

Relationship of slice shear force and quality grade of strip loin steaks from Brangus steers

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Introduction (Click)

- **The USDA Quality Grade system:** used in the U.S. to predict consumer eating satisfaction
- **Tenderness:** the most important beef quality attribute for consumers, but not always accurately predicted by Quality Grade
- **Objective:** investigate the relationship between quality grade and tenderness assessed by slice shear force in strip loin steaks from Brangus cattle

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Material & Methods (Click)

- **Population:** 1043 Brangus steers
- **Carcass:**
 - Traits evaluated
 - One steak was obtained from each carcass and aged for 14 days
- **Tenderness:** measured using Slice Shear Force (SSF)
- **Statistical Analysis:** SSF values analyzed using a general linear model (GLM)

Results (Click)

- **USDA Quality Grades:** Se⁻ to Pr^o
- **SSF values:** 7.13 to 70.7 kg/g
- **Significant Relationships:** Cooking loss (P<0.0001), lot within ranch (P<0.0001), and USDA Quality Grade (P=0.0485) with SSF
- **SSF and Quality Grade:**
 - A slight trend from less tender to more tender with increasing Quality Grade
 - Individual SSF values vary considerably even within Quality Grade

Conclusion (Click)

A good portion of the carcasses being discounted for low quality grade actually may have a higher consumer satisfaction than some of the carcasses being awarded premiums, due to the differences in tenderness.



Introduction



Objective

The objective of this study was to investigate the relationship between quality grade and tenderness assessed by slice shear force in strip loin steaks from Brangus cattle.

USDA Quality Grade System

- **Purpose:** to predict consumer eating satisfaction of beef
- **Based on:** the amount of intramuscular fat (marbling) within the ribeye and the maturity of the carcass
- **Industry Importance:** producers are paid premiums for carcasses receiving high Quality Grades and are discounted for carcasses receiving low Quality Grades



Tenderness

- **Importance:** the most important quality attribute for consumers
- **Tenderness and Quality Grade System:** the Quality Grade system is expected to predict eating satisfaction, including tenderness



Financial Support

UF Agricultural Experimental Station, UF ANS Hatch Project; Seminole Tribe of Florida

Materials and Methods

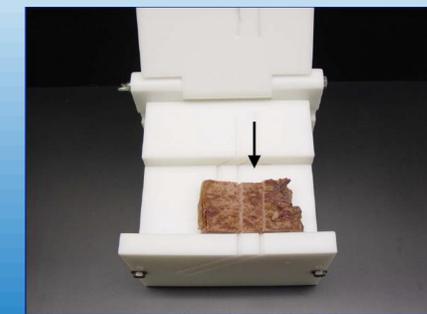
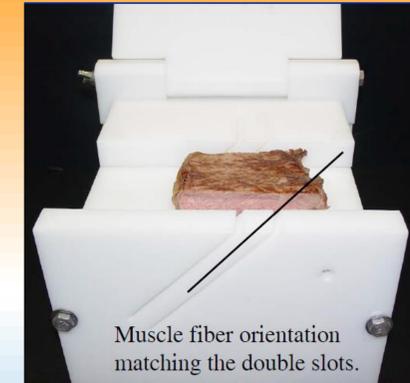


Population:
1043
Brangus
steers



Slice Shear Force (SSF)

- **Preparation:** Steaks were prepared according to the American Meat Science Association (AMSA) guidelines
- **Cooking:** on open hearth grills to an internal temperature of 71° C
 - Cooking loss was calculated
 - Degree of doneness was recorded
- **Cutting:** according to AMSA guidelines, leaving a 1cm thick, 5cm long sample cut parallel to the muscle fibers
- **SSF:** The force required to shear through the slice was measured using an Intron Universal Testing Machine
 - The sample was placed in the machine so the blade shears perpendicular to the muscle fibers, down the center of the 5cm of the slice
 - Completed within 2 minutes of the steak being taken off the grill



Harvest and Sample Collection

- **When Harvested:** approximately 1.27 cm of fat over the back
- **Carcasses:**
 - ribbed between 12th and 13th rib
 - Carcass traits including marbling score, fat over the eye, ribeye area, and maturity were evaluated
 - USDA Quality Grade was calculated
- **Steak:** One 2.54 cm thick steak from the longissimus lumborum, posterior to the 12th rib was obtained from each carcass, vacuum sealed, and aged for 14 days



Statistical Analysis

- SSF values were analyzed using the general linear model (GLM) procedure in SAS 9.4
- Significance levels were set at P<0.05.

Results

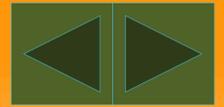


Table 1. Summary data for USDA Quality Grade and tenderness categories.

		N	%
Quality Grade	Select	353	33.84
	Choice ⁻	482	46.21
	Choice ⁰	148	14.19
	Choice ⁺	39	3.74
	Prime	21	2.01
Tenderness	Very Tender	97	9.30
	Tender	223	21.38
	Tough	723	69.32

Trait	F Value	Pr > F
Cookloss	15.76	<.0001
Quality Grade	2.24	0.0485
Lot(Ranch)	2.09	<.0001

Table 2. Traits with a significant (P < 0.05) relationship with Slice Shear Force

Tenderness categories were determined based on the USDA Tender and Very Tender Marketing Claim requirements, with a Slice Shear Force below 4.6kg considered very tender and 4.7-20.0kg considered tender.

Results

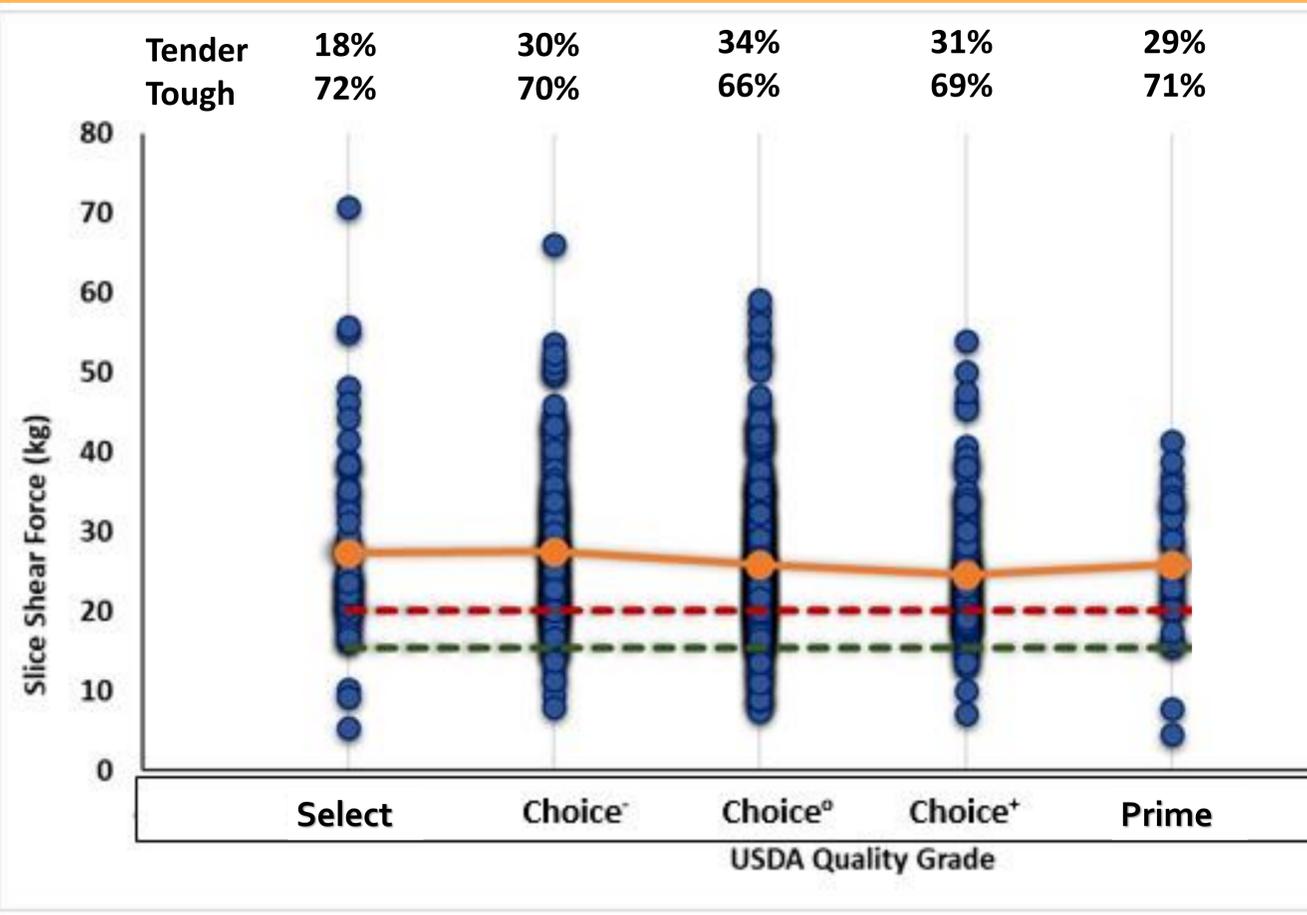


Figure 1. Slice Shear Force values (SSF) by USDA Quality Grade

- Blue= SSF for each individual sample
- Orange= least square means SSF for each quality grade. Red= threshold for USDA certified tender beef
- Green= threshold for USDA certified very tender beef

Quality Grade	Min	Max	Mean	Std Dev
Select	7.93	66.09	27.43 ^a	9.96
Choice ⁺	7.40	59.07	25.83 ^b	8.63
Choice [°]	7.13	53.95	24.60 ^b	7.87
Choice ⁺	7.85	41.44	25.92 ^b	7.85
Prime	17.83	47.21	24.34 ^b	7.29

Table 4. Slice Shear Force values for each USDA Quality Grade

- A trend in SSF values was observed when moving from Select to Prime Quality Grades.
- Individual Slice Shear Force values vary considerably even within USDA Quality Grade, indicating a large variation in tenderness, with the range being especially large in the lower Quality Grades.
- Many samples classified with a low Quality Grade still fall under the tender category.
- A percentage of steaks that are classified in high Quality Grade categories produced tough beef.

Conclusion



Tenderness Variation

The variation in tenderness within USDA Quality Grades presents a challenge because USDA Quality grades are how we predict eat ability and ultimately the consumer satisfaction of the product



Industry Impact

- **Unsatisfied customers:** Inaccurate prediction of tenderness causes dissatisfied consumers, which can lead to non-repeat consumers
- **Additional premiums for producers:** Accurately identifying carcasses that are tender could lead to some producers who typically produce animals with carcasses of lower Quality Grades to receive premiums still if their meat is tender. A good portion of the carcasses being discounted for low quality grade actually may have a high consumer satisfaction than some of the carcasses being awarded premiums, due to the differences in tenderness.

Inaccurate Prediction of Consumer Satisfaction

Inaccurately estimated in many steaks in this study due to the tenderness variation. With tenderness being the most important attribute to consumers,

