

Quality traits of plant-based ground beef alternatives in comparison to ground beef of various fat levels

Cattle and Forage Feed Days

August 3, 2021

Lane Egger, M.D., Kansas State University



Kansas State Research Team

- Dan Thomson
- Travis O'Quinn
- A. J. Tarpoff
- Michael Chao
- Morgan Zumbaugh
- Jessie Vipham
- Mike Apley
- Dale Blasi
- Steve Ensley
- Mark Haub
- Matt Miesner
- KC Olson
- Sydney Bigger
- Sam Davis



Sam Davis, M.S.

Ground Beef

- Most consumed beef product in U.S.
- Americans consume 26 lb of ground beef annually (Beef2Live, 2021)
- Accounts for 63% of beef sales volume at foodservice and 49% at retail (Speer et al., 2015)



Plant-Based Background

- Not a new concept: at least 3 distinctive waves
- First waves targeted vegetarian consumers
- Modern GBA actively targeting beef consumers



PB Ground Beef Alternatives

- Increased in retail sales by more than 45% over the past year (Garver, 2021)
- Increased by more than 20% in market-share in foodservice (KBC, 2021)
- Global market share expected to grow by 318% by 2027 (Grand View Research, 2020)



- Numerous products now available in retail and foodservice
- Most of the “traditional” products were mainly composed of soy or soy-proteins
- Many “modern” products utilize various bean and pea proteins

Research Objective

- Many of these GBA products market and position themselves as “similar” or “replacements” for ground beef, though these claims have never been evaluated in a scientific study

Our objective was to evaluate many of the quality traits and eating characteristics of three GBA in comparison to ground beef




Selected Alternatives

3 plant-based ground beef alternatives (GBA)

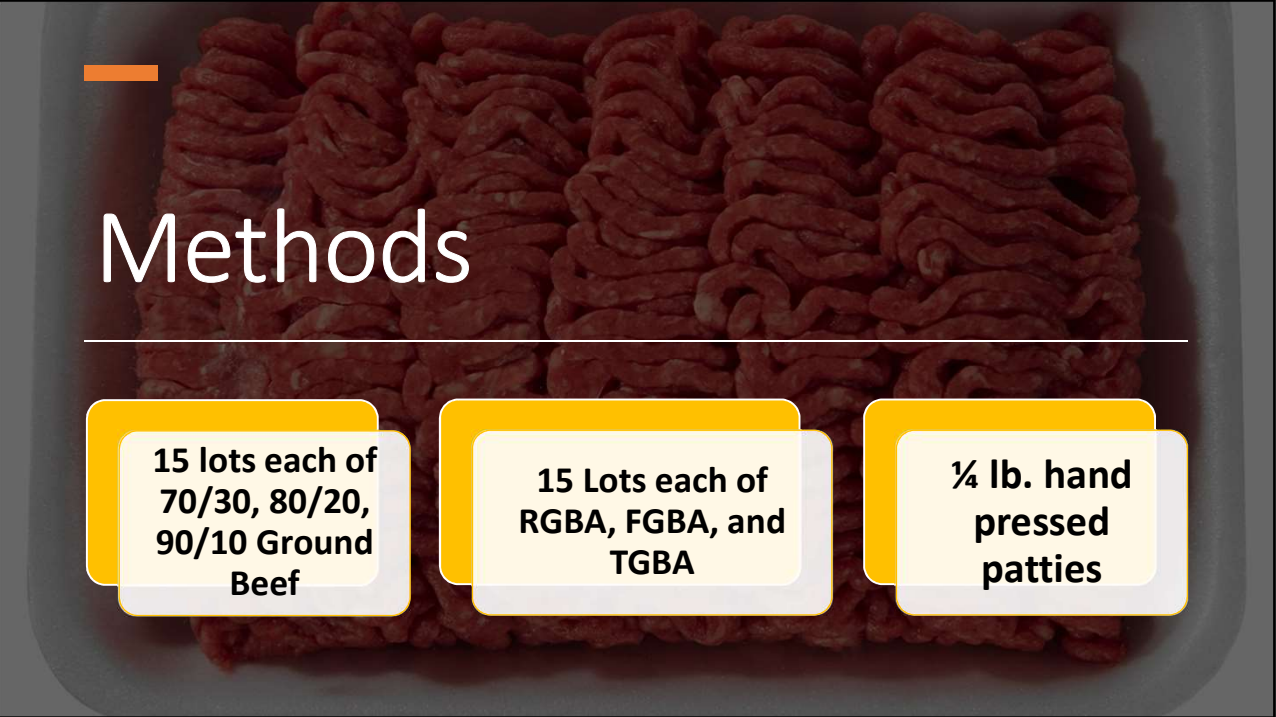
Product Overview

- Retail GBA - mostly found in retail markets (pea-protein based)
- Food Service GBA - mostly found in food service establishments (soy and potato protein based)
- Traditional GBA - most indicative of a traditional soy-based patty



Methods

- 15 lots each of 70/30, 80/20, 90/10 Ground Beef
- 15 Lots each of RGBA, FGBA, and TGBA
- ¼ lb. hand pressed patties





Consumer Taste Testing

- **120 Consumers (Manhattan, KS area)**
- **Cooked to 160°F**
- **Served blind in random order**

Traits Evaluated

Appearance

Juiciness

Tenderness

Texture Liking

Overall Flavor Liking

Beef Flavor Liking

Overall Liking

Trained Sensory Analysis



Cooked same manner as consumer panels



Color evaluated in normal light



All other traits evaluated under red light

Traits Evaluated

Juiciness

Tenderness

Beef Flavor ID

Beef Flavor Intensity

Off Flavor

Texture

Color

Beef Odor

Non-Beef Odor

Objective Measurements

Shear Force

Pressed Juice Percentage

Texture Profile Analysis

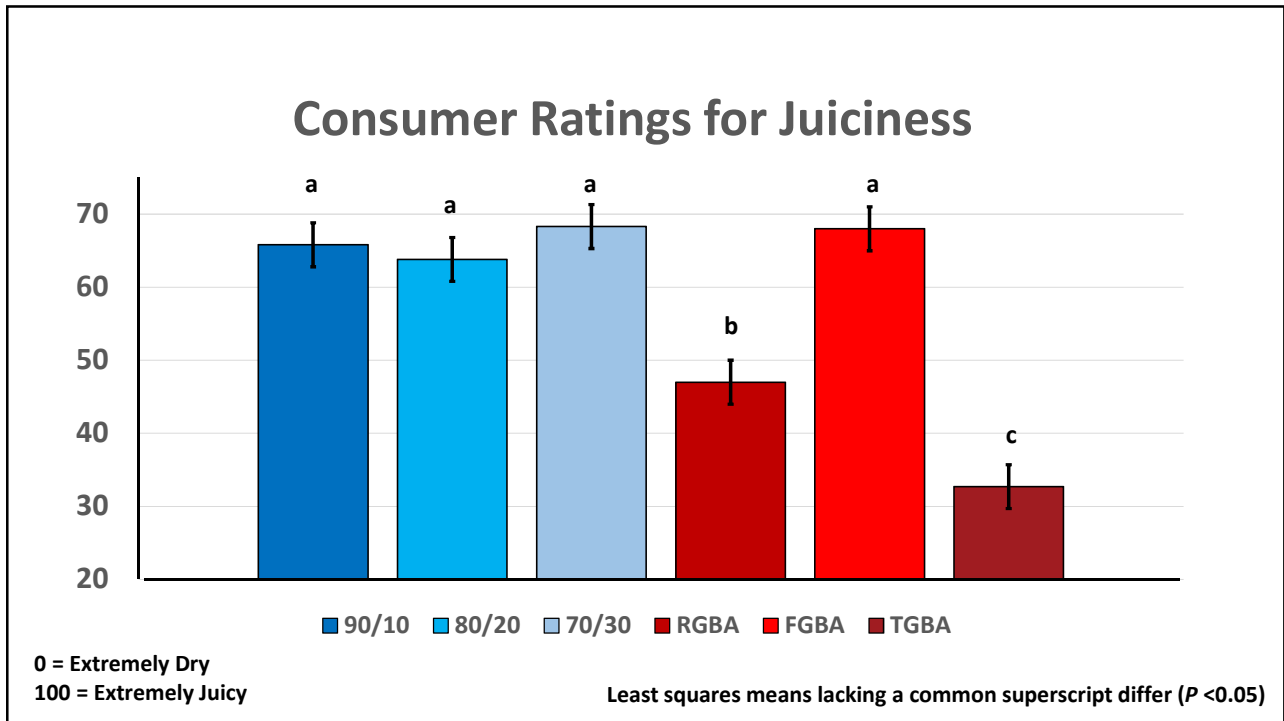
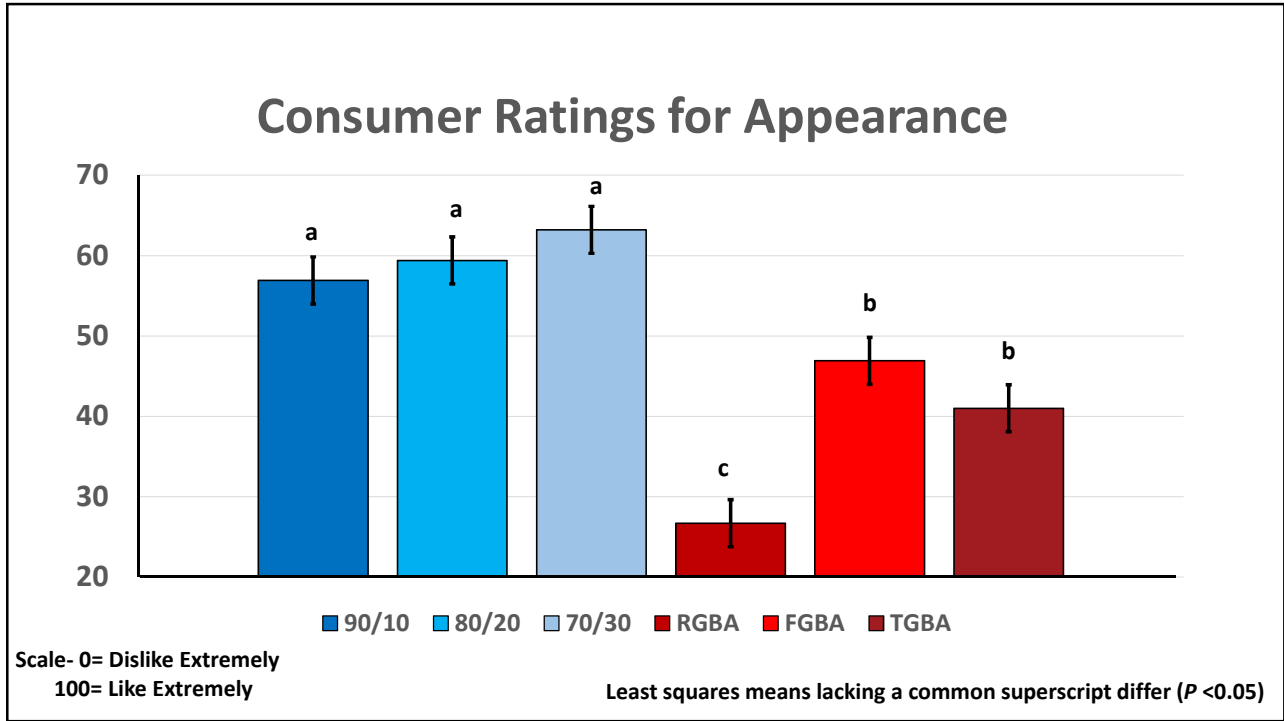
Instrumental Color

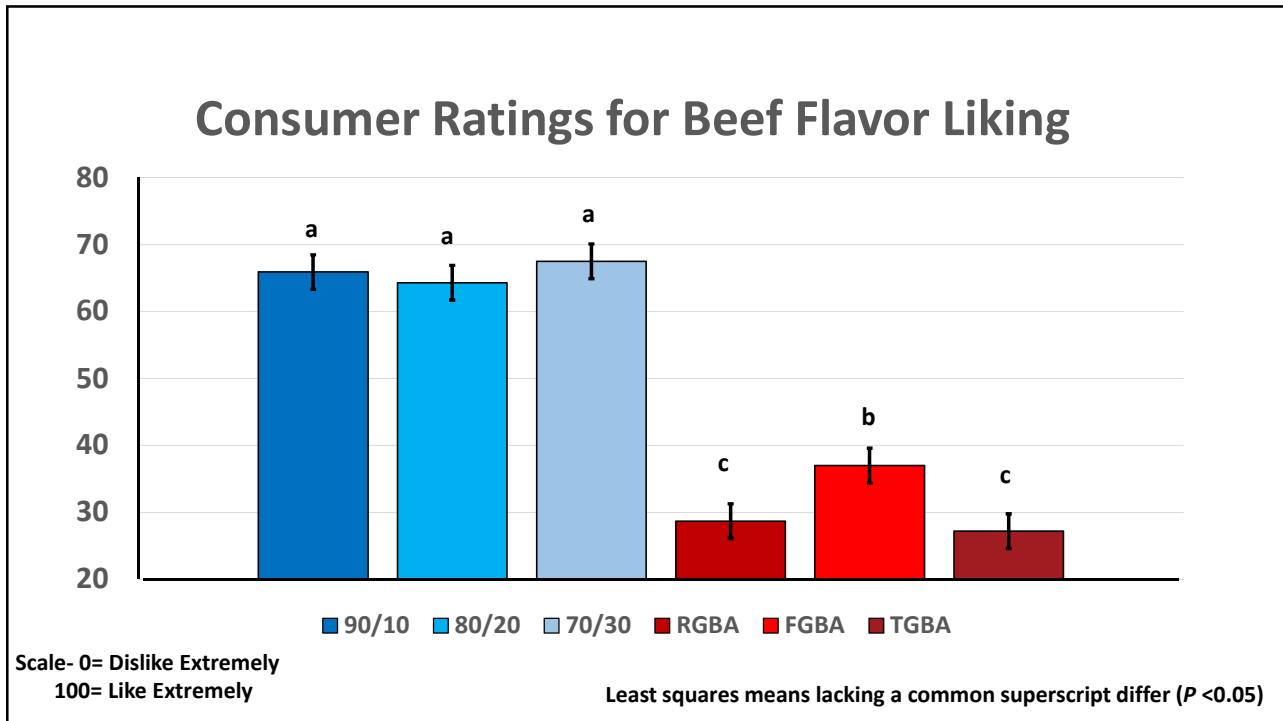
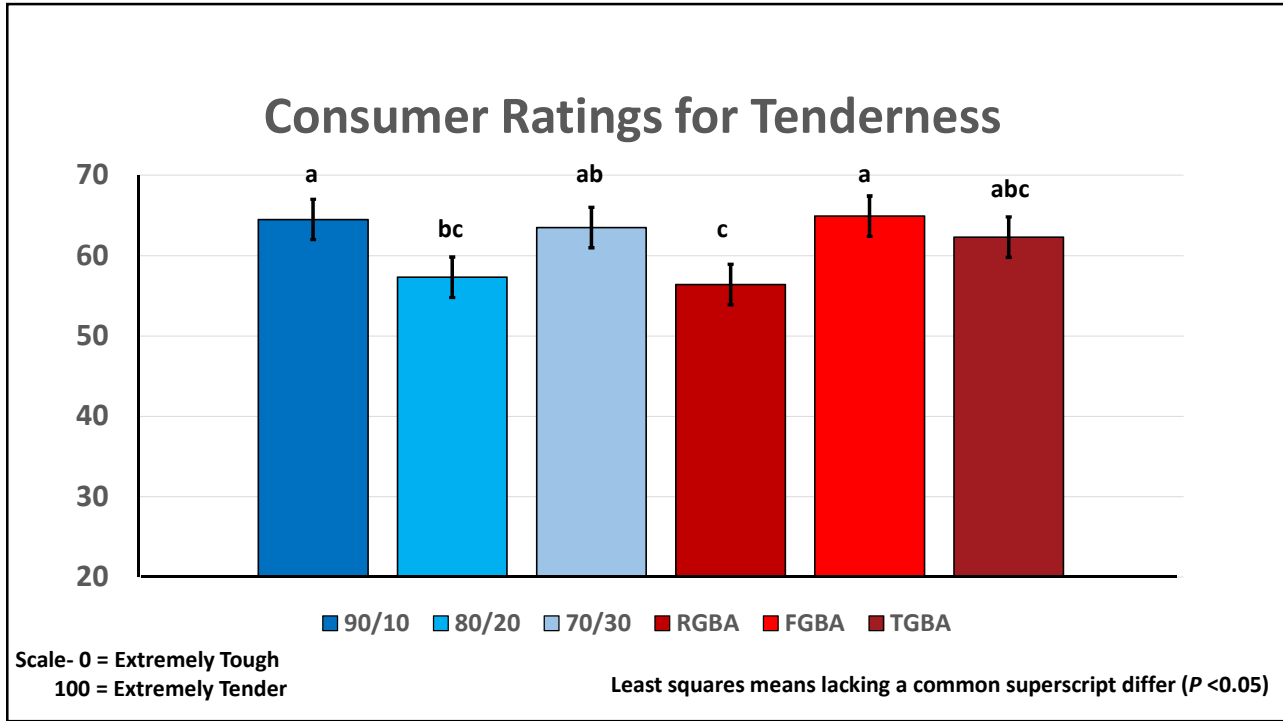
Fat and Moisture Percentage

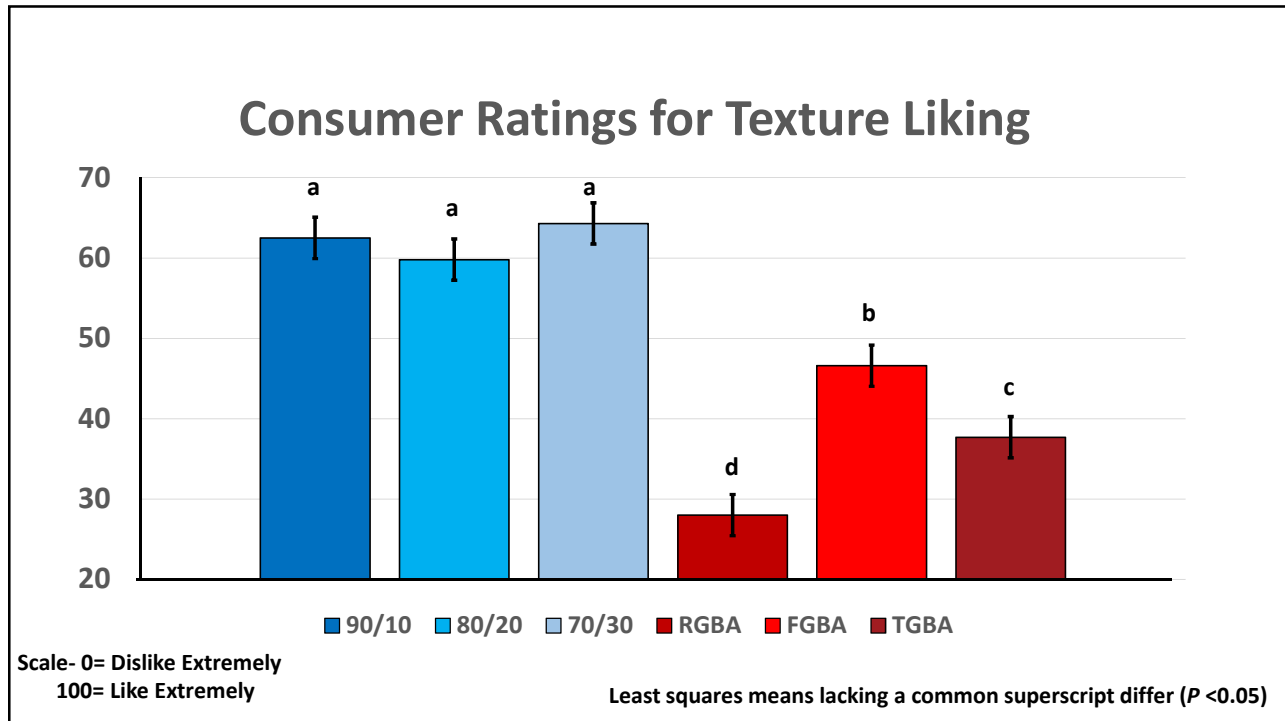
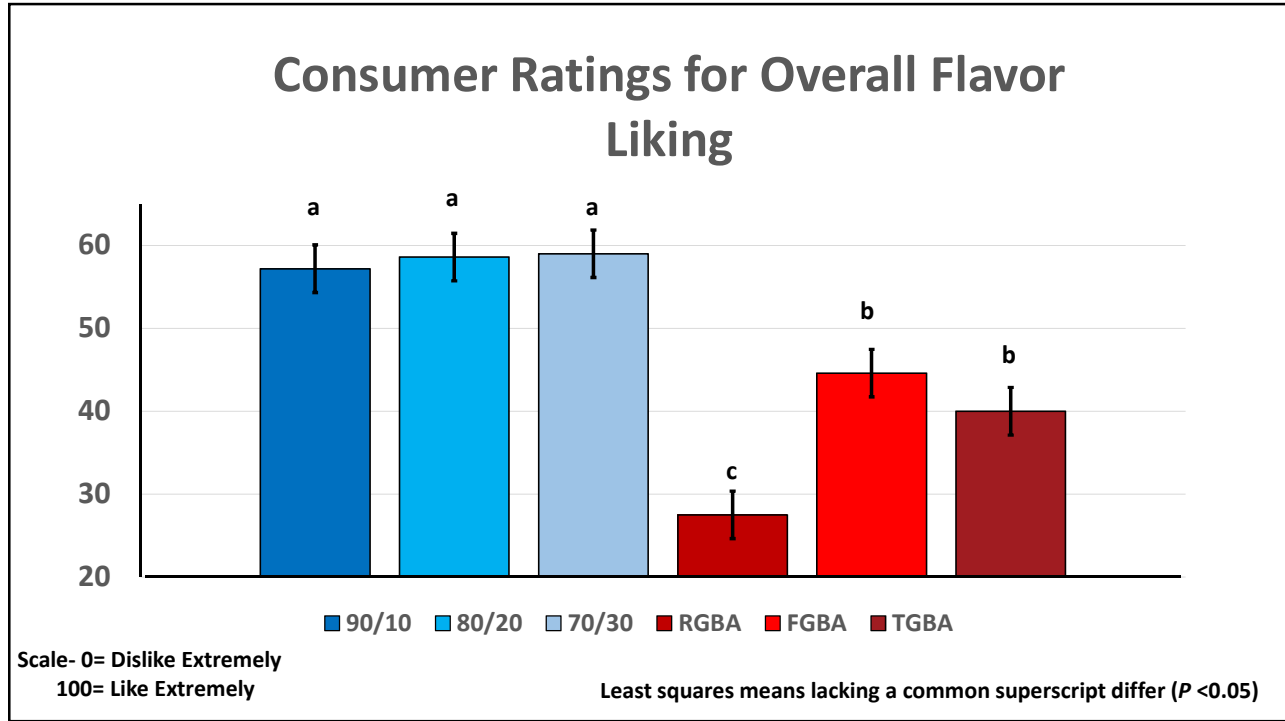
Cook Time and Cook Loss

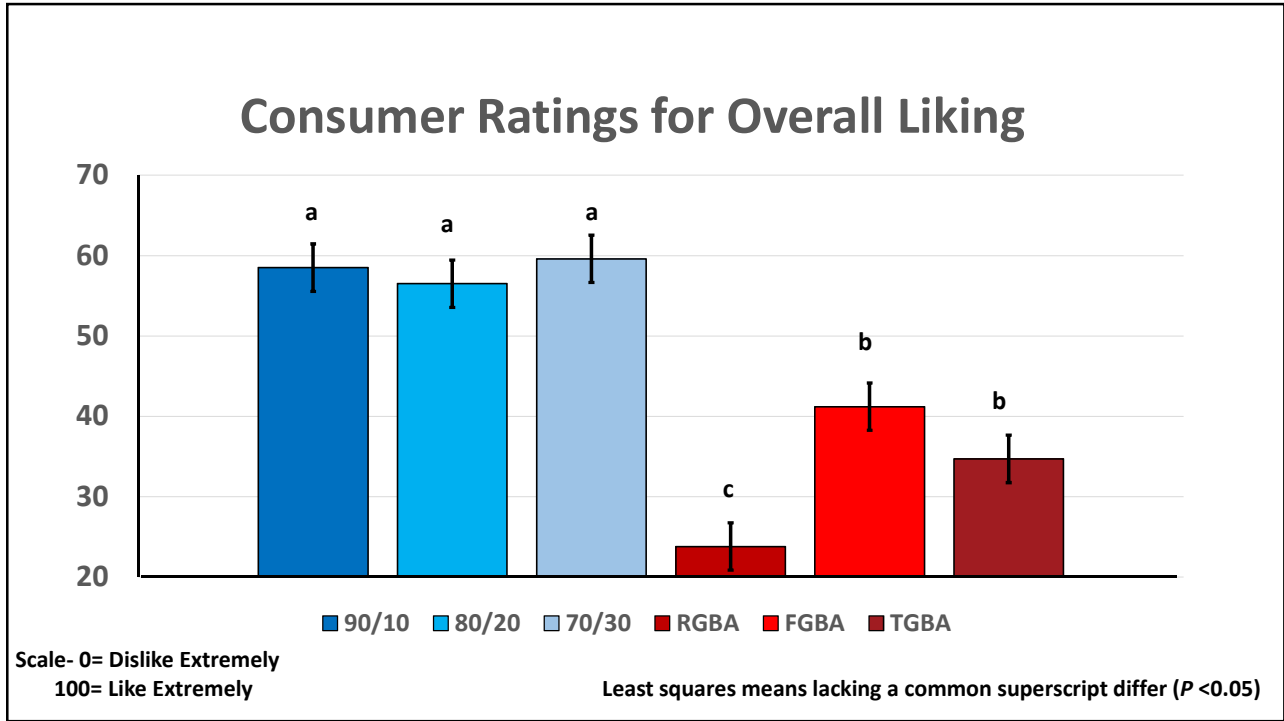


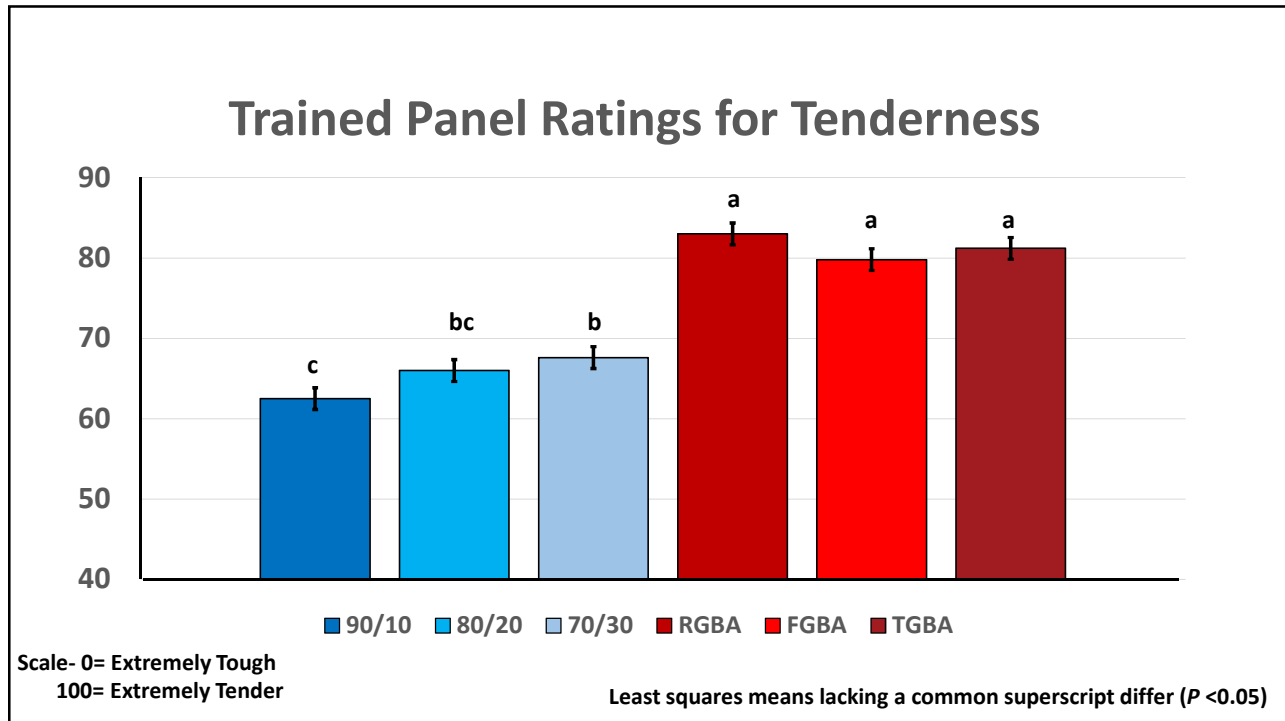
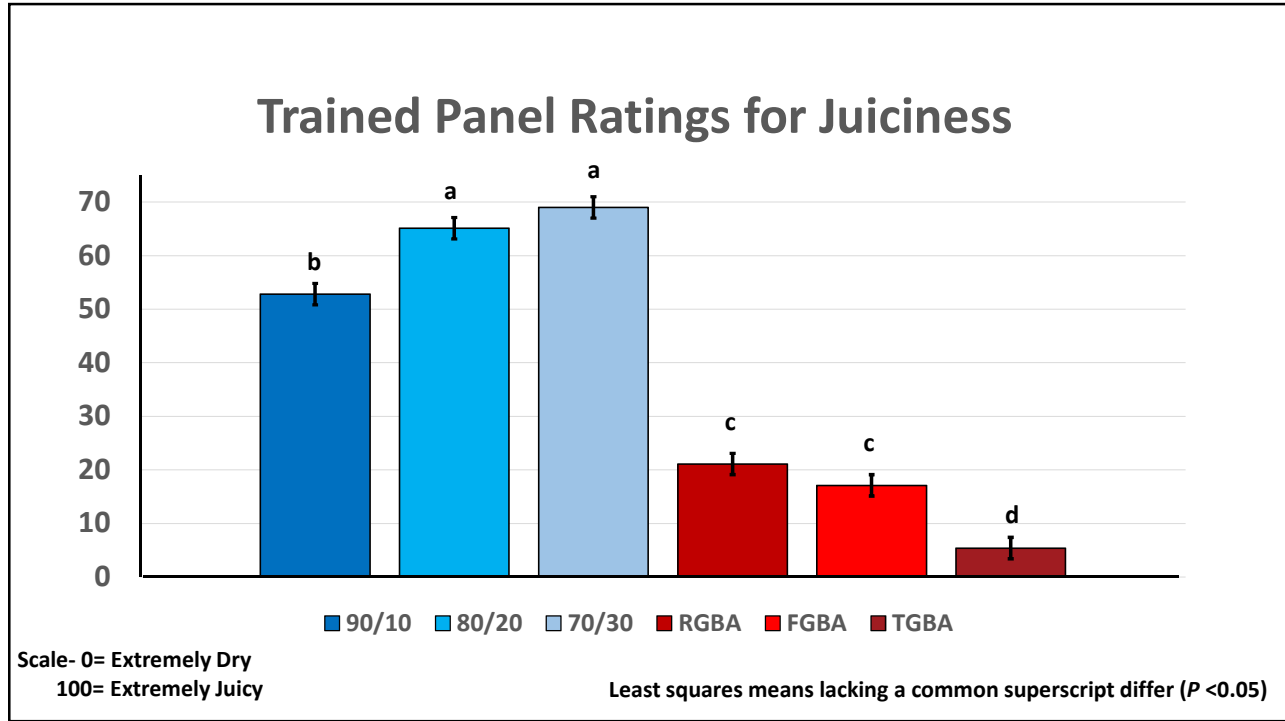
Results

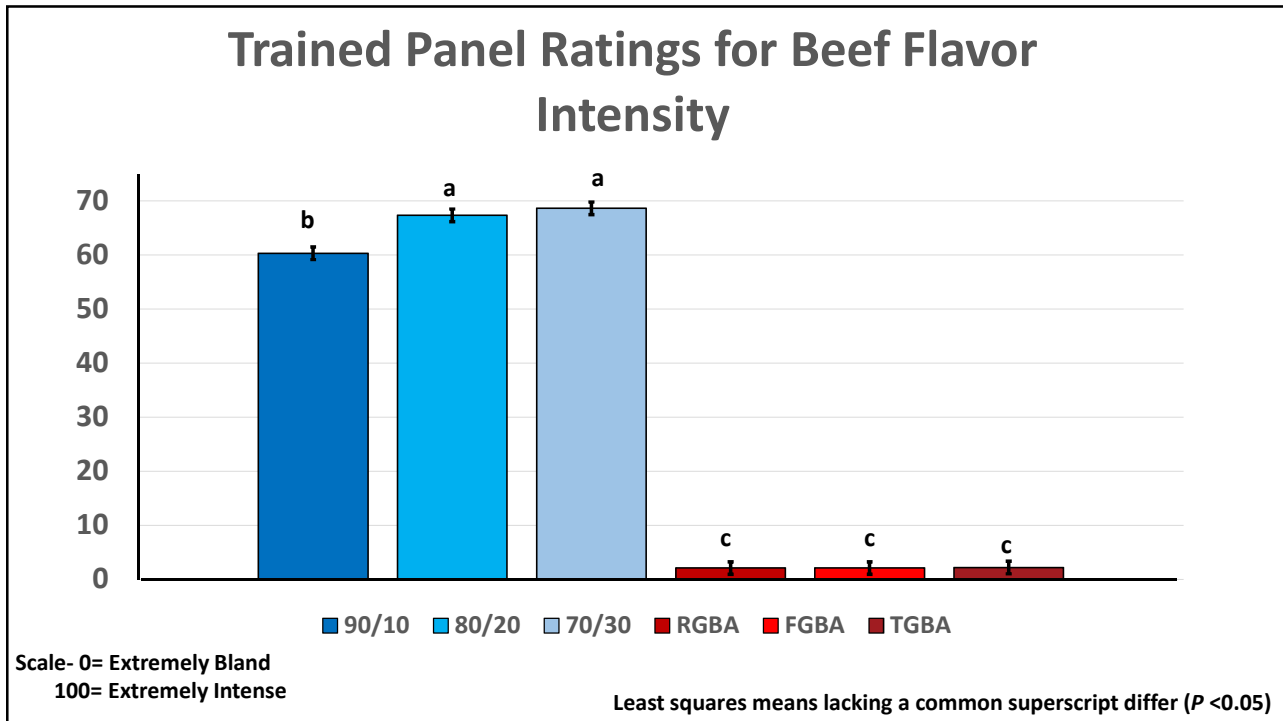
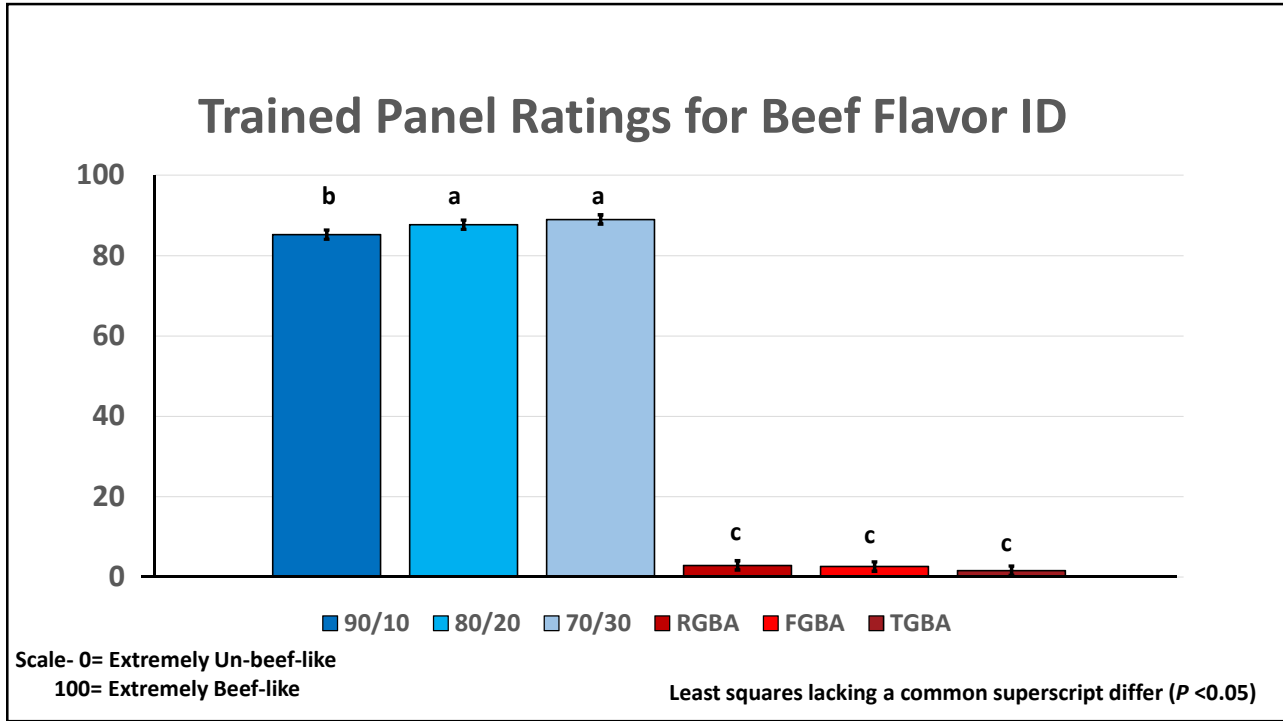


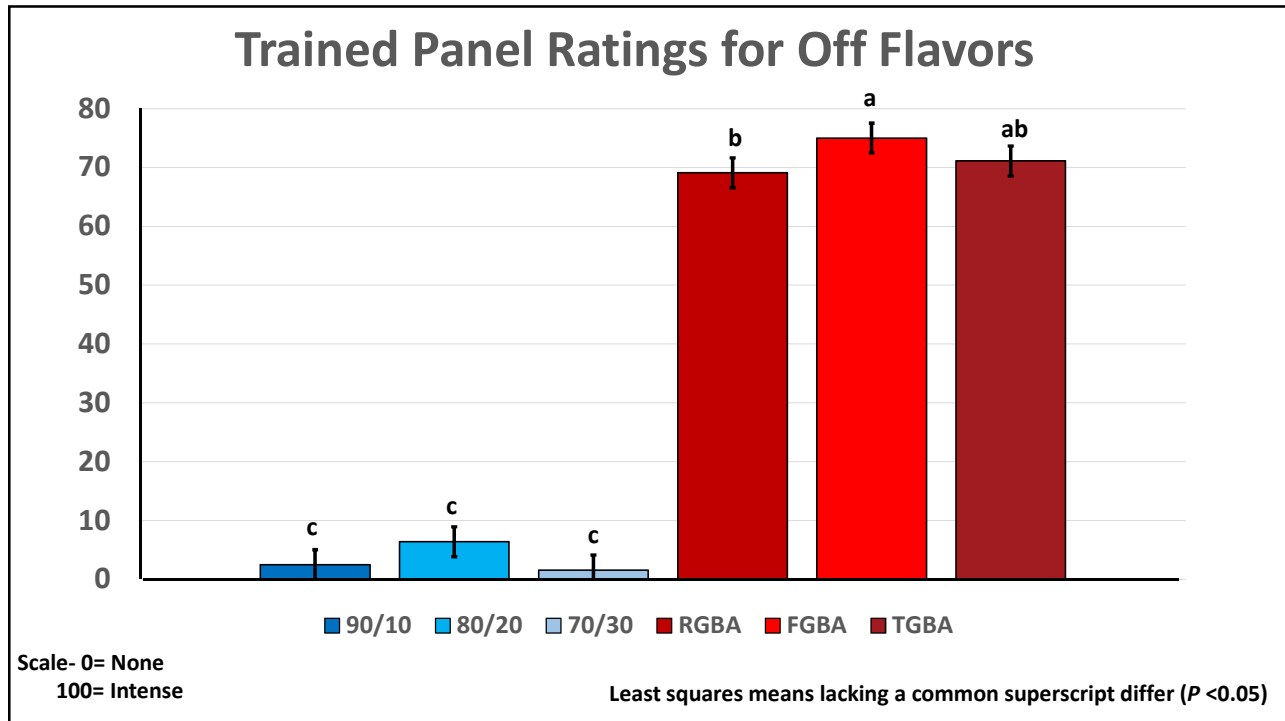
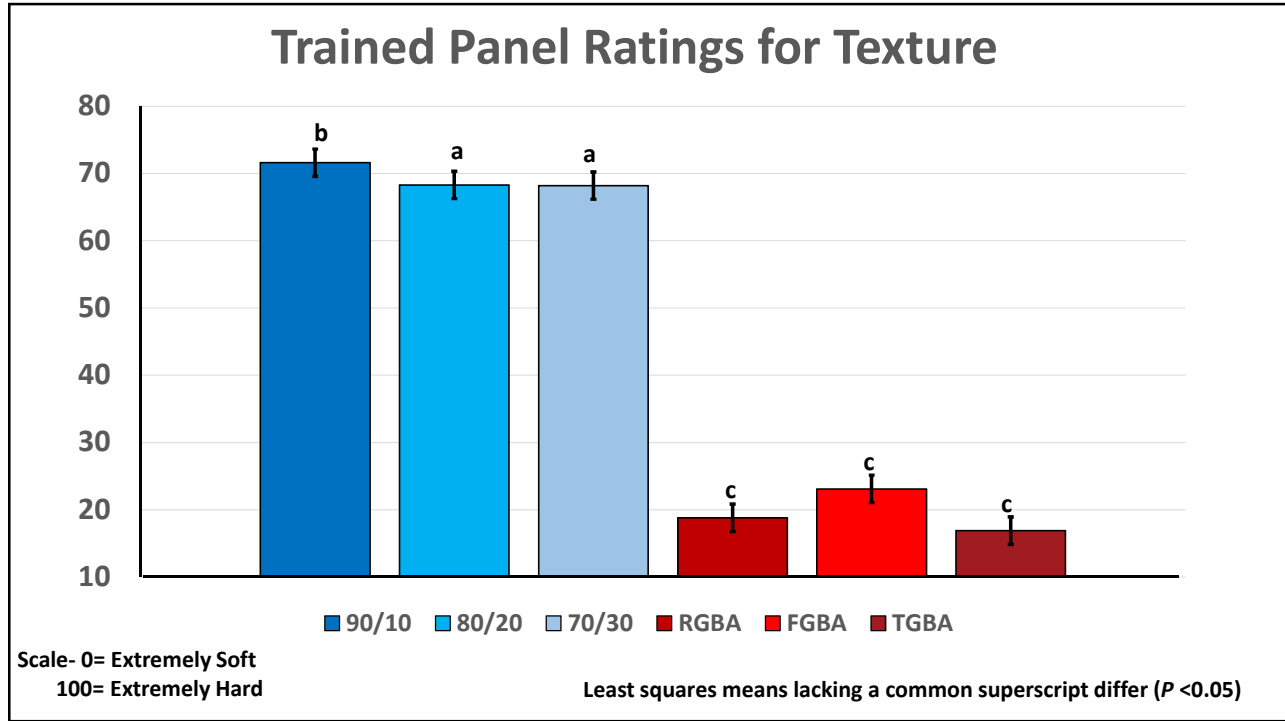


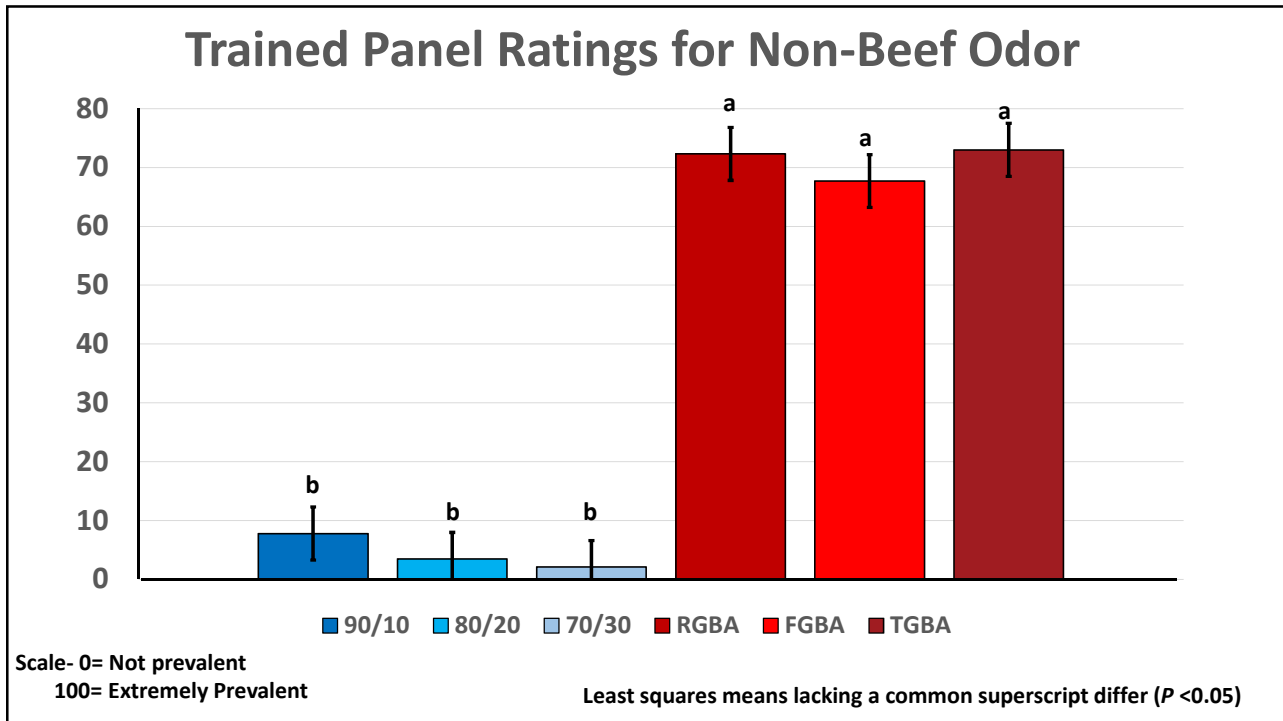
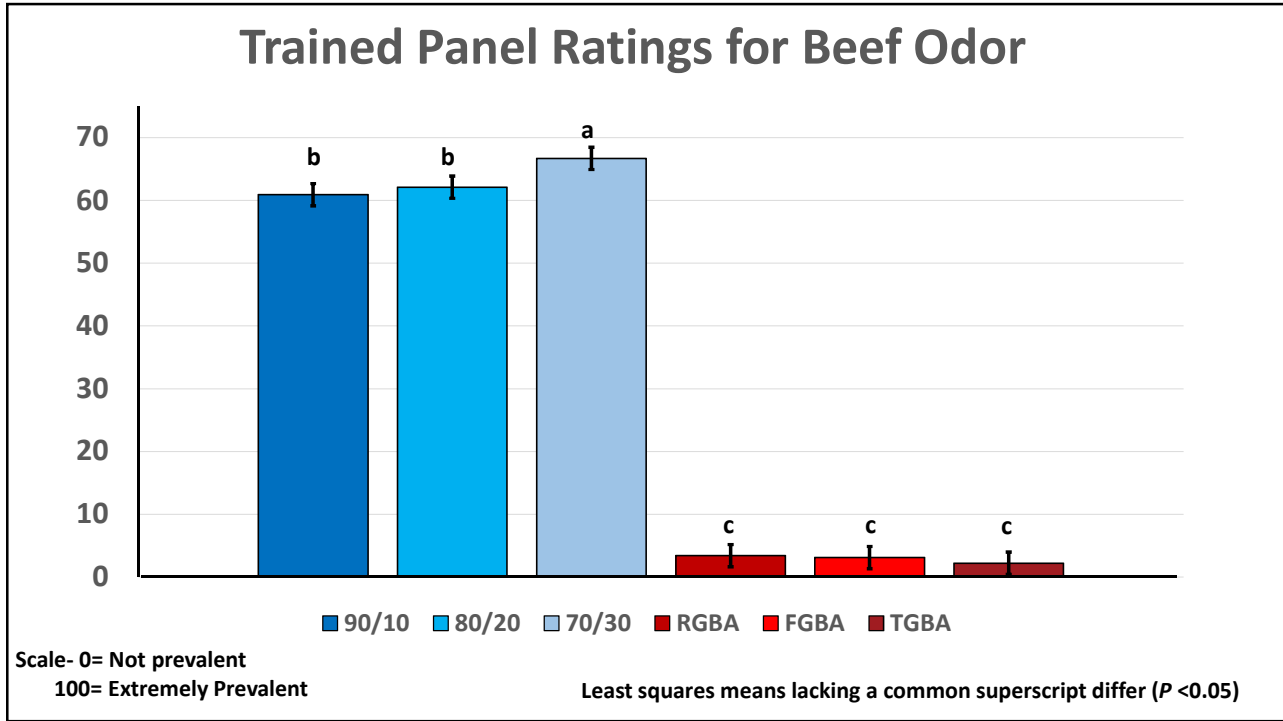








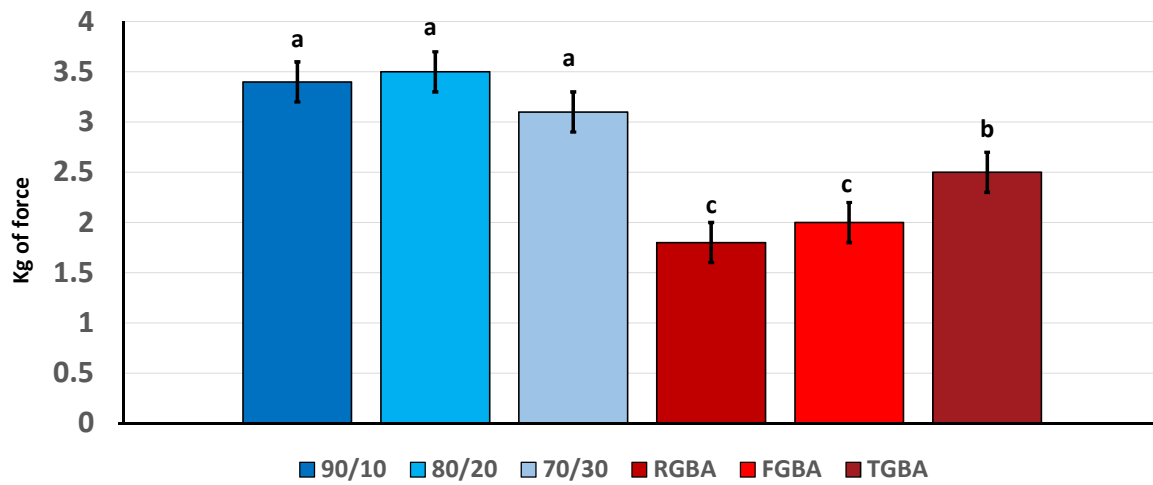




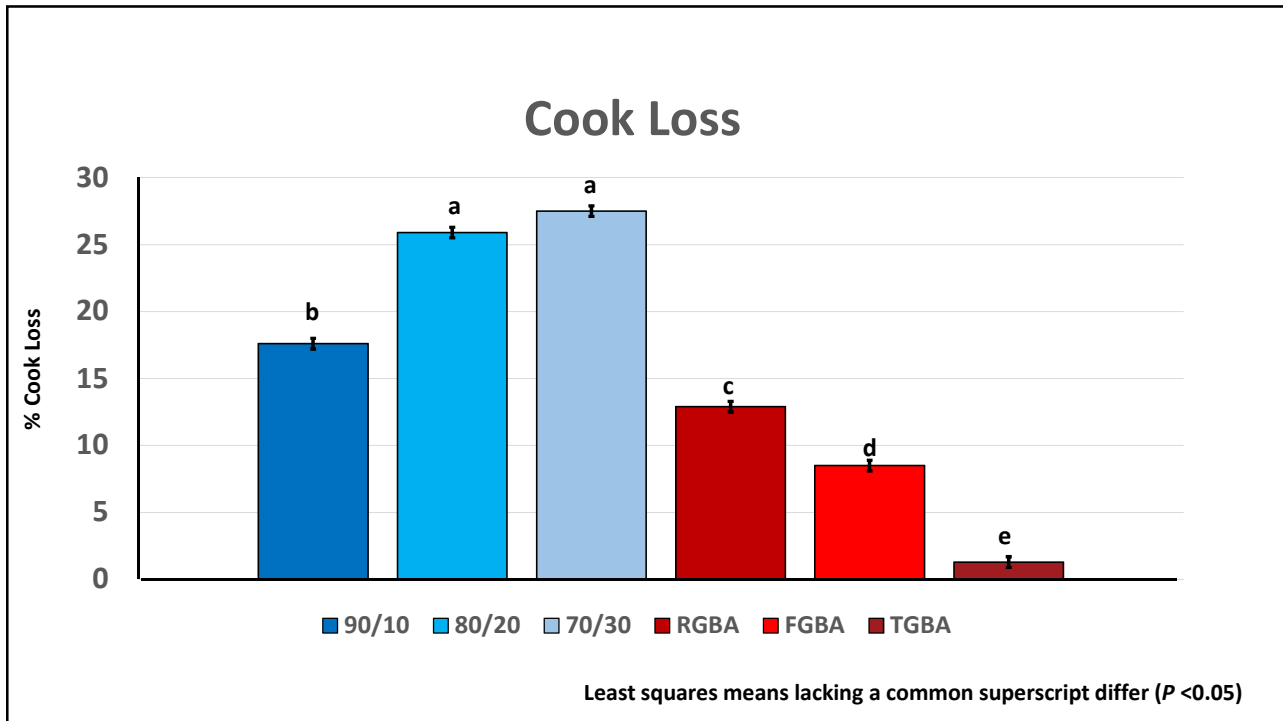
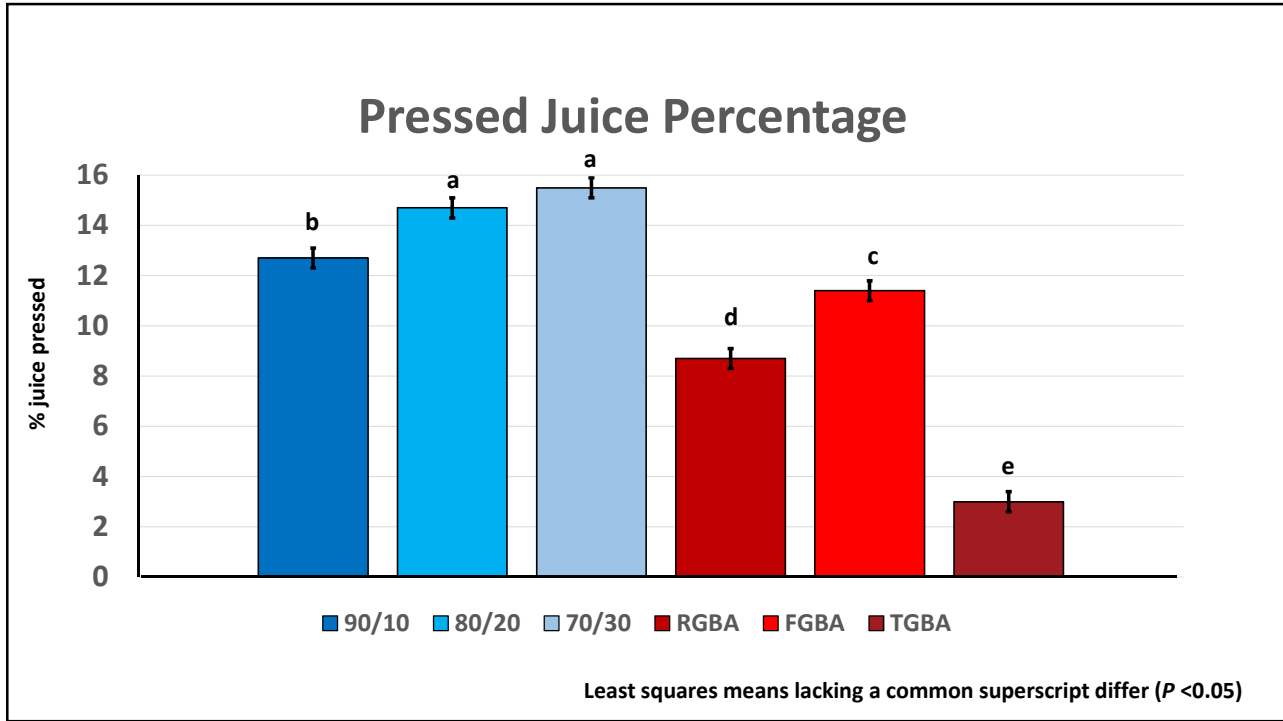
Objective Measure Results

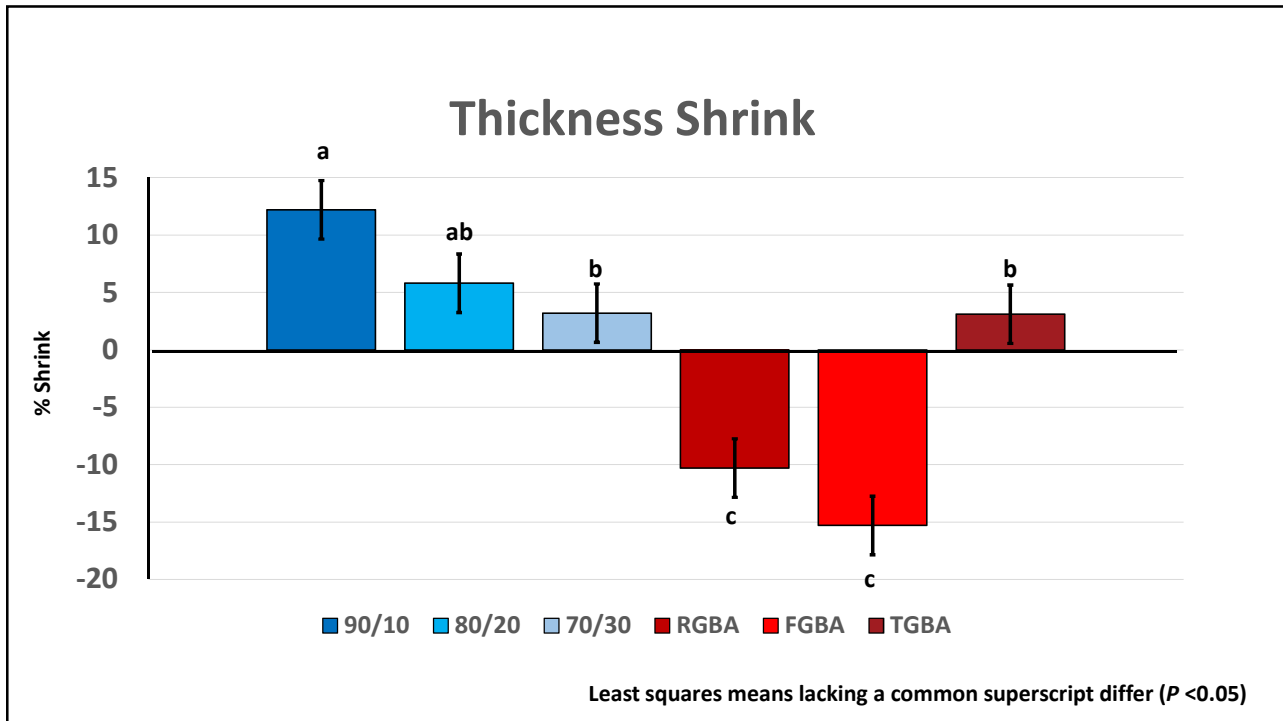
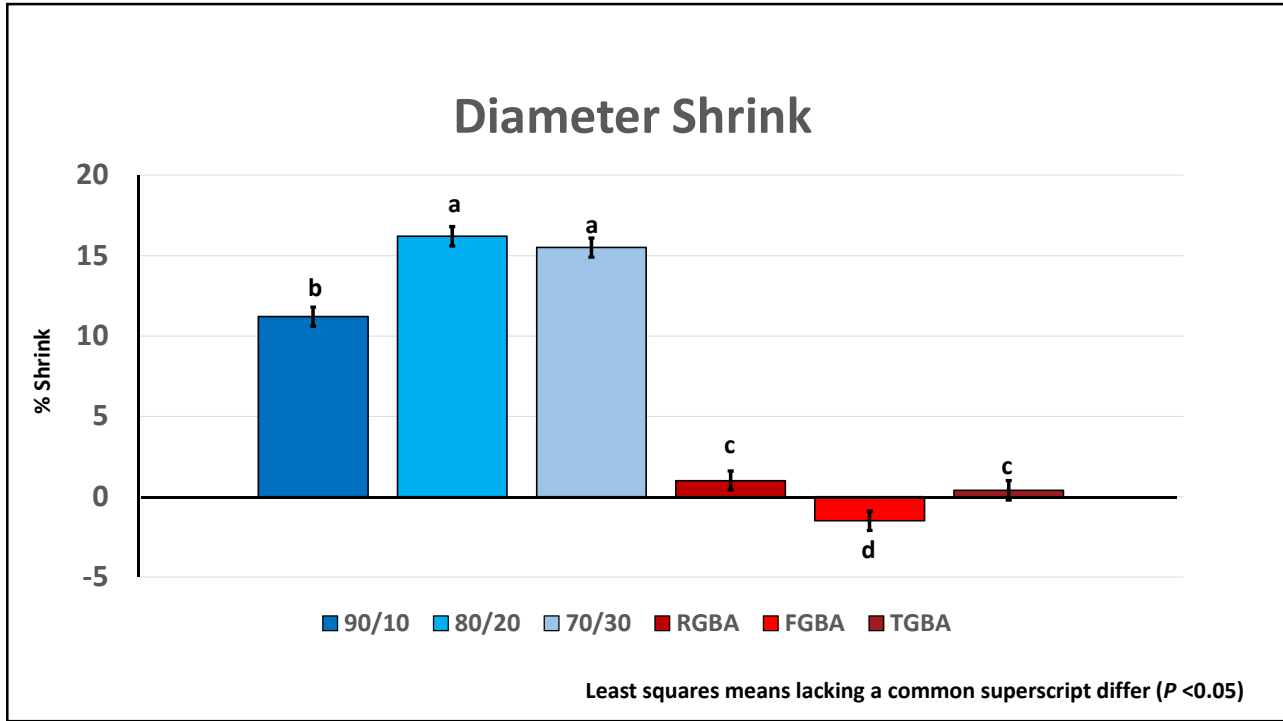


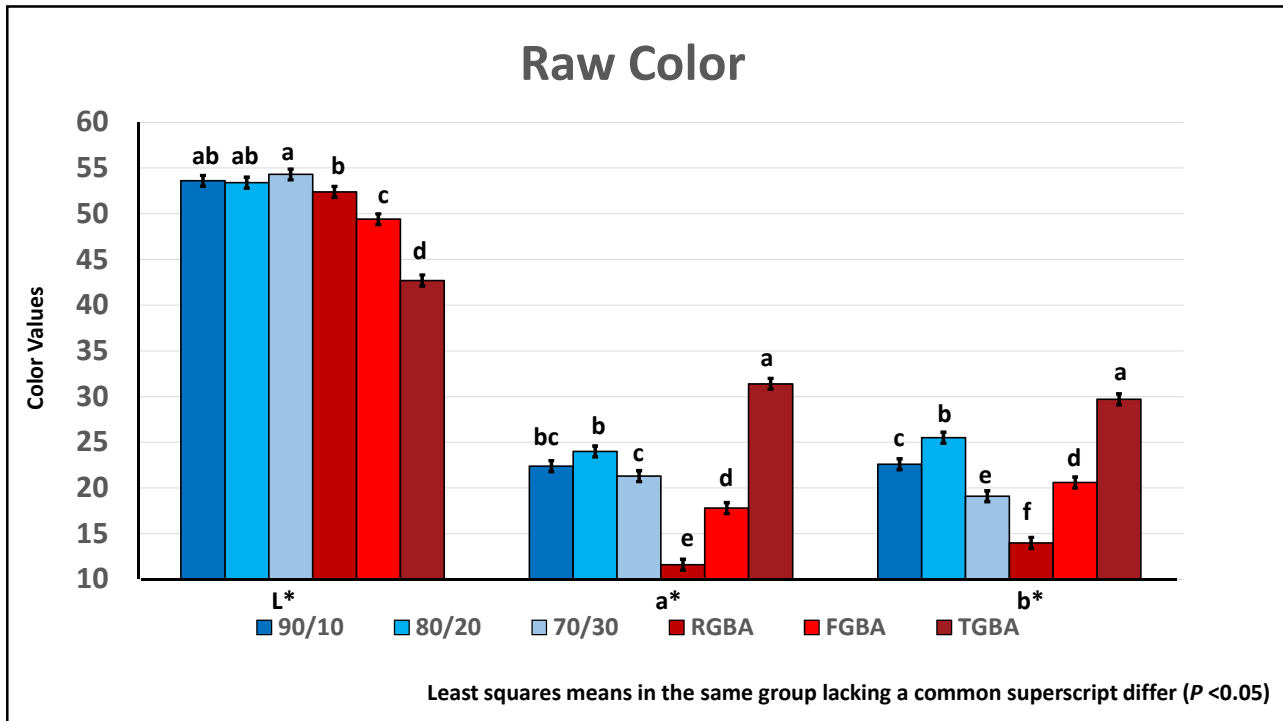
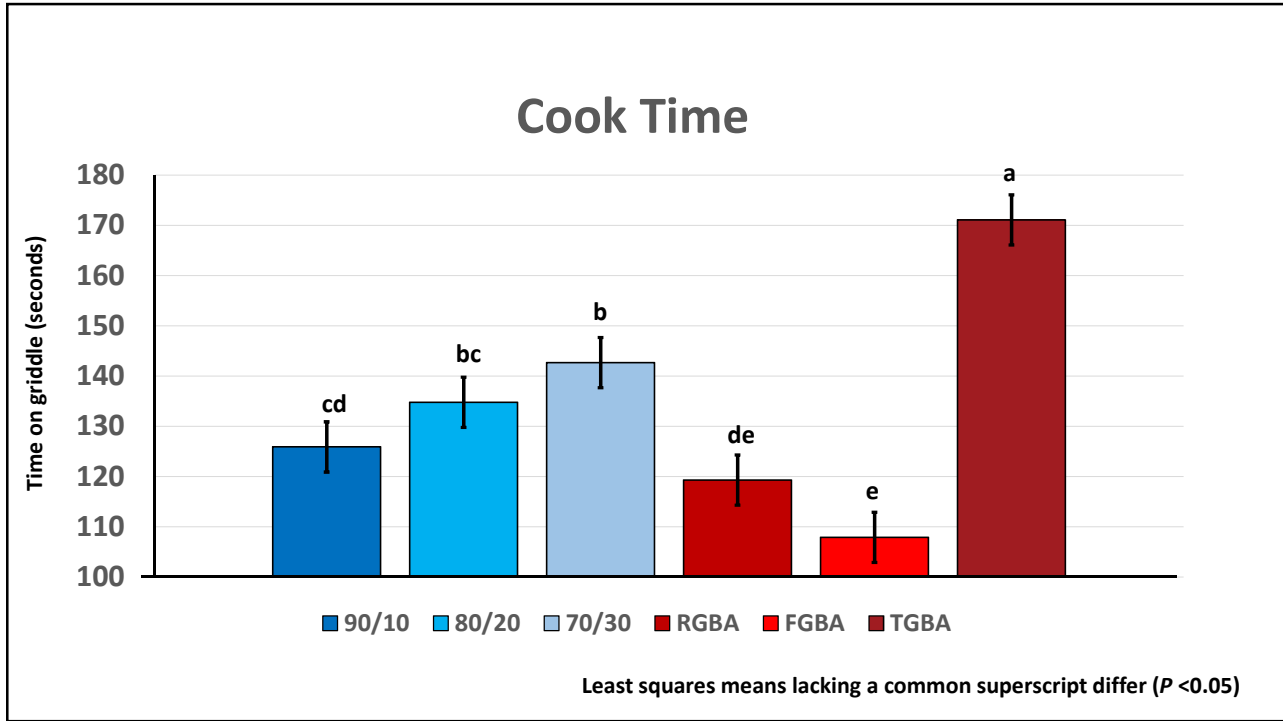
Shear Force

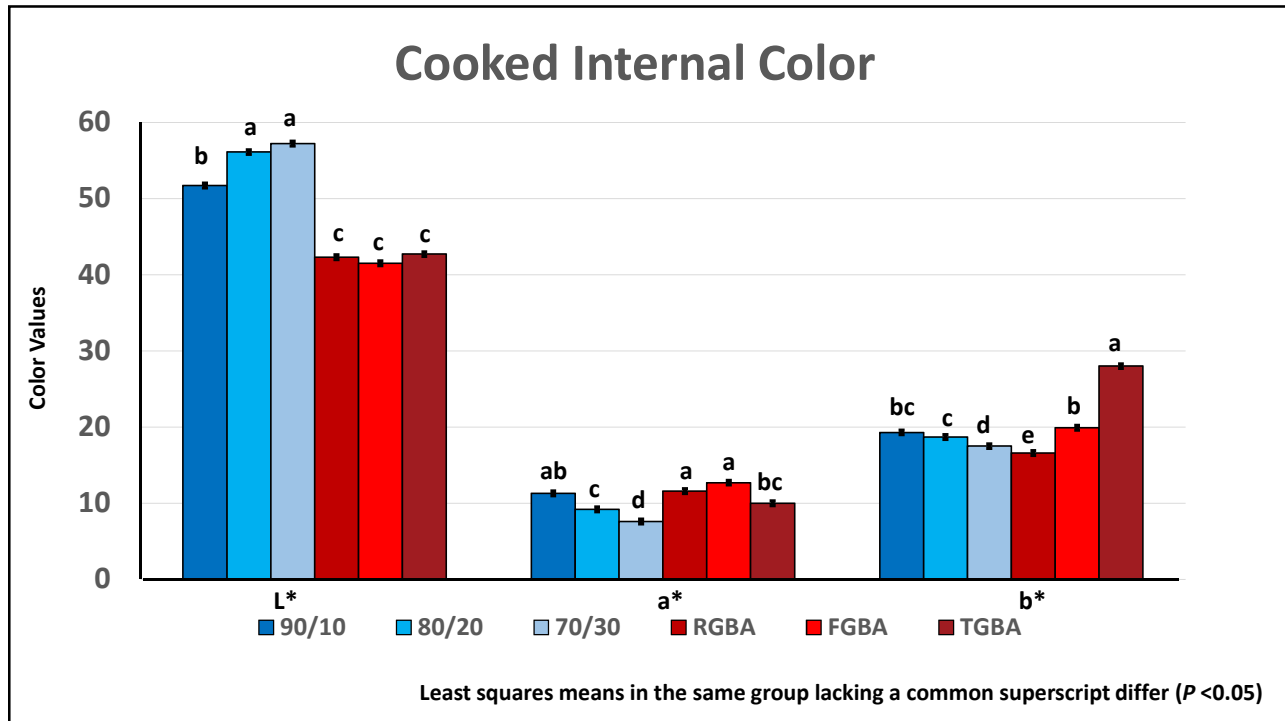
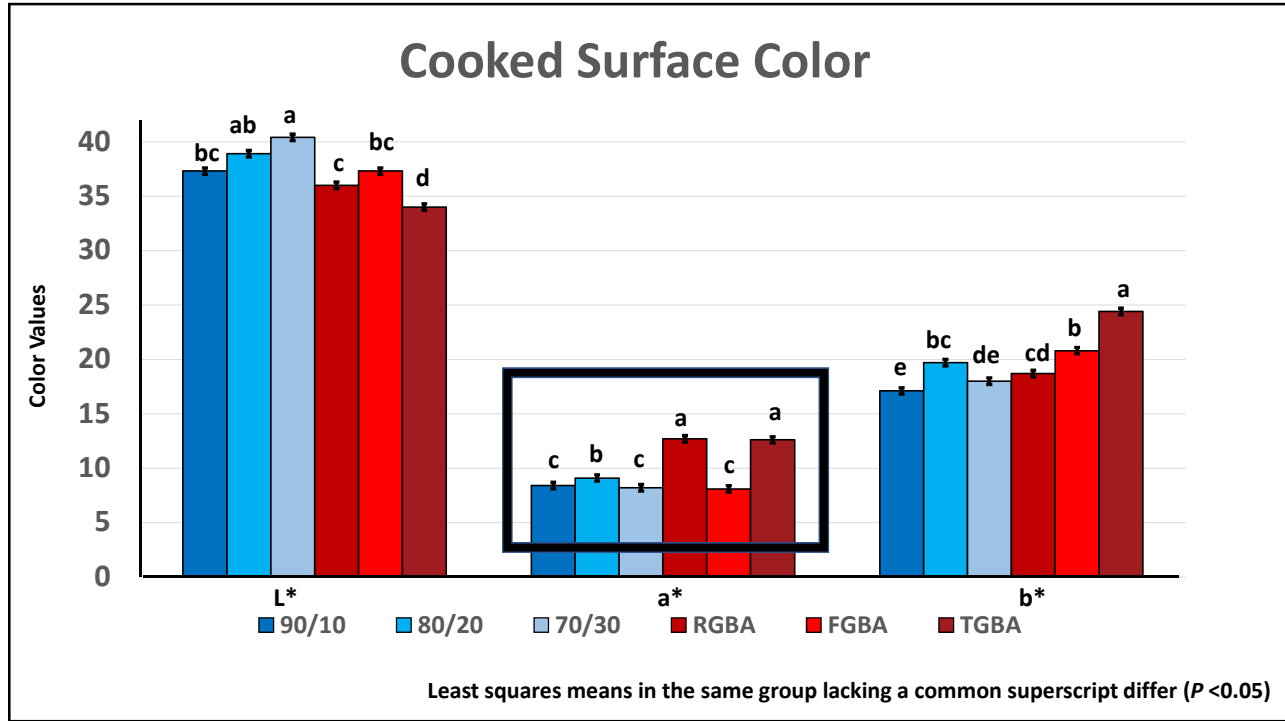


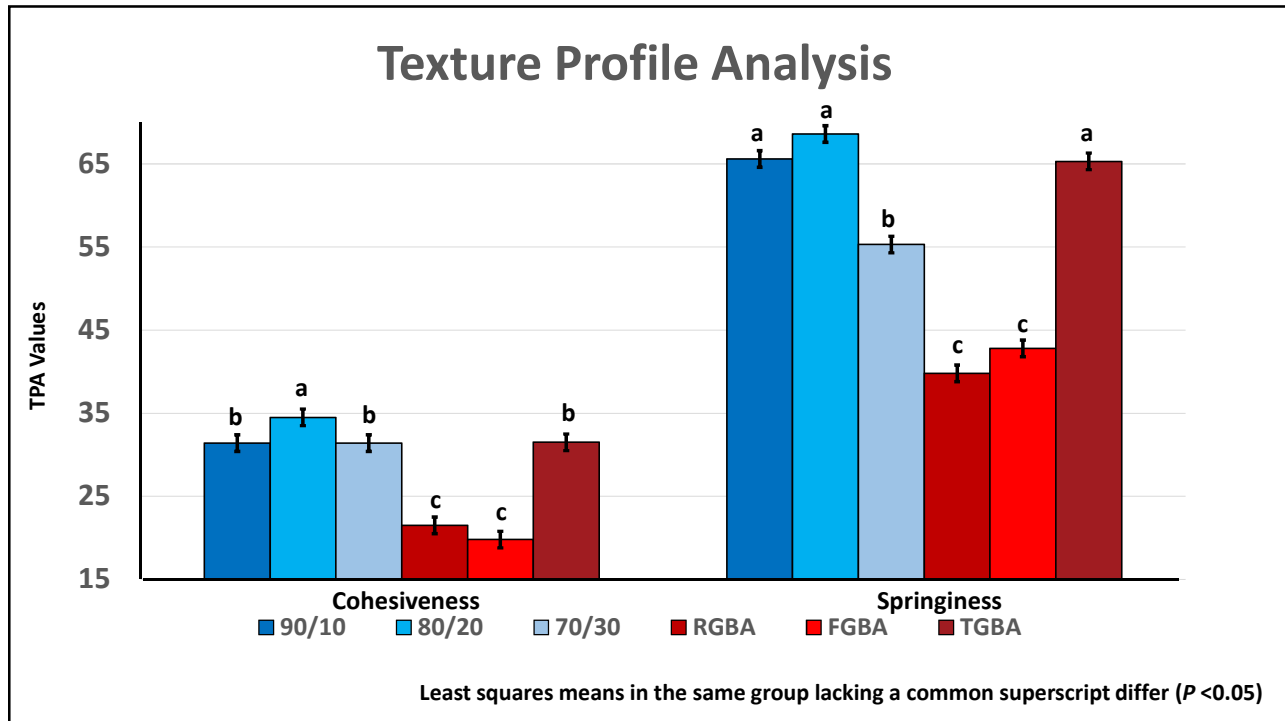
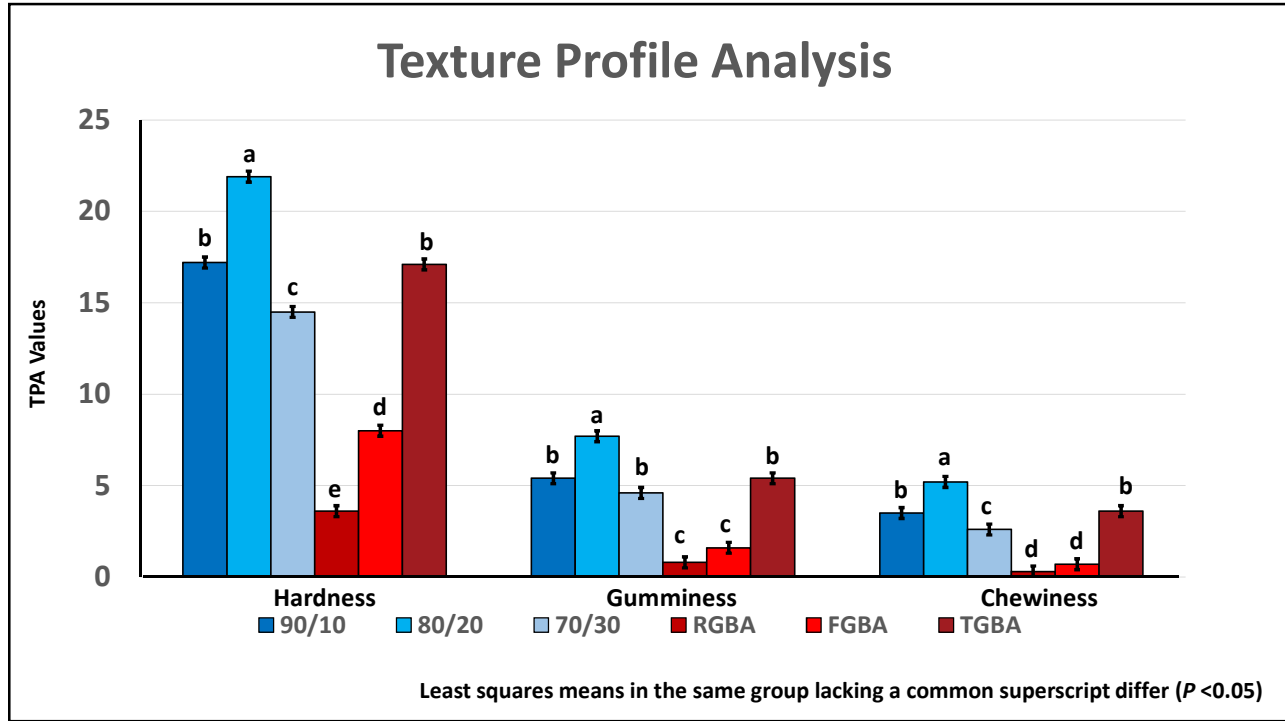
Least squares means lacking a common superscript differ ($P < 0.05$)











Conclusions

GBA differed from ground beef for most traits evaluated

Few differences among ground beef samples, but substantial differences were found among GBA

Consumers, retailers, & marketers of GBA should consider these very different products from ground beef

Future Considerations

- Though our study produced clear, decisive evidence of the difference between the GBA and ground beef and consumers indicated a strong preference for ground beef over the GBA, demand and sales for these products continue to increase
- This discrepancy between our data and “real world” evidence might be due to the inclusion of these products as an ingredient as opposed to the sole product
- Further investigation is needed related to how these products perform with other ingredients included (ie. burgers, tacos, etc.) to help bridge this gap in current knowledge



