Factors Affecting Milk Production of Range Beef Cows

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The quantity of milk available for the calf has long been recognized as one of the most important factors affecting weaning weights. It is known, for example, that two-year-old heifers wean about 80 lb. lighter calves than they will at maturity. In any herd, some beef cows appear to be better mothers and milkers than others, and consistently wean off heavier calves.

The amount of milk produced by a beef cow depends on many factors, such as: available feed, time of calving relative to spring grass, age, condition, and inherent producing ability. Unfortunately, little emphasis has been placed on milk production in many range herds. Many of the factors that influence milk production among range cows are poorly understood.

During the past three years, milk production data have been obtained on more than 300 range beef cows, in both fall- and spring-calving herds. While the data have been collected primarily to study the effects of winter feed on milk production, during both the winter and the following summer on grass, a number of interesting observations can be made as to the importance of milk to the growing calf, and the factors that influence milk production of beef cows.

Procedure

Estimates of dairy milk production were obtained from differences in body weight of suckling calves during two nursing periods at 12-hour intervals, following a preliminary period to establish the base time. Chute and scale facilities were designed to permit rapid handling of calves in small groups (6 to 10 head) before and immediately after nursing. Calves were separated from the cows 12 hours before the initial nursing and during the next two periods. Cows were fed prairie hay and had water available. The scales were graduated to the nearest ¼ lb., and the records show a rather high degree of accuracy in obtaining weights. Such a procedure made it possible to obtain frequent estimates on large number of cows.

The calves were weighed before and after nursing, as rapidly as possible, and data on any calves which showed excretory loss were discarded. It has been determined from more detailed studies with identical-twin cows at Stillwater that the calf obtains more milk from nursing the beef cow than can be obtained by hand-milking. Also, the cow is in the proper state for optimum lactation while nursing the calf. A disadvantage of the nursing procedure is that it is not possible to obtain samples of milk for chemical analysis. Other stations have employed different techniques for collecting milk production data. One method involves the injection of a hormone which causes the "let down" of

milk. With any method, it is probable that the estimates obtained are conservative and that cows actually produce more out in the pasture.

Milk production records were obtained on two-year-old heifers as well as mature cows under a spring-calving program. Other studies included fall-calving cows. In one experiment, it was possible to collect milk production data on the same females for two consecutive years. Results of the first estimate may be somewhat in error if the young calves were unable to completely nurse out the cows. Similarly, the accuracy of the last sampling is probably influenced by the reduced milk flow of the cow and heavier weights of the calves. It is believed that the records obtained between two to five months of age are reasonably accurate, and estimates of the repeatability of low or high performance suggest that this is true.

Results

1. **Difference in milk production among individual cows.** Since numerous studies on weaning weights of calves from different cows show a rather consistent pattern between low and high producers in the same herd, it is not surprising that milk production data also exhibit the same trend. Data on the 7-month lactation pattern of the top and bottom cows which were on the same wintering regimes and of the same age are shown in Figure I. Note that the better producing cows averaged 8.4 lbs. more milk per day, as determined from seven estimates taken during the summer of 1962. Sex corrected weaning weights (210 days) of their calves were 70 lbs. heavier than for the low producers.

2. **Relationship of milk yield to calf gain.** In both fall- and spring-calving herds, it has been possible to express mathematically the relationship (correlation) between the amount of milk produced by the cow and the average daily gain of her calf. This has been determined at various intervals during lactation, and shows some difference between spring vs. fall calving, since the fall-dropped calf is much more dependent for growth on the dam's milk.

Table I shows some of the correlation coefficients that have been obtained in spring-calving herds. From these, it is possible to calculate the percent of the variation in calf gain which can be accounted for by differences in milk production of their dams (correlation squared). Note that the correlations are much higher early in life of the calf, with values in excess of .8 up to three months of age. After the third month, the correlations decline sharply, and often become slightly negative as the calf depends less on milk and more on other feed for gain. From birth to weaning, as much as 50% of the variation in calf gain can be accounted for by differences in milk production of their dams.

With such correlations between milk yield and calf gain, it is apparent that as we select for heavier weaning weights we also favor heavier milk production, especially if the selection is made early in the calf's life.

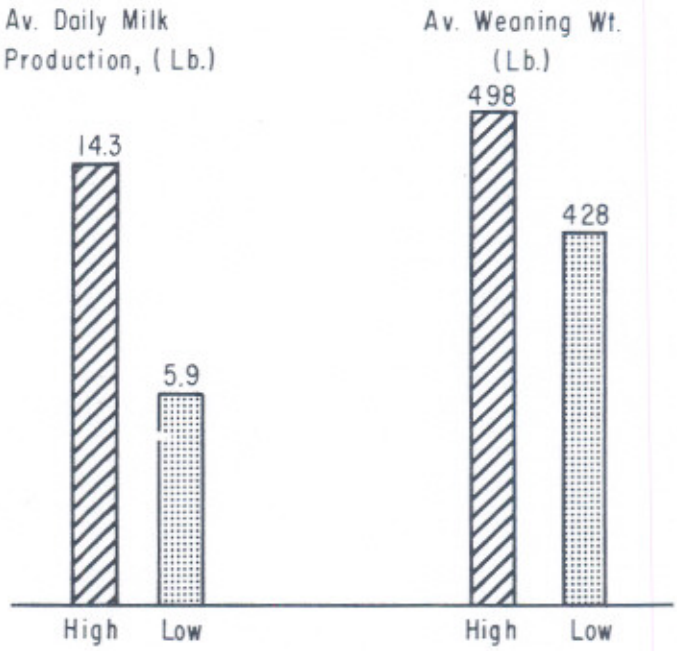

Figure 1. Average Daily Milk Production (5 Estimates) and Weaning Weights of Calves from 6 High and 6 Low Producers at Ft. Reno.

3. **Effect of winter feed level on milk production.** Graphs presented in Figures II and III show dramatically the shape of the milk production curve for spring and fall calving cows, as influenced by winter feed levels. This is one of the most dramatic and important factors influencing milk production. Fall-calving cows fed poorly during the winter give less milk than those fed more liberally (see Figure II). With cows calving in February and March, this effect of poor winter feed conditions carries into the following summer, even though the cow is on good pasture. Such a carryover effect is apparent in Figure III. This substantiates the common practice of dairymen to build up the cow shortly before each lactation. This is necessary for the development of proper secretory tissue, and must precede each succeeding lactation, otherwise milk yields suffer. Cows fed poorly up to calving may not recover and milk as well as those well-fed before parturition. Preparation for milk production must begin, therefore, before calving and especially during the last 6 weeks.

Are the depressing effects of low feed levels early in life permanent as far as the beef female is concerned? Some indication of this can be obtained from data on milk production of spring-calving cows that had

function of body weight ($W^{.73}$), this factor was calculated for each of 49 cows, using an average of spring and summer weights. When correlated with average milk production for the summer, a value ____ was obtained.

It is apparent from the above data that, regardless of the means of expressing body size or weight, there appears to be little or no relationship between size at 4 years of age and milk production, within the two groups of cows. Among cows that are well-developed for their age, there seems to be little association between body size and milk production. Both large and small cows in the above group appeared to be able to lactate to their inherent capacity for production, while on summer grass. This poses a fundamental question as to the optimum size of a range beef cow, in line with most economical and profitable production.

8. **Are current feeding standards adequate for lactating beef cows?** From the body weights of a beef cow, and with some idea of probable production, it is possible to utilize the data available on dairy females and apply this to different weights and production levels among beef cows. Thus, it is possible to estimate whether or not our current standards (Morrison or NRC) are adequate for the lactating beef female. Such data have been calculated in Table III, using an estimated value of 3.5% for butterfat.

It appears that the digestible protein allowance may be seriously low for cows producing 25 lbs. of milk a day, especially with body weights in excess of 1,100 lbs. TDN standards appear adequate for all but the heavier, high producing beef cows. Calcium requirements appear to exceed current standards for the high producers, but this may

Table 3.—Comparison of Calculated Nutrient Requirements Based on Body Weight and Milk Production vs. Current Recommended Allowances (lb./day)[1]

Nutrients or Mineral	Digestible Protein	TDN	Calcium	Phosphorus
900 lb. Cow				
15# milk/day	1.28	11.7	.053	.046
25# milk/day	1.74	14.7	.075	.062
1,100 lb. Cow				
15# milk/day	1.40	13.1	.057	.050
25# milk/day	1.86	16.1	.079	.066
Current Recommendations for 900-1,100 lb. beef cows nursing calves	1.2-1.4	12-15	.066	.053

[1]Assuming 3.5% butterfat; calculated values based on requirements of dairy cows (Morrison, *Feeds and Feeding*, 22nd Ed., Appendix Table III).

not be critical since excess quantities are available in most roughages and pasture. Phosphorus is apparently ample, or nearly so, for most weights and levels of production.

Summary

Estimates of milk production on more than 300 range beef cows, representing both spring and fall-calving herds, were analyzed to determine some of the factors that influence milk production. A wide individual difference in milk production among cows was observed. Milk production was highly correlated with daily gain of calves, accounting for 50 to 80% of the variation observed in calf gains to three months of age. Data on 49 four-year-old cows were analyzed to determine the effects of birth date, sex, and birth weight of calf on milk production. Time of calving in relation to the first sample had an important bearing on the first milk production estimate. Male calves and those with heavier birth weights were associated with a slight increase in milk production of the dam. Body size of the beef cow had little bearing on milk production, and fall body weights were negatively associated. Milk production was found to be a highly repeatable trait, hence good or poor producers tend to repeat their performance in relation to other cows in the herd. The feed level prior to and during lactation had a marked influence on milk yields.

The Comparative Value of Corn, Milo and Barley Rations For Fattening Calves

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Sorghum grain is the principal high energy feed available for fattening cattle in the Southwest. Barley has been an increasingly abundant grain in recent years and has been extensively used in cattle fattening rations by the small feeder in particular. Even more sorghum grain and barley may be available for beef rations in future years. Corn, which consistently produces good results and is the standard grain to which others are compared, is often used as the grain in cattle fattening rations in the eastern portion of the state.

Although considerable research has been done on the relative feeding value of grains, many of the previously reported feeding trials involved hand-feeding and often high concentrate rations. Furthermore, most of the comparisons have been with rations which contained constant levels of protein supplement and roughage, with the kind of grain as the only variable and no allowance made for differences in chemical