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Lighting Effects on Beef Carcass Grade Factors

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Summary

Beef carcass quality factors were evaluated under 25 different lighting systems (five lighting types each at five light intensities). Cool White fluorescent caused the darkest and most mature lean score, but marbling quantity score was not affected by lighting type or intensity. Lean was scored progressively brighter and more youthful with increasing lighting intensity.

Introduction

USDA beef carcass quality grade is largely determined by carcass maturity and marbling. Beef is graded under a variety of lighting conditions, but research on how lighting affects evaluation of beef quality factors is very limited. This study determined the effect of lighting type and intensity on quality scores.

Experimental Procedure

Rib steaks were obtained from 43 beef carcasses from the 1981 Beef Germ Plasm Evaluation study. Carcass sides were transported to the Kansas State University Food Service Center where steaks were cut at 72 to 126 hours after slaughter. Rib steaks were selected to fit into 5 marbling levels: Traces+, Slight-, Slight+, Small and Moderate.

Each steak was evaluated visually for amount of marbling, marbling distribution (even to uneven), lean color, lean maturity and lean texture by four experienced evaluators under all possible combinations of five lighting types and five lighting intensities. Lighting types were incandescent and Deluxe Cool White, Cool White, GroLux Wide Spectrum and Standard GroLux fluorescent. These were selected because they represent different proportions of red emission. Lighting intensities included 10, 20, 50, 100 and 300 foot candles.

Results

Scores for amount of marbling were not affected by lighting type or intensity. Marbling distribution and lean texture scores were not strongly affected by lighting.

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However, lean color was scored both brighter and more youthful under incandescent and Standard Grolux fluorescent lighting and darker and more mature under Cool White fluorescent. Grolux Wide Spectrum and Deluxe Cool White fluorescent lights were intermediate and resulted in 16% and 14% of a maturity score increase compared to Incandescent. Cool White caused a markedly older maturity score, raising it to B-08 compared to A-59 under the incandescent lighting.

More intense lighting resulted in brighter, more youthful appearing lean, but the maximum difference was A-91 under 10 foot candles and A-64 under 300 foot candles. Thus, an investment in more intense lighting could improve quality grade of a small percentage of A+ and of B maturity beef carcasses.

BEEF COLOR -- LIGHT MAKES A DIFFERENCE

White light is a combination of all the colors of the spectrum. Beef looks red to us because it reflects the red portion of the spectrum. But if one light source produces more red light than another, beef will look redder under that light. Thus, the kind of light in coolers and show cases influences the way we see beef color. Incandescent light contains a high proportion of red light, and makes beef look bright red and youthful. Some fluorescent lights contain lots of blue and green light, and make beef look too dark. Because the blue end of the spectrum can cause changes in muscle pigments, some fluorescent lights may also decrease the display life of beef. Because high electrical costs have made fluorescent lighting almost mandatory, fluorescent tubes have been developed that vary in their spectral output, and consequently differ in the way beef looks under them. "Cool white" fluorescent lights contain lots of blue and less red. "Grolux" lights contain more red and less blue. "Grolux wide spectrum" and some other lights bring out the natural color of beef.
