated that best reproductive function and performance have been obtained by feeding the amount of supplemental feed necessary to secure gains of 1 lb. per day in the weaner heifer and maintain the fall weight through calving in bred yearlings. However, satisfactory performance has been obtained from a moderate level which permitted gain of 0.5 lb. per day in the weaner heifer and a loss of 10% of the fall weight through calving in the bred yearling. Because of the excessive cost of the high level, the moderate level has been recommended as the best practical level even though performance is not as desirable as that obtained on the high level.

Although recommendations have been made on the basis of earlier studies, many questions still remain unanswered. There is the question as to whether the improved performance of the high level could be obtained more economically by feeding this level only part of the winter. If so, which period during the winter is most critical in feeding the bred yearling who is to calve in the early spring? In an effort to determine this, a study was set up to feed four different sequences of high and/or low levels before and after calving. The results of this study are reported in this paper.

EXPERIMENTAL PROCEDURES

Eighty bred yearling Hereford heifers were started on two different winter feed levels in the fall of 1962 at the Ft. Reno Beef Cattle Research Station. These heifers were selected from a group of 105 heifers that had been carried on four levels of feeding as weaner calves the previous winter. The effects of the first winter trial have been reported previously[1]

The heifers, weighing approximately 800 lb., were allotted to four groups of 20 each on the basis of body weight, previous winters feed level, bull to which they were bred and expected date of calving. The heifers, grazing dry native grass pasture, were fed supplemental feed as needed to obtain the desired weight change from early November to mid April.

Two levels of supplemental feeding (milo and cottonseed meal) were used. The amount of feed to be fed on each level was determined by how much was needed to produce the following weight changes:

Low—Loss of 20% or more of fall weight through calving (including calving loss).

High—Loss less than 5% of fall weight through calving.

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[1] 1963 Feeders Day Report, MP-70, p28-35

It was estimated that heifers of this age would lose approximately 100 lb. at calving. Therefore, heifers on the low level weighing 800 lb. should lose 60 lb. up to calving time. The high level heifers should gain approximately 100 lb. to calving.

Two lots were started on each level on November 14. At calving time one lot on each level was switched to the opposite level. The four lots and treatments were as follows:

Lot 1 (Low-Low) —Low level prior to calving and continued on low level after calving.

Lot 2 (Low-High)—Low level prior to calving and high level after calving.

Lot 3 (High-Low)—High level prior to calving and low level after calving.

Lot 4 (High-High)—High level throughout the entire winter feeding period.

The total amount of supplemental feed that was required is shown in table 1. No milo was needed for the Low level and cottonseed meal was not started until early January. In contrast two lb. cottonseed meal per day, starting November 14, was required for the High level plus some milo. During the early part of the winter period only 2.0 lb. milo was required, but from February on the daily feeding of milo was 7.0 lb. It should be remembered that these were the levels required on the dry range forage on the Ft. Reno Station. More or less may be required at other locations depending on the quality of the dry grass available.

The heifers in lots 2 and 3 were changed individually to the opposite regime as they calved. The amount of feed they were fed after being placed on the opposite level was determined by the amount fed to the heifers on the respective level just prior to calving.

After calving, the heifers were checked for occurrence of first postpartum heat. Vasectomized bulls were placed with the heifers from calving until May 1, whereupon the heifers were exposed to fertile bulls until August 15. The bulls were equipped with a special marking harness with a grease-filled pad covering the brisket. The heifers were checked daily, and those with grease marks on their rumps were recorded as being in heat on that day. All heifers were checked for pregnancy by rectal palpation approximately 45 days after the end of the breeding season.

The calves were weighed at birth and permanently identified by ear tattoos. A score was given each cow for difficulty of calving ranging from 1 for no help necessary to 6 for a very difficult birth in which both cow and calf were lost. Calves were weighed at intervals of 3 months. All calves were weaned on October 12 and weaning weights were corrected for sex and adjusted to 210 days of age.

Estimates of daily milk production were obtained on each heifer once each month by measuring the differences in body weight of suckling calves before and after nursing. Briefly the procedure involved separating the cows and calves 12 hours before the initial nursing and during the next 12-hour period before the second nursing. The calves were weighed before and immediately after nursing, as rapidly as possible, on scales graduated to the nearest ¼ lb. Data on any calf that showed excretory loss were discarded. The gain in weight of the calf after suckling was taken as the estimate of milk produced by the cow during that period.

RESULTS AND DISCUSSION

The performance of the heifers is presented in table 1. In this study the nutritional level of the heifer during gestation had a marked effect on birth weight. There was a highly significant difference ($P<.01$) of 14 lb. in the birth weights of calves from heifers fed on the two different levels up to calving time.

Table 1. Performance of two year old heifers fed different levels of supplemental feed before and after calving.

Item	Winter Feed Level			
	Lot 1 Low-Low	Lot 2 Low-High	Lot 3 High-Low	Lot 4 High-High
No. Heifers	20	20	20	20
No. Weaning Calves	16	13	15	14
Heifer Weights (lbs.)				
Nov. 1, 1962	797	804	796	798
Apr. 16, 1963	586	649	701	762
Nov. 13, 1963	868	921	928	961
Winter weight loss as percent of Fall Wt. (%)	26.4	19.2	11.9	4.5
Summer gain as percent of Spring Wt. (%)	46.1	41.4	31.3	24.8
Calving Data:				
Avg. Calving Date	3/11	3/17	3/18	3/15
Avg. Birth Wt. (lb.)[1]	62	63	77	75
% Heifers Requiring Assistance	58	60	84	58
Breeding Data:				
Post-partum interval Calving to 1st heat (days)	92.6	70.4	63.6	55.6
Avg. Breeding Date	6/12	5/29	5/22	5/17
% Pregnant	53	75	100	93
Weaning Wt. (lb.) [2] [3]	358	376	408	432
Supplemental Winter Feed per heifer (lb.)				
CSM	161	203	284	313
Milo	0	249	651	891

[1] HL and HH heavier than LL and LH ($P<.01$)
[2] Corrected for Sex and adjusted to 210 days
[3] HL and HH heavier than LL and LH ($P<.01$)

It might be expected that larger calves at birth would result in more calving difficulty. This was true in the case of one lot (lot 3) of heifers carried on the high level. However, there was no difference in the percent of heifers in the other lots that required assistance. While the cause of calving difficulty cannot be determined from this data, it does indicate that the low feed levels in this study did reduce birth weights but the lower birth weights were not necessarily associated with less calving difficulty. This is not proof, however, that, other factors being equal, birth weight is not an important factor in calving difficulty. The heifers in this study with the lowest birth weights may have had more difficulty calving because of a generally weaker body condition resulting from the low feed level.

The average calving date of the heifers in each lot is about a month before green grass is normally available. It is apparent from the weaning weights that providing additional feed during this month has a beneficial effect. This is evident from a comparison of lot 1 (Low-Low) with lot 2 (Low-High), and lot 3 (High-Low) with lot 4 (High-High). However, it is likewise apparent that the level of feeding prior to calving also has an important effect on the subsequent mothering ability of the heifer. If the amount of feed fed after calving was the most important factor influencing mothering ability, the heifers of lot 2 (Low-High) should have weaned heavier calves than did those of lot 3 (High-Low). When these two lots are compared, the heifers of lot 3 (High-Low) weaned calves that averaged 32 lbs. heavier than those of lot 2 (Low-High), and only 14 lb. of this difference could be explained by a heavier birth weight.

This improved mothering ability is largely milk production, as shown by the average daily milk production data of heifers in the four lots (figure 1). In general they agree with the weaning weights. Although the Low-High lot had higher average production initially and in April, the heifers of the High-Low lot were higher producers from May until August. It is interesting to compare the two extremes, Low-Low and High-High. Even during their period of greatest production in May and June, the Low-Low heifers did not produce as much milk as the High-High heifers were producing as late as July.

The most marked differences between the treatments is in the rebreeding performance of the heifers (table 1). It is apparent that in this trial the level fed before calving was more important than that fed after calving. Nearly all of the heifers in lots 3 and 4 fed high prior to calving conceived. This compares to only 58% of the heifers fed on the low level continuously and 75% of those fed low to calving then raised to high (lot 2).

An increased conception rate was not the only advantage of the high level over the low level. High level heifers had an earlier breeding date and, thus, will have an earlier calving date. When the two extremes (lots 1 and 4) are compared, heifers fed on the high level continuously (lot 4) should calve, on the average, nearly one month earlier than those fed low continuously (lot 1).

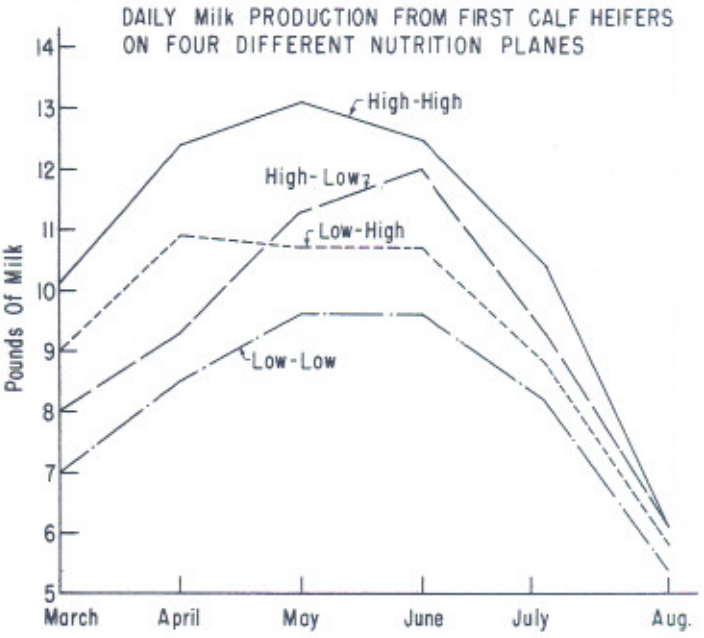

Figure 1.

Most of the difference in average breeding date can be explained by the post-partum interval from calving to first estrus. Again comparing the extremes, the heifers fed high continuously (lot 4) returned to heat, on the average, in 56 days, while those fed low (lot 1) required 93 days. These data point out the practical importance of reducing this post-partum interval since it is closely associated with earlier rebreeding. The earlier the average breeding date, the earlier the average calving date the next year, and the older, and heavier, the calves will be at weaning time in the fall.

As mentioned previously, the level of feeding prior to calving seemed to be more critical than the level fed after calving in this study. This would probably be true in any situation where the heifers are calving in the spring within a month of grass. However, it is very doubtful if this would be the case if they were forced to nurse calves for several months before grass came. Under such a situation the response to the Low-High and High-Low levels might be reversed from what they were in this trial.

Although this study was directly concerned with winter feed levels for bred yearling heifers, it is interesting to consider possible "carryover" effects of their first winter's treatment. The data presented in table 2

suggests the first winter's treatment can have a big influence on rebreeding. Heifers fed on a high level (1 lb. day gain) during their winter as a weaner heifer had a satisfactory conception rate regardless of their second winter treatment. Only one heifer out of nine fed low until calving was open at the end of the breeding season. Likewise, if the heifers were fed at the high level prior to calving during their winter as bred yearlings their conception rate was good regardless of their level of feeding as weaner heifers. The rebreeding performance of heifers fed at a moderate level (.5 lb. per day gain) or a low level (no gain) during their first winter, and carried on a low level prior to calving as bred yearlings suggests more study is needed. Fifty-three percent of the moderate level group and 33% of the low level group were open. Admittedly the numbers are small and further work is needed on this important point.

Earlier studies with weaner heifers have indicated that the low level was not to be recommended because of poor breeding performance. However, although the best performance was obtained with the high level, satisfactory performance was obtained with the moderate level. Because of the costs involved the moderate level has been recommended as the best practical level. These data suggest that the moderate level may be borderline, and may be too low for weaner heifers if they must also be fed at a low during the winter they are bred yearlings.

The economics of these four winter feeding levels must be considered. It is obvious that the High-High level costs more than any other level. However, it seems hardly fair to charge the full cost against the calf weaned in the year concerned. It is obvious that the returns from the next calf crop will be greatly influenced by the breeding performance of the heifers as shown in table 1. Comparing again the two extremes, 40% fewer open heifers would be wintered in the High-High group than the Low-Low group, they would calve, on the average, 25 days earlier and, thus, if all were weaned at the same time, would be approximately 50 lb. heavier. If we assume that the heifers were checked for pregnancy after the breeding season and all open heifers removed

Table 2. Rebreeding performance of 2-year-old heifers fed three different levels their first winter as weaner calves and four different levels the second winter as bred yearlings.

Feed Level	Item	Second Winter Feed Level			
		Low-Low	Low-High	High-Low	High-High
High	No. Heifers	6	3	6	4
	No. Open	1	0	0	0
Moderate	No. Heifers	5	7	4	5
	No. Open	4	4	0	0
Low	No. Heifers	4	5	5	5
	No. Open	2	1	0	1

so no open heifers would be wintered, a replacement rate of 47% would be required for this reason alone for the Low-Low group, compared to 7% for the High-High.

Since the winter feed bill is one of the largest "out-of-pocket" costs to the cattleman this study relates to an annual problem facing the cattleman. No set answer can be given to the question, "How much supplemental feed must I provide?" The amount varies from year to year on the same ranch, and certainly from area to area and even between ranches in the same area. The results reported from this study, combined with data from previous studies at Ft. Reno, suggests that *a low level for heifers up to two years may be a false economy.* It is invariably associated with (a) delayed breeding of yearling heifers, (b) lighter weaning weights of calves, and (c) delayed rebreeding of two-year old heifers, with a higher percent of open heifers at both ages. There is a real need for additional information as to what is the best level of winter feeding consistent with maximum production at the most economical cost.

SUMMARY

Eighty bred yearling Hereford heifers were fed four different levels of winter supplemental feed (milo and cottonseed meal) while grazing dry native grass pastures. Two groups were fed at a low level prior to calving and two groups were fed at a high level prior to calving. The heifers of one group on each level were switched to the opposite feed level at calving time. Thus, the four treatments were: Low-Low, Low-High, High-Low and High-High, indicating, respectively, the feed levels before and after calving. The low level was the amount of feed necessary to establish a loss of more than 20% of the fall weight through calving. The high level was the amount necessary to maintain the fall weight through calving.

Heifers fed at the High level prior to calving dropped calves that averaged 14 lbs. heavier at birth than did the Low level heifers. Heifers fed High prior to calving returned to heat earlier, bred back earlier and had a higher conception rate (93% and 100% vs 53% and 75%) than did heifers fed low up to calving. Raising the Low level heifers to High at calving resulted in a 2 weeks earlier breeding date, a higher conception rate (75% vs 53%) and an 18 lb. heavier average weaning weight. Average weaning weights followed amount of winter feed fed and were as follows: High-High, 432 lbs.; High-Low, 408 lbs.; Low-High, 376 lbs.; and Low-Low, 358 lbs. The heifers of the High-High lot had the highest average milk production, the heifers of the Low-Low lot had the lowest, and the other two lots were intermediate between the two extremes.

These data do not permit specific recommendation as to the best practical level for wintering bred yearling heifers. They do suggest that low levels, while costing less at the time, may be false economy. They eventually are costly in terms of more open heifers, later breeding and calving, and reduced calf crop percentages.