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Comparison of conventional and Alltech Beef PN finishing programs: meat color characteristics

Abstract

To maximize efficiency and profit when producing beef, American producers currently employ a multitude of production programs that use feed additives such as Rumensin or Tylan (Elanco Animal Health, Greenfield, IN) and growth promotants such as implants and Optaflexx (Elanco Animal Health). Rumensin and Tylan fed in combination can improve average daily gain and feed efficiency, and utilizing growth promotants enhances feed efficiency, average daily gain, hot carcass weight, and yield grades of carcasses. Although these products improve production efficiency, they can affect meat quality characteristics such as retail shelf life, necessitating better understanding of how management decisions in the feedlot can affect retail display. The Alltech PN Beef Program (Alltech Inc., Nicholasville, KY) consists of two products that are designed to replace components of a conventional feedlot diet. The PN Beef Receiver is intended to be fed during the step-up period of feeding, whereas PN Beef Finisher is intended to be fed during the remainder of finishing period. Because both products are new feed alternatives, the objective of this study was to compare the effects of the Alltech PN Feed Program to a conventional diet on fresh meat retail shelf life color when both diets were fed with or without implants and Optaflexx.

Keywords

Cattlemen's Day, 2014; Kansas Agricultural Experiment Station contribution; no. 14-262-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1101; Beef Cattle Research, 2014 is known as Cattlemen's Day, 2014; Beef; Feed additives; Growth promotants; Meat quality; Color; Shelf life; Altech PN Beef Program

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Comparison of Conventional and Alltech Beef PN Finishing Programs: Meat Color Characteristics

K.J. Phelps, K.A. Miller, C.L. Van Bibber-Krueger, J. Jennings¹, B.E. Dejenbusch², J.S. Drouillard, and J.M. Gonzalez

Introduction

To maximize efficiency and profit when producing beef, American producers currently employ a multitude of production programs that use feed additives such as Rumensin or Tylan (Elanco Animal Health, Greenfield, IN) and growth promotants such as implants and Optaflexx (Elanco Animal Health). Rumensin and Tylan fed in combination can improve average daily gain and feed efficiency, and utilizing growth promotants enhances feed efficiency, average daily gain, hot carcass weight, and yield grades of carcasses. Although these products improve production efficiency, they can affect meat quality characteristics such as retail shelf life, necessitating better understanding of how management decisions in the feedlot can affect retail display. The Alltech PN Beef Program (Alltech Inc., Nicholasville, KY) consists of two products that are designed to replace components of a conventional feedlot diet. The PN Beef Receiver is intended to be fed during the step-up period of feeding, whereas PN Beef Finisher is intended to be fed during the remainder of finishing period. Because both products are new feed alternatives, the objective of this study was to compare the effects of the Alltech PN Feed Program to a conventional diet on fresh meat retail shelf life color when both diets were fed with or without implants and Optaflexx.

Experimental Procedures

Crossbred yearling steers ($n = 512$; 848 ± 17 lb initial body weight) were blocked by body weight and assigned to 64 pens with 8 steers assigned to each pen. The study was conducted as a randomized complete block experiment with a 2×2 factorial treatment arrangement. Factors in the study design consisted of dietary program and growth promotant regimen. For the dietary program factor, steers were separated into a conventional finishing program treatment or the Alltech PN Beef Program treatment (Table 1). The components of the Alltech PN Beef Program diet were premixed into a ground corn carrier and subsequently blended into the total mixed ration. Both supplements contained a proprietary blend of organic trace elements, ascorbic acid, fermentation products, fermentation extracts, and selenium yeast. The PN Receiver portion of the diet was included in the total mixed ration for the first 21 days at a rate of 0.5 oz/animal daily. The PN Finisher was included in the total mixed ration at a rate of 0.7 oz/animal daily for the final 154 days of the feeding period. Each diet was fed with or without growth promotants. Steers receiving growth promotants were administered a Component E-S (Elanco Animal Health) implant on day 1 of the study, reimplanted with Component TE-IS (Elanco Animal Health) on day 94, and fed Optaflexx at a rate of 400 mg/animal daily the final 28 days before harvest.

¹ Alltech, Nicholasville, KY.

² Innovative Livestock Services, Great Bend, KS.

On day 175 of the experiment, animals were harvested at a commercial abattoir, where slaughter and carcass data were collected. After a 24-hour chill, strip loins were randomly selected from two carcasses per pen and transported back to Kansas State University. Upon arrival, strip loins were weighed, vacuum-packaged, and stored for 14 days. On day 14, packages were opened and a 1-in. steak was cut for a 7-day retail shelf life display.

Results and Discussion

Consumer perception of meat color is an important consideration for retailers because it is the most important attribute the consumer utilizes to determine whether to purchase a product. Because the PN Beef Program removes vitamin E from the mixed ration and this vitamin is vital to maintaining color stability, valid concerns have been voiced about the program's impact on meat color. Strip loins were aged for 14 days before objective measurements of color, including steak surface metmyoglobin percentage (Figure 1), lightness (L^* ; Figure 2), and redness (a^* ; Figure 3) were measured during a 7-day simulated retail display study. As expected, day of display had an effect on surface discoloration, lightness, and redness of steaks ($P < 0.01$). Metmyoglobin formation on the surface of steaks increased throughout the display period. All steaks became darker from day 0 to 4, but they faded during the remainder of the display period to obtain lightness values similar to day-0 values. Steaks from all treatments reached peak redness on day 2 of the display period and decreased in redness through the remainder of the display period. For all retail display characteristics measured, no two-way or three-way interactions were observed between dietary program, growth promotants, and day of display ($P > 0.10$). In addition, no growth promotant effects were detected on any of the measured retail display characteristics ($P > 0.10$). Dietary program had an effect ($P < 0.02$) on steak lightness measurements, with strip loin steaks from steers fed the Alltech PN Beef Program objectively measuring darker during the entire retail display period. Although lightness was affected, dietary treatment did not affect surface discoloration, as indicated by surface metmyoglobin formation or steak redness ($P > 0.10$).

Implications

Using the Alltech PN supplements minimally affected meat color during retail display, and use of implants and Optaflexx did not affect meat color.

Acknowledgements

We would like to thank Alltech, Inc. for financial support of this experiment.

Table 1. Diets (dry basis) for steers fed conventional feedlot diets¹ or Alltech PN program²

Ingredient, %	Conventional	Alltech
Wet corn gluten feed	35.00	35.00
Steam-flaked corn	53.55	53.56
Ground wheat straw	7.00	7.00
Feed additive premix	2.16	–
Mineral/vitamin supplement	2.29	2.23
PN supplement	–	2.21

¹ Conventional diets included vitamin A at 1,000 IU/lb; vitamin E at 10 IU/lb; copper sulfate to provide 10 ppm copper; cobalt carbonate to provide 0.15 ppm cobalt; ethylenediamine dihydriodide to provide 0.5 ppm iodine; manganous sulfate to provide 60 ppm manganese; sodium selenite to provide 0.3 ppm selenium; zinc sulfate to provide 60 ppm zinc on a dry matter basis; and 300 mg/animal daily of monensin and 90 mg/animal daily of tylosin (Elanco Animal Health; Greenfield, IN).

² The Alltech diet (Alltech, Nicholasville, KY) included PN Receiver in the total mixed ration for the first 21 days at the rate of 14 g/animal daily, which contained: zinc proteinate to provide 10.7 ppm zinc; manganese proteinate to provide 7.1 ppm manganese; cobalt proteinate to provide 1.2 ppm cobalt; copper proteinate to provide 2.9 ppm copper; calcium iodate to provide 0.6 ppm iodine; selenium yeast to provide 0.31 ppm selenium on a dry matter basis; as well as ascorbic acid, *Aspergillus oryzae* fermentation product, *Lactobacillus acidophilus* fermentation product, and *Enterococcus faecium* fermentation product. Thereafter, PN Finisher was included in the total mixed ration at the rate of 20 g/animal daily: 10.7 ppm Zn; manganese proteinate to provide 7.1 ppm manganese; cobalt proteinate to provide 1.2 ppm cobalt; copper proteinate to provide 2.9 ppm copper; calcium iodate to provide 0.6 ppm iodine; selenium yeast to provide 0.3 ppm selenium on a dry matter basis; as well as ascorbic acid, *Aspergillus niger* fermentation product, *Lactobacillus acidophilus* fermentation product, and *Enterococcus faecium* fermentation product. Both supplements were premixed into a ground corn carrier and subsequently blended into the total mixed ration.

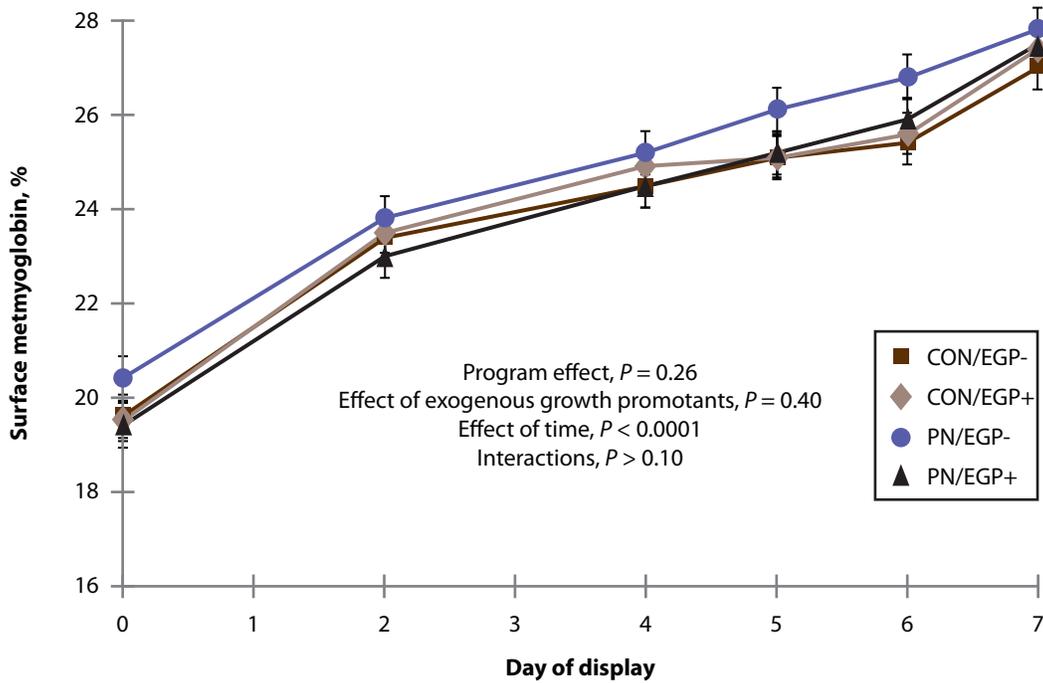


Figure 1. Surface discoloration of strip loin steaks displayed for 7 days.
 CON/EGP- = conventional feeding program; CON/EGP+ = conventional feeding program with exogenous growth promotants; PN/EGP- = Alltech Programmed Nutrition (PN) without exogenous growth promotants; PN/EGP+ = Alltech PN with exogenous growth promotants.

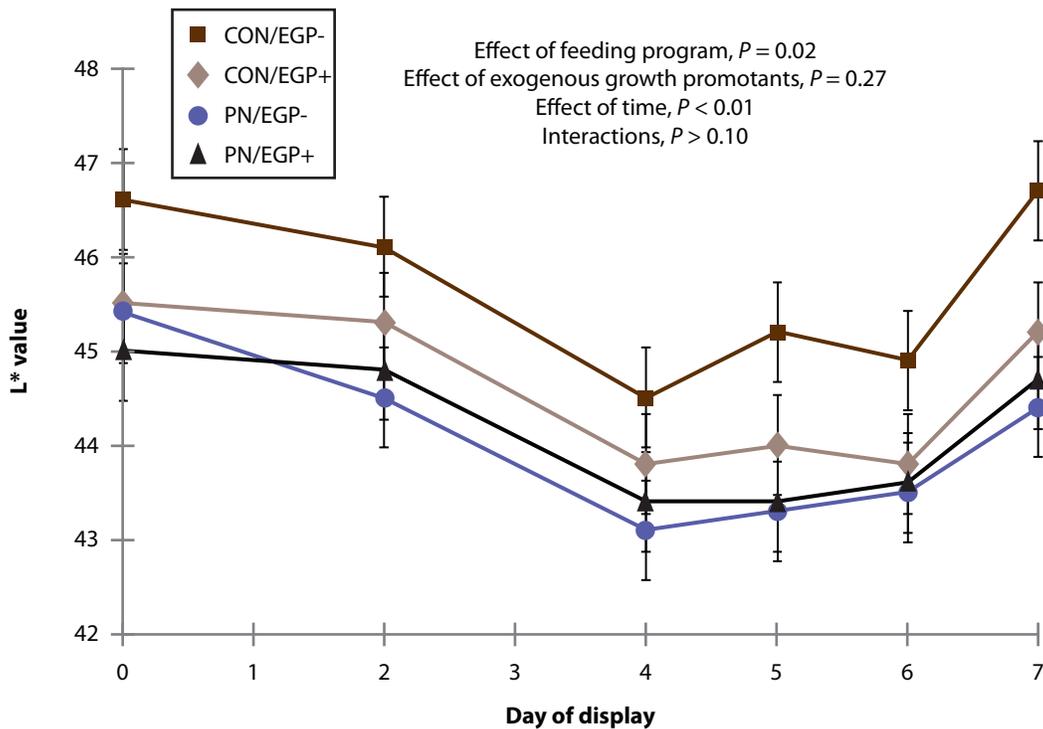


Figure 2. L* (lightness) value of strip loin steaks displayed for 7 days.
 CON/EGP- = conventional feeding program; CON/EGP+ = conventional feeding program with exogenous growth promotants; PN/EGP- = Alltech Programmed Nutrition (PN) without exogenous growth promotants; PN/EGP+ = Alltech PN with exogenous growth promotants.

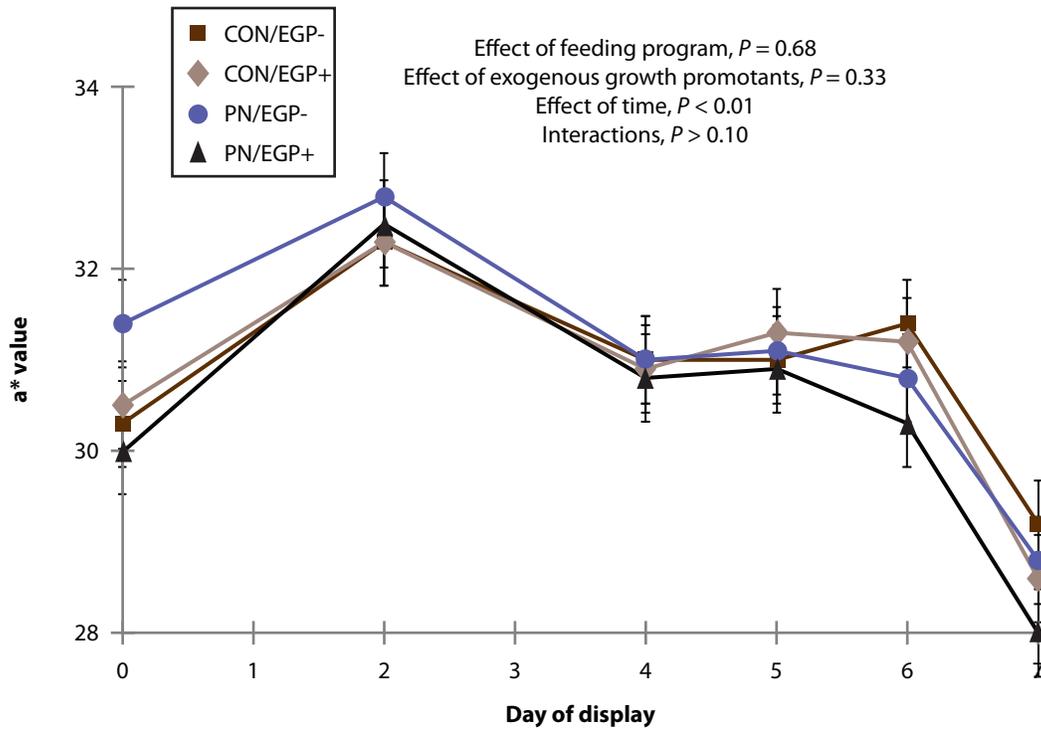


Figure 3. a* (redness) value of strip loin steaks displayed for 7 days.
 CON/EGP- = conventional feeding program; CON/EGP+ = conventional feeding program with exogenous growth promotants; PN/EGP- = Alltech Programmed Nutrition (PN) without exogenous growth promotants; PN/EGP+ = Alltech PN with exogenous growth promotants.