

BREEDING YEARLING HEIFERS

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Many studies have shown returns are increased by breeding yearling heifers to calve for the first time at 2 years of age. Generally this is a sound recommendation, but it requires that replacement heifers are "grown-out" after weaning. They will need to reach puberty and start cycling by 12-14 months of age, which is attainable if heifers are fed adequately over their first winter.

It is common for calves to lose weight after weaning and not start gaining until new forage appears the following spring or summer. This results in breeding replacement heifers to calve first when they are approximately 3 years of age. Under these conditions, the rancher has two alternatives if he wants to breed heifers as yearlings:

- 1) provide supplemental feed on range after weaning replacement heifers,

or
- 2) place them in a drylot environment and provide adequate feed to ensure puberty by 12-14 months of age.

This report summarizes the results of a study designed to evaluate the effects of supplemental feed for replacement heifers under range conditions, and discusses potential benefits of a drylot system.

PROCEDURES

For more than a quarter of a century, The University of Arizona has had a cooperative research project with the San Carlos Apache Tribe's registered Hereford herd at Arsenic Tubs. The heifers used in this study were from this project. The general range area is at an altitude of 5,000 feet with forage consisting primarily of desert grassland vegetation. Annual rainfall averages about 14 or 15 inches with most of it occurring during the summer months of July and August. Temperature extremes may range from -10 F in January to 95 F in July.

At weaning time (October 6) the replacement heifers were divided into three groups of approximately 60 head each on the basis of weight. One group was maintained as a control with no supplemental feed and the other two groups were fed a high energy supplement to gain either 0.5 lb. (low) or 1.0 lb. (moderate) per day until the beginning of the breeding season (May 1). The supplement consisted of 65 percent milo, 25 percent cottonseed meal, 6 percent molasses, 1.5 percent dicalcium phosphate, 1.5 percent urea, 1 percent salt and vitamin A. It was prepared in 3/4-inch pellets and fed on the ground three times per week.

The .5 and 1.0 lb. gain-per-day levels were selected to determine the minimum weight (gain) required to breed yearling heifers successfully. The moderate-gain group would result in heifers weighing an average of 600 lbs. at the beginning of the breeding season. Weights were taken several times during the experiment and feed level adjusted in an attempt to obtain the desired rates of gain. All heifers were exposed to bulls for a 90-day breeding season beginning on May 1.

RESULTS

Heifers receiving supplemental feed were weighed four times during the wintering period; the controls were weighed twice. One of the major difficulties encountered in this study was maintaining the desired rate of gain (Table 1). Although feed levels

group. The greatest difference between actual and desired rate of gain occurred in the moderate group, even though feed levels were increased to almost 8 lbs. per heifer daily in this group from January 26 until the end of supplementation (April 23). Other studies have shown that providing supplemental feed to range cattle results in a decrease in grazing activity and intake of range forage.

Table 1. Gain, Feed Levels and Reproductive Performance.

Items	Control	Projected Gain Group	
		0.5 lb.	1.0 lb.
Number Heifers	61	60	61
Weaning Weight (10-6)	396	396	400
Feed Level and Gain (by period):			
11-17 Avg. Da. Gain, lb.		.41	.79
Avg. Da. Feed, lb.		2.70	2.70
12-21 Avg. Da. Gain, lb.	0.28	.21	.64
Avg. Da. Feed lb.		3.50	4.60
1-26 Avg. Da. Gain, lb.		.40	.33
Avg. Da. Feed, lb.		5.00	6.60
3-23 Avg. Da. Gain, lb.	-.11	0.60	0.83
Avg. Da. Feed, lb.		5.10	7.90
Total Avg. Da. Gain, lb.	-.21	0.43	0.66
Avg. Da. Feed, lb.		4.20	5.60
Total Feed/Heifer		701	946
Cwt. Feed/Cwt. Gain		974	843
Weight, 3-23	361	468	513
Number Exposed to Bull	27	55	59
Number of Live Calves	0	17	32
Percent Calving	0	30.9	54.2
Weaning Rate, Percent			
of Total	-	20.0	35.6
of Those Calving	-	64.7	65.6
Weaning Weight	-	352	336
Total Supplement (lb.)/ 100 lb. Calf Weaned	-	942	747

This would certainly seem to be the case in this study. The amount of pellets required per cwt. gain would indicate that practically all of the nutrient intake was being derived from the supplement.

No additional weights were taken after March 23, although supplemental feeding continued for another month (to April 23). Heifers weighing 400 lb. or more in March were exposed to bulls from May 1 to July 1. The actual numbers exposed were: controls, 27; low gain, 55; moderate gain, 59. None of the control heifers conceived during the breeding season, whereas 30.9 percent and 54.2 percent of the low and moderate groups conceived. Approximately one-third of the pregnant heifers lost their calves at birth or shortly thereafter, primarily due to calving difficulty. This resulted in a very low percent calf crop weaned for the supplemental group (20.0 percent for the low and 35.6 percent for the moderate). Based on the amount of supplement fed, it required approximately 800 lb.

were increased after each weigh period, the actual gains obtained by March 23 were 0.43 lb/day in the low group and 0.66 lb/day in the moderate

of feed to produce 100 lb. of calf at weaning time. Using 1984 prices, this would be roughly \$80-\$90 per 100 lb. calf at weaning time.

The system for growing-out heifers on the range used in this study was not effective. The biggest problem was maintaining the desired rate of gain with a reasonable amount of supplemental feed. Perhaps other methods of providing supplement would have been more effective, but any system used must address the problem of reduced grazing activity.

It may be more efficient to grow-out heifers after weaning under drylot conditions if they are to be bred at 12-14 months of age. This system has several potential advantages for Arizona ranchers grazing public lands. Heifers could be grown-out and bred while in drylot, and only those replacements that conceived would be returned to the cow herd. A short, 45-day breeding season starting approximately

one month in advance of the normal breeding season will assure that replacements would produce early calves and have additional time to re-breed for their second calf.

This system would also permit the use of estrus synchronization and artificial insemination to bulls with proven records for calving ease, as well as enable ranchers to gradually phase into a crossbreeding system if they desired to do so. Finally, there would be a reduction in Animal Units charged against the allotment, thereby reducing grazing pressure on the range during the critical winter and early spring months. Obviously, these potential advantages would have to offset the costs of feeding and breeding replacements under drylot conditions.

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SUPPLEMENTATION OR EARLY WEANING FOR RANGE BEEF CATTLE

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A maximum reproductive rate under range conditions is the most important consideration in a cow-calf herd. Although there are interrelationships between each successive reproductive cycle, probably the most critical stage involves the breeding performance of the first-calf heifer for her second calf. Among the more important factors influencing fertility during this period are 1) how early conception occurred during the previous (first) breeding season, 2) current nutritional status and, 3) level of lactation.

Studies were conducted with a range herd of registered Herefords owned and managed by the San Carlos Apache Indian Tribe to determine the effects on reproductive performance of 1) supplemental feeding prior to and during the breeding season of virgin and first-calf beef heifers on the range and 2) early-weaning calves from first-calf heifers on the range.

EXPERIMENTAL METHODS

The San Carlos Apache tribal herd is maintained approximately 60 miles east of Globe, Arizona at an elevation of 5,000 feet. Range forage consists primarily of desert grassland vegetation. Average annual rainfall is approximately 14 inches with a range in mean temperature from 45°F in January and to 84°F in July.

During each of two consecutive years, approximately 100 two-year-old virgin and 100 three-year-old first-calf heifers were allotted to six single-sire pastures 30 days prior to the breeding season (May 1 to August 1). Breeding pastures were originally designed to minimize differences resulting from forage and water availability. Approximately equal numbers of each age group were allotted to each pasture. In both years two pastures were allotted to each of the following treatments: control, supplementation or early-weaning. The number of cattle in each pasture was based on quantity of available forage. The supplement was pelleted and consisted of the following ingredients: 62% milo, 31% cottonseed meal, 5% molasses, 1% dicalcium phosphate, 1% salt and 10,000 I.U. vitamin A per pound of supplement. Feeding was initiated 2-4 weeks prior to the breeding season and continued for 90 days. The pellet was fed on the ground three times weekly at a rate equivalent of 5 lb. per animal daily. Calves in the early-weaning groups were weaned at an average of 70 to 80 days and placed in drylot on a self feeder.

Weights and condition scores were obtained prior to and following the supplemental-feeding period for virgin heifers in 1970 and for both age groups in 1971. Condition was subjectively rated, with higher values indicating better condition. A score of 6 is considered optimal and 4 adequate condition for normal reproductive performance. Reproductive performance was evaluated by percentage of calf-crop born and average day of birth during the subsequent year.

RESULTS AND DISCUSSION

Results of the first-year study are presented in Table 1. Availability of range forage was considered average

Table 1. Influence of Supplementation and Early Weaning, Normal Year

Heifer Age at Breeding	Item	Treatment			
		Control	Supplement	Early Weaning	Average
2	Initial weight, lb.	701	705	708	705
2	Weight change, lb.	190	201	176	187
2	Initial condition, units	4	4	4	4
2	Condition change, units	1	1	1	1
2	Percent calf crop at birth	79	71	81	77
3		83	73	89	82
Average		81	72	85	79
2	Average day of birth	62	84	65	70
3	(Jan. 1 = 1, etc.)	70	104	74	83
Average		66	94	69	76

during the period of this study. Weights and condition scores were obtained only from virgin heifers. Average daily gain of all groups (1.5 to 1.8 lb.) was considered excellent and all groups showed identical increases in body condition scores.

Both unsupplemented groups (control and early-weaning) had approximately an 80% calf crop born, which was substantially higher than the supplemented group. The average day of birth in the calving season, by treatments, followed the same trend. Milking first-calf heifers had a longer interval to conception than virgin heifers. This is normal and indicates the added stress imposed by the additional requirements for lactation and growth.

The results of this study indicate that supplemental feed or early removal of the

calf does not enhance reproductive performance if range conditions are adequate to provide a "flushing" effect immediately prior to and during the breeding season.

The next year's study was conducted during a period of extreme drought which had started the preceding fall. Results are presented in Table 2. Weights and condition scores were

Table 2. Influence of Supplementation and Early Weaning, Drought

Heifer Age at Breeding	Item	Treatment			
		Control	Supplement	Early Weaning	Average
2	Initial wight, lb.	648	644	646	646
3		780	745	750	758
Average		714	694	697	701
2	Weight change, lb.	18	97	11	42
3		-40	82	-44	0
Average		-11	90	-15	22
2	Initial condition, units	4	4	4	4
3		3	2	3	3
Average		4	3	4	4
2	Condition change, units	0.1	0.6	0.3	0.3
3		1.0	2.7	1.0	1.6
Average		0.5	1.7	0.7	1.0
2	Percent calf crop at birth	92	89	88	90
3		62	84	91	79
Average		77	86	90	84
2	Average day of birth	77	63	63	68
3	(Jan 1 = 1, etc.)	86	76	78	80
Average		82	69	71	74
3	(Jan 1=1, etc.)	86	76	78	80
Average		82	69	71	74

obtained from both age groups (virgin and first-calf) during this study. Initial weights of virgin heifers averaged 60 lbs. less than for the preceding year, reflecting the influence of sparse range forage on growth.

Supplemental feeding resulted in a large difference in weight gain when compared to control and early-weaning treatments. Heifers in both the latter treatments lost weight (11 and 15 lb., respectively), whereas the supplemental groups gained 90 lb. Although weight change was approximately the same for both age groups with supplement, a difference in weight change of approximately 55 lb. existed between the two age groups in the non-supplemented treatments (control and early-weaning). It is interesting to note that first-calf heifers in the early-weaning groups showed the same weight loss as control heifers that were suckling a calf.

Differences in initial-condition scores between the two age groups reflect the effects of gestation and lactation on first-calf heifers (4 vs. 3). Although both age groups had low condition scores, the influence of the drought was more evident among first-calf heifers. Changes in condition differed among treatments (control and early-weaning). The first-calf heifers showed the greatest overall improvement in condition, although their average scores were slightly less than those of virgin heifers at the end of the treatment period (4 vs. 4.5).

Virgin heifers averaged 11% higher calf crop than first-calf heifers. Supplementation did not improve calf crop percentage among virgin heifers (89% vs. 92%),

although substantial differences were noted in weight gain between the groups. Among first-calf heifers, both supplementation and early-weaning improved calf crop percentage, resulting in a 22% to 29% increase over control groups. The highest-percent calf crop in first-calf heifers was obtained from the early-weaning groups (91%). This was in spite of the fact that early-weaning heifers lost approximately the same amount of weight as control heifers, although the latter group had only a 62% calf crop. This difference apparently reflects the effect of lactation, independent of weight changes during the breeding season.

Earliness of conception during the breeding season, as measured by day of birth, followed the same general trends as percent calf crop. Both supplemental and early-weaning treatments were associated with earlier calving dates than controls. The average difference between age groups was of approximately the same magnitude as recorded in the previous year's study.

The results of these studies demonstrate that "flushing" virgin heifers does not improve reproductive performance if sufficient range forage is available to maintain body weight. In lactating first-calf heifers, weight loss during the breeding season is detrimental to fertility. If range conditions are not adequate to prevent weight loss, either providing supplemental feed to the heifer or removing the calf will result in normal reproductive performance.

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FEEDLOT VS. RANGE PERFORMANCE

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The San Carlos Apache Indian Tribe and The University of Arizona Animal Sciences Department have been cooperating in beef cattle research since 1956. The program involves a 500-head registered Hereford cow herd owned and maintained by the tribe on the San Carlos Apache Indian Reservation. The registered cows observed in the research are maintained as a separate unit on the reservation. Facilities include cattle corrals and working areas, scales, and 20 single-sire breeding pastures.

This cooperative project was included as a part of the Arizona Agricultural Experiment Station contribution to Regional Research Project W-1, the Improvement of Beef Cattle through the Application of Breeding Methods. As a part of this regional effort, some of the participating stations have developed high performance lines of beef cattle selected with use of performance testing procedures. Participating stations agreed to make sires available from these performance-selected inbred lines for use in the San Carlos registered cow herd.

The purpose of the study reported here was to evaluate these inbred lines for economically important traits. The study was also designed to permit a comparison of range and feedlot performance of bull progeny of the test sires. Sires from inbred lines were obtained from Agricultural Experiment

Stations at Montana, Wyoming, Utah and New Mexico. Two lines were represented from the Nevada and Colorado Experiment Stations and from the U.S. Range Livestock Experiment Station, Miles City, Montana. The 10 lines were all of registered Hereford breeding. A different bull was provided from each line during four successive breeding seasons during the 1970s.

The registered Hereford cows and heifers used in the test herd were allotted at random each year within age-of-cow classes. Approximately 30 cows were allotted per sire in single-sire breeding pastures. The breeding season extended from May 1 to August 1.

The general range area is at an altitude of 5,000 feet with range forage consisting primarily of desert grassland vegetation. Annual rainfall averages about 14 inches with most of it occurring during the summer months of July and August. Temperatures may range from -20°F in January to 95°F in July.

The calves were ear tattooed, and individual birth dates and weights were recorded. Pertinent comments concerning information that could affect performance were also noted during the nursing period.

In early November, all cows and calves were brought to the corrals for weaning. The calves were weighed and individually scored for conformation and condition. At weaning, half of the bull calves of each sire group were randomly selected for feedlot performance testing. The remaining bull calves were left on the range.

The bulls and heifers on the range were maintained separately after weaning. Subsequent weights were obtained in the early spring (about

March 1) before the growth of new forage, again in the fall in November and the following spring. Thus, four stages of development were represented with an average age of 235, 340, 600 and 710 days. The herd was maintained on a year-long grazing program with no supplementation.

The feedlot performance test was conducted at the Agricultural Experiment Station at Tucson. The bulls were group fed for a 140-day period. Individual weights were taken at 28-day intervals. The test ration containing approximately 50% concentrates was fed free choice during the four years of the test. Average weights at the beginning and end of the test were 469 lbs. and 893 lbs., respectively. This resulted in an average daily gain of 3.03 lbs. The heritability of gain during this test was 54%.

Half-siblings remaining on the range actually lost weight during the same period. (Bulls, -.29 lb. per day and heifers -.50 lb. per day.) This is a common pattern for unsupplemented range calves in Arizona during their first winter after weaning. During the following growing season (340-600 days of age), gains of the calves on the range were excellent, with bulls averaging 1.43 lbs. per day and heifers 1.40 lbs. per day.

DOES FEEDLOT PERFORMANCE REFLECT RANGE PERFORMANCE?

To evaluate the relationship between feedlot performance and range performance requires a look at the correlation between sire groups on the range and in the feedlot. Using the period of growth for the range calves (approximately 12 to 20 months of age), this correlation for the bulls from the same sire groups was 0.84 (perfect correlation = 1.0). The relationship for the bulls on feed test and their half-sibling heifers on the range was less (0.49),

but still fairly large and positive. These correlations tell us that a feedlot performance test is a good indication of how the same animals would perform on the range, particularly for bull progeny from the same sire. Simply stated, the higher gaining bulls on a feed test should also be the higher gaining bulls under range conditions. Thus, selecting bulls based on a feedlot performance test should result in improvement of gaining ability on the range.

The fact that the correlation or relationship is not perfect would indicate that some change in ranking bulls based on a feed test or range performance would occur. This leads us to the general conclusion that the best way to evaluate replacement animals for their growth potential is to test them under the conditions we expect them to live. However, substantial improvement can be made by selecting bulls based on a feedlot performance test where they can express their maximum ability to gain.

A COMMENT OR TWO

A word of caution. Simply because a bull is "performance tested" doesn't tell us he will improve the gaining ability of calves on the range (or anywhere else). We have to use the performance test information in a logical manner by selecting only those animals that are at the "top of their class" in the performance test. Only through this method can we expect substantially to improve gaining ability of beef cattle on the range.

Finally, any valid comparison of performance must be between animals tested in the same environment. To compare records of performance at one ranch with those from another or between one test station and another would not be valid because of different dates, management and other environmental factors.

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