The Effect on Meat Quality of Integrating Pasturing Systems into Cattle Finishing Programs

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Summary

The effect on meat quality of integrating pasturing systems into cattle finishing programs was observed over a two-year period. Year one consisted of 84 fall born calves and 28 spring born calves and year two consisted of 116 fall born calves. The effect of using Rumensin® for cattle on bromegrass pasture was incorporated into year one. In year two cattle on pasture received bromegrass pasture, and one treatment group received switchgrass during the warm season. In both years there was a control group of calves that went directly to the feedlot with the remaining calves going to pasture for varying periods of time before being finished in drylot. At the conclusion of the feeding trial, cattle were processed into beef, and a ribeye steak was removed from each carcass for sensory evaluation.

In year one cattle that were on pasture the longest had the lowest ($P<0.05$) average quality grades. In year two this trend was reversed, and cattle placed directly into drylot had the lowest ($P<0.05$) average quality grades. In both years cattle carcasses in all treatments averaged yield grade 2. Warner Bratzler shear force values were not affected by treatments. Sensory panel evaluations indicated tenderness was unaffected by treatments, and in year two flavor and flavor intensity were unaffected by treatments. In year one flavor intensity was lowest ($P<0.05$) for steaks derived from cattle that were on pasture the longest and received Rumensin®. Inclusion of Rumensin® for cattle on pasture did not influence yield and quality grades or affect tenderness, juiciness, and flavor. Results of this study indicate that steer calves placed on cool and warm season pastures prior to being finished in drylot, can produce carcasses with acceptable yield and quality grades and that the meat eating qualities will be largely unaffected by the inclusion of pasture.

Introduction

The question of forage source and quality in finishing cattle programs continues to be a source of concern in the beef industry, not only because of economics, but also because of its impact on beef eating qualities. Cattle finished on high levels of forage have been characterized in past studies as having lower dressing percentages, darker ribeye color, limited retail acceptability and lower palatability attributes. Grain-finished cattle have been characterized as having improved meat color and retail acceptability, reduced shear force, and higher dressing percentages.

Today consumers demand beef products that are lean and highly palatable. The use of large quantities of forage to minimize external and seam fat is one production method to accommodate consumer demands. The integration of pasturing systems for cattle finishing programs should allow the producer to produce a leaner and possibly more economical beef supply thus benefiting the consumer and the producer. The problem is that packers have traditionally discriminated against forage-fed market cattle due to anticipated meat quality problems of cattle finished on forages.

This experiment was designed to investigate alternative pasture management systems for finishing cattle and to study the impact on meat quality. The objectives of this research were to determine the eating qualities of ribeye steaks from cattle provided pasture during the finishing program.

Materials and Methods

A 2-year study was conducted involving 84 fall-born and 28 spring-born calves in year one and 116 fall-born calves in year two, all of similar genotypes. Fall-born calves were started on test in May and spring-born calves in October. Seven treatments were imposed in year 1: 1) fall-born calves direct to feedlot; 2 and 3) fall-born calves provided cool season pasture with or without Rumensin® and then to the feedlot at the end of July; 4 and 5) fall-born calves provided cool season pasture with or without Rumensin® and then to the feedlot at the end of October; and 6 and 7) spring-born calves provided cool season pasture with or without Rumensin® and then to the feedlot at the end of October. Four treatments with all cattle receiving Rumensin® were imposed for year 2: 1) calves direct to feedlot; 2) calves provided cool season pasture and then to the feedlot at the end of July; 3) calves provided cool season pasture and then to the feedlot at the end of October; and 4) calves provided cool season pasture until July, followed by warm season grass until the middle of August, cool season pasture until the end of October, and then to the feedlot. Rotationally grazed cool season grass consisted of smooth bromegrass and warm season grass consisted of switchgrass. The feedlot diet consisted of an 82% concentrate diet containing corn, alfalfa hay, and a protein, vitamin and mineral supplement containing Rumensin® and

molasses. When steers averaged 1,150 lb (year 1) and 1,200 lb (year 2) they were processed into beef.

Following processing, one 12th rib ribeye steak was removed from each carcass. These samples were vacuum packaged in oxygen impermeable cryovac bags and aged postmortem for 15 days. After postmortem aging they were trimmed of external fat and vacuum packaged and stored in a blast freezer. These steaks were later used for meat quality determination by sensory panel evaluation and Warner Bratzler shear force values.

The sensory panel evaluation consisted of eight panelists. Testing was conducted by tasting samples from each treatment, and scoring was based on an eight point scoring system with eight being the best. The meat quality characteristics evaluated were tenderness, juiciness, flavor intensity, and flavor. The samples were broiled to a final temperature of 71°C. The steaks were taken to a sensory panel room and each panelist received two half-inch cubes from each steak for evaluation. These same steaks had six 1.5-inch cores removed for Warner Bratzler shear evaluation.

There were seven treatment combinations in the first trial, with four replications in treatment 1 and two replications in each of the remaining six treatments. In the second trial there were four treatments, each with four replications.

Results and Discussion

The mean values for hot carcass weight (HCW), backfat (BF), ribeye area (REA), kidney, pelvic and heart fat (KPH), yield grade (YG), and quality grade (QG) are presented in Table 1. Fall-born steers on pasture until October and not receiving Rumensin® had lower (P<0.05) HCW when compared with the continuous drylot fed steers, all cattle on pasture until July, and spring-born calves receiving Rumensin® on pasture. Fall-born cattle on pasture until October had lower (P<0.05) BF than steers that went directly to the feedlot. The KPH followed the trend of BF with cattle on pasture for the longest duration having the least amount of KPH (P<0.05). Quality grades for all fall-born cattle on pasture until October were poorer (P<0.05) than the other treatments.

Table 1. Least square means and SEM of carcass composition and meat eating qualities of steers in year one

	Treatments						
	Fall born calves					Spring born calves	
	Direct	Pasture to July 28		Pasture to Oct. 16		Pasture to Oct. 16	
Variable	to drylot (1)	No ionophore (2)	Ionophore (3)	No ionophore (4)	Ionophore (5)	No ionophore (6)	Ionophore (7)
Hot carcass wt., lb.	747.1^{a}±13.5	737.2^{a}±19.1	734.0^{a}±19.1	670.0^{b}±19.8	710.0^{ab}±19.1	721.9^{ab}±19.1	733.6^{a}±19.1
Backfat, in.	0.6^{a}±0.03	0.5^{abc}±0.1	0.6^{abc}±0.1	0.4^{bc}±0.1	0.4^{bc}±0.1	0.5^{abc}±0.1	0.5^{abc}±0.1
Ribeye area, in.^{2}	13.1±0.2	12.4±0.3	12.7±0.3	12.4±0.3	12.6±0.3	12.9±0.3	12.9±0.3
Kidney, pelvic, heart fat, %	2.4^{a}±0.1	2.7^{bc}±0.1	2.7^{bc}±0.1	2.2^{ad}±0.1	1.9^{d}±0.1	3.0^{bc}±0.1	2.9^{bc}±0.1
Yield grade[f]	2.7±0.1	2.6±0.2	2.6±0.2	2.4±0.2	2.4±0.2	2.5±0.2	2.6±0.2
Quality grade[g]	6.1^{ad}±0.2	6.1^{abde}±0.2	6.1^{abde}±0.2	6.7^{ac}±0.3	6.8^{bc}±0.2	5.8^{d}±0.2	5.5^{de}±0.2
Warner Braztler shear, kgf[h]	2.3±0.1	2.4±0.1	2.2±0.1	2.5±0.1	2.7±0.1	2.4±0.1	2.3±0.1
Tenderness[i]	5.7±0.1	5.4±0.2	5.9±0.2	5.8±0.2	5.4±0.2	5.7±0.2	5.6±0.2
Juiciness[i]	5.3^{bc}±0.1	5.1^{b} ±0.2	5.4^{bc}±0.2	5.3^{bc}±0.2	5.2^{bc}±0.2	5.7^{c}±0.2	5.6^{bc}±0.2
Flavor intensity[i]	5.2^{bd}±0.1	5.3^{bcd}±0.1	5.4^{bc}±0.1	5.3^{bc}±0.1	5.0^{d}±0.1	5.5^{bc}±0.1	5.5^{c}±0.1
Flavor[i]	5.4^{bc}±0.1	5.3^{bc}±0.1	5.5^{bc}±0.1	5.4^{bc}±0.1	5.2^{c}±0.1	5.6^{b}±0.1	5.6^{b}±0.1

[a,b,c,d,e] Means within the same row with different letters are different P<0.05.

[f]Yield grades were called by the USDA Meat Grading Service.

[g]Quality grade was converted to a number system: Choice^{+}=4; Choice^{0}=5; Choice^{-}=6; Select^{+}=7; etc.

[h]Warner Bratzler shear measured by kilograms of force (kgf).

[i]Sensory panel scores based on eight point scale (8=excellent; 1=very poor).

The means for body composition for year two are presented in Table 2. There were no significant differences among treatments for HCW and REA. Backfat for cattle on bromegrass pasture until October and cattle that were on warm season and cool season grass was less (P<0.05) than for cattle that went directly to the feedlot and were on bromegrass pasture until July. Carcasses from cattle that were on bromegrass pasture until July had higher (P<0.05) KPH. The YG for cattle on bromegrass pasture until October was higher (P<0.05) than the YG for cattle on bromegrass and switchgrass pastures. The QG for the steers that went directly to the feedlot was lower (P<0.05) than for the other three treatments. This may have been due to slightly lower HCW. The effect of integrating pasture into cattle finishing programs for years one and two in this study generally provided similar results for YG and QG. In both trials there were differences (P<0.05) among treatments for QG, and in year 2 differences (P<0.05) existed for YG. However, all YG were within the YG 2 category, and nearly all QG averaged low Choice or higher.

The Warner Bratzler shear force values are presented in Tables 1 and 2. In neither year were there any differences among treatments for tenderness. Thus time on pasture did not affect tenderness.

Table 1 presents the sensory panel evaluations for tenderness, juiciness, flavor intensity and flavor in year one. The sensory panel also found no differences in tenderness among treatments. Although differences (P<0.05) were observed among treatments for juiciness, flavor intensity and flavor, no consistent patterns were observed. However, in spite of these unexplainable differences among treatments for juiciness and flavor attributes, all sensory scores averaged five or higher and average scores of five or higher are considered acceptable eating attributes.

Year two sensory panel evaluations are shown in Table 2. There were no significant differences among treatments for tenderness, flavor intensity and flavor. There was a difference (P<0.05) in juiciness. Cattle on bromegrass and switchgrass pastures had a significantly lower score than steers on bromegrass pastures until July and October, respectively.

Table 2. Least square means and SEM of carcass composition and meat eating quality of steers in year two

	Treatments				
Variable	Direct to drylot (1)	Bromegrass pasture to July 13 (2)	Bromegrass pasture to Oct. 1 (3)	Bromegrass and switchgrass pasture to Oct 1 (4)	SEM
Hot carcass wt., lb.	730.6	764.1	744.6	754.4	12.5
Backfat, in.	0.5[a]	0.5[a]	0.4[b]	0.4[b]	0.02
Ribeye area, in.^{2}	13.2	13.1	13.1	13.4	0.2
Kidney, pelvic, heart fat, %	2.3[a]	2.7[b]	2.3[a]	2.4[a]	0.1
Yield grade[d]	2.5[ab]	2.6[ab]	2.7[b]	2.4[a]	0.1
Quality grade[e]	6.4[a]	5.8[b]	5.8[b]	5.8[b]	0.2
Warner Bratzler shear, kgf[f]	2.5	2.5	2.4	2.4	0.1
Tenderness[g]	5.3	5.6	5.5	5.3	0.1
Juiciness[g]	5.0[ac]	5.5[b]	5.2[c]	4.8[a]	0.1
Flavor intensity[g]	5.2	5.7	5.4	5.2	0.3
Flavor[g]	5.4	5.4	5.5	5.3	0.1

[a,b,c]Means within the same row with different letters are different P<0.05.
[d]Yield grades were called by the USDA Meat Grading Service.
[e]Quality grade was converted to a number system: Choice$^+$=4; Choice^0=5; Choice$^-$=6; Select$^+$=7; etc.
[f]Warner Bratzler shear measured by kilograms of force (kgf).
[g]Sensory panel scores based on eight point scale (8=excellent; 1=very poor).

Implications

The integration of cool and warm season grass pasturing systems into cattle finishing programs does not seem to have a major impact on cattle carcass yield grades and resulting meat eating quality attributes such as tenderness, juiciness and flavor. Although carcass quality grades showed some differences due to treatments in this study, it seems this is primarily related to hot carcass weight and might thus be corrected with proper monitoring of live slaughter weight.

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