



A Comparison of High Quality U.S. and Spanish Beef

C.M. Leick¹, G. Indurain², K. Insausti², M.J. Beriain², T.R. Carr¹

¹ University of Illinois at Urbana-Champaign, Urbana, IL

² Public University of Navarra, Pamplona, Spain



Introduction:

This project was conducted as part of a collaborative research effort between the University of Illinois at Urbana-Champaign and the Public University of Navarra, Pamplona, Spain entitled “Beef Quality Attributes for Consumers and its Relation with Beef Carcass Classification Systems in Spain and the USA.” Spanish beef animals are typically intact bulls, slaughtered at approximately twelve months of age. Factors involved in carcass classification in Spain include carcass conformation, fat cover, and lean color, as opposed to the USDA grading system which is based on carcass maturity and marbling. Beef producers in Spain are currently looking to expand the methods of beef carcass evaluation in order to better predict eating quality as actually perceived by the consumer.

Objective:

The purpose of this study was to characterize palatability attributes of high quality U.S. and Spanish beef, based on each country’s respective beef classification system.

Materials and Methods:

Product: Twenty strip loins obtained from young bulls of the Pirenaica breed were evaluated for marbling score and loin eye area at the Public University of Navarra, Pamplona, Spain and shipped to the University of Illinois Meat Science Laboratory (MSL). Twenty USDA Prime beef strip loins were obtained from a commercial U.S. packing plant, aged 14 days at 4° C, and evaluated for marbling and loin eye area at MSL. Strip loins were cut into one inch steaks and frozen until further analysis.

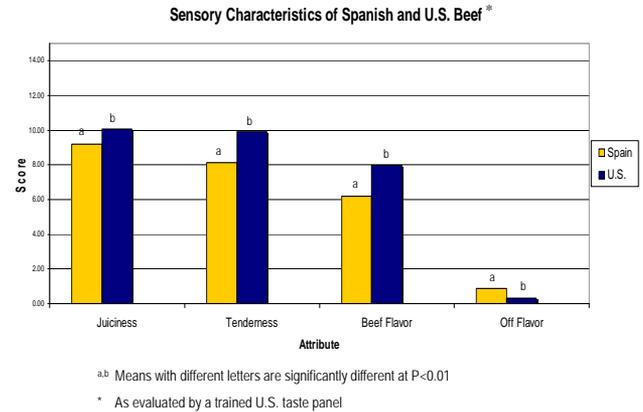
Shear Force: Steaks were cooked to an internal temperature of 70° C and weighed before and after cooking to determine cook loss. Six cores were taken from each steak for Warner-Bratzler shear force evaluation.

Sensory Evaluation: Six trained U.S. taste panelists evaluated steaks for tenderness, juiciness, beef flavor, and off flavor on a 15-point unstructured line scale where 0= extremely tough, extremely dry, no beef flavor, and no off flavor and 15= extremely tender, extremely juicy, intense beef flavor, and intense off flavor.

Proximate Analysis: Ten-gram homogenized samples were dried overnight in a 110° C oven to determine percent moisture. Dried samples were extracted in a 4:1 mixture of Chloroform:Methanol to determine lipid as a percentage of wet weight.

Total Collagen Quantification: Samples were hydrolyzed in sulfuric acid for 36 hours at 105° C. Hydrolysates were filtered and diluted prior to adding oxidant solution and a color reagent. Samples were read against a hydroxyproline standard curve at 557 nm to determine hydroxyproline concentration.

Figure 1: Sensory Attributes



Results:

- Loin eye area was larger in Spanish loins compared with U.S. loins (P<0.01).
- Marbling scores reflected the different management practices of the two countries, as U.S. beef had a mean marbling score of Slightly Abundant⁷³, whereas Spanish beef had a mean marbling score of Traces¹⁰.
- Lipid content of U.S. beef was more than 10-fold higher than that of Spanish beef (P<0.01).
- Spanish beef had a higher percent moisture than U.S. beef (P<0.01) and had a higher percent cook loss (P<0.01).
- U.S. Sensory panelists detected significant differences in tenderness, juiciness, and beef flavor: USDA Prime beef was more tender and more juicy, with more beef flavor and less off flavor than Spanish beef (P<0.05); however, the magnitude of these differences was less than two sensory points for each attribute.
- Statistically significant, though numerically small, off flavor was detected in both U.S. and Spanish beef.
- Off flavor in U.S. beef was most commonly described by panelists as “buttery,” whereas off flavor in Spanish beef was described as “grassy” and “metallic.”
- Differences in sensory panel scores for tenderness were reflected in the Warner-Bratzler shear force values; Spanish beef had higher average shear force values than U.S. beef (P<0.05), though the magnitude of this difference was relatively small.
- There were no significant differences in total collagen content between the two countries of origin.

Table 1: Population Characteristics

	Spain	U.S.	P-value	SEM
Loins, n	20	20	-	-
Loin Eye Area, cm ²	104.5	77.9	<0.0001	2.5324
Marbling Score	Traces ¹⁰	Slightly Abundant ⁷³	<0.0001	-
Lipid Content, %	1.2	14.6	<0.0001	0.5393
Moisture Content, %	75.4	65.4	<0.0001	0.4169
Cook Loss, %	24.9	22.1	0.0012	0.5564
Shear Force, kg	3.85	3.11	0.0136	0.2037
Total Collagen, mg/g	2.53	2.69	0.2486	0.1030

Conclusions:

- The results show that USDA Prime beef had significant advantages in juiciness, tenderness, beef flavor, and off flavor; however, both U.S. and Spanish beef were acceptable in palatability as perceived by a U.S. taste panel.
- At the completion of the trials in the U.S. and Spain, data will be pooled in order to assess the palatability differences as perceived by a U.S. taste panel and a Spanish taste panel, as well as a Spanish consumer panel. This information will be useful in defining a fast, efficient beef classification system in Spain that effectively represents the consumer’s eating experience.

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