COMPARISON OF THE PHYSICAL ATTRIBUTES OF PLANT-BASED GROUND BEEF ALTERNATIVES TO GROUND BEEF

K. Harr*, S. G. Davis[1], S. B. Bigger[2], D. U. Thomson[3], M. D. Chao[1], J. L. Vipham[1], M. D. Apley[2], D. A. Blasi[1], S. M. Ensley[2], M. D. Haub[4], M. D. Miesner[2], A. J. Tarpoff[1], K. C. Olson[1], and T. G. O'Quinn[1],

[1]*Animal Science and Industry, Kansas State University, Manhattan, KS, USA*,

[2]*College of Veterinary Medicine, Kansas State University, Manhattan, KS, USA*,

[3]*Animal Science, Iowa State University, Ames, IA*,

[4]*Nutrition, Dietetics, and Health, Kansas State University, Manhattan, KS, USA*,

*keaylah@ksu.edu

I. OBJECTIVES

The objective of this study was to evaluate the physical attributes of 3 different plant-based ground beef alternatives (GBA) in comparison to ground beef (GB) of 3 different fat percentages.

II. MATERIALS AND METHODS

GB of 3 different fat percentages (10%, 20%, and 30%), a retail pea-protein–based GBA (RGBA), and a traditional soy-flour–based GBA (TGBA) were obtained from retail stores in the Manhattan, Kansas, area over several weeks in order to obtain different production lots for each product ($n = 15$ lots/treatment). Additional samples from 15 production lots of a foodservice soy-protein–based GBA (FGBA) were obtained from a commercial foodservice chain. GB, RGBA, and FGBA were fabricated into 151 g (approximately 13-cm diameter; 1-cm thick) patties using a manual patty former and randomly assigned to one of 4 assays: color analysis, texture profile analysis (TPA), shear force (SF), and pressed juice percentage (PJP). Patties used for TPA and SF were cooked to 71°C on a clamshell-style grill with three 2.54-cm cores taken from each patty for TPA and two 2.54-cm-wide strips taken from each patty for SF. Patties were evaluated for L^*, a^*, and b^* both in the raw, precooked state as well as after cooking for both external and internal color. PJP measured the percentage of weight lost from 1 cm^3 cooked samples that were compressed for 30 s at 8 kg of force. During cooking for TPA, SF, and PJP, patty weights, diameters, and thicknesses were measured for determination of size change through cooking. All data were analyzed as a completely randomized design.

III. RESULTS

When evaluating raw color, TGBA had the highest ($P < 0.05$) a^* value and were redder when compared to all other treatments, with RGBA having the lowest ($P < 0.05$) a^* value. TGBA and RGBA had the highest ($P < 0.05$) a^* value, whereas FGBA and 30% and 10% fat GB had the lowest ($P < 0.05$) a^* value for cooked surface color. Additionally, 30% and 20% fat GB had higher ($P < 0.05$) L^* values for internal cooked color than all other treatments, with all GBA patties having the lowest ($P < 0.05$) L^* values. For texture attributes, RGBA and FGBA had lower ($P < 0.05$) values for cohesiveness, gumminess, hardness, and chewiness, as well as higher values for springiness, than all other treatments evaluated. Few differences were found between TGBA and 20% and 30% fat GB for texture, with TGBA only found softer and less chewy ($P < 0.05$) than both GB treatments. For SF, the 3 GBA were more tender ($P < 0.05$) than all 3 GB treatments, with FGBA and RGBA being more tender ($P < 0.05$) than all treatments. The 3 GB treatments had greater ($P < 0.05$) PJP values than all GBA, indicating that the GB was juicier than any of the GBA evaluated. Finally, during cooking, the 3 GB

treatments had a greater ($P < 0.05$) cook loss percentage and decrease in patty diameter and thickness than the 3 GBA, with FGBA and RGBA increasing in thickness during cooking.

IV. CONCLUSION

For physical attributes, the GBA evaluated differed significantly from GB. RGBA and FGBA had the greatest differences, with the TGBA being the most similar to 20% and 30% fat GB for some traits. This provides evidence that that, though these products attempt to mimic GB, they provide very different color, texture, tenderness, and cooking characteristics than traditional GB.

Keywords: alternative proteins, color, ground beef, ground beef alternatives, texture