Project Summary

Identifying Beef Muscles and Processing Treatments Suitable for use in Fajita Applications

Principal Investigator: Jeff W. Savell, Ph.D.
Texas Agricultural Experiment Station
Texas A&M University

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Background

The checkoff-funded Bovine Myology and Muscle Profiling study examined 39 muscles of the beef chuck and round for palatability and functionality characteristics. This study highlighted fabrication methods that can help the beef industry better utilize each muscle individually according to its specific characteristics. Therefore, work continues to evaluate alternative merchandizing methods to optimize the value of each of these 39 muscles and ultimately increase the value of the entire beef carcass.

One way to optimize the value of some of these muscles is through enhancement with a salt, phosphate and water solution. Papain is a plant enzyme that comes from the papaya and can be added to an enhancement solution to improve beef tenderness through proteolytic activity. Blade tenderization is an additional treatment used to improve beef tenderness by disrupting connective tissue and muscle fibers.

Skirt steaks, or fajitas, are a very popular beef cut in the southern region of the U.S. and are often grilled outdoors. In recent years, the demand for both inside and outside skirt has dramatically increased due to the popularity of fajitas. This increase in demand has also raised fajita purchasing costs for consumers, retailers, and foodservice operators. Therefore, there is a substantial need to evaluate alternative muscles from the beef carcass, in combination with traditional processing techniques such as tenderization and marination, to provide the industry and consumers with palatable fajita alternatives from the under-utilized thin muscles of the beef chuck.

The objectives of this project were:

1. To identify individual muscles having potential for use in fajita applications.
2. To identify best processing treatments for individual muscles.

Methodology

Sixty USDA Choice beef arm chucks, short plates, outside skirts, inside skirts, and bottom sirloin flaps were obtained from a major beef processor and shipped to Texas A&M University for further analysis. Muscles removed included the *M. rhomboideus*, *M. trapezius, M. latissimus*, *M. serratus ventralis, M. obliquus abdominus int., M. transversus abdominus* (inside skirt) and *M. diaphragma pars costalis*. Muscles were sorted into four tenderization treatment groups, including control, blade tenderization, papain, and papain + blade tenderization.

After sorting, control muscles were individually vacuum packaged and frozen. Blade tenderized muscles were passed through the blade tenderizer twice. The papain treatment was applied in a vacuum tumbler as a brine solution containing 6.50% salt, 3.50% sodium tripolyphosphate, 89.97% water, and 0.033% papain.

After treatments were applied, muscles were frozen for ten weeks before tempering and fabrication into fajita strips. Due to muscle variation, the sections obtained were of different

lengths, widths, and thickness. After sections were cut, they were packaged in oxygen permeable bags and frozen for subsequent trained panel, consumer panel, and Warner-Bratzler shear force evaluation.

Findings

Trained Panel

In general, regardless of muscle, papain treatments improved juiciness especially for the *M. obliquus abdominus int*., *M. latissimus*, and *M. trapezius*. Juiciness did not differ across treatments for *M. diaphragma pars costalis* muscles; however, the *M. transversus abdominus* and *M. rhomboideus* containing papain and the *M. serratus ventralis* with the papain + blade tenderization treatment were juicier compared to the other treatments within the muscles.

Papain treatments improved the muscle fiber tenderness of the *M. obliquus abdominus int*., *M. rhomboideus*, *M. latissimus*, and *M. trapezius*. The *M. serratus ventralis* and *M. diaphragma pars costalis* had the least tenderness improvement due to treatment but were considered the most tender, except for their controls. The tenderness of the *M. obliquus abdominus int*. was greatly improved when treated with papain and was considered among the most tender.

Blade tenderization increased tenderness in the *M. transversus abdominus*, *M. obliquus abdominus int*., *M. rhomboideus*, and *M. trapezius*. The *M. diaphragma pars costalis* and *M. serratus ventralis* were tender, regardless of treatment. In this study, papain worked more effectively then blade tenderization and tenderness variation between muscles was generally significant.

The *M. serratus ventralis* and *M. rhomboideus* received the highest serumy/bloody scores. Burned scores tended to follow the same trend of the general attributes evaluated by the trained panel. Papain treatments received higher chemical scores and lower burned scores in comparison to control and blade tenderized. In general, trained panelists gave higher ratings to muscles that were treated with papain.

Consumer Panel

Overall, consumers preferred fajita strips treated with papain alone or in combination with blade tenderization. Consumers tended to like the *M. diaphragma pars costalis*, *M. transversus abdominus*, and *M. obliquus abdominus int*. treated with papain the most and the *M. trapezius* control and blade tenderized the least. Papain treatments were scored as having more intensity of flavor and salt flavor, and tended to have less undesirable flavors. Consumers tended to prefer the flavor and tenderness of beef fajita strips that were treated with papain and papain + blade tenderization, and were more willing to purchase these.

Tenderness

The *M. diaphragma pars costalis* and *M. obliquus abdominus int*. had the lowest (most tender) shear force values. Regardless of muscle, blade tenderization did not improve Warner-Bratzler shear (WBS) force in comparison to controls. The WBS values followed the same trends in tenderness as the overall level of tenderness evaluated by trained and consumer panelists. According to previous beef muscle research, the *M. transversus abdominus* would be considered

‘very tender’ and the *M. rhomboideus* in this study would be considered ‘intermediate’ in tenderness.

Implications

Trained panelists found that the addition of papain improved palatability scores. In general, treatment tended not to affect the palatability scores of the *M. diaphragma pars costalis* and *M. serratus ventralis*, which tended to receive higher scores in comparison to other muscles. Consumers tended to prefer the flavor and tenderness of beef fajita strips that were treated with papain and papain + blade tenderization, and indicated a preference to purchase muscles with these treatments. Consumers were willing to purchase the *M. latissimus* and *M. serratus ventralis* muscles treated with papain + blade tenderization and papain, respectively, and these muscles performed well enough to be considered as alternatives in the beef fajita market.

For more information contact:
National Cattlemen's Beef Association
9110 East Nichols Avenue
Centennial, Colorado 80112-3450
(303) 694-0305