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Influence of Zinc and Ractopamine Hydrochloride Supplementation on Beef Carcass Characteristics and Quality Attributes of Aged Ribeye Steaks

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Objectives

Growth promoting technologies such as the β agonist ractopamine hydrochloride (RAC) and nutritional practices such as increased zinc (ZN) supplementation have potential to positively impact beef cattle growth. However, the impact of these strategies (RAC and ZN) on meat quality is unclear. The objective of this experiment was to determine the extent to which ZN and RAC supplementation in the diets of finishing beef steers influence carcass characteristics and meat quality of aged longissimus steaks.

Materials and Methods

Crossbred Angus steers (~431 kg initial body weight) from a single source were fed one of four diets in GrowSafe bunks. Steers were assigned to diets based on growth potential (Gene Max gain score) and initial body weight: control (CON-NO; 30 ppm Zn (NRC requirement); $n = 7$), ZN supplementation (SUPZN-CON; 150 ppm ZN (60 ppm $ZnSO_4$, 60 ppm Zn-AA); $n = 7$), RAC supplementation (CON-RAC 300 mg/hd/d; 30 ppm Zn; $n = 6$), and ZN supplementation combined with RAC supplementation (SUPZN-RAC; 150 ppm ZN (60 ppm $ZnSO_4$, 60 ppm Zn-AA), RAC 300 mg/hd/d; $n = 7$). Zn treatments were fed for the entire 90 d trial. RAC supplementation occurred for the final 28 d of the feeding trial. At finishing weights (~739 kg), steers were harvested at a commercial processing facility. Yield and quality data were collected. Whole rib sections were collected 6 d postmortem, transported to the Iowa State University Meat Lab, and fabricated into 2.54 cm thick steaks. Temperature, pH, Hunter L, a, and b values, and proximate analysis (moisture, fat and protein) were measured at 6 d postmortem on the longissimus muscle. Pairs of adjacent steaks were vacuum packaged, aged for 7, 14, 28 or 42 d, and frozen until quality evaluation. At the completion of aging and storage; purge, pH, Hunter L, a, and b values, marbling scores, cook loss, and Warner-Bratzler Shear Force (WBS) values were measured on each pair of steaks. Data were analyzed using the PROC MIXED procedure of SAS version 9.4 with fixed effect of treatment. Initial body weight was used as a covariate for hot carcass weight (HCW) analysis. HCW was used as a covariate for analysis of ribeye area, fat thickness (FT), kidney, pelvic and heart fat percentage, yield grade, and d 6 marbling score. FT was used as a covariate for d 6 pH and temperature measurements.

Results

Supplementation of Zn and RAC resulted in a greater HCW and REA with decreased fat thickness, marbling scores, and yield grades than CON-NO. Zn only supplementation had greater redness at 6 and 7 d postmortem. RAC supplementation resulted in increased WBS values at 7, 14, and 28 but no differences were observed at 42 d aging. No differences in KPH, pH, temperature, L and b value, proximate analysis and purge were determined between treatments at any d aging.

Conclusion

The results demonstrate that supplementation of ZN and RAC increased carcass yield. However, RAC inclusion negatively impacted WBS values unless aged for greater than 28 d. The data reveal that WBS differences exist between treatments. The molecular explanations for these differences should be defined to understand how ZN and RAC inclusion impact tenderness development.