Efficiency of Early Weaned Beef Calves Is Not Improved by Restricting Feed Intake During 84-Day Growing Phase

E.A. Bailey, J.R. Jaeger, J.W. Waggoner, G.W. Preedy, L.A. Pacheco, and KC Olson

Introduction

Early weaning can be used by cow-calf producers to reduce stocking rates by 20% to 30% during drought. Ranchers may be reluctant to wean early because of reduced calf weights and reduced revenue compared with weaning calves at conventional ages. To avoid revenue shortfalls, calves can be retained and grown before selling; however, grain prices are currently at unprecedented levels. Feeding grain-based diets to calves less than 125 days of age has been associated with excessive fat accumulation early in the feeding period and decreased carcass weights. Conversely, several researchers have noted marked improvements in feed efficiency when grain-based finishing diets were limit-fed. High feed costs and early fat deposition may be attenuated by limit-feeding a grain-based diet to early weaned calves. Our goal was to measure performance and efficiency of lightweight, early weaned beef calves during an 84-day postweaning growing phase when feed intakes were varied to achieve targeted gains of 1, 2, or 3 lb/day.

Experimental Procedures

Angus × Hereford calves (n = 243; initial body weight = 343 ± 68 lb) originating from the Kansas State University commercial cow-calf herd in Hays, KS, were used in this experiment. All calves were dehorned and steer calves were castrated before 60 days of age. Calves were weaned at approximately 100 days of age. At weaning, calves were weighed individually and assigned randomly to 1 of 3 rates of gain: 1 lb/day (Logain), 2 lb/day (Midgain), and 3 lb/day (Higain). Calves were fed a common diet (Table 1); growth and health performance were evaluated during an 84-day backgrounding period.

At weaning, calves were blocked by gender and assigned to 1 of 18 pens (6 pens/treatment). Animals were fed once daily. One common diet was formulated using formulation software that predicted calves to gain ~3 lb/day at maximal intake. We fed this diet to all treatments but restricted the intake of the Logain and Midgain calves to a level that decreased their predicted gain to 1 and 2 lb/day, respectively.

Calf body weights were measured at weaning and every 28 days thereafter until the end of the study. Initial feed allowances were determined based on initial body weight and targeted rates of gain. Feed deliveries were adjusted every 28 days to match observed rates of gain. Treatment diets were individually fed once daily at 6:00 a.m. throughout the study.

All calves were vaccinated against respiratory pathogens (Bovi-Shield Gold 5; Pfizer Animal Health, Whitehouse Station, NJ), clostridial pathogens (Ultrabac 7; Pfizer Animal Health), and *H. somnus* (Somnubac; Pfizer Animal Health) on the day of

weaning. In addition, calves were treated for internal and external parasites (Ivomec; Merial Limited, Atlanta, GA) at weaning. Booster vaccinations were administered 14 days later.

All calves were monitored for symptoms of respiratory disease twice daily during our study. Calves with clinical signs of respiratory disease were removed from pens and evaluated. Calves were assigned a clinical morbidity score (scale of 1 to 4; 1 = normal, 4 = moribund), weighed, and assessed for fever. Calves with a clinical illness score >1 and a rectal temperature >104°F were treated with therapeutic antibiotics according to label directions (first incidence = Baytril, Bayer Animal Health, Shawnee Mission, KS; second incidence = Nuflor, Merck Animal Health, Summit, NJ). Cattle were evaluated 72 hours after treatment and re-treated based on observed clinical signs.

Results and Discussion

Daily gain increased ($P < 0.01$) as feed allowance increased (Table 2). At the end of the 84-day experiment, Higain calves weighed more ($P > 0.01$) than either Midgain or Logain calves. We were unsuccessful in reaching our targeted average daily gain for the Midgain and Higain treatments, likely due to limitations of the prediction equations used by our formulation software.

Feed intake was greater ($P < 0.01$) for the Higain treatment than for the Midgain treatment; moreover, feed intake of the Midgain treatment was greater ($P < 0.01$) than for the Logain treatment (Table 2). Unexpectedly, feed efficiency did not differ ($P = 0.77$) among treatments. Previous research noted that feed efficiency of older cattle increased dramatically when feed intake was restricted; we expected comparable increases in efficiency in our lightweight, early weaned calves. Incidence of undifferentiated fever was not different among treatments ($P = 0.95$) and was relatively mild (6% or less) overall.

Implications

Lightweight, early weaned calves that were fed a grain-based diet at restricted rates did not exhibit improved feed efficiency relative to their full-fed counterparts. In addition, there appeared to be limitations associated with predicting feed intake and performance of lightweight, early weaned calves fed a grain-based diet.

Table 1. Composition of backgrounding diet on a 100% dry matter basis

Ingredient, %	Concentration
Dry-rolled sorghum grain	39.3
Dried distillers grains	17.5
Sorghum silage	40.1
Supplement[1]	3.1
Nutrient	
Crude protein, %	14.09
Net energy for maintenance, Mcal/lb	0.77
Net energy for gain, Mcal/lb	0.50

[1] Supplement contained Rumensin 80 and Tylan 40 (Elanco Animal Health, Greenfield, IN), limestone, salt, and trace minerals.

Table 2. Performance of beef calves fed a common diet to achieve targeted gains of 1, 2, or 3 lb/day

	Targeted average daily gain			
	1 lb/day	2 lb/day	3 lb/day	SEM
Weaning weight, lb	341	341	347	11.5
Final weight, lb	444[a]	468[a]	510[b]	9.0
Average daily gain, lb				
Arrival to day 28	1.07[a]	1.51[b]	1.87[c]	0.102
Day 28 to 56	1.54[a]	1.62[a]	2.00[b]	0.099
Day 56 to 84	1.02[a]	1.46[b]	1.96[c]	0.107
Overall	1.21[a]	1.53[b]	1.94[c]	0.064
Feed intake, lb/day	4.57[a]	6.03[b]	7.58[c]	0.002
Feed:gain	3.77	4.00	3.87	0.333
Incidence of fever, %	4.89	6.05	5.85	3.046

[a,b,c] Values with different superscript letters are different, $P < 0.05$.