

Relationship Among Performance Traits in Young Cattle  
as Influenced by Nutritional Level<sup>1/</sup>

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Records of performance have clearly demonstrated their merit in selection programs for the improvement of beef cattle. The selection of animals for replacement stock and for the feedlot is often carried out at a young age; consequently, the success of such selection depends on the accuracy of predicting future performance from early growth. Several workers have studied relationships of performance traits during different periods of growth. However, published information regarding the influence of feeding level on these relationships is limited. The purpose of the work reported in this paper was to study the relationships of weaner performance under high and low levels of feeding, yearling performance on summer range, and long yearling performance under a high level of feeding.

#### Materials and Methods

The data used in this study were collected at the Squaw Butte Experiment Station, Burns, Oregon. Individual records on 254 Hereford cattle were used to study the relationships of suckling gain, weight gains and feed efficiency during a 120-day feed test as weaner calves, and gain on summer range as yearlings. The data were collected over a ten-year period from 1951 to 1961.

During the test periods, 95 animals received a low level of feeding (a ration composed of 14 percent concentrate and 86 percent native meadow hay) while the other 159 animals received a higher level of feeding (a ration composed of 50 percent native meadow hay and 50 percent barley-cottonseed meal mix). All animals tested under the low level of feeding were heifers while those tested under the high level of feeding were heifers and steers. All animals were individually fed during each test period. Rations were weighed to the animals daily and refusals were weighed at weekly intervals. The animals were tied to individual mangers from 7:00 a.m. to 3:00 p.m. daily and ranged in common lots during the remainder of the day. Individual weights

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were recorded at 14-day intervals. All weights were taken following an overnight restriction from feed and water. During the summer following each test period, the animals were grazed in common on sagebrush-bunchgrass range. Individual records of weight gains on summer range were maintained on all animals.

Fifty-three animals (of the original 254 involved in this study) were individually fed through a second feed test period as long yearlings making it possible to study relationships of performance traits during this period with suckling gain, performance on test as weaner calves, and gain on summer range. All animals fed as long yearlings received a common ration (50 percent native meadow hay and 50 percent barley-cottonseed meal mix). The same procedure regarding methods of feeding and weighing animals was followed during the long yearling tests as was used during weaner calf tests. Data on this phase of the study were collected over a two-year period.

All possible correlations were made among performance traits recorded at different periods of growth. Since two levels of feeding were used during weaner calf tests, each was analyzed separately. Adjustments were made for year, age of calf and sex effects.

### Results and Discussion

The average suckling gain for animals used in this study was 1.44 pounds with a standard deviation of 0.25 pounds. Means and standard deviations of other performance traits studied are shown in table 1.

Table 1. Means and Standard Deviations of Performance Traits at Different Periods of Growth by Level of Feeding<sup>a/</sup>

Period and trait	Low level feeding			High level feeding		
	No.	Mean	S.D.	No.	Mean	S.D.
<u>Weaner calf</u>						
Daily gain	95	0.89	0.27	159	1.57	0.32
TDN/lb. gain	95	6.64	2.82	159	5.00	0.95
<u>Yearling</u>						
Daily gain	95	1.54	0.35	159	1.43	0.43
<u>Long yearling</u>						
Daily gain	26	1.73	0.34	27	1.78	0.22
TDN/lb. gain	26	6.56	1.61	27	6.79	0.79
Two-year old weight	26	869.0	91.0	27	946.0	76.0

<sup>a/</sup> Animals received high and low levels of feeding as weaner calves, grazed in common on summer range as yearlings, and were fed a common ration as long yearlings.

Correlations of suckling gain with performance under two levels of feeding as weaner calves, summer performance on range, and long yearling performance on a feed test during which all animals received the same feed are given in table 2. The correlations involving suckling gain with performance traits during later periods of life show similar patterns under the two levels of feeding. The relationships of suckling gain with performance on feed test as weaner calves were low and non-significant. These relationships appeared somewhat closer with long yearling performance but the correlations still lacked significance. Dahmen and Bogart (1952) reported that suckling gain had no effect on feedlot gain.

Table 2. Correlations of Suckling Gain with Performance Traits at Later Periods of Growth by Level of Feeding

Correlation of suckling gain with: <sup>a/</sup>	Level of feeding <sup>b/</sup>			
	d.f.	Low	d.f.	High
Gain on test (1)	87	-.12	147	.01
Feed efficiency (1)	87	.20	147	.09
Gain on range	87	.08	147	-.23**
Gain on test (2)	23	.27	24	.22
Feed efficiency (2)	23	-.17	24	-.13
Two-year old weight	23	.67**	24	.44*

a/ Numbers 1 and 2 in parentheses refer to feed tests as weaner calves and long yearlings, respectively.

b/ High and low levels of feeding conducted only during test period as weaner calves.

Yearling gains on range were negatively correlated with suckling gain when animals received the higher level of feeding as weaner calves but under the low level of feeding this relationship was not apparent (table 2). Koger and Knox (1951) found a negative relationship between weaning weight and yearling gain under semi-arid range conditions of southern New Mexico.

A close relationship existed between suckling gain and two-year old weight under each level of feeding (table 2). This would favor emphasis on suckling gain in a selection program directed towards increasing size and weight in two-year old heifers. In studies conducted by Romo and Blackwell (1954) and Swiger (1961) high correlations were found between weaning weight and yearling weight. Koger and Knox (1951) reported that weight differences at weaning time became greater at later periods of growth.

Correlation among performance traits at weaner calf, yearling, and long yearling periods of growth are presented in table 3. Negative correlations where feed efficiency is involved denotes greater efficiency. Faster gaining animals during weaner calf and long yearling tests were also more efficient animals regardless of feeding level.

Table 3. Correlations among Performance Traits at Weaner, Yearling and Long Yearling Periods of Growth by Level of Feeding

Correlations <sup>a/</sup>	Level of feeding <sup>b/</sup>			
	d.f.	Low	d.f.	High
Gain on test (1) with:				
Feed efficiency (1)	87	-.71**	147	-.67**
Gain on range	87	.27*	147	.08
Gain on test (2)	23	.21	24	.44*
Feed efficiency (2)	23	-.30	24	-.14
Feed efficiency (1) with:				
Gain on range	87	-.14	147	-.17*
Gain on test (2)	23	-.13	24	-.58**
Feed efficiency (2)	23	.24	24	.38*
Gain on range with:				
Gain on test (2)	23	.36	24	-.20
Feed efficiency (2)	23	-.49*	24	.07
Gain on test (2) with:				
Feed efficiency (2)	23	-.89**	24	-.90**

a/ Numbers 1 and 2 in parentheses refer to feed tests as weaner calves and long yearlings, respectively.

b/ High and low levels of feeding conducted only during test period as weaner calves.

Correlations of gain on test as weaner calves and subsequent summer gains on range were small but significant when weaners received low level feeding (table 3). The work of Kidwell (1954) and that of Koger and Knox (1951) suggests that relationships between growth made at different periods can be masked by variable environmental conditions. Perhaps in this study the more drastic nutritional change between weaner and yearling periods for the higher fed animals accounts for their lower relationship of gains between the two periods. In past studies, several workers (Ruby *et al.*, 1948; Kidwell, 1954; Embry *et al.*, 1958) have reported negative or no correlation between winter and summer gains in young cattle. Contrary to these findings, Urick *et al.* (1957) found that gains on summer mountain range were highly correlated with previous (0.45) and succeeding (0.87) winter gains.

Weaner calves requiring less TDN per pound of gain tended to gain faster on summer range as yearlings (table 3). High level feeding for weaner calves appeared to strengthen this relationship. A high rate of gain on summer range for animals previously wintered on the low level of feed was indicative of greater efficiency on feed as long yearlings.

The association of rate and efficiency of gain as weaner calves with the same data as long yearlings was quite close when weaners were tested under the higher level of feed; however, this did not hold true when weaners received the lower level of feed. This might indicate that animals on the low level ration were not able to express their inherent growth potential. These data would also suggest that the prediction of feedlot performance from weaner calf performance would be considerably more accurate where calves are fed a more liberal growing ration rather than a somewhat limited ration. Kidwell (1954) and Urick *et al.* (1957) reported high correlations between gains made by animals fed during two successive winter periods as calves and long yearlings. In studies conducted by these workers animals were fed similar rations during the two winter periods.

Correlations of two-year old weight with performance traits at weaner calf, yearling, and long yearling stages of growth are shown in table 4 by level of feeding. Where the higher level of feeding was used on weaner calves their test gains were more closely related to two-year old weight than were their suckling gains (tables 2 and 4); however, the reverse was true in the case of calves fed the low level ration. Performance traits during the yearling and long yearling growth periods for animals fed at the lower level as calves showed a much closer association with two-year old weight than was found for the higher fed animals. This, however, should be expected since the higher fed animals naturally acquired a larger percent of their two-year old weight at a younger age than did the lower fed animals.

Table 4. Correlations of Two-year Old Weight with Performance Traits at Earlier Periods of Growth by Level of Feeding

Correlation of 2-year old weight with: <sup>a/</sup>	Level of feeding <sup>b/</sup>			
	d.f.	Low	d.f.	High
Gain on test (1)	23	.39*	24	.72**
Feed efficiency (1)	23	.09	24	-.35
Gain on range	23	.59**	24	.02
Gain on test (2)	23	.69**	24	.47*
Feed efficiency (2)	23	-.60**	24	.16

<sup>a/</sup> Numbers 1 and 2 in parentheses refer to feed tests as weaner calves and long yearlings, respectively.

<sup>b/</sup> High and low levels of feeding conducted only during test period as weaner calves.

## Summary

Two hundred fifty-four Hereford cattle were used to study the relationships of performance during the suckling period, weaner performance under high and low levels of feeding, and yearling performance on summer range. Part of these animals were fed through the long yearling period of growth to approximately two years of age which allowed expansion of the study to include performance during this period.

Suckling gains were closely associated with two-year old weight, were not related to performance as weaner calves and were negatively correlated with yearling gains when animals had received the higher level of feed as weaner calves.

Feeding weaner calves at a higher level tended to strengthen the relationship of weaner and long yearling performance and tended to weaken the relationship of weaner performance on feed with yearling performance on range. Two-year old weight was more closely associated with weaner performance when high level of feeding was used and with long yearling performance when animals had received low level feeding as weaner calves.

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