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Replacement Heifer Development Programs

Gene H. Deutscher
University of Nebraska-Lincoln, gdeutscher@inebraska.com

Andy Applegarth
Gudmundsen Sandhills Laboratory, andy.applegarth@unl.edu

Dave Colburn
University of Nebraska-Lincoln

Rex Davis
University of Nebraska-Lincoln, rdavis1@unl.edu

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Gene Deutscher
Andy Applegarth
Dave Colburn
Rex Davis[1]

Grazing subirrigated meadows in the spring with replacement heifers prior to breeding may cause lower pregnancy rates. Better management programs are needed for developing summer-born heifers for replacements.

Summary

A three-year study was conducted to evaluate heifer development programs using Sandhills resources. During the first two years, spring-born yearling heifers that grazed subirrigated meadows for 30 days in May prebreeding had greater weight gains. However, the heifers tended to have lower (10%) pregnancy rates than the heifers on hay and range during May. Grazing meadows in May with summer-born heifers had no effect on pregnancy rates when heifers were bred in September. In comparing spring- and summer-born heifers, initial results indicate yearling and 2-year-old reproductive performance and calf weaning weights may be lower for the summer-born heifers. Additional studies on heifer performance and economics are in progress.

Introduction

Proper development of replacement heifers is of major importance to the productivity and profitability of a cow herd. Heifers should be managed to reach puberty early, conceive early in the first breeding season, calve unassisted and breed back early for their second calf.

Grazing of subirrigated meadows in the Sandhills in early spring should increase heifer gains, increase percentage of heifers cycling and improve early conception rates, as well as reduce feed costs. However, some reports indicate that the lush green forage may lower fertility because of its very high protein level.

Summer calving is gaining interest in the Sandhills and heifer development programs are needed for these cow herds. How should heifer calves be managed so they will breed early in September to calve in mid-June? Will the 2-year-old heifers then breed back for their second calf and what will their calves weigh at weaning?

The objectives of this study were: 1) to compare two programs of developing heifers — grazing meadows in May versus range and hay, and 2) to begin comparing heifer development programs for summer calving cow herds versus traditional spring calving herds.

Procedure

Heifer calves from the MARC II cow herds at the Gudmundsen Sandhills Laboratory (GSL) near Whitman were used in this three-year project. During the first two years, about 50 heifers were selected from each of the spring and summer calving cow herds each year to study the effects of meadow grazing in May on reproductive performance. Less selection was possible on the summer-born heifers because of a smaller number of calves produced in the summer herd.

Each year, spring-born heifer calves were weaned in October and summer-born heifer calves were weaned in January. All heifers were fed meadow hay plus protein supplement and corn during the winter to achieve about one pound gain per day until May. Prebreeding (June) weights for the spring-born heifers were 750 lb in Year 1 and 690 lb in Year 2. Summer-born heifers weighed about 525 lb in May and had prebreeding (Sept.) weights of 740 lb in Year 1 and 720 lb in Year 2.

On May 4 each year, heifers were assigned randomly according to weight and age to two treatment groups (meadow or range) within each calving group. Half the heifers were placed on subirrigated meadows for 30 days while the other half continued on hay and supplement for 15 days and then were placed on native range about May 20. After June 4, all heifers grazed native range at GSL during the summer.

The breeding season began on June 5 for the spring-born heifers and on Sept. 5 for the summer-born heifers. Two blood samples were obtained from the heifers 10 days apart before each breeding season to determine progesterone levels and the percentage of heifers cycling. Heifers were also estrus synchronized using the Syncromate B system and were bred by AI using the AM-PM rule with semen from one Angus sire for a five-day period. Two Angus bulls then were placed with the heifers for 25 days to give a total 30-day breeding season. The same two bulls were used on both the spring and summer heifers.

Heifers were examined for pregnancy about 60 days after the end of the breeding seasons and the open heifers culled. Pregnant heifers were fed hay and supplement during the winter at GSL. About 30 days before calving, heifers were moved to the West Central Center at North Platte for the calving season. Spring heifers began calving on March 15 and summer heifers began calving on June 15. Heifers were assisted at calving if needed and calving data recorded. Two-year-old cows and calves were returned to GSL after the calving season for a 60-day breeding season using MARC II bulls. The breeding season began on June 5 for the spring calving cows and on Sept. 5 for the summer calving cows. Spring-born calves were weaned in early September and summer-born calves were weaned in November. Pregnancy rate for the second calf and the calving date the following year were recorded.

For the third year of the study, 82 spring-born heifers and 60 summer-born heifers were used to compare breeding and calving performance. Heifer calves were fed meadow hay and supplement

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during the winter at GSL to achieve prebreeding weights of 690 lb for both the spring-born and summer-born heifers. Heifers were not allowed to graze meadows in the spring. The breeding season began on May 20 for the spring heifers and on Aug. 20 for the summer heifers. These dates were two weeks earlier than previous years to help determine if earlier breeding may help increase overall reproduction and cow productivity. Five Angus bulls were used to natural service the heifers in both groups for a 45-day breeding season. Two blood samples were taken 10 days apart before the breeding season to determine percentage of heifers cycling.

Heifers were examined for pregnancy about 60 days after the end of the breeding seasons. Pregnant heifers were fed hay and supplement during the winter and spring and remained at GSL for calving beginning on March 1 (spring) and June 1 (summer). Heifers were assisted at calving if needed and calving data recorded. Two-year-old cows were placed with MARC II bulls for 60-day breeding seasons beginning on June 5 (spring) and September 5 (summer). Spring-born calves were weaned in early September and summer-born calves were weaned in late November. Pregnancy rate for the second calf was recorded.

Data were analyzed using SAS analysis of variance with treatment and season in model. Calf weaning weights were analyzed with calf age, sex and sire in model. Percentage data were tested using Chi-Square analyses. In year 3, cow productivity was calculated as pounds of adjusted calf weaning weight divided by number of heifers exposed to breeding. Calving interval was determined by number of days between first and second calving dates.

Table 1. Heifer development of spring-born heifers on range or meadow - 2 years.

	Year 1			Year 2		
Trait	Range	Meadow	Diff	Range	Meadow	Diff
No. of heifers	24	24		30	30	
Wt. on May 4, lb.	723	720		642	643	
Gain during May, lb.	23	42	+19*	39	55	+16*
Prebreeding June wt., lb.	746	762	+16*	680	697	+17*
Prebreeding June pel. area, cm^2	179	189	+10*	174	176	+ 2
Prebreeding June cond. score	5.2	5.4	+ .2	5.3	5.5	+ .2*
Gain during summer, lb.	134	135	+ 1	174	159	-15*
Cycling before breeding, %	83	96	+13	80	73	- 7
Pregnant in 5 days AI, %	29[a]	33[a]	+ 4	59	61	+ 2
Pregnant in 30 days, %	67[a]	58[a]	- 9	93	83	-10

[a]Pregnancy percentages low due to poor AI technique and bull injury.
* Treatments differ (P <. 05).

Table 2.Heifer development of summer-born heifers on range or meadow - 2 years.

	Year 1			Year 2		
Trait	Range	Meadow	Diff	Range	Meadow	Diff
No. of heifers	23	24		22	23	
Wt. on May 4, lb.	546	554		488	497	
Gain during May, lb.	33	57	+24*	46	51	+ 5
Prebreeding Sept. wt., lb.	731	752	+21*	713	730	+17
Prebreeding Sept. pel. area, cm^2	172	176	+ 4	168	175	+ 7
Prebreeding Sept. cond. score	5.1	5.3	+ .2	5.1	5.4	+ .3*
Gain during summer, lb.	152	141	-11	179	182	+ 3
Cycling before breeding, %	91	88	- 3	61	64	+ 3
Pregnant in 5 days AI, %	48	46	- 2	-[a]	-[a]	
Pregnant in 30 days, %	78	79	+ 1	-[a]	-[a]	

[a]Data not reported due to BVD outbreak.
* Treatments differ (P<.05).

Results

The heifer development results of the spring-born heifers on range or meadow for two years are shown in Table 1. Results are reported separately for each year because of some year differences. All heifers were lighter in weight on May 4 in Year 2 than in Year 1. Heifer gain on meadow during May for each year was higher (P < .05) than gain on range and hay. This weight gain increased prebreeding weight in June for the heifers on meadow and also tended to increase body condition scores.

Percentage of heifers cycling (based on serum progesterone) tended to be higher for the meadow heifers compared to range and hay heifers in Year 1 but lower in Year 2. Percentage of heifers pregnant during five days of AI was similar for both treatment groups in both years. However, in Year 1 percentages for both groups were low due to a poor AI technique. Total pregnancy rate was also reduced when a bull became injured and too many heifers had to be serviced by one yearling bull.

The 30-day pregnancy rates tended to be lower (10%) for the meadow heifers than the range heifers each year. These differences were not statistically significant with the small number of heifers in each group, but they may be real. Research on dairy heifers found that feeding excess rumen-degradable protein was detrimental to fertility. The researchers reported that the increased protein in the rumen increased plasma urea nitrogen (PUN) in the blood and lowered the pH of uterine fluids. This in turn reduced pregnancy rates. Other reports have indicated that lush grass with very high protein levels can lower conception rates and/or cause embryonic losses. To overcome this potential problem, cows and heifers could be removed from lush, subirrigated meadows a couple of weeks before and during the breeding season.

Table 2 shows the results on the summer-born heifers for two years. Heifers weighed about 525 lbs on May 4 and the meadow grazing increased gains during May. Prebreeding weights and condition scores in September were also slightly higher for the heifers grazing meadow. However, no differences were found in percentage of heifers cycling or pregnant between the two groups in Year 1. Therefore, meadow grazing in May did not affect pregnancy in September. Year 2 pregnancy results are not reported

Table 3. Calving results of spring and summer-born heifers - 2 years.[a]

Trait	Year 1 Spring Mar-Apr	Year 1 Summer Jun-Jul	Year 1 Diff.	Year 2 Spring Mar-Apr	Year 2 Summer Jun-Jul	Year 2 Diff.
No. of heifers calving	29	34		53	20	
Precalving wt., lb.	1028	951	77*	974	971	
Precalving pel. area, cm^2	268	246	22*	NA	256	
Precalving cow condition.	5.3	5.2		5.0	5.9	.9*
Calf birth date	Mar. 22	Jun. 17		Mar. 18	Jun. 28	
Calf birth weight, lb.[b]	75	75		69	76	7*
Calving difficulty, %	17	3	14*	22	0	22*
Calf losses to weaning (no.)	3	6		4	3	
Weaning date	Sept. 9	Nov. 4		Sept. 3	Nov. 24	
Avg. age of calf (days)	172	-[e]		170	148	22*
Actual calf weaning wt., lb.	431	-[e]		393	340	53*
Calf ADG, lb.	2.1	-[e]		1.9	1.8	
Adjusted calf weaning wt., lb.[c]	499	-[e]		451	439	12
Cow condition at weaning	5.2	-[e]		5.7	5.1	.6*
Cow weight at weaning, lb.	1064	-[e]		1001	958	43*
Cycling before second breeding season, %	15	-[e]		45	55	10*
Pregnant for 2nd calf, %	92	-[e]		92	65	27*
Calving interval 1st to 2nd calf (days)[d]	376	-[e]		383	370	13*

[a]No differences between development treatments, so data pooled and reported by calving seasons.
[b]Effects of sex and sire removed from calf birth weight means.
[c]Calf weaning weight adjusted to 205 day age, sire, and sex of calf.
[d]Days between first and second calf birth dates.
[e]Data not reported due to affects of a BVD outbreak
* Seasons differ (P<.05).

Table 4. Breeding and calving results of spring- and summer-born heifers - 3rd year.

Trait	Spring	Summer	Diff.
Breeding			
No. of heifers	82	60	
Wt. on May 16, lb.	688	562	
Summer ADG, lb.	1.5	1.4	.1*
Begin breeding season	**May 20**	**Aug. 20**	
Prebreeding wt., lb.	688	690	2
Prebreeding condition score	5.3	4.8	.5*
Prebreeding pel. area, cm^2	174	171	3
Cycling before breeding, %	83	75	8
Pregnant in 45 days, %	85	72	13*
Calving	**Mar.-Apr.**	**Jun.-Jul.**	
No. of heifers calving	69	43	
Precalving wt., lb.	963	933	30*
Precalving pel. area, cm^2	240	246	6
Precalving condition score	5.1	5.5	.4*
Calf birth date	Mar. 11	Jun. 8	
Calf birth wt., lb	77	72	5*
Calving difficulty, %	43	16	27*
Calf losses to weaning, %	12	14	2
Weaning date	Sept. 3	Nov. 23	
Avg. age of calf, days	176	169	7
Actual calf weaning wt., lb	389	333	56*
Calf ADG, lb.	1.77	1.54	.23*
Adjusted calf weaning wt., lb.[a]	441	386	55*
Cow condition at weaning	5.4	4.9	.5*
Cow weight at weaning, lb.	938	890	48*
Pregnant for 2nd calf, %	82	62	20*
Cow productivity, lb.[b]	328	238	90*

[a]Calf weaning wt. adjusted to 205 days of age and for sex of calf.
[b]Cow productivity equals pounds of calf weaned (adjusted wt.) per heifer exposed at breeding.
*Seasons differ (P < .05)

due to a BVD outbreak which caused some early abortions.

Because no differences were found between range and meadow heifer groups on calving data, the results were pooled and reported by calving season for the two years in Table 3. The variation in results may be due in part to the method of selecting the heifers from the spring and summer cow herds. Precalving heifer weights were heavier for the spring-calving than the summer-calving heifers in Year 1, but were similar in Year 2. Calf birth weights were heavier from the summer-calving heifers in Year 2, but were similar in Year 1.

Calving difficulty percentage was consistently greater (P < .05) for the spring-calving heifers. The summer heifers calved essentially unassisted both years. However, calf losses to weaning were greater for the summer heifers than for the spring heifers.

Calf weaning weights and pregnancy rates of the summer-calving cows in Year 1 were affected by the BVD outbreak so are not reported. In Year 2, calves from the summer calving heifers were younger at weaning, so were lighter in weight. Calf ADG and adjusted calf weaning weights were similar between the spring and summer groups. However, the summer calving cows were lighter (P < .05) in weight at weaning time and lower in body condition, which may have caused the lower (P < .05) rebreeding rate (92 vs. 65%, spring and summer, respectively). These summer cows were on native range during the breeding season in September and October, so grasses were mature and lower in quality than the green grass that the spring cows grazed during their breeding season in June and July.

Results of the third-year trial comparing spring and summer heifers are shown in Table 4. No meadow treatment was involved with these heifers. Prebreeding heifer weights were 690 lb for both groups. The breeding season began for the spring heifers on May 20 and for the summer heifers on Aug. 20. The summer heifers were lower in prebreeding body condition than the spring heifers which may have caused a 13% lower (P < .05) pregnancy rate in

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the 45-day breeding season (85 vs. 72%, spring and summer, respectively). Previous results also suggested a lower pregnancy rate for the yearling summer heifers.

The calving results on these heifers also are shown in Table 4. The spring heifers were 30 lb heavier at calving in March, but lower in body condition than the summer heifers calving in June. The spring-calving heifers were fed hay and supplement before and after calving, while the summer heifers were on winter and spring native range with some hay and supplement before calving. Calf birth weights were heavier ($P < .05$) for the spring-calving heifers and they had greater ($P < .05$) calving difficulty (43 vs. 16%, spring and summer, respectively). It appears that heifers calving in the summer calve much easier than heifers calving in the spring. This difference may be partially due to the relationship of size of calf and size of pelvic area, but other factors may be involved, such as warm temperatures and green grass which reduced stress on the heifers at calving. Interestingly, calf losses to weaning were similar for the two groups, with more early losses in the spring calves and more later losses in the summer calves. Calf scours were not a problem in either group, and heat stress during the summer calving was no problem.

Calves were sired by the same Angus bulls and were of similar age at weaning. Calf ADG was higher ($P < .05$) for the spring calves than for the summer calves (1.77 vs. 1.54 lb). The adjusted calf weaning weights were 55 lb greater ($P < .05$) for the spring calves than for the summer calves. The summer calving heifers had lower quality native range during the fall before weaning in November, so milk production was probably decreased.

The summer cows were 48 lb lighter at weaning and one-half body condition score less than the spring cows. These differences were probably the reason only 62% of the summer cows rebred for the second calf, compared to 82% of the spring cows ($P < .05$). Extra supplementation in the fall is probably needed for the young summer cows to breed back at a high level. Spring calving cows had a 90 lb advantage in cow productivity over the summer calving cows.

Additional studies on production and economics of spring and summer heifers are being conducted. However, from these initial results, it appears that summer calving heifers may be lower in reproduction as yearlings and as 2-year-olds and produce lighter calves at weaning. This means that extra inputs of feed and management will probably be needed at critical times of the production cycle for the young summer calving heifers to be highly productive.

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[1]Gene Deutscher, professor, Andy Applegarth, GSL manager; Dave Colburn, former beef manager; Rex Davis, beef manager; Animal Science, WCREC, North Platte.