Relationships of On-Test Hip Height With Growth and Carcass Traits of Hereford Calves

P.J. Zerbino[1] and R.R. Frahm[2]

Story in Brief

A total of 571 Hereford calves were measured at the hips to study the relationships of on-test hip height with growth, feedlot performance and carcass traits of cattle slaughtered at a constant final weight of 1150 pounds.

On-test hip height was moderate to highly correlated with weaning weight, yearling weight and weight per day of age (average .59), suggesting that taller on-test cattle were generally heavier at all stages. Taller cattle on-test tended to gain more rapidly ($r = .18$) and to remain fewer days on feed ($r = -.51$), thus were younger at slaughter ($r = -.52$). Taller cattle on-test also tended to have less fat at slaughter ($r = -.19$ and $-.17$ for fat thickness and marbling, respectively).

The ranking of three traits in terms of predictability based on weight and height measurements was days on feed ($R^2 = .73$), weight per day of age ($R^2 = .69$) and feedlot ADG ($R^2 = .24$). Weight was a more useful predictor of performance than height and including height in addition to weight yielded little if any improvement.

Introduction

Historically there has been considerable controversy as to what type of beef cattle are most profitable. Consequently, at different times both small, early maturing cattle types and larger, later maturing types have been favored by producers. The current trend seem to favor larger framed, later maturing cattle and thus many producers are currently interested in increasing the height of their cattle. Research is needed to more clearly determine the relationships of height measurements with economically important traits in order to more effectively utilize height in developing selection criteria to produce more efficient cattle. The purpose of this study was to estimate the correlation of on-test hip height with growth, feedlot performance and carcass traits and to determine the predictability of certain traits using weight and height measurements on Hereford calves when slaughtered at a constant final weight of 1150 pounds.

Materials and Methods

Data involved in this study were provided by the American Hereford Association from herds that were enrolled in their Total Performance Record Keeping Program (TPR). Calves were born in the spring of 1979 and consisted of 417 steer and 154 heifer calves from 10 different herds. Following a

[1]Graduate Student [2]Animal Science Professor

variable period of time (from 9-70 days) after weaning calves were placed in the feedlot and fed a finishing ration until a constant final weight of 1150 pounds was attained.

Data supplied by the American Hereford Association for each of the 577 calves were: hip height and age of calves at the start of the feeding period, 205-day adjusted weaning weight, 365-day adjusted yearling weight, weaning to yearling ADG, feedlot ADG, age at slaughter, days on feed, weight per day of age, fat thickness, percent cutability and marbling score. Since the average age of the calves at the beginning of the feeding phase was 280 days, hip heights were adjusted for 280 days for purposes of this analysis.

Results and Discussion

Correlations of on-test hip height with various growth, feedlot and carcass traits are presented in Table 1. These correlations indicate that taller cattle at the start of the feeding period were heavier at weaning ($r = .66$) and yearling time ($r = .56$) and had higher weight per day of age at slaughter time ($r = .55$). Although the relationship was not as strong, tall cattle on test tended to gain more rapidly in the feedlot ($r = .18$). When the intended slaughter weight of approximately 1150 pounds was reached, taller cattle on-test were generally in the feedlot fewer days ($r = -.51$) and were younger at slaughter ($r = -.52$). These results are in agreement with the relationships described in the growth curve for cattle of different mature sizes. Taller, larger framed cattle would generally gain more rapidly and thus be younger at constant weights. Correlation of hip height with fat thickness ($-.19$) and marbling ($-.17$) indicated that taller cattle on-test attained final weight with less backfat and lower stage of maturity than shorter cattle. Consequently, taller cattle on-test tended to have higher cutability ($r = .16$). Even though the cattle were to be slaughtered at a constant weight of 1150 pounds, taller cattle on test tended to have heavier slaughter weights ($r = .25$).

Prediction equations for feedlot daily gain, days on feed and weight per day of age based on weight and height measurements are presented in Table 2. The values in the upper part of the table are partial regression coefficients and thus represent the expected change in the predicted trait for each unit change in that particular trait in the prediction equation. For example in equa-

Table 1. Correlations of on-test hip height with various growth, feedlot and carcass traits[a]

Trait	On test hip height	Trait	On test hip height
Weaning weight	.66**	Slaughter age	−.52**
Yearling weight	.56**	Wt/day of age	.55**
Wn to Yrlg ADG	.19**	Fat thickness	−.19**
Feedlot ADG	.18**	Cutability	.16**
Days on feed	−.51**	Marbling	−.17**
Slaughter weight	.25**		

**P < .01.
[a]Correlations adjusted for sex of calf, age of dam and location (herd of origin).

Table 2. Prediction equations for feedlot daily gain, days on feed and weight per day of age[a]

	Feedlot average daily gain			Days on feed			Weight per day of age		
	1	2	3	4	5	6	7	8	9
Weaning weight	−.0012**			−.075**			0.0005**		
Yearling weight	0.0017**	0.0014**	0.0014**	−.214**	−.233**	−.266**	0.0011**	0.0012**	0.0015**
On-test hip height	0.0157	−.0007		−2.069*	−3.137**		0.0237**	0.0307**	
R^2[b]	.24	.23	.23	.72	.71	.69	.68	.65	

*P<.05, **P<.01.

[a]Partial regression coefficients included only for the traits of interest. Prediction for an individual animal would also require the appropriate coefficient for herd location, sex of calf and age of dam.

[b]R^2 = coefficient of determination which represents the proportion of the variation in the trait being predicted that is accounted for by the respective prediction equations.

tion 8, weight per day of age is predicted by .0012 (yearling weight) + .0307 (on-test hip height). The .0012 indicates that for each pound heavier in yearling weight an individual is weight per day of age is expected to increase by .0012 lb and each inch increase in hip height is expected to increase weight per day of age by .0307 lb. In order to complete the prediction of weight per day for an individual, it is necessary to also include appropriate coefficients for herd location, sex of calf and age of dam. These partial regression coefficients are included solely to indicate the form of the respective prediction equations and will not be discussed further.

The usefulness of different prediction equations can be compared by making comparisons among the coefficients of determination (R^2) which gives the proportion of the variation in the predicted trait that is accounted for by the respective prediction equations. The higher the R^2 value is the more accurate that equation is in predicting performance with regard to a particular trait. The ranking of the three traits in terms of predictability was days on feed ($R^2 = .73$), weight-per-day-of-age ($R^2 = .69$) and feedlot ADG ($R^2 = .24$).

The predictability of feedlot ADG was too low to be of practical value since only 24 percent of the variation in feedlot ADG could be accounted for by the best prediction equation ($R^2 = .24$, equation 1). Yearling weight alone ($R^2 = .23$, equation 3) was as good a predictor as yearling weight plus hip height ($R^2 = .23$, equation 2).

Days on feed was much more predictable. Yearling weight alone ($R^2 = .71$, equation 6) was nearly as good as those equations that also included hip height ($R^2 = .72$, equation 5) or hip height and weaning weight ($R^2 = .73$, equation 3).

A similar pattern was exhibited for predicting weight per day of age. Yearling weight alone ($R^2 = .65$, equation 9) accounted for 65 percent of the variation in weight-per-day-of-age. Little practical improvement was attained by adding hip height and weaning height to the prediction equation ($R^2 = .69$, equation 7).

Although hip height of Hereford cattle at the start of the finishing period does have some association with rate of gain during the finishing period, it is not as high as weight traits. Weight traits appear to be more useful as indicators of growth, feedlot and carcass traits. Thus, if weight measurements are available, there would be little practical value from including hip heights in the evaluation.