

## The Age and Weight at Puberty of Some Angus and Angus-Hereford Crossbred Heifers

E. J. Turman, R. H. Edwards, R. L. Willham and R. E. Renbarger

### Story in Brief

Seventy-four Angus heifers were started on self-feeders containing a 60 percent concentrate ration one week after weaning. After 140 days on feed, 69 (93.2 percent) had attained sexual maturity (puberty) at an average age and weight of 267 days and 514 lbs. Average daily gain during this period was 2.02 lbs. per day. In comparison, a comparable group of Angus heifers being developed as replacement heifers gained 0.19 lbs. per day during the same period and 4 (15.5 percent) reached puberty. Twenty-seven Angus-Hereford crossbred replacement heifers gained 0.53 lb. per day during this period and only 2 (7.4 percent) attained puberty.

The Angus and crossbred replacement heifers were maintained on native grass pastures and fed the necessary supplemental feed (cottonseed meal and ground milo) for the moderate level of winter gain (approximately 0.5 lb. per day). Estrus observations were discontinued on April 16, at which time the average ages of the heifers were just under 14 months. Twelve (46.1 percent) of the Angus and 7 (25.9 percent) of the crossbred heifers had attained puberty. The average ages and weights were: Angus 375 days and 474 lbs.; and crossbred, 383 days and 459 lbs. This response of the Angus and crossbred heifers is very similar to that reported previously for Hereford replacement heifers on the moderate level of winter feeding.

The data obtained in this study emphasized, again, the effect of higher levels of nutrition in stimulating early sexual maturity in heifers. It suggests that Angus and crossbred heifers must be fed during the winter to gain faster than 0.5 lb. per day if all are to reach sexual maturity by 15 months of age.

### Introduction

The age at which beef heifers start production is usually dictated by the system of management. The most common management system practiced by Oklahoma cow-calf operators is calving only during a single limited season. This forces the cattleman to make the decision as

to whether heifers should be bred to calve first at 2-years of age or wait until they are 3-year-olds.

The results of studies at the Ft. Reno Research Station have indicated that if beef heifers are sufficiently well developed they may safely be calved at two-years of age. The results, as summarized in the 1963 Feeders' Day report (Okla. Agr. Exp. Sta. MP-70, page 15), showed there was no adverse effect of two-year old calving on later reproductive performance, mature size, or life span.

If heifers are to be bred to calve at two-years of age they must have reached sexual maturity (puberty), as evidenced by the establishment of a regular estrual cycle, by 15 months of age. Several factors are known to influence age of puberty, the most important of which is the level of nutrition following weaning. It has also been reported that there are definite differences between breeds in age of puberty, although most of these studies have been concerned with heifers of the dairy breeds.

A previous Feeders' Day report (Okla. Agr. Exp. Sta. MP-70, page 28) reported the average age of puberty for replacement Hereford heifers being carried at three levels of winter feeding at the Ft. Reno Station. The average ages and weights for heifers on the various levels were: high level, 353 days and 540 lb.; moderate level, 373 days and 522 lb.; and low level, 386 days and 475 lb. The average daily gain of the heifers on each of these levels during the winter were: high, 1.05 lbs./day; moderate, 0.53 lb./day; and low no gain.

Comparable observations have not been obtained for Angus heifers at the Ft. Reno Station. This report is concerned with data collected on the attainment of puberty of a limited number of Angus and Angus-Hereford crossbred heifers that were being carried on two levels of post-weaning nutrition.

## Materials and Methods

The data used in this report were obtained from: 100 Angus heifers produced in an Experiment Station cow herd at the Lake Carl Blackwell range, Stillwater in 1965, and moved to the Ft. Reno Experiment Station at time of weaning; and 27 Angus-Hereford crossbred heifers produced in a Ft. Reno Experiment Station cow herd in 1965. Seventy-four of the Angus heifers were immediately placed on full-feed for 168 days at the Ft. Reno Station. They are part of the 279 Angus described in a previous Feeders' Day report (Okla. Agr. Exp. Sta. MP-79, page 31). They were self-fed a 60 percent concentrate ration starting one week after weaning. The remaining 26 Angus heifers, plus the 27 crossbred

heifers, were developed as replacement heifers to be used in estrus synchronization studies in the following spring. They were maintained on a moderate level of winter feeding on native grass pastures receiving 1½ lb. cottonseed meal per head per day starting November 15, plus ground milo as needed to obtain approximately 0.5 lb. per day gain.

The occurrence of estrus was determined by use of vasectomized bulls running with the heifers. Estrus observations were terminated in the feedlot heifers on February 10, 1966. The observations were continued in the replacement heifers until April 16, 1966 at which time hormone feeding was started.

## Results and Discussion

The data reported in Table 1 compares the rate of reproductive maturity of full fed and limited fed beef heifers. The Angus heifers used in this study responded to full feeding following weaning by reaching sexual maturity at an average age of slightly less than 9 months. After 140 days in the feedlot, 93.2 percent had reached puberty and began to cycle. This compares to only 15 percent of a comparable group of Angus heifers fed to gain only 0.19 lb./day during the same period, and 7.4 percent of the crossbred heifers gaining 0.53 lb. per day. Certainly, this data does not suggest that any heterosis is associated with attainment of sexual maturity of crossbred heifers being fed only a limited amount of supplemental feed during the winter.

The data summarized in Table 2 suggests that there are differences between sires in the rate at which their daughters reach sexual maturity. The difference of nearly a month in the ages at which heifers of the various sire groups reached puberty (range 253.1 days to 277.1 days) was

Table 1. Some measures of reproductive development of Angus and Angus-Hereford crossbred heifers maintained under two different levels of nutrition from weaning on September 28, 1965 until February 10, 1966—number attaining puberty and age and weight at first estrus.

Description of Heifer	No.	Avg. Wt./Heifer		Avg.			First Estrus	
		9-28-65	2-10-66	Daily Gain	Attaining Puberty	Avg. Age	Avg. Weight	
		(lb.)	(lb.)	(lb./day)	No.	%	(days)	(lb.)
Feedlot Heifers								
Angus	74	401.2	683.8	2.02	69	93.2	267.4	514.4
Replacement Heifers								
Angus	26	422.9	448.8	0.19	4	15.4	329.8	490.0
Crossbred	27	392.2	462.8	0.53	2	7.4	328.5	420.0

**Table 2.** Some measures of reproductive development of sire progeny groups of Angus heifers on full feed—number attaining puberty during a 140 day feedlot period and average age and weight at first estrus.

Sire	No. Heifers	Avg. Wt./Heifer		Avg. Daily Gain (lb./day)	First Estrus		Attaining Puberty	
		9-28-65 (lb.)	2-10-66 (lb.)		Age (days)	Wt. (lb.)	No.	%
02303	7	396.4	686.0	2.15	253.1	510.3	7	100.0
02305	8	411.3	705.5	2.18	255.5	524.9	8	100.0
02205	7	438.6	715.4	2.06	260.5	502.3	7	100.0
02222	9	377.8	617.0	1.79	263.3	458.8	7	77.8
02211	8	407.5	675.9	1.99	269.7	520.0	6	75.0
02227	8	388.1	642.8	1.89	269.8	502.8	6	75.0
02301	8	427.5	704.6	2.04	275.3	564.7	7	87.5
02302	9	392.8	677.8	2.12	277.1	530.3	8	88.9

not statistically significant, but the differences in the groups in weight at first estrus (range 458.8 lb. to 564.7 lb.) was significant ( $P < .05$ ). This suggests that the differences between sire groups in attainment of sexual maturity are largely a function of differences in average rate of gain of their daughters. The importance of rate of gain is further indicated by the observation that the three groups in which all heifers had reached puberty by February 10 were also the three groups with the youngest average age at first estrus and included the top two groups and the fourth ranked group in average daily gain.

Table 3 presents data on the reproductive development of Angus and Angus-Hereford crossbred replacement heifers wintered at a moderate level (0.5 lb./day gain). Because of the necessity to start hormone treatments on April 16, data on age and weight at first estrus was not obtained on all heifers in the experiment. At the time the observations were terminated on April 16, the average ages of the heifers in each breed group were; Angus heifers 13.7 months, and crossbred heifers, 13.9 months. Twelve (46.1 percent) of the Angus heifers had attained sexual maturity at an average age of 375 days and a weight of 474 lbs. Seven (25.9 percent) crossbreds had reached puberty at an average age and weight of 383 days and 459 lbs., respectively. These limited data obtained on the Angus and crossbreds compare very closely to the average age at first estrus of 373 days observed in Hereford heifers wintered on the moderate level at Ft. Reno and referred to previously (Okla. Agr. Exp. Sta. MP-70, page 28). The average weight reported for the Hereford heifers (522 lbs.) was approximately 50 lbs. heavier. However, it should be pointed out that these averages were obtained on only one-half of the Angus and one-fourth of the crossbred heifers. Had observations been continued until all heifers had reached puberty it is

**Table 3.** Some measures of reproductive development of Angus and Angus-Hereford crossbred replacement heifers maintained at a moderate level of winter feeding—number of heifers attaining puberty by April 16, and average age and weight at first estrus.

Breed	No.	Av. Wt./Heifer		Avg. Daily Gain (lb./day)	Attaining Puberty No.	%	At First Estrus	
		11-15-65 (lb.)	4-13-66 (lb.)				Avg. Age (days)	Avg. Wt.
Angus	26	431.5	491.9	0.41	12	46.1	375.1	474.2
Crossbred	27	437.6	513.7	0.51	7	25.9	383.3	458.9

likely that the average age would have been older and average weight heavier.

These observations confirm other reports of the importance of level of nutrition on rate of sexual development. While complete data was not available on the Angus replacement heifers, it would appear that their performance is very similar to that observed in Hereford heifers in previous years. When age of sexual maturity was checked in Hereford heifers wintered at high (1.0 lb. per day gain), moderate (0.5 lb. per day gain), and low (no winter gain) levels of feeding, it was found that the group on the high level was the only one in which all of the heifers had reached puberty by 15 months of age. In comparison, in the moderate and low level groups respectively, 90 and 70 percent were cycling by 15 months and, thus, could have been bred to calve at 24 months. Since only 46 percent of the Angus heifers maintained at the moderate level had reached puberty by 13½ months of age, it would appear that if data had been available for 15 months the number reaching puberty would have been very similar to that reported for Herefords.

The results reported in this study emphasize, again, the stimulatory effect of high levels of nutrition (and, conversely, the suppressing effects of low levels) on sexual maturity of heifers. Of course there are so many undesirable effects associated with full feeding of heifers that it cannot be recommended regardless of its effect on attainment of puberty. It appears, therefore, that the optimum level for developing replacement heifers is somewhere between the full-feeding and the moderate levels reported in this paper. Therefore, even though the high level used in previous Ft. Reno research (1.0 lb. per day gain) was not studied in this trial, the results obtained does not give any reason to alter the recommendation that a level of winter feeding to give a gain of approximately 1.0 lb. per day is the level that will result in the optimum development of replacement heifers.