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1982

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CHARACTERIZATION OF BREEDS REPRESENTING DIVERSE BIOLOGICAL TYPES: POSTWEANING GROWTH AND FEED EFFICIENCY

Larry V. Cundiff,¹ Robert M. Koch, and Keith E. Gregory

Introduction

On a life-cycle basis, about 30% of the energy requirements for beef production are consumed by steers and heifers during the period from weaning to slaughter. About 45 to 55% of the total feed costs are incurred in the postweaning period, depending on the cost of feed resources for the cow herd relative to those for the feedlot. We find it is important, therefore, to characterize breeds of cattle for rate and efficiency of postweaning gain.

Procedure

Steers were weaned in late October and allowed a conditioning period of about 28 days before feeding trials were initiated in mid-November of each year when the steers were about 8 months of age. Steers were fed free choice diets consisting of corn silage-concentrate (concentrate contained varying amounts of ground corn, ground grain sorghum, and ground wheat) and supplement (primarily soybean meal) varying in energy density from 1.2 Mcal metabolizable energy (ME/lb) dry matter early in the feeding period to about 1.35 Mcal ME/lb dry matter late in the feeding period.

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Steers were allotted to pens by sire breed groups except that Hereford-Angus reciprocal crosses were penned together. Breed groups were randomly divided into two pens each year to provide for statistical analyses of postweaning feed efficiency. Steers were slaughtered in three to five groups each year with an average interval of 70 days between the first and last kill. Time on feed required to reach end points of a small degree of marbling or 18.9% fat trim was estimated from increases in marbling or fat trim associated with increased time on feed. Steers were generally weighed at 28-day intervals. Quadratic regression of pen mean weights and cumulative ME on days fed were used to estimate gain, ME consumption, and efficiency (Mcal ME/lb gain) in alternative intervals.

Efficiency of live weight gain was evaluated for four different intervals: time constant (0 to 238 days on feed), weight constant (545 to 1,035 lb), grade-constant (0 days on feed to a small degree of marbling), and fat-trim constant (0 days on feed to 18.9% fat trim). The level of marbling selected as an end point was small because this is the level of marbling required for cattle of these ages to achieve a quality grade of USDA Choice. The 18.9% fat trim level was the average fat trim for breed groups at 0.5 in fat thickness at the 12th rib.

Results

Results presented in Table 1 for postweaning growth and feed efficiency to time, weight, grade, and fat trim end points are organized on the basis of biological type. Important differences were observed among breed groups in postweaning growth rate and final weight.

In the postweaning period, Jersey, Red Poll, and Sahiwal cross steers gained more slowly and had lower final weights than Hereford-Angus cross steers. Brahman, South Devon, Tarentaise, and Pinzgauer cross steers had final weights 1 to 3% greater than those of Hereford-Angus cross steers. Brown Swiss, Gelbvieh, Simmental, Maine-Anjou, Charolais, and Chianina cross steers were 4 to 9% heavier than Hereford-Angus cross steers in final weight.

Feed efficiency for different intervals of evaluation is summarized in Table 1. The range between breed groups was greatest in the weight-constant interval. Brown Swiss, Gelbvieh, Simmental, Maine-Anjou, Charolais, and Chianina crosses were most efficient; Hereford-Angus, South Devon, Tarentaise, Pinzgauer, Limousin, and Brahman crosses were intermediate; and Jersey, Red Poll, and Sahiwal crosses were least efficient in conversion of ME to live-weight gain from 545 to 1,036 lb. The correlation between breed-group means for 452-day weight and feed efficiency in the weight-

Table 1.—Breed group means for postweaning growth and feed efficiency to time, weight, grade, and fat-trim end points

Breed group	Number	Post-weaning ADG (lb)	452-day weight (lb)	452-day weight ratio ¹	Feed efficiency (Mcal ME/lb gain)			
					Time 0 to 238 days	Weight 545 to 1,036 lb	USDA Choice 0 days to small marbling	Fat trim 0 days to 18.9% fat trim
Jersey-X	132	2.23	981	94	10.90	11.76	11.06	10.43
Hereford-Angus-X	508	2.40	1046	100	10.49	10.67	10.54	10.07
Red Poll-X	111	2.20	995	95	11.36	11.49	11.54	11.34
South Devon-X	94	2.58	1082	103	10.35	10.40	10.72	10.29
Tarentaise-X	103	2.38	1054	101	10.75	10.97	11.39	11.11
Pinzgauer-X	176	2.45	1058	101	10.44	10.60	10.77	10.84
Sahiwal-X	154	2.20	999	96	11.04	11.80	11.55	10.98
Brahman-X	153	2.40	1068	102	10.83	11.00	11.81	10.98
Brown Swiss-X	154	2.47	1087	104	10.36	9.67	10.84	11.20
Gelbvieh-X	111	2.56	1115	107	10.17	9.45	10.92	11.11
Simmental-X	176	2.69	1141	109	10.36	9.95	11.20	11.47
Maine-Anjou-X	109	2.65	1133	108	10.22	9.35	11.01	11.84
Limousin-X	173	2.32	1035	99	10.15	10.25	11.74	11.70
Charolais-X	176	2.67	1143	109	10.02	9.46	10.94	11.61
Chianina-X	119	2.49	1099	105	10.39	9.86	12.13	13.29

¹Ratio relative to Hereford-Angus crosses.

constant interval was -0.91, indicating that larger breed groups required significantly less Mcal of ME/lb of gain than smaller breed groups to grow from 545 to 1,036 lb. Breed groups with the most rapid growth rates required less feed per unit of gain than slower-gaining groups in the weight-constant interval primarily because fewer days of maintenance were required in the weight-constant interval.

The ranking and relative differences of breed groups for feed efficiency in the time-constant interval (0 to 238 days post-weaning) were similar to that for the weight-constant interval, but the range and differences between breed groups were smaller. The larger, faster-gaining breed groups that were heaviest at weaning maintained more weight throughout the time-constant interval. Even with heavier weights maintained, the faster-gaining breed groups were more efficient in the time-constant interval. The correlation between breed-group means for 452-day weight and feed efficiency in the time-constant interval was -0.78.

Feed efficiency from weaning (except for adjustment period of about 28 days) to a grade-constant end of USDA

Choice (0 days to small amount of marbling) or to a fat trim-constant end point of 18.9% is also presented in Table 1. The ranking of breed groups for feed efficiency to a USDA Choice grade end point was similar to that to a fat-trim end point (correlation of breed group means was 0.66). There is considerable difference in the ranking of breed-group means for feed efficiency to a grade- or a fat-constant end point compared to ranking for feed efficiency to a time- or a weight-constant end point.

To a grade end point of USDA Choice, Hereford-Angus crosses were significantly more efficient than Charolais, Brown Swiss, Gelbvieh, Chianina, Tarentaise, Brahman, and Sahiwal crosses. The correlation of breed-group means for 452-day weight and feed efficiency to a grade end point was only -0.14, indicating no significant association between size and feed efficiency (Mcal of ME/lb of gain) to a grade end point. The correlation of breed-group means for number of days on feed required to reach a small degree of marbling and feed efficiency to a grade end point was 0.62. Breed groups reaching a small degree of marbling in the

fewest days tended to be more efficient, primarily because fewer days of maintenance were required. Evaluation to a grade-constant end point assumes that feeding to higher levels of fatness is justified in terms of improving the eating quality of beef. Taste-panel evaluations of flavor, juiciness, and tenderness indicated that this assumption was not justified.

To a fat-trim end point of 18.9%, Hereford-Angus crosses were significantly more efficient than Limousin, Charolais, Simmental, Red Poll, Brown Swiss, Gelbvieh, Maine-Anjou, Chianina, Pinzgauer, Tarentaise, Brahman, and Sahiwal crosses. The correlation among breed group means between 452-day weight and feed efficiency (Mcal of ME/lb of gain) to a fat-trim end point was 0.40, indicating that breeds of larger size tended to be less efficient than breeds of smaller size to the fat-trim end point. The correlation of breed group means for number of days on feed required to reach 19% fat-trim and feed efficiency to a fat-trim end point was 0.92. Breed groups reaching the 18.9% fat-trim end point in the fewest days tended to be more efficient, primarily because fewer days of maintenance were required.