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D.J. Patterson

L.R. Corah

D.D. Simms

See next page for additional authors

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Abstract

Heifer development as effected by nutrition was evaluated in 148 F Angus x Hereford (A x H) and 148 F Brahman x Hereford (B x H) heifers. Heifers within each breed cross were assigned to one of two energy levels and weight groups. Heifers on the low and high energy-level diets were fed to reach 55 or 65%, respectively, of their projected mature body weights by the start of spring breeding. A higher (P<.05) percentage of A x H heifers had reached puberty by the start of spring breeding; however, their average age at puberty was greater (P<.05) than that of B x H heifers. Weight at puberty, for heifers that cycled prior to the start of spring breeding, did not differ between breed groups. Weight of heifers at puberty was greater with the high-energy than with the low-energy diets. Prebreeding body condition scores of heifers on the two energy levels differed (P<.05) more among the A x H females. The A x H heifers had higher (P<.05) fall pregnancy rates than the B x H heifers (89.2 vs 71.9%). Energy level has no significant effect on fall pregnancy rate of A x H heifers, but B x H heifers on the high-energy level had a higher (P<.05) pregnancy rate than those on the low-energy diet.

Keywords

Cattlemen's Day, 1986; Kansas Agricultural Experiment Station contribution; no. 86-320-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 494; Beef; Reproductive performance; Target weight; Pregnancy rate

Authors

D.J. Patterson, L.R. Corah, D.D. Simms, J.R. Brethour, and W.R. Negus

Reproductive Performance of Angus x Hereford and Brahman x Hereford Heifers Fed to Prebreeding Target Weights

D.J. Patterson, L.R. Corah, D.D. Simms,[1] J.R. Brethour[2], and W.R. Negus[2]

Summary

Heifer development as effected by nutrition was evaluated in 148 F_1 Angus x Hereford (A x H) and 148 F_1 Brahman x Hereford (B x H) heifers. Heifers within each breed cross were assigned to one of two energy levels and weight groups. Heifers on the low and high energy-level diets were fed to reach 55 or 65%, respectively, of their projected mature body weights by the start of spring breeding.

A higher (P<.05) percentage of A x H heifers had reached puberty by the start of spring breeding; however, their average age at puberty was greater (P<.05) than that of B x H heifers. Weight at puberty, for heifers that cycled prior to the start of spring breeding, did not differ between breed groups. Weight of heifers at puberty was greater with the high-energy than with the low-energy diets. Prebreeding body condition scores of heifers on the two energy levels differed (P<.05) more among the A x H females.

The A x H heifers had higher (P<.05) fall pregnancy rates than the B x H heifers (89.2 vs 71.9%). Energy level had no significant effect on fall pregnancy rate of A x H heifers, but B x H heifers on the high-energy level had a higher (P<.05) pregnancy rate than those on the low-energy diet.

Introduction

Attainment of puberty in beef heifers depends largely on age and weight; however, the influence of these two factors differs with breed. Sorting heifers and feeding heavy and light weight groups separately effectively reduces age at puberty and increases pregnancy rate.

This study was conducted to evaluate reproductive performance in the first and subsequent calvings of two different biological types of beef females fed to reach target percentages of their projected mature body weight by the start of spring breeding.

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[1]Extension Livestock Specialist, Northeast Kansas.

[2]Fort Hays Branch Experiment Station.

Experimental Procedures

This project was designed to measure the effects of breed cross and heifer development as affected by nutrition and breeding scheme on lifetime productivity and reproductive performance. We used 148 F_1 Angus x Hereford (A x H) heifers and 148 F_1 Brahman x Hereford (B x H) heifers obtained from 17 ranches throughout Kansas, east central Colorado, and northeastern Oklahoma. All heifers purchased for the study were known F_1's with a recorded birth date.

At the start of the trial, heifers within each breed group were randomly allotted to one of two nutritional treatments based on origin and birth date. Within each treatment, heifers were then divided into light (below average) and heavy weight (above average) groups based on initial weight.

Nutritional treatments consisted of either low or high-energy feeding programs designed to allow both light and heavy heifers to reach 55% or 65%, respectively, of their projected mature body weight by the start of spring breeding. Frame measurements were used to predict mature weights. Nutritional treatments were started on December 5, 1984 and continued through June 29, 1985. Diets consisted of prairie hay, ground milo, and a soybean meal-based supplement. Heifers were weighed every 28 days and gains were compared with the desired gain for each treatment group. Based on monthly gains, diets were adjusted to attain the following month's desired weight change.

Prior to the breeding season, heifers were observed twice daily for visible estrus. In addition, the eight groups of heifers were exposed to either marker bulls or androgenized cows to aid in estrus detection. Criteria used to determine age at puberty included:

1) marked by a bull or androgenized cow, or seen standing in estrus

2) presence of a palpable corpus luteum

3) progesterone levels $\geq$ 1 ng/ml of serum 6 to 10 days following observed estrus

At the start of the breeding season, heifers were classed as either cycling or prepuberal based on these criteria. Beginning on May 12, heifers were observed continuously during the daylight hours to detect signs of visible estrus and the use of marker bulls was continued. Heifers were inseminated 12 hr following the onset of estrus by one of two AI technicians, using semen from a single sire. At the end of the 45-day AI period, heifers were transferred to the Fort Hays Branch Experiment Station and exposed to a clean-up bull for 35-days.

Results and Discussion

Heifer weights are summarized in Table 12.1. Actual prebreeding weights of both breed groups closely matched the targeted weights. The one exception was the light weight, B x H heifers on the high energy diet, which gained slower than anticipated. Average daily gains across all treatments ranged from .49 to 1.59 lb per day. Daily gains do not reflect actual gain potential, since all heifers were fed to prebreeding target weights.

Age and weight at puberty, prebreeding body conditon score and weight, and fall pregnancy status of the respective breed groups are summarized in Table 12.2. A higher percentage (P<.05) of the A x H heifers had reached puberty by the start of spring breeding compared to the B x H heifers (92.6 vs. 66.8%). This difference may be explained in part by the fact that the A x H heifers were about a month older.

Of the heifers that reached puberty before spring breeding, average age at puberty was greater (P<.05) for the A x H heifers (361 vs. 338 days), but a smaller percentage of the B X H heifers had cycled. No significant difference was observed between breed groups for weight at puberty. Weight at puberty was heavier (P<.05) in both breed groups for heifers on the high-energy level.

Prebreeding body condition scores for the two breed groups differed (P<.05) among the energy levels and weight groups. Body condition scores increased with increasing weight in the A x H heifers, but not in the B x H heifers.

Fall pregnancy rates were higher (P<.05) among the A x H heifers compared to the B x H heifers (89.2 vs. 71.9%). No major differences in pregnancy rates were seen in the A x H heifers because of energy level or weight grouping. However, in the B x H heifers, fall pregnancy rates were higher (P<.05) on the high-energy level. This may represent an important difference between the breed groups that warrants further consideration.

We will continue to measure subsequent reproductive performance of these heifers to examine the long-term effects of nutritional treatments imposed during the early development period.

Table 12.1. Prebreeding Heifer Weight and Body Condition Score Summary

	Breed, Treatment, and Weight Group							
	Angus x Hereford				Brahman x Hereford			
	Low energy[1]		High energy		Low energy		High energy	
Item	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
No. Heifers	37	37	37	37	37	37	37	37
Initial Wt., lb[2]	442	516	436	504	426	502	431	505
Estimated Mature Wt., lb[3]	1050	1050	1050	1050	1125	1125	1125	1125
Target Prebreeding Wt., lb	578	578	682	682	619	619	731	731
Actual Prebreeding Wt., lb	609	590	677	690	621	640	662	727
Average Daily Gain, lb (12/5/84 to 5/6/85)	1.09	.49	1.59	1.22	1.28	.91	1.52	1.46

[1]Energy level: heifers were fed to weigh 55% (low level) or 65% (high level) of projected mature body weight by the start of spring breeding.

[2]Initial wt. obtained on Dec. 5, 1984.

[3]Mature wt. estimates were based on age, frame size, and weight.

Table 12.2. F_1 Angus x Hereford and F_1 Brahman x Hereford Yearling Prebreeding and Fall Pregnancy Summary

	Low Energy						High Energy					
	Light		Heavy		Total		Light		Heavy		Total	
Item	Cycling	Prepuberal	Cycling	Prepuberal	Cycling	Prepuberal	Cycling	Prepuberal	Cycling	Prepuberal	Cycling	Prepuberal
						F_1 Angus x Hereford						
No. heifers,	36/37	1/37	33/37	4/37	69/74	5/74	35/37	2/37	33/37	4/37	68/74	6/74
%	97.3	2.7	89.2	10.8	93.2	6.8	94.6	5.4	89.2	10.8	91.9	8.1
Age at puberty, days[1]	365[abd]	–	358[ac]	–	361	–	376[b]	–	348[cd]	–	362	–
Wt at puberty, lb[1]	543[a]	–	564[a]	–	553	–	592[b]	–	590[b]	–	591	–
Prebreeding body condition score[2]	4.7[b]	5.0	4.3[a]	4.4	4.5	4.5	5.5[c]	5.0	5.5[c]	5.8	5.5	5.5
Prebreeding wt, lb	610	580	591	580	600	580	675	712	687	715	684	714
No. pregnant,	32/36	0/1	31/33	3/4	63/69	3/5	32/35	2/2	28/33	4/4	60/68	6/6
%	88.8[a]	0.0	9.39[a]	33.3	91.3	60.0	91.4[a]	100.0	84.8[a]	100.0	88.2	100.0
						F_1 Brahman x Hereford						
No. heifers,	32/37	5/37	24/37	13/37	56/74	18/74	22/37	15/37	21/37	16/37	43/74	31/74
%	86.5	13.5	64.9	35.1	75.7	24.3	59.5	40.5	56.8	43.2	58.1	41.9
Age at puberty, days[1]	328[a]	–	348[b]	–	338	–	340[ab]	–	338[ab]	–	339	–
Wt at puberty, lb[1]	540[c]	–	571[a]	–	555	–	598[ab]	–	613[b]	–	606	–
Prebreeding body condition score[2]	5.6[b]	5.3	5.3[a]	5.3	5.5	5.3	5.7[a]	5.6	6.0[c]	6.1	5.9	5.9
Prebreeding wt, lb	622	615	642	643	630	635	670	650	716	742	694	698
No. pregnant	21/32	4/5	14/24	11/13	35/56	15/18	15/21	12/15	17/20	11/16	32/41	23/31
%	68.8[a]	80.0	58.3[a]	84.6	62.5	83.3	71.4[ab]	80.0	85.0[b]	68.8	78.0	74.2

[1]Least squares means.

[2]Body condition score statistical comparisons reflect only differences among cycling heifers.

[a,b,c,d]Means with different superscripts within rows differ (P<.05).