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THE RELATIVE INFLUENCE OF AGE OF DAM, BIRTH WEIGHT, AND SIZE OF DAM ON WEANING WEIGHT OF CALVES

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INTRODUCTION

The range beef cattle breeder is vitally concerned with the size of his calves at weaning. Either he is selling feeder calves and needs large ones to make the selling price high or he is developing them on grass and cheap forage and needs large calves to winter well and make good use of forages.

Several factors influence weaning weights of calves. The present study considers the influence of size of calf at birth and age and size of cow on weaning weight.

LITERATURE

Larger dairy cows generally produce more milk than smaller ones of the same breed (Gowen, 1925; Gaines, 1931, 1940; and Misner, 1938). If the same relation between size of cow and milk production exists in beef cattle, one would expect that calves getting the advantage of more milk from the larger cows would reach heavier weaning weights.

The age of dairy cattle has sufficient influence on milk production that age conversion factors have been developed for each of the major dairy breeds. Early investigators showed that young cows did not produce as much milk as they did at maturity (Gowen, 1920 and Gaines, 1935). With advancing age production of milk declines, which means that cows between 6 and 8 years of age are at their maximum in milk production. Beef cattle might be expected to improve in milk yield as they reach maturity and this increased milk should reflect itself in heavier calves at weaning.

Some data at the U. S. Range Livestock Station at Miles City, Montana ( ) and at the New Mexico Station ( ) indicate that larger cows wean heavier calves.

PROCEDURE

The data were collected on birth weight, cow weight, and age, and weaning weight of calf over a period of 11 years at the Squaw Butte-Harney Station. A total of 885 calves on which complete data were collected were used in the study. The cows at the Station were fed meadow hay during the winter and pastured during the summer on desert range consisting mostly of bunchgrass as the source of feed.

During the fall the cattle were grazed on meadow grass and hay stubble and had access to bunched meadow grass hay.

The weight of the cow is on the basis of a non-pregnant animal. Fall weights were used and pregnant cows had a correction deducted from their weights to eliminate the calculated weight contributed by the calf, fluids and membranes. In using fall weights only a small correction for pregnancy is necessary and, therefore, the error in use of a factor will have little influence. The normal breeding season was June - October, inclusive.

The calves were all weighed periodically during the summer and were weaned the last of November. The weight of the calf was corrected to a 32-week-age basis by use of a factor of 8.9 lbs. per week. This factor, 8.9 lbs. per week or 1.28 lbs. per day, was calculated from data on 432 calves produced at the Squaw Butte-Harney Station (Sawyer, Oloufa and Bogart, 1948) and is in agreement with a factor of 1.33 lbs. per day for range cattle at the New Mexico Station (Koger and Knox, 1945).

The data were analyzed by correlation and partial regressions using weaning weight as the dependent variable.

RESULTS

Age of cow, weight of cow and birth weight of calf not only influence the weaning weight of calves, but also they are all interrelated. For example, age of cows, when cow size and birth weight of calves were ignored, had a marked effect upon weaning weight of calves.

TABLE 1

EFFECT OF AGE OF DAM ON WEANING WEIGHT OF CALF

Age of Dam	Number	Weaning Wt.
2	44	272
3	67	296
4	61	322
5	40	343
6	51	339
7	42	348
8	47	355
(over)8	80	336

But we know that age of cow influences her size and the birth weight of her calf.

Size of cows influences the weaning weight of calves. When the regression of calf weaning weight on cow size is determined without regard to cow age or birth weight of calf, the figure obtained is 0.33. Thus, for each 100 lbs. difference in cow weight there is a corresponding difference of 33 lbs. in weaning weight of the calf.

When the method of partial regressions is used, each of the factors, i.e., age of cow, weight of cow and birth weight of calf, can be studied by holding the other two factors constant.

The correlation coefficients are shown in Table 2.

TABLE 2

CORRELATION COEFFICIENTS OF
AGE OF COW, SIZE OF COW, BIRTH WEIGHT
AND WEANING WEIGHT OF CALF

	Birth Wt.	Wt. of Dam	Weaning Wt. of Calf
Age of Dam	⁄0.151	⁄0.524	⁄0.316
Birth Weight		⁄9.229	⁄0.287
Weight of Dam			⁄0.419

All are significant.

The regression equation is: $Y = 2.85X - 2.14X_2 - 0.15X_3$ where

X = age of dam in years at calving
X_2 = birth weight of calf
X_3 = corrected weight of the dam
Y = corrected weaning weight

By analysis of variance it was shown that the variance due to regression was significantly greater than the error variance (Table 3).

TABLE 3

ANALYSIS OF VARIANCE

Source of Variance	D/F	2 x 2	G 2	F
Total	884	2,873,658		
Regressions	3	647,982	215,994	85.5
Error	881	2,225,676	2,526	

The confidence intervals at the 95% level of the population regression coefficients B are shown.

TABLE 4

CONFIDENCE INTERVALS

B1	Age of Dam	1.29 to 4.41	(2.85)
B2	Birth Weight of Calf	1.49 to 2.78	(2.14)
B3	Weight of Dam	0.11 to 0.18	(0.15)

The data show the following:

1. When birth weight of calf and weight of dam are held constant each year of age of the dam accounts for 1.29 to 4.41 (2.85) lbs. difference in weaning weights of the calf.

2. When age of the dam and weight of the dam are held constant, each difference of one pound at birth is associated with a difference of 1.49 to 2.78 (2.14) lbs. in weaning weight of calf.

3. When age of dam and birth weight of calf are held constant, each 100 lb. difference in weight of dam is associated with 11 to 18 (15) pounds difference in weaning weight of calf.

4. Approximately 23 percent of the variations in weaning weight of calves is accounted for by differences in birth weight, age of dam and size of dam.

There are two major factors which may cause cows of the same age to differ in size--the feed and management and the inherent growth tendencies.

Heifers at the Squaw Butte-Harney Station have been developed under different feed conditions and a part of them have been bred first as yearlings, whereas the others were bred first as two-year-olds. Preliminary results indicate that breeding as yearlings, particularly when the heifers were not well grown out, reduced the size of the heifers and lowered the weaning weight of the calves. Heifers that were grown out on meadow hay alone were 100 lbs. lighter as yearlings than those that got 2 lbs. per day of soybean cake in addition to meadow hay or than those grown out on alfalfa hay alone. This effect, though not as great, was still evident as three-year-olds, particularly when they were bred as yearlings, even though all were handled the same after they were yearlings. Those heifers that were stunted in development by poor feed and breeding

as yearlings weaned smaller calves and settled with more difficulties than those developed in better conditions. Breeding as yearlings had a much greater influence on size of cows as three-year-olds and on weaning weight of calves when the cows were three years old than feed during the development of the heifers (Table 5).

TABLE 5

EFFECT OF BREED FIRST AS YEARLINGS
COMPARED WITH BREEDING FIRST AS 2-YEAR-OLDS

Group	Cow Weight as 3-yr.-old	Weaning Weight of Calf (Cow 3-yrs.-old)
Bred first as yearling	643	275
Bred first as 2-year-olds	712	320

DISCUSSION

Large cows definitely wean heavier calves. Studies on feeding and management indicate that environmental factors which influence cow size also influence the weaning weight of calves. However, heavier calves are associated with heavier cows of the same age and handled under the same conditions. This indicates that the genes for growthiness are associated with genes for heavier milk production. It stresses the importance of selecting for large cow size in our breeding program.