

WHAT'S YOUR BEEF: GRAIN VERSUS GRASS FINISHING ON BEEF QUALITY PERCEPTIONS*

ALEXANDER M. STELZLENI

The comparison of grain-finished to grass-finished beef is not a new concept. In fact, the research literature shows that we have been debating this topic for over a century. Initially, the focus back in the 1880s was on animal growth and efficiency, and it was realized that beef animals would grow faster and to heavier end weights with increased energy intake. This is important when we start talking about quality and tenderness. In the 1920s, focus shifted to the effects on meat color and quality. Since then, the industry has faced a number of issues concerning the differences between grain- and grass-finished beef. These include: defining the production system and products; effects of animal age, genetics, nutritional composition of the diet, and utilization of different forages; perceived health implications to the human diet; and most recently sustainability (see research from Dr. Jude Capper at <http://www.bovidiva.com>). The current article will focus primarily on some of the meat quality differences between grain- and grass-finished beef.

Where do we start with quality?

The Agricultural Marketing Service of the USDA (www.ams.usda.gov) handles beef grading based on qualitative and quantitative measurements, including marbling (intramuscular fat at the 12-13th rib break), physiological maturity, and to a lesser extent lean color, firmness and texture. The goal of the beef quality grading system is to segregate carcasses from a mixed heterogeneous population into homogeneous groups based on expected cooked eating satisfaction. Beef grading is available for all beef carcasses harvested in USDA (Food Safety Inspection Service) inspected facilities, but the facility must request grading services and pay an hourly rate to the USDA. Therefore, grading is typically reserved for young beef (A-B maturity) that have been finished using concentrate-based rations. The quality grades that these carcasses are eligible for include Prime, Choice, Select (A-maturity only) and Standard. Beef grades do not set the price of beef products, but provide information that is used to facilitate trading and market price establishment based on the expected eating satisfaction, end use, and supply and demand.

Grass-finished beef can be graded if slaughtered at a facility that provides this service, but it typically is not. Grass-finished beef usually results in an animal that is fed a diet lower in energy than those receiving concentrates, which can lead to a slower growth rate (longer time to reach slaughter weight) and less marbling (last fat depot deposited) than their grain-finished contemporaries. Additional reasons forage-finished beef typically is not graded include the following: it is usually slaughtered at small packers that don't process the volume to make it feasible to pay for grading; grass-finished beef producers are not interested in pricing their beef based on the commodity market; and most grass-finished beef consumers have a different definition of "quality" than the USDA definition. Most grass-fed beef consumers have a definition of quality that revolves around the story, keywords and perceived benefits (health, environmental) of grass-finished beef. Therefore, most grass-finished beef producers sell their

product directly to the end user or retail sector and are priced based upon their production costs plus profit.

Factors that determine eating satisfaction

No matter the definition of quality, research over the years has shown inherent factors that affect eating satisfaction: color, tenderness, juiciness and flavor. All of these traits can be greatly influenced by the age of the animal, the amount of intramuscular fat (marbling) present, genetic potential, and diet during the finishing period. The research results on grass- or grain-finishing have been very contradictory, depending on whether the study was terminated when animals were at a consistent age, weight or fat level, the different breeds utilized, and the quality of the forage. Therefore, we will look at major trends instead of individual study results.

Color

Although color does not directly impact eating satisfaction, the old rule “you eat with your eyes first” holds true. Meat color, especially at display, is the first quality indicator to the consumer and is the primary determinate as to whether they will purchase the product or not. Typically, grass-finished beef is rated as being darker in color. This might sound negative because most consumers are used to the bright cherry-red color of grain-finished beef. However, individuals who prefer grass-finished beef tend to use the darker color as an indicator that the beef was indeed grass-finished. When comparing the same muscle, age of animal has a major impact on overall color. As the animal gets older a protein complex called myoglobin, which stores oxygen in the tissue, increases, creating a darker color in the meat. Many times grass-finished beef is darker in color because the animal was older when slaughtered than the grain-finished contemporary, so it will have more myoglobin. When grain- and grass-finished animals are finished at the same age, there is little difference in lean color.

Marbling and Juiciness

Grass-finished beef tends to have less marbling than grain-finished beef because of lower energy intake. Less marbling is correlated to lower juiciness scores. As the percentage of marbling increases, it is inversely related to the percentage of moisture. This may sound counterintuitive at first; but during cooking, moisture is easily expressed and lost. During cooking, marbling melts and moves around the muscle fibers, giving the feeling of juiciness. While moisture can be lost at lower temperatures, it usually takes higher temperatures to express marbling. When grass- and grain-finished steaks are cooked to similar degrees of doneness (medium or less) there is little difference in total juiciness. However, when steaks are cooked above medium, juiciness favors grain-finished beef. The main point here is to not overcook your steak, no matter how it was finished!

Tenderness

Consumers rate tenderness as the dominant trait determining whether they had a satisfactory eating experience. When comparing grain- and grass-finished steaks, we routinely hear that the grass-finished steak is less tender. There are multiple factors that go into determining tenderness. One was discussed in the preceding section dealing with proper cookery. If a steak is overcooked, it will become less tender because of changes in the proteins and additional loss of moisture, which will give the sensation of being less tender. The amount of marbling can also have a direct influence on tenderness, but the greatest tenderness factor is age of the animal. As

animal age increases so does muscle use, resulting in the animal developing a more extensive connective tissue network in the muscle system, leading to a decrease in tenderness. In many comparisons, this is why grass-finished beef was less tender; they were older than the grain-finished contemporaries because the research was targeting a similar final weight or fat thickness between treatment groups. However, if grain- and grass-finished contemporaries are finished at the same age and steaks are cooked to a medium degree of doneness or below, there is little difference in tenderness.

Flavor

Now that we know we can control for the differences in color, juiciness and tenderness, the focus turns to flavor. In my opinion, this is the real difference between grain- and grass-finished beef. Flavor is very complex, with more than 1,000 compounds identified to date. Flavor is largely influenced by animal age, amount of fat (especially marbling) and diet. As discussed earlier, age is related to an increase in myoglobin production, which can lead to increased flavor sensations of irony, minerally, and serum-like (bloody). Fat is primarily responsible for species flavor differences and is where fat-soluble flavor compounds end up, which leads us to the diet. When it comes to the diet, the *quality* of the diet has a large impact on flavor. Concentrate-based rations will typically produce beef with a buttery, tallow, roasted nut flavor. Grass-finished beef can produce an array of flavors, depending on what the animal was eating prior to slaughter. For example, animals grazing in pastures contaminated with wild onion and garlic will produce beef with sour, onion and garlic off-flavors. Research (Larick and Turner, NCSU, 1989 and 1990) has also shown that beef produced with higher-quality forages will result in fewer off-flavors. It is common for grass-finished beef to have stronger flavor profiles rated as grassy, blood-like or mineral. However, unless these flavors are overpowering, they are not necessarily off-flavors and are seen as the natural flavor profile of grass-finished beef.

There are many factors that influence meat quality and eating satisfaction – too many to be covered in one article. Additionally, many of the traits that determine eating satisfaction are influenced by a variety of other factors – including diet ingredients, diet quality, age of the animal, genetics and more. However, one of the largest differences between grass- and grain-finished beef really comes down to flavor preference. These two production systems inherently produce beef with differing flavor profiles, and ultimately consumers will pick the product that they prefer. At the University of Georgia, research is currently being conducted to investigate high-quality warm-season forages for beef grass-finishing systems. The ultimate goal of the research is to be able to produce forage-finished beef that is younger, more tender, juicier and has fewer undesirable flavors than beef finished on lower-quality summer forages.

*This article has been previously reported in the Georgia Cattlemen's magazine (May 2015) and Tennessee Cattlemen's magazine (July 2015).