Impact of Weaning Date on Calf Growth and Carcass Traits*

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Introduction

Traditional northern Great Plains cattle producers usually calve out their brood cows in the late winter-early spring months (February and March) to guarantee ranch resources, time and labor will be available for spring crop planting and fieldwork. Some producers, however, have chosen to push their calving cycles further into the spring months (May and June) to follow nature's traditional growth patterns for pasture grasses. For these producers, high-quality grazing diets are readily available for their lactating brood cows and nursing calves, further maximizing milk production and calf growth.

The definition of early weaning varies; generally, calves weaned before 150 days of age are considered early-weaned (Loy et al., 1999). Most research on early weaning has focused on late winter-early spring calving (Schoonmaker et al., 2001; Story et al., 2000) with little research evaluating early weaning outcomes on late spring-born (May and June) calves. Our study objective was to evaluate the impact of weaning date (early vs. normal) on calf growth and carcass traits in spring-born Angus calves during the grow-finish period.

Materials and Methods

The NDSU Institutional Animal Care and Use Committee approved all protocols. The experiment was conducted at the NDSU Hettinger Research Extension Center's feedlot in Hettinger, ND, and the NDSU Carrington Research Extension Center's feedlot in Carrington, ND. Sixty-two Angus steer and heifer calves (average birth date = April 16 ± 1.4 days) from the NDSU Hettinger Research Extension Center's cowherd were assigned to one of two weaning dates early wean = September 15 and 16, 2008, (EW), or normal wean = November 3 and 4, 2008, (NW). On their respective weaning dates, EW and NW calves were hauled (five miles) to the feedlot after morning gathering and weighing in the pasture. Normal wean calves remained on pastures with their dams until their respective weaning date.

At feedlot arrival, calves were stratified by weight and sex and allotted to one of 10 pens (six or seven calves/pen; five pens/weaning date) to evaluate the effect of weaning date on calf growth and performance. At the start of their respective receiving periods, all calves were dewormed, vaccinated for respiratory, clostridial, *Hemophilus somnus*, and Mannheimia diseases, and tagged with a radio-frequency identification tag (RFID) for enrollment in an age and source verification program (AgInfoLink, Longmont, CO). All calves were fed the same receiving ration (total-mixed ration) for the first 21 days (EW) and 20 days (NW) after weaning. The receiving diet consisted of ground-mixed hay, cracked corn, dried distillers grains with solubles (donated by POET Nutrition Inc., Sioux Falls, SD), a medicated growing supplement (containing Rumensin®, Elanco Animal Health, Greenfield, IN and Melengesterol acetate [MGA], Pfizer Animal Health, New York, NY), deccox crumbles, sodium bicarbonate and limestone (dry matter basis [DM]; 14.8% crude protein; 0.52 megacalories/pound of net energy for gain; Table 1).

Table 1. Dietary ingredient and nutrient concentration of calf growing diets.

Item	Receiving diet	Growing diet
Ingredient, % DM basis		
Cracked corn	31.8	31.7
Deccox crumbles	1.5	1.5
Dried distillers grains w/solubles	12.6	12.6
Growing supplement[a]	3.9	4.2
Limestone	0.5	0.5
Mixed hay[b]	39.8	39.6
Oat silage	9.3	9.3
Sodium bicarbonate	0.6	0.6
Nutrient Concentration[c]		
DM, %	77.1	74.9
CP, % DM basis	14.8	13
NE_g, Mcal/lb.	0.52	0.56
Ca:P	2	2.1

[a] Calf growing supplement contained minimum 7.2% CP, 3.375% Ca, 0.27% P, 1.0% K, no animal byproducts, 350 mg/lb. Rumensin® and MGA (melegesterol acetate) at 0.5 mg (as fed).

[b]Mixed hay composed of equal parts of ground barley and alfalfa-grass hays.

[c]Analytical results from growing diets are from composited samples.

At the onset of the background periods, weights were measured on the calves prior to morning feeding (October 14 and 15, 2008; December 4 and 5, 2008). All calves were implanted with a Ralgro implant (36 mg zeranol; Schering-Plough Animal Health Corp., Kenilworth, NJ) post weighing. During the growing period, calves were fed a 49:51 forage:concentrate diet (13% crude protein; 0.56 megacalories/lb. of net energy for gain growing diet; DM basis; Table 1). All diets were formulated for 2.20 pounds of daily gain. Diets were fed once daily (8 a.m.) and slick bunk management was used to determine individual pen daily feed allotments. Calves had free access to water in ice-free automatic fence-line water fountains.

Calves were checked daily for signs of bloat and respiratory illness. Calf weights were recorded on day 0, 1, 20, 21, 51, 52, 71, 72, 114, and 115. Initial and final weights were unshrunk body weights measured over two consecutive weigh days before morning feeding. Diet samples were collected (day 6, 35, 37, 72, 78, 91, 103 and 113), composited by diet and analyzed by a commercial laboratory (Midwest Laboratories, Omaha, Neb.) for nutrient components.

After backgrounding, calves (n=58) were shipped to the NDSU Carrington Research Extension Center, Carrington, ND, for finishing on January 21, 2009. During the finish period, calves were fed a diet containing 61 megacalories/pound of net energy for gain during a 105-day feeding period. Calves were fed to a common end weight (1,100 lbs.) and backfat thickness (0.4 inch) prior to harvest. During the course of finishing, 13 calves (EW = 5 and NW = 8) were harvested at a local abattoir (Barton Meats, Carrington, ND). Consequently, no carcass characteristics were measured on those calves. The remaining calves (n = 45) were harvested at Tyson Foods, Dakota City, NE, on May 5, 2009. Following a 24-hour chill, qualified university personnel, in concert with USDA graders, collected carcass data on the individual carcasses. Carcass traits measured included hot carcass weights; marbling scores; 12th rib fat thickness; longissimus areas; kidney, pelvic and heart fat measures; and USDA yield grades.

Calf growth and carcass traits were analyzed as a completely randomized design with the backgrounding phase pen serving as the experimental unit. Treatment means were separated by least square means following a protected F-test ($P < 0.05$).

Results and Discussion

This is the third year of analyzing early weaning impacts on calf growth and carcass traits in May-born Angus calves at the Hettinger Research Extension Center. This year, the calves' average birth date was two weeks earlier (mid April) as compared to previous years (Thompson et al., 2009; Stamm et al., 2007).

The effects of weaning strategies on calf performance and health are displayed in Table 2. Final veterinary medicine costs, respiratory illness treatments and calf mortality were unaffected by treatment during the growing period ($P > 0.05$). Two EW and one NW calves died and another EW calf had to be removed from the study because of bloat. Because the ruminal bloat occurred during the early stages of the study, sodium bicarbonate was added to the calf diets to promote saliva production through increased cud chewing, resulting in increased rumen-buffering capacity. All performance data from the removed calves was deleted from subsequent performance analyses. Two EW calves were treated for respiratory illness. Of the calves treated for respiratory symptoms, one EW calf required additional treatment with a second antibiotic during the feeding period.

Hettinger Research Extension Center's early weaned calves.

Table 2. Weaning strategy effects on calf performance.

Item	Early Weaning[a]	Normal Weaning[b]	SEM[c]	*P*-value[d]
	Treatments			
No. head	30	32	-	-
Age at weaning, days	178	227	1.34	-
Period 1, day 0 to 50				
Initial weight, lb.	590	-	-	-
DMI, lb./d	17.7	-	0.45	-
Weight gain, lb.	170	-	17.3	-
ADG, lb./d	3.33	-	0.34	-
Gain:feed	0.14	-	0.03	-
Feed cost, $/lb. of body weight gain[e]	0.48	-	0.03	-
Period 2, day 51 to 114				
Initial weight, lb.	-	723	-	-
DMI, lb./d	22.6	23.2	0.35	0.29
Weight gain, lb.	149	140	12.3	0.6
ADG, lb./d	2.33	2.18	0.19	0.6
Gain:feed	0.1	0.26	0.11	0.36
Feed cost, $/lb. of body weight gain[e]	1.17[g]	0.84[f]	0.1	0.047
Overall, day 114				
Final weight, lb.	838	801	18.5	0.2
DMI, lb./d	21.1[f]	23.2[g]	0.36	< 0.001
Weight gain, lb.	314[g]	138[f]	10.4	< 0.001
ADG, lb./d	2.73[g]	2.17[f]	0.14	0.02
Gain:feed	0.13[g]	0.09[f]	0.007	0.002
Feed cost, $/lb. of body weight gain[e]	0.74	0.85	0.05	0.16
Veterinary medicine costs, $/hd	14.64	11.8	2.15	0.38
Treatment for respiratory illness, % of calves				
Once	6.6	0	4.67	0.35
Twice	3.34	0	2.36	0.35
Mortality, % of calves	6.68	3.34	5.28	0.54

[a] Early wean calves; wean date = Sept. 15 and 16, 2008.

[b]Normal wean calves; wean date = Nov. 3 and 4, 2008.

[c]Standard error of mean; n = 5 observations per treatment.

[d]*P*-value for F-test of treatment.

[e]Cracked corn = $0.09/lb.; deccox crumbles = $0.36/lb.; growing supplement = $0.23/lb.; limestone = $0.11/lb.; ground mixed hay = $0.05/lb; oat silage = $ 0.01/lb, salt block = $0.10/lb, sodium bicarbonate = $0.28/lb.

[f, g]Means with different superscripts differ ($P < 0.05$).

By design, weaning dates influenced weaning weights; EW calves were lighter and younger at weaning (523 lbs.; 178 days of age) compared with NW calves (660 lbs.; 227 days of age; $P < 0.001$). Feed intake of early weaned calves averaged 17.7 pounds/day and average daily gain (ADG) was 3.33

pounds/day. As a result, feed costs averaged $0.48/lb. gained during the first 50 days of backgrounding. Normal weaned calves, placed on feed for 64 days, had similar feed intakes and daily gains as compared to EW calves ($P > 0.05$; Table 2). Though not statistically different, feed efficiency (gain:feed) for NW calves was numerically higher than EW calves (0.10 vs. 0.26 for EW and NW calves, respectively; $P = 0.36$) while feed cost/pound of gain differed across treatment ($1.17/lb. gained vs. $0.84/lb. gained for EW and NW calves, respectively; $P = 0.047$) for the same period. The difference in feed cost/pound of gain may be contributed to the decreased potency of the Ralgro implant in the EW calves (Ralgro implant potency period is approximately 90 days post-implanting).

Although final weights were similar across treatment and averaged 820 ± 18.5 pounds ($P = 0.20$), background weight gain differed by treatment (314 and 139 lbs. for EW and NW, respectively; $P < 0.001$). Calf weight gain was influenced directly by the number of days on feed. Early-weaned calves spent 51 days more on higher energy rations (based on weaning date) as compared with the NW calves (EW = 115 days vs. NW = 64 days). Overall, EW calves had nine percent lower dry matter intake as compared to NW calves (21.1 vs. 23.2 pounds for EW and NW calves, respectively; $P < 0.001$). This may be attributed to their weaning date and weight, incidences of bloat, and respiratory illness events that affected the EW calves, resulting in lower feed intakes over the course of the study. Although feed costs/pound of gain was comparable across treatments and averaged $0.80/pound ($P = 0.16$), EW calves had greater ADG (2.73 lbs. vs. 2.17 lbs.; $P = 0.02$) and feed efficiencies (0.13 vs. 0.09; $P = 0.002$) compared to NW calves for the background period.

The impact of weaning date on carcass traits is presented in Table 3. In this study, all carcass traits measured were similar at harvest ($P > 0.05$), regardless of treatment.

Early-weaned steer at the bunk.

Table 3. Weaning strategy effects on carcass traits.

	Treatments			
Item	EW[a]	NW[b]	SEM[c]	*P*-value[d]
No. head	22	23	-	-
Hot carcass weight, lb.	700	723	13.4	0.26
Marbling score[e]	496	503	11.75	0.7
12th rib fat thickness, in.	0.56	0.57	0.02	0.72
Longissimus area, $in.^2$	12.5	12.4	0.21	0.76
Kidney, pelvic and heart fat, %	2.4	2.32	0.05	0.31
USDA Yield Grade (adjusted)[f]	3.04	3.16	0.06	0.15

[a] EW: early weaned calves; wean date = Sept. 15 and 16, 2008.

[b] NW: normal weaned calves; wean date = Nov. 3 and 4, 2008.

[c] Standard error of mean; n = 5 observations per treatment.

[d] *P*-value for F-test of treatment.

[e] The amount and distribution of intramuscular fat; Modest = 400 to 499; Moderate = 500 to 599.

[f] Yield grades determined by the following calculation: YG = 2.5 + (2.5x adjusted fat thickness, in.)+(0.20 x kidney, pelvic and heart fat %) - (0.32 x longissimus area, sq. in) + (0.0038) x hot carcass weight, lb.). Yield grade is defined as the comingled yield of closely trimmed, boneless retail cuts from the round, loin, rib and chuck. Yield grades are denoted by numbers 1 through 5 with yield grade = 1 representing the highest cutability.

Implications

In the present study, calves that were weaned at 178 days of age had lower dry matter intake and greater feed efficiency than those weaned at 227 days of age. Carcass measurements were not different between early-weaned or normally-weaned calves when they were managed collectively during the finishing phase. In this trial, days on feed had a direct influence on weight gained during the feeding period. Early weaning of spring-born calves appears to be a feasible production option for cattle producers who calve between mid April and mid June. More research is warranted to determine what effects early weaning has during the finishing phase of feedlot feeding.

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