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Abstract

Limit feeding cattle a high-energy diet can be an effective strategy in the backgrounding phase to program more efficient gains in young growing cattle. Research is needed to better understand the extent to which limit feeding cattle in the backgrounding phase affects cattle performance in the feedlot and carcass merit. To determine these impacts, 409 crossbred heifers previously backgrounded at the Kansas State University Beef Stocker Unit were tracked through the feedlot phase and carcass data were obtained at the abattoir. Original backgrounding treatment integrity was maintained throughout the finishing phase. Each backgrounding treatment group was split into a light-heavy sort and fed separately, with approximately 102 or 103 head per group. The heavy-sort, high-energy, limit-fed cattle had more backfat, compared to cattle previously fed a high roughage diet ad libitum ($P < 0.01$). In addition, it appears the light-sort, high-energy, limit-fed cattle deposited a greater amount of muscling in the ribeye compared to the light-sort, high roughage, ad libitum cattle ($P < 0.01$). The effects of limit feeding the high-energy diet on liver abscesses were not apparent.

Introduction

In a typical feedlot setting, cattle are fed ad libitum in order to maximize energy intake. This has also been the case for many backgrounding operations, where primarily roughages are used. Recent work conducted at the Kansas State University Beef Stocker Unit demonstrated that limit feeding a high-energy diet based on corn in the backgrounding phase does not negatively impact rate of gain; efficiency of energy intake is improved in growing cattle when compared to those fed a high roughage diet ad libitum. However, what is not known is the extent of limit-feeding's impact on subsequent cattle performance in the feedlot, and ultimately, how carcass merit is affected. Another question

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raised is whether this strategy causes a greater incidence of liver abscesses. Research is also needed to identify how economically important carcass traits may be affected by the limit feeding strategy prior to finishing.

Experimental Procedures

A total of 418 weaned, crossbred heifers (body weight = 615 ± 53 lb) were purchased at auction markets in Texas and New Mexico, assembled at two different farms approximately 90 miles southwest of Amarillo, TX, then shipped 570 miles to the Kansas State University Beef Stocker Unit, Manhattan, KS, on May 28, 2019. The heifers were used in an 84-day receiving and growing study to evaluate the impact of limit-fed diets containing dry-rolled corn and Sweet Bran (Cargill Animal Nutrition, Blair, NE) compared to high roughage diets fed ad libitum on animal performance. Upon completion of the backgrounding phase, each treatment group was split into a light and heavy sort. All cattle were shipped 188 miles to Pratt Feeders in Pratt, KS, on August 26–27, 2019, for the finishing phase, and original treatment integrity was maintained throughout. Cattle were fed according to Pratt Feeders' standard protocols. Heavy-sort cattle were sent to National Beef (Dodge City, KS) for processing on January 14, 2020, and light-sort cattle were sent on February 4, 2020. Carcass data were obtained, including liver scores, by a team of researchers from West Texas A&M University.

Results and Discussion

Carcass results and liver scores for each feed group are shown in Table 1. The heavy-sort, high-energy, limit-fed cattle had the greatest backfat thickness ($P < 0.01$). Moreover, they scored nearly one-half of a yield grade higher compared to the other feed groups. The light-sort, high roughage, ad libitum cattle had almost 1 in² less ribeye area compared to the other feed groups ($P < 0.01$). In terms of quality grade, the light-sort, high roughage, ad libitum cattle had the most prime carcasses ($P < 0.05$). Regarding the livers, the light-sort, high-energy, limit-fed cattle had the least amount of edible liver tissue ($P < 0.01$), whereas the heavy-sort, high-energy, limit-fed group had the most edible liver tissue ($P < 0.01$). Both the light and heavy-sort, high-energy, limit-fed cattle trended toward greater incidence of major abscesses, or the A+ score, according to Elanco's liver scoring system ($P < 0.11$). Despite this, effects of limit feeding a high-energy diet during the backgrounding phase on the promotion of liver abscesses were not apparent.

Implications

Cattle previously receiving a high-energy, limit-fed diet in the backgrounding phase appeared to have greater backfat deposition and higher overall yield grade scores, along with greater muscle deposition, particularly in the light-sort cattle. The effects of limit feeding the high-energy diet on liver abscesses were not apparent.

Acknowledgments

National Cattlemen's Beef Association
Kansas Corn Commission

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Table 1. Carcass traits, quality grades, and liver scores collected from crossbred heifers fed in separate feeding groups during the finishing phase

Item	Backgrounding diet				Standard error of the least square means ²	P-value
	High roughage, ad libitum		High-energy, limit-fed			
	Feedlot sort ¹					
	Light	Heavy	Light	Heavy		
Carcass traits ³						
Live weight, lb	1252.4	1307.5	1270.3	1302.1	19.6	0.17
Hot carcass						
Weight, lb	809.3 ^b	851.5 ^a	826.4 ^{ab}	855.1 ^a	12.7	0.05
Backfat, in	0.64 ^b	0.66 ^b	0.66 ^b	0.75 ^a	0.02	< 0.01
Yield grade ⁴	2.54 ^b	2.45 ^b	2.43 ^b	2.84 ^a	0.09	< 0.01
Ribeye area, in ²	14.0 ^b	14.8 ^a	15.0 ^a	14.7 ^a	0.19	< 0.01
Quality grade ⁵						
Select, %	7.8	3.1	9.4	2.1	9.4	0.13
Choice, %	76.5 ^b	91.8 ^a	85.4 ^{ab}	92.8 ^a	4.2	0.01
Prime, %	14.7 ^a	5.2 ^b	5.2 ^b	5.2 ^b	3.5	0.05
Liver score ⁶						
No abscesses, %	83.3	88.7	80.2	92.8	4.1	0.09
A-, %	5.9	5.2	6.3	5.2	2.5	0.98
A, %	1.0	0.0	1.0	1.0	1.0	1.00
A+, %	9.8	6.2	11.5	10.3	3.3	0.11

^{abc} Means in the same row with different superscript are significantly different ($P < 0.05$).

¹ A light-heavy sort for each original backgrounding treatment was created before shipping to Pratt Feeders. These four groups were fed separately at the feed yard according to their standard feeding protocols for finishing cattle.

² Standard error (largest) of the least square means.

³ Carcass traits collected upon slaughter at National Beef (Dodge City, KS).

⁴ U.S. Department of Agriculture yield grade score.

⁵ The percent of cattle that graded either U.S. Department of Agriculture Select, Choice, or Prime.

⁶ Livers were scored according to Elanco's liver check system (O, A-, A, A+). Scores of O indicated a normal, healthy liver with no abscesses. Scores of A- indicated one or two small abscesses. Scores of A had up to four abscesses under 1-in in diameter. Livers with a score of A+ had one or more large, inflamed abscesses.