Skeletal measurements for the trial are summarized in Table 6. Growth in heart girth circumference and height was quite similar for heifers receiving control and monensin treatments. These observations are in agreement with weight response data.

As previously indicated, data relative to reproductive performance for these heifers will be reported at a later date.

Twenty-Four vs 30-Month-Old Calving with Hereford Heifers

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Story in Brief

Twenty-nine Hereford heifers born in the spring of 1976 and 36 born in the fall of 1975 were managed alike following weaning and were bred in the spring of 1977 to calve at 24- or 30-months of age. Thirty-month-old first calving heifers had 13 percent ($P<.18$) higher conception rates at first breeding and 40 percent higher ($P<.001$) conception rates at rebreeding after calving. Calving difficulty and calf mortality were similar for both groups.

The older heifers were larger at calving but had heavier calves than the younger heifers. Calves of 30-month-old heifers were 45 lb heavier ($P<.001$) at weaning than calves of 24-month-old heifers. Thirty-month old heifers had approximately a 120 lb weight advantage ($P<.001$) at first breeding and maintained that advantage through the weaning of the first calf.

Introduction

Much research has compared the merits of calving heifers for the first time at 24- or 36-months of age. In general, the data have shown that 36-month-old heifers wean heavier calves and rebreed more successfully than two-year-old heifers. Two-year-old heifers will usually require more assistance at delivery but calf losses will be similar since three-year-old heifers will have larger calves than two-year-olds.

In many respects, neither two-year-old nor three-year-old first calving is a feasible alternative for the producer. Many find it very difficult to develop heifers adequately for breeding at 15 months of age and as a result encounter low conception rates at both first breeding and at rebreeding after first calving. Developing heifers for 36-month-old calving is easy but the advanced age at first calving wastes a significant portion of the heifers productive life.

An alternative for those producers calving in both fall and spring would be to breed for first calving at 30 months of age. A great saving in terms of rebreeding rate, productive lifespan and feed could result if an additional six months of development could overcome many of the problems of calving at 24 months of age.

The objectives of this work was to compare the growth and reproductive performance of 24- and 30-month-old first calving heifers and the performance of their calves.

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Experimental Procedure

Data were summarized from 29 Hereford heifers born in the spring of 1976, and 36 heifers born in the fall of 1975. After weaning of the younger group, all heifers were managed alike through the weaning of their first calves in September of 1978. The heifers were used in fly control studies during the summers of 1976 and 1977 and in a wintering study during the winter of 1977 to 78, but were blocked according to age in each case. The study was conducted at the Lake Carl Blackwell experimental range in North Central Oklahoma.

Management of the heifers consisted of wintering on standing tallgrass native range with protein supplementation. Hay was fed on days when snow or ice covered the ground. Summer forage consisted of native range during the summer of 1977 and Midland Bermuda during the summer of 1978.

The breeding season was 60 days in length beginning on May 2, 1977 (first breeding) and May 10, 1978 (rebreeding after 1st calving). In each season, heifers were randomly assigned by age to three Hereford bulls. Pregnancy was determined by rectal palpation about 60 days after bulls were removed.

All calves were weighed, eartagged and tattooed at birth. A calving difficulty score was assigned to each according to a scale of 1-5 where 1 = no difficulty, 2 = some difficulty with no assistance rendered, 3 = light assistance, 4 = hard pull and 5 = caesarean section. No sections were required. Calves were creep fed a mixture of 95 percent oats-5 percent molasses for 60 days before weaning on September 28, 1978.

Results and Discussion

Preweaning performance of calves from the 24- and 30-month-old calving heifers is shown in Table 1. Adjusted weaning weights for 30-month-old heifers were 45 lb heavier ($P<.001$) than for calves of 24-month-olds. Calves of the older heifers were also heavier at birth by 3.4 lb. The number of heifers requiring assistance at delivery was high but similar for both 24- and 30-month-olds (36 and 37 percent respectively). Calving difficulty scores were similar for both groups as were the number of calves failing to survive the first seven days.

Rice (1976) summarizing data comparing two- and three-year-old calving from Miles City, Montana and Fort Robinson, Nebraska showed that while two-year-old heifers required more assistance at birth, calf mortality was not different from that of three-year-olds. The difference was attributed to the fact that three-year-olds had

Table 1. Preweaning performance of first calves from heifers calving at 24- or 30-months of age.

Item	Heifer age at first calving		
	24 mo.	30 mo.	Prob.
Number of calves weaned	16	23	
Calf birth date (day 1=Jan 1)	80	61	P<.001
Calf birth weight, lb	63.7	67.1	P<.11
Calving difficulty score	1.8	1.9	
No. calves dead within 7 days	6	7	
Birth wt of calves assisted	70	72	
Birth wt of calves unassisted	60	64	
Calves assisted at delivery, %	36	37	
Adjusted weaning wt (205 day steer equivalent)	401	446	P<.001

calves weighing 6 to 10 lb more at birth than two-year-olds. Apparently the small increase in birth weight seen with the 30-month-old heifers in this study was enough to offset the larger size of the older heifers at calving.

A breakdown of birth weights by assistance shows that the average birth weight of calves requiring assistance was 10 lb heavier for calves of 24-month-olds and 8 lb heavier for calves of 36-month-olds. These data suggest that difficulty may be encountered when birth weights approach 70 lb in either age of heifers.

Aside from calving difficulty, the greatest problems encountered with 24-month-old calving heifers have been developing them to adequate size to reach puberty at 15 months of age and getting acceptable rebreeding rates after first calving. Conception rate data (Table 2) shows that the older heifers tended to breed more readily at first breeding than did the heifers bred to calve first at 24 months of age (89 percent vs 76 percent).

The older heifers weighed 115 lb more ($P<.001$) than the younger heifers at the beginning of the first breeding season. Since heifer weight is an important factor in determining the onset of puberty in heifers, breeding first at 21-months to calve at 30-months should improve conception rates at first breeding. This is especially true in times when forage and supplemental feed are not adequate for the rapid growth required for breeding at 15 months of age.

The most striking effect of age at first calving is seen in the rebreeding rates following first calving. Only 42 percent of the 24-month-old heifers rebred during the 60-day breeding season compared to 82 percent of the older heifers.

Harsh weather conditions during the winter of 1977 to 78 (47 days of snow cover) may have reduced overall rebreeding performance from that expected in a more normal winter. However, the rebreeding rates seen here are probably indicative of the consequences of calving at an early age when nutritional or climatic stress is encountered.

Weight change patterns in Table 2 show that both groups of heifers lost about the same amount of weight during the winter and regained about the same amount of weight during the summer when they were lactating. These weight changes suggest that the greatest advantage of calving first at 30 months of age is found in the larger weight and increased development at first breeding which seems to carry on through the weaning of the first calf.

Table 2. Weight changes and conception rates of 24- and 30-month-old heifers through the first calf crop.

Item	Heifer age at first calving		
	24 mo.	30 mo.	Prob.
Heifers weight			
at birth	73	70	
at first breeding (5/2/77)[1]	522	637	P<.001
fall before 1st calving (9/28/77)[2]	726	850	P<.001
30 days before 1st calving season (2/1/78)[2]	776	883	P<.001
at 2nd breeding (5/10/78)[3]	668	724	P<.001
at weaning of 1st calf (9/28/78)[3]	784	851	P<.001
Conc. rate after 1st breeding season, %	76(22/29)	89(32/36)	P<.18
Conc/ rate after 2nd breeding season	42(8/19)	82(22/27)	P<.004

[1]Includes all heifers exposed to bulls.
[2]Includes all heifers pregnant 60 days after breeding season.
[3]Includes only heifers weaning a calf.

These results show that calving Hereford heifers first at 30 months of age improves conception at both first breeding and rebreeding after calving over that seen with calving first at 24-months. Weaning weight of the first calf crop was increased by 45 lb with the older heifers. Calving difficulty and calf mortality were similar with both groups. If forage and feed supplies are adequate, heifers may be properly developed and maintained for calving at 24-months. On the other hand, these results show that many effects of harsh weather and marginal nutrition can be overcome by calving at 30 months of age.

Literature Cited

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Effect of Potassium on Weight Gains of Steers Wintered on Dormant Native Range[1]

G. W. Horn, P. L. Sims and K. S. Lusby

Story in Brief

Hereford steer calves were wintered on dormant native range and fed protein supplements containing 20 or 40 percent crude protein. The 40 percent crude protein supplements contained all natural protein or coated urea and 1.47 or 3.0 percent potassium (K). Gains of steers fed the coated urea, 3 percent K supplement were similar to those of steers fed the coated urea, 1.47 percent K supplement when averaged across four blocks of pastures.

Introduction

Potassium (K) markedly affects cellular protein synthesis (Lubin and Lubin and Ennis, 1964). In experiments conducted by Rinehart *et al.* (1968), significantly less of the amino acid, leucine, was incorporated into skeletal muscle protein by chicks fed a K-deficient diet.

Weight gains of steers, fed rations in which supplemental soybean meal was withdrawn during the latter part of the finishing period, were slightly increased by supplemental K (Preston *et al.*, 1974 and Preston and Cahill, 1974).

Recent studies by Karn and Clanton (1976 and 1977) have shown that weight gains of steer calves wintered on dry, native range were increased by the addition of K to urea-containing protein supplements. The object of this study was to obtain additional information relative to the effect of K, when added to urea-containing supplements, on weight gains of steers wintered on dry, native range.

[1]In cooperation with USDA, Science and Education Administration, Agricultural Research, Southern Region.