Predicting Feedlot Growth Performance over the Feeding Period Utilizing Steer Age and Body Weight

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Summary with Implications

A pooled-analysis of UNL feedlot pens examined the effects of steer age and body weight on feedlot growth performance. For data analysis, pens were divided into 3 subclasses based on steer age (calf-fed, short yearling, or long yearling) and, grouped based upon initial body weight (500 to 1200 lb, in 100 lb increments) within each age class. As initial body weight increased, DMI (lb/d) for the whole feeding period increased quadratically in calf-fed steers and increased linearly in short and long yearlings. A quadratic increase in ADG was observed in calf-feds as initial body weight increased. No differences in ADG were observed for short and long yearlings due to initial body weight. As heavier cattle were placed within age group, feed conversion increased linearly. Predicting DMI is more consistent when expressed as % of body weight. Predicting intake and growth performance over the entire feeding period, in order to facilitate management decisions, is dependent upon steer age and initial weight when starting the finishing diet.

Introduction

Predicting feedlot growth performance over the feeding period is critical when determining the nutritional requirements of the animal at different stages of growth. For diet formulation, knowing DMI and ADG at the beginning of the feeding period is more critical than knowing overall average performance for the entire feeding period, as the requirement for protein is greatest at the beginning of the feeding period. Also, the capability for feedlot managers to predict feedlot performance of varying ages of steers entering the feedlot is valuable for marketing decisions. Numerous factors affect steer growth performance during the finishing period such as diet, age, temperature, weather, etc. A common practice is to background steers on forages, such as crop residue or pastureland, for a certain period of time before starting the finishing phase. In Nebraska, the abundance of crop residues, such as cornstalks, allows producers to background spring-born calves during the winter months at a relatively inexpensive cost of gain. Furthermore, grazing pasture allows producers to further prolong the backgrounding period and add weight to the animal. Therefore the objective of this pooled analysis was to determine how age and body weight (**BW**) of steers at feedlot entry affects DMI, ADG and F:G over the finishing phase.

Procedure

A pooled-analysis from pens at the University of Nebraska-Lincoln Eastern Nebraska Research and Extension Center feedlot examined the effects of steer age and initial BW on feedlot growth performance in studies conducted from 2002 to 2015. Spring born, predominately black, crossbred steers were purchased each fall by the feedlot. For data analysis, pens were divided into 3 subclasses based on steer age (calf-fed, short yearling, or long yearling) when they started the finishing diet. Calf-feds were defined as starting the finishing diet in the fall, usually November, and then finished the following spring, typically May. Average initial BW for calf-feds was 689 lb. Short yearlings grazed corn residue or were grown in dry-lot from November to April, and then started on the finishing diet in May and were harvested in September or October. Short yearlings had an initial BW of 820 lb. Long yearlings backgrounded from November to April similar to short yearlings, grazed pasture from May to September, and then started finishing in October and were harvested in January or February. Average initial BW for long yearlings was 904 lb. Furthermore, within each steer age class, pen means were grouped based upon initial BW (500 to 1200 lb, in 100 lb increments) when starting the finishing diet. The data set included 1,002 pens of calf-feds, 1,144 pens of short yearlings, and 435 pens of long yearlings. In total, the data set included 92 experiments consisting of 23,438 steers. Dietary treatments within each experiment were ignored in the data set.

Weekly DMI during the feeding period, as a percentage of current BW, was calculated for each pen in the data set. Using initial pen BW and carcass adjusted ADG over the entire feeding period, weekly pen BW were calculated by increasing carcass-adjusted ADG by 0.00658 lb/d up to 50% of DOF and then decreasing carcass-adjusted ADG by 0.00658 lb/d beyond 50% DOF (Wilken et al., 2015 *PAS* pp. 224–236). Body weight gain for each pen was calculated weekly and added to pen BW from the previous week. Finally, weekly DMI for each pen was divided by the pen BW for the same week to determine DMI as a percent of current BW.

Average daily gain was calculated from HCW adjusted to a common dressing percentage (63%). Performance data from each pen of steers were used in the pooled-analysis. Experiments were weighted by the number of initial BW classes within each experiment to prevent artificial responses from experiments that consisted of few pen means in each initial BW class. Linear and quadratic regression coefficients were calculated using the mixed procedures of SAS (SAS Institute, Inc., Cary, N.C.). The significances of the linear and quadratic coefficients were tested for each response variable using the mixed procedures of SAS. Experiment was included in the model as a random effect.

Results

As initial BW class increased, DMI (lb/d) increased quadratically ($P < 0.01$; Table 1) in calf-fed steers and averaged 22.8

Table 1. Effect of initial BW class (lb.) when starting the finishing phase on steer growth performance

Initial BW Class	500	600	700	800	900	1000	1100	1200	SEM	Linear[1]	Quad[2]
Calf-feds											
Pens, n	81	500	349	72							
Head, n	826	4794	3379	805							
DMI, lb/d	21.5	22.2	23.1	24.4	-	-	-	-	0.2	<0.01	<0.01
ADG, lb[3]	3.75	3.79	3.81	3.97	-	-	-	-	0.06	<0.01	0.03
F:G[4]	5.71	5.85	6.05	6.18	-	-	-	-	-	<0.01	0.48
DMI, % CBW[5]	2.26	2.28	2.25	2.23	-	-	-	-	-	-	-
Short Yearlings											
Pens, n		21	521	400	180	22					
Head, n		210	4320	3261	1522	206					
DMI, lb/d	-	24.3	25.1	25.8	26.6	27.6	-	-	0.5	<0.01	0.54
ADG, lb[3]	-	3.83	3.84	3.84	3.86	3.89	-	-	0.13	0.64	0.87
F:G[4]	-	6.35	6.51	6.71	6.88	7.12	-	-	-	<0.01	0.93
DMI, % CBW[5]	-	2.57	2.43	2.35	2.28	2.19	-	-	-	-	-
Long Yearlings											
Pens, n			77	141	141	63	8	5			
Head, n			780	1318	1337	561	74	45			
DMI, lb/d	-	-	25.3	26.6	28.1	29.2	29.7	31.1	0.73	<0.01	0.16
ADG, lb[3]	-	-	3.78	3.82	4.02	4.03	3.93	4.01	0.17	0.05	0.13
F:G[4]	-	-	6.68	6.96	6.94	7.25	7.48	7.60	-	<0.01	0.99
DMI, % CBW[5]	-	-	2.56	2.48	2.32	2.20	2.23	2.30	-	-	-

[1]Linear contrasts for initial BW class within steer age group.
[2]Quadratic contrasts for initial BW class with steer age group.
[3]Calculated using carcass-adjusted final BW.
[4]Analyzed as G:F, the reciprocal of F:G.
[5]Dry matter intake calculated as a percent of current BW (CBW) over the entire feeding period.

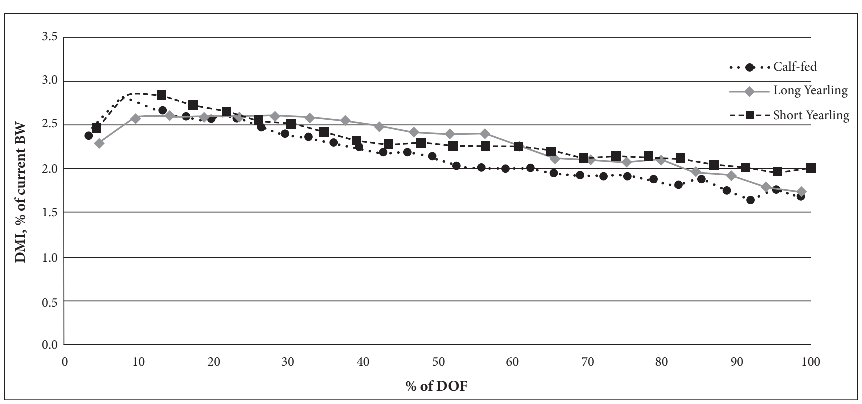

Figure 1. Dry matter intake as a percent of current BW across DOF

lb/d over the entire feeding period. However, in short yearlings, DMI increased linearly ($P < 0.01$) as initial BW class increased, with DMI averaging 25.9 lb/d. Likewise, DMI increased linearly ($P < 0.01$) as initial BW class increased for long yearlings and averaged 28.3 lb/d. A quadratic increase ($P = 0.02$) in carcass-adjusted ADG was observed in calf-feds as initial BW class increased. Numerically, ADG was greatest for calf-fed steers that started the finishing phase at an initial BW class of 800 lb. No differences ($P > 0.63$) in carcass-adjusted ADG were observed for short yearlings. Carcass-adjusted ADG increased linearly ($P = 0.05$) as initial BW class increased for long yearlings. Feed conversion (F:G) increased linearly ($P < 0.01$) as initial BW class for calf-fed steers increased. Feed conversion in calf-feds was 7.7% poorer for steers starting the finishing phase at an initial BW of 800 lb compared to steers at 500 lb. For short yearlings, F:G increased linearly ($P < 0.01$) as initial BW class increased. Feed conversions were 12.1% poorer for steers starting the finishing phase at 1000 lb compared to 600 lb short yearlings. Lastly, F:G increased linearly ($P < 0.01$) as initial BW class increased for long yearlings. Feed conversions were 13.8% poorer for long yearlings starting the finishing phase at 1200 lb compared to 700 lb. These data support what many producers already know, bigger cattle are less efficient (greater F:G) than lighter cattle. This common observation holds true within cattle age group though as well. Overall, DMI was quite variable for all age groups of steers with a range of 21.4 to 31.0 lb/d being observed. However, when calculating DMI as a percent of current BW (Table 1), DMI was relatively constant over the entire feeding period with a range of 2.2 to 2.6% for all age groups and initial BW class of steers. Dry matter intake as a percent of current BW is presented in Figure 1. Intake as percent of current BW was greatest early in the finishing period and decreased as days on feed increased. Throughout much of feeding period, DMI as percent of current BW was lowest for calf-fed steers.

Conclusion

Delaying the time (i.e., increasing age) in which steers start the finishing phase resulted in poorer feed conversions. Evaluating DMI as a percent of current BW reduces variation due to steer age and BW; however, as days on feed increases, intake as a percent of current BW decreases. Predicting intake and growth performance over the entire feeding period is critical for producers to meet the nutritional requirements of the animal at certain stages of growth and varies depending on steer age and BW when started on the finishing diet.

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