A Comparison of Serially Scanned Replacement and Feedlot Angus Sired Heifers for Body Composition Traits: Ribeye Area, Fat Cover, and Percent Intramuscular Fat

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R. G. Tait, Jr., Graduate Assistant
G. H. Rouse, professor of Animal Science
D. R. Maxwell, Ag Specialist
M. L. Spangler, Graduate Assistant
P. B. Wall, Graduate Assistant

Summary and Implications

This study evaluated 167 Angus sire heifers which were managed as either potential replacement breeding stock or feedlot performance heifers. Each heifer was scanned three times over the experiment period. This study would indicate that evaluation for percent intramuscular fat (PFAT) would be more feasible under typical replacement heifer development management schemes than evaluation for subcutaneous fat or REA. The difference in the level of energy fed had a much smaller response on the rate of change for PFAT than on either subcutaneous fat or REA.

Introduction

Real-time ultrasound is being used throughout the beef cattle industry to evaluate potential breeding stock for body composition traits. As more breeders are applying this technology for selection decisions, replacement heifers are becoming an important source of information for genetic improvement programs. One of the questions raised by breeders who are planning to collect ultrasound information on replacement females relates to how those females should be managed to see genetic differences in body composition traits. This study was conducted to help producers evaluate the influence of management for gain on body composition traits as measured with ultrasound.

Materials and Methods

One hundred sixty-seven (167) Angus sired heifers were utilized in this study. Heifers were being managed as one of two groups: potential breeding stock replacements (n = 84) or performance feedlot cattle (n = 83). This study was conducted on heifers born in two years: 2001 spring born (n = 72) and 2002 spring born (n = 95). Both management groups shared in common twenty-two (22) Angus sires having 2 to 14 progeny each.

Real-time ultrasound images were collected on each animal by an Annual Proficiency Testing and Certification (APTC) field-certified technician. A Classic Scanner 200 (Classic Medical Supply, Tequesta, FL) with a 3.5MHz 18 cm animal science probe attached was used to collect images on all animals. Images were then brought back to the Iowa State University image interpretation lab and interpreted by an APTC lab-certified technician with software developed by Iowa State University. Measures collected included: weight (WT), rump fat thickness (RUMPFT), 12th rib fat thickness (12FT), 12th rib ribeye area (REA), percent intramuscular fat (PFAT).

All heifers were scanned 3 times for this study. There were 76 days between scan 1 and scan 3 for all 2001 born heifers. The 2002 born feedlot heifers were on test 131 days between scan 1 and scan 3, while the 2002 born replacements had 146 days between scan 1 and scan 3.

Results and Discussion

Phenotypic measures collected on these heifers at all three scan sessions is presented in Table 1. As would be expected an increasing trend over time was observed for nearly all traits. The exceptions to this trend were the measurements of 12FT and REA on the replacement heifers, which had a decrease from scan 1 to scan 2 measures, and then an increase above scan 1 measures for scan 3. This phenomenon could be attributed to scan session measurement differences.

Rates of change for the body composition traits over the period of this test are presented in Table 2. Rate of WT change was approximately 2X as great in the feedlot heifers as the replacement heifers. A rate of gain of 1.53 lb./day may be considered minimal for replacement heifers. As indicated by the initial weights (Table 1) the groups of heifers had already been on different planes of nutrition prior to the first scan. Rate of subcutaneous fat deposition was approximately 4X (RUMPFT) to 19X (12FT) as great in the feedlot heifers as was observed in the replacement heifers. Rate of REA increase was approximately 5X to 9X as great in feedlot heifers as in replacement heifers. Rate of PFAT deposition was approximately 3X as great in feedlot heifers as in replacement heifers. This could be interpreted as PFAT being the body composition trait that is least impacted by rate of gain, i.e. energy level. Whereas, REA and external fat deposition rates are more directly related to plane of nutrition or rate of gain. These results are in agreement with earlier serial scanning results which suggest that REA and subcutaneous fat are significantly affected by weight increases, while PFAT is significantly related to age.

Implications

Based on this data it appears that producers can adequately evaluate potential replacement heifers for PFAT after being managed for breeding season. If producers are more interested in a heifer's genetic potential for

subcutaneous fat deposition or REA development, then the plane of nutrition should be increased to see the larger differences from animal to animal in these traits.

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Table 1. Phenotypic measures of heifers at different scan sessions.

	Age days	WT lb.	RUMPFT in.	12FT in.	REA $in.^2$	PFAT %
All Replacements, n = 84						
Scan 1, average	289	580	0.14	0.15	8.43	3.77
Scan 2, average	355	694	0.16	0.14	8.02	4.27
Scan 3, average	406	765	0.19	0.16	8.68	4.61
Scan 3 - Scan 1	117	185	0.05	0.01	0.25	0.84
All Feedlot, n = 83						
Scan 1, average	285	631	0.20	0.23	9.19	4.51
Scan 2, average	350	843	0.32	0.33	9.78	6.16
Scan 3, average	391	962	0.38	0.42	11.38	6.66
Scan 3 - Scan 1	106	331	0.18	0.19	2.19	2.15
Feedlot change compared to Replacement change		1.8X	3.6X	19.0X	8.8X	2.6X

Table 2. Rates of change in composition traits over the test period from scan 1 to scan 3.

	WT lb./day	RUMPFT in./day	12FT in./day	REA $in.^2$/day	PFAT %/day
All Replacements, n = 84	1.53	0.0004	0.0000	0.0047	0.0070
All Feedlot, n = 83	3.09	0.0017	0.0019	0.0218	0.0201
2001 born replacements, n = 35	1.36	0.0005	0.0001	0.0151	0.0062
2002 born replacements, n = 49	1.66	0.0004	0.0000	-0.0027	0.0076
2001 born feedlot, n = 37	3.00	0.0019	0.0021	0.0272	0.0196
2002 born feedlot, n = 46	3.16	0.0016	0.0017	0.0175	0.0206