Drought Management: Effect of Early Weaning on Immune Response, Backgrounding and Finishing Performance, and Economics

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This paper summarizes an undergraduate research project that was conducted at the Dickinson Research Extension Center under the direction of Animal Scientist, Doug Landblom and was prepared cooperatively with Jeremy Harper, Dickinson State University, Department of Agricultural and Technical Studies student to fulfill Jeremy's undergraduate research project requirement for graduation with a degree in Agricultural Studies from Dickinson State University.

Abstract: Forty-eight crossbred cows and calves were used to evaluate the effect of weaning date (Aug.-**EW** vs. Nov.-**NW**) immune response, pasture, backgrounding and finishing performance, carcass closeout, and economics as a drought management procedure. Antibody titer measured preweaning, weaning, and at 28-30 day intervals through 60 days of finishing increased numerically from preweaning vaccination to 30d postweaning for BVD Types I and II, but the difference was not significant. IBR declined from initial vaccination over time and was greater for EW steers (P< 0.01). At weaning, EW steers were transferred to the University of Nebraska feedlot at Scottsbluff, NE and NW continued to graze for 92d until weaning in November, and then transferred to the feedlot in Nebraska. For growth, pasture vs. drylot gain and ADG did not differ (P=0.38); 56d backgrounding: EW grew faster (P<0.01) and were more efficient (P<0.01); 84d backgrounding: ADG did not differ (P>0.01), but feed efficiency was improved for EW (P<0.05. For overall backgrounding and finishing performance, age at slaughter did not differ (P>0.01), but EW required 95 more days on feed. Finishing ADG was greater for NW (P<0.01), but feed efficiency did not differ (P>0.01). Carcass closeout values for hot carcass weight, dressing percent, fat depth, ribeye area, yield grade, and percent Choice quality grade did not differ (P>0.01). Carcass price was slightly higher for EW steers, but price did not differ significantly (P=0.95). Carcass net return was $54.40 per head greater for NW steers. While early weaning did not provide the highest return, these data clearly show that EW is a viable drought management strategy.

Key Words: Early Weaning, Immune Response, Postweaning Performance, Drought Management

Introduction:

This drought management investigation is multi-faceted; encompassing range sparing, effect of weaning date on immune response, backgrounding and finishing, performance, closeout value, and partial system economics. This Capstone Project report focuses on postweaning calf performance only. Impact on pastures and cow performance can be found in a separate report.

An animal's immune response is one of natures many phenomena. Calves start to build their immune system immediately upon the time of birth. The ability for a calf to build immunity towards disease is essential, both from the animal's health standpoint and from the economic standpoint of the producer. A producer must keep his/her herd healthy especially since their profit margins are usually slim as a result of what it costs in order to produce the product. As we try to cut costs, we cannot overlook an animal's health. All prevention steps should be taken when trying to keep the animals healthy. After all, a dead calf gives no return to the producer. A producer's profit margin is what keeps him/her in business. Sick calves create costs not only from the drugs that it takes treat the sickness, but they have other costs that relate to decreased daily gain and overall poor performance.

Performance of early-weaned calves during the backgrounding and finishing phase is important and research has shown calves weaned a 100 to 150 days of age were heavier and younger at slaughter than that of normal weaned calves that are around 230 days old when weaned (Peterson et al., 1987). Meyers et al (1999) found that 40% of the calves that were subjected to early weaning graded average choice or ever higher than calves that were weaned at the normal weaning age.

Materials and Methods:

Over a year's time, 48 steers from the NDSU - Dickinson Research Extension Center were used in this study. Spring-born steer calves were weaned from cows at either 140 days (EW) or 215 days of age (NW). Cow body weight and condition scores were recorded in order to determine the impacts of weaning on cow performance. The mother cows received Pfizer's preventative shots Scour-Guard-3 during their third trimester of pregnancy, and Preg-Guard Gold-10 as their pre-breeding vaccination. Three weeks before the calves were weaned, the calves received a preconditioning vaccination with Pfizer's Ultrabac-7, Bovi-shield Gold-5, and One-Shot. The booster shots were given at the time of weaning. Early and normal weaned calves were weighed at August weaning (EW) and NW steers continued to nurse their mothers until weaning in November. Blood samples were drawn for serum recovery 3 weeks before weaning, at weaning, and at 28-30 day intervals until the steers were on finishing rations for about 60 days. Immediately after pasture weaning, the EW calves were transported to the University of Nebraska's Panhandle Feedlot located in Scottsbluff, Nebraska. The steer calves were implanted with on arrival with the estrogenic implant Ralgro®.

Serum samples recovered from blood draws were analyzed to determine antibody titer levels for infectious Bovine Respiratory disease (IBR) and Bovine Virus Diarrhea types I and II (Table 1) at the Texas A&M Veterinary Diagnostic laboratory, Amarillo, Texas.

The steers stayed on feed at the UNL Panhandle Feedlot from weaning to final harvest and growth performance was monitored at 28 day intervals. Live animal ultrasound was used to determine final harvest endpoint which was based on back fat depth (BF), ribeye area (REA), and percent intramuscular fat (IMF). The harvest target for BF was set at 0.50 inch, ribeye was set at 12.0 sq. inch, and percent intramuscular fat was set at 4.0% (low Choice).

Results:

Pasture (NW) versus feedlot (EW) performance is shown in Table 2 and 84 day backgrounding performance is shown in Table 3. Overall, backgrounding and finishing performance is summarized in Table 4 and carcass closeout results, and weaning system economics are shown in Table 5.

Immune Response:

► Antibody titers measured did not differ between treatments ($P > 0.05$), but did differ over time reaching maximum level by 30 days postweaning ($P < 0.01$).

Pasture versus Feedlot Growth:

► Early weaned (EW) steers were weaned 92 days before normal weaned steers (NW)

► At November weaning date, EW and NW gain and ADG did not differ ($P > 0.01$) (EW = 517 lbs.; NW = 566 lbs.)

84-Day Backgrounding Performance:

► Gain and ADG did not differ between EW and NW groups ($P = 0.118$); however, feed efficiency was improved ($P = 0.039$)

Overall Backgrounding and Finishing Performance:

► Due to the longer feeding period for EW steers, the amount of gain was significantly greater ($P < 0.01$) for EW steers (850 lbs. versus 672 lbs.)

► Steer age at final harvest did not differ ($P > 0.01$)

► Final ADG was significantly greater for NW steers ($P > 0.05$) (EW = 3.05 lbs./day; NW = 3.67 lbs./day)

► Average daily feed intake and feed efficiency did not differ between weaning treatments; however, there was a numerical advantage favoring the normal weaned steers

Carcass Closeout:

► Hot carcass weight, dressing percent, fat depth, ribeye area, yield grade, and percent Choice carcass quality grade did not differ ($P > 0.01$)

Postweaning Economics:

► Carcass price/hundredweight and carcass value did not differ ($P > 0.01$); however, due to the longer feeding period for EW steers, feed and yardage costs were greater resulting in a $54.40 advantage per head for NW steers

Conclusion:

Although early weaned steers in this investigation did not return as much as their normal weaned counterparts, using early weaning and retained ownership is an effective drought management strategy. The data presented here only accounts for postweaning calf performance. However, when cow body condition improvement of from 0.80 to 1.0 and improved rebreeding performance are taken into account, an early weaning system becomes a very effective drought management procedure. New early weaning research is evaluating the use of annual forage grazing as an alternative to drylot for early weaned calves.

Literature Cited:

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Table 1. Effect of weaning date on humoral antibody titer change. [a, b]

	Pre-Wean	Weaning	30-Day Post-Weaning			
Vaccination	Initial	Booster				
August Wean (Early)						
Serum Recovery Date	**7/19**	**8/11**	**9/9**	**10/10**	**11/11**	**12/9**
IBR	28.0	14.2	9.3	4.0	4.0	4.0
BVD Type I	43.1	23.1	42.6	12.0	33.8	18.2
BVD Type II	30.2	52.0	114.7	27.1	22.7	12.8
November Wean (Normal)						
Serum Recovery Date	**10/20**	**11/10**	**12/9**	**1/6**	**2/3**	**3/3**
IBR	5.7	4.4	5.8	4.4	4.0	4.0
BVD Type I	5.7	5.7	9.8	14.2	21.8	12.9
BVD Type II	4.4	33.3	87.1	52.9	71.1	36.0

[a]Treatment means differ significantly:

IBR: Treatment ($P = 0.062$); Treatment * Time ($P = 0.030$), BVD Type I: Treatment ($P = 0.375$); Treatment * Time ($P = 0.0001$), BVD Type II: Treatment ($P = 0.71$); Treatment * Time ($P = 0.15$)

[b]Serum antibody titer change over time was significant.

IBR: Time ($P = < 0.0001$), BVD Type I: Time ($P = < 0.0002$), BVD Type II: Time ($P = < 0.68$)

Table 2. Pasture vs. Feedlot for EW vs. NW Performance

	Early Weaning	Normal Weaning	SE	P_Value
Pasture Start Wt (Aug. 11),lb	365.7	393.9	23.21	0.438
Feedlot/Pasture Wt. (Nov. 11), lb	517.3	565.8	35.09	0.384
Feedlot/Pasture Gain, lb	151.6	171.9	14.6	0.382
Early vs. Normal Wn. Interval, days	92	92		
ADG, lb	1.65	1.87	0.1587	0.382

Table 4. 84 Day Backgrounding for EW vs. NW Performance (February 3, 2006)

	Early Weaning	Normal Weaning	SE	P_Value
Start Wt., lb	517.3	565.8	35.09	0.384
84 Day WT., lb	876.2	870.8	50.81	0.944
84 Day Gain, lb	358.8	305.0	19.41	0.118
84 Day ADG, lb	4.27	3.63	0.228	0.118
84 Day Feed/Head, lb	1173.8	1206.1	73.6	0.772
84 Day Feed/Head/Day, lb	13.97	14.35	0.876	0.772
84 Day Feed:Gain, lb[a]	3.27[x]	3.95[y]	0.162	0.039

[a]Means within a row are significantly different if ($P < 0.05$).

Table 5. Backgrounding and Finishing Performance for EW vs. NW Calves

	Early Weaning	Normal Weaning	SE	P_Value
Number	24	23		
Start Wt., lb[a]	365.7[x]	565.8[y]	29.82	0.009
Feedlot Closeout Wt., lb	1215.4	1237.6	35.23	0.679
Feedlot Gain, lb[a]	849.7[x]	671.7[y]	9.38	0.0002
Days On Feed, days[a]	279.0[x]	183.6[y]	1.68	<0.0001
Kill-age, days	401.2	397.5	3.41	0.495
ADG, lb[a]	3.05[x]	3.67[y]	0.049	0.0009
Feed/Head/Day, lb	16.12	17.43	0.814	0.318
Feed:Gain, lb	5.285	4.752	0.190	0.118
Feed Cost/Head, $	$203.66	$173.22		
Feed Cost/Head/Day, $	$0.7299	$0.9435		
Yardage Cost/Day, $	$0.30	$0.30		
Yardage Cost/Head, $	$83.70	$55.08		
Feed & Yardage/Head, $	$287.36	$228.30		

[a]Means within a row are significantly different if ($P < 0.05$).

Table 6. EW vs. NW Carcass Closeout and Economics.

	Early Weaning	**Normal Weaning**	**SE**	**P_Value**
Carcass Closeout				
Hot Carcass Wt, lb	756.6	763.7	22.74	0.859
Dressing %	62.3	61.7	0.002	0.132
Fat Depth	0.541	0.565	0.035	0.651
Ribeye Area, Sq. In.	11.69	11.58	0.158	0.621
Yield Grade	2.67	2.68	0.141	0.933
% Choice	79.2	69.6		0.249
Post Weaning Economics				
Carcass Price/cwt, $	$129.73	$127.83		0.843
Carcass Value, $	$983.03	$978.37		0.954
Feed & Yardage Cost, $	$287.36	$228.30		
Finishing Net Return, $	$695.67	$750.07		
Difference, $		+54.40		