Meat Science 96 (2014) 419–422

Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci

Consumer evaluation of palatability characteristics of a beef value-added cut compared to common retail cuts

A.N. Lepper-Blilie, E.P. Berg *, A.J. Germolus, D.S. Buchanan, P.T. Berg

Department of Animal Sciences, North Dakota State University, NDSU Department 7630, PO Box 6050, Fargo, ND 58108-6050, USA

ARTICLE INFO

Article history:
Received 21 February 2013
Received in revised form 30 July 2013
Accepted 1 August 2013

Keywords:
Consumer
Value cut
Palatability

ABSTRACT

The objectives of this study were to educate consumers about value-added beef cuts and evaluate their palatability responses of a value cut and three traditional cuts. Three hundred and twenty-two individuals participated in the beef value cut education seminar series presented by trained beef industry educators. Seminar participants evaluated tenderness, juiciness, flavor, and overall like of four samples, bottom round, top sirloin, ribeye, and a value cut (Delmonico or Denver), on a 9-point scale. The ribeye and the value cut were found to be similar in all four attributes and differed from the top sirloin and bottom round. Correlations and regression analysis found that flavor was the largest influencing factor for overall like for the ribeye, value cut, and top sirloin. The value cut is comparable to the ribeye and can be a less expensive replacement.

1. Introduction

Tenderness, juiciness, and flavor are palatability attributes that are commonly used to describe beef quality (Voges et al., 2007). Dikeman (1987) showed that tenderness is the major determinant of beef quality followed by flavor. With this understanding, the beef industry has heavily marketed the middle cuts of beef (rib and loin) to meet the consumers demand for a tender, juicy, and flavorful product. This demand for the middle cuts of beef has led to a lesser utilization for the end cuts (chuck and round; Kukowski, Maddock, & Wulf, 2004). Beef chuck and round are traditionally marketed as underutilized low-end roasts and steaks because they are considered to be tougher than middle cuts (Bratcher, Moore, Keene, & Lorenzen, 2006; Paterson & Parrish, 1986). Retail cuts from the chuck generally have lower sensory panelist tenderness and overall palatability ratings because muscle fibers run in multiple directions (Adhikari, Keene, Heyman, & Lorenzen, 2004). The challenge to the beef industry is to capture the underutilized value of end cuts by appealing to the consumers demand for a palatable product that is convenient. Bagley, Nicholson, Pfeiffer, and Savell (2010) stated that today's consumer differs from the traditional cook who prepared large roasts. Consumers are now looking for cuts that are convenient and smaller without sacrificing favorable palatability attributes.

With this understanding, the Beef Checkoff funded a Muscle Profiling Study in the late 1990s to establish a database of palatability attributes of the individual muscles in the beef chuck and round (Von Seggern, Calkins, Johnson, Brickler, & Gwartney, 2005). This study brought attention to muscles in the chuck that had the potential to be a value-added cut. The flat iron (*infraspinatus*; IF) was the first successful value-added chuck cut. It was identified because it is the second most tender muscle in the beef carcass once the internal connective tissue seam is removed (Calkins & Sullivan, 2007; Von Seggern et al., 2005). The muscle profiling study also classified the *serratus ventralis* (SV) and *triceps brachii* (TB) muscles to possess palatability attributes suitable for retail steak fabrication (Bratcher et al., 2006; Calkins & Sullivan, 2007).

Based on the Beef Checkoff Muscle Profiling study, new beef cuts have been introduced over the past 10 years (National Cattlemen's Beef Association, 2012). These "next generation value cuts" include the Delmonico (chuck eye steak) and Denver cut. The Delmonico steak can consist of four different muscles, *longissimus thoracis* (LT), *spinalis dorsi* (SPI), *complexus* (COM), and *multifidus dorsi* (MUL), whereas the Denver cut is only the *serratus ventralis* (SV; Cattlemen's Beef Board, 2012). Kukowski et al. (2004) had consumers' rate muscles from the chuck for tenderness, juiciness, flavor, and overall like. They found that the COM, SV, IF, and TB rate equal or superior to *longissiumus thoracis* (ribeye) steaks and thus were candidates for retail steaks. Paterson and Parrish (1986) found similar results, where the SV did not differ from the IF in tenderness. It is important to educate consumers about these cuts and allow them the opportunity to evaluate samples so the industry is aware of their perception of palatability attributes. The objectives of this study were to educate consumers about value-added cuts in the beef industry and to evaluate consumer assessment of palatability traits of three traditional retail cuts (bottom round, ribeye, and top sirloin) and a value-added cut (Delmonico or Denver cut).

* Corresponding author. Tel.: +1 701 231 6271; fax: +1 701 231 7590.
E-mail addresses: ashley.lepper@ndsu.edu (A.N. Lepper-Blilie), eric.p.berg@ndsu.edu (E.P. Berg), austen.germolus@ndsu.edu (A.J. Germolus), david.s.buchanan@ndsu.edu (D.S. Buchanan), paul.berg@ndsu.edu (P.T. Berg).

0309-1740/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.meatsci.2013.08.002

2. Materials and methods

2.1. Educational program

Four locations within North Dakota (northwest, southwest, south central, and southeast) were selected to best represent the population. Meat science personnel travelled to the four sites to present information about beef palatability and how the Beef Checkoff research has worked to increase the value of beef carcasses. Those attending this educational program were consistent beef consumers either directly (cattle production) or indirectly (allied industry) affiliated with the beef industry. Attendees were presented with details about the new value-added cuts that were being introduced to foodservice and retail markets. This educational presentation was followed by beef sample consumption and evaluation where all attendees participated. The impact of the educational presentation was not measured, simply an opportunity to showcase new information to consumers and allow for them to relate the information to the samples.

2.2. Sample preparation

USDA Choice chuck rolls (square-cut, clod-out; IMPS 116), bottom rounds (IMPS 170), ribeye rolls (lip-on; IMPS 112A), and top sirloins (IMPS 184) were purchased from a local meat processing facility and stored at the NDSU meat science laboratory. It is important to note that the method of sample procurement would mimic the general consumer purchase action of a consumer as the investigators had no information regarding duration of aging, genetic, or environmental background. Chuck rolls were further processed into either a "Delmonico" (chuck eye roll; IMPS 116D) or "Denver" (under blade, center cut; IMPS 116G) steak (Agricultural Marketing Service, 2010). Steaks were cut (2.54 cm thick), vacuum packaged, and stored at 4 °C before each site presentation. Samples for kabobs were cut into 5.08 × 5.08-cm cubes, vacuum packaged, and stored at 4 °C before each site presentation.

Before cooking, all steaks and kabobs were minimally seasoned with salt, black pepper, and granulated garlic mix (10:1:0.4 by weight ratio). Kabob samples were separated on a skewer by cherry tomatoes. Meat samples were placed on the grill and lightly sprinkled with the spice mix, upon reaching 31 °C, samples were flipped and sprinkled again with the spice mixture. Steaks and kabobs were cooked on a Weber® gas grill (Model E-310™, Weber-Stephen Products, Palatine, IL) set to a medium heat setting. Steak temperature was monitored with handheld thermometers (HH801B, Omega Engineering Inc, Stamford, CT) and removed once a medium-rare (62–63 °C) degree of doneness was reached. Steaks were allowed to rest approximately 10 min then cut into 2.54 × 2.54-cm cubes, lean portion only. Kabob samples were removed from the grill and allowed a 10-min rest period before being plated. Consumers (n = 253; southwest = 38, south central = 29, southeast = 186) received the samples from warmed chafing dishes in a buffet style presentation. In the southeast location (n = 186 õconsumers), samples were served to a steady flow of approximately 20 consumers every 20 min. The slow distribution of samples prevented accumulation of samples in the chafing plates and allowed for a more consistent dissemination of samples from grill to consumer plate. In the northwest location, samples were presented to consumers on a kabob stick to an additional 69 consumers to maintain sample order as samples were served as a plated meal instead of buffet style. Sample identification was described to the consumers according to where the meat samples were positioned (in specific order) on the kabob skewer.

2.3. Consumer analysis

Procedures using human subjects for consumer analysis were approved by the North Dakota State University Institutional Review Board prior to initiation of the study. Consumers consumed each cut one time and were not aware of the identity of each sample due to the randomized presentation order to eliminate first order bias. Each sample was evaluated on a 9-point scale for tenderness, juiciness, flavor, and overall like (9 = extremely tender, juicy, flavorful, really like; 1 = extremely tough, dry, bland, and don't like). Consumer demographic information was not obtained. The intent of the study was to obtain information about the different cuts and not project consumer targets. Once all ballots had been turned in, the cut identity was revealed to allow for the consumers to assess the relationship of the commonly used steak samples relative to the Delmonico and Denver value cuts. Data were tabulated in Microsoft Excel to show basic means to consumers.

2.4. Statistical analysis

Data were analyzed using ordinary least squares (PROC GLM, SAS Institute, Cary, NC). The statistical model for the palatability attributes included geographical location, cut, and the interaction of location by cut. The analysis takes serving type (kabob versus chafing dishes) into account in that it is included in the model as part of location. Least square means were separated by using probability of difference. Significance was declared at $P < 0.05$. Correlation coefficients were generated utilizing MANOVA/print in order to determine tenderness, juiciness, and flavor's relationship to overall like. The PROC REG RSQUARE analysis was used to determine a prediction equation. "Overall like" served as the dependent variable regressed on tenderness, juiciness, and flavor scores separately for value cut (VC), ribeye (RE), top sirloin (TS), and bottom round (BR).

3. Results and discussion

3.1. Consumer overall like ratings

Consumers in the southeast region rated almost all cuts higher for overall like compared to the other regions ($P < 0.001$; Fig. 1). The VC and ribeye RE were preferred over the top sirloin TS and bottom round BR in this region, with the RE having the highest overall like score. A location effect was expected because of the different locations utilized in the study, but northwest region consumers generated an interesting trend. These consumers ranked all of the cuts lower for overall like compared to other regions. Goodson et al. (2002) found a significant difference in overall like of clod steaks comparing two cities (Chicago and Philadelphia), which differed by cooking method. Chicago consumers had higher scores for grilling compared to Philadelphia. The findings of Goodson et al. (2002) underscore the diversity of consumers

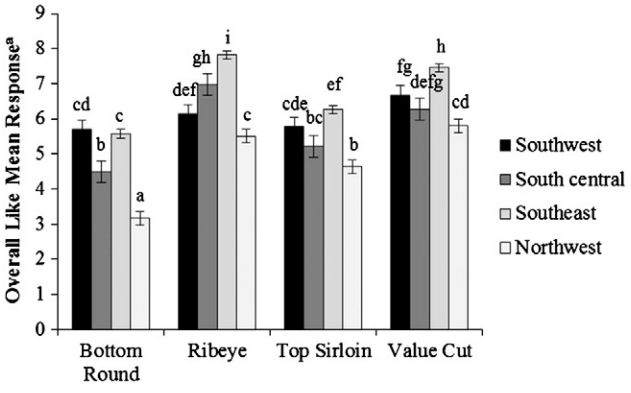

Fig. 1. Effect of geographic location[1] and cut on consumers overall like[2] response ($P < 0.001$). [1]Consumers (southwest = 38, south central = 29, southeast = 186) received the samples from warmed chafing dishes in a buffet style presentation. The samples were presented to consumers in the northwest location ($n = 69$) on a kabob stick to maintain sample order as samples were served as a plated meal instead of buffet style. [2]9 = extremely tender, juicy, flavorful, and really like; 1 = extremely tough, dry, bland, and don't like. [a–i]Least square means without a common letter differ ($P < 0.05$).