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Abstract

Longissimus samples from seven pork loins were used to determine display color stability when packaged in oxygen-permeable (polyviny lchloride, PVC) film and when vacuum packaged. Color scores were different at all times when evaluation was done under display lighting, with poorest color under Cool White and most desirable color under NAFA or Grolux Wide Spectrum. Since differences were minor or non-existent when evaluation was under a common light, we conclude that a different color rendition caused the differences noted and no photochemical effect occurred.; Swine Day, Manhattan, KS, November 19, 1987

Keywords

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EFFECT OF DISPLAY LIGHTING ON FRESH PORK LONGISSIMUS PACKAGED IN OXYGEN-PERMEABLE AND OXYGEN-BARRIER FILMS

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Summary

Longissimus samples from seven pork loins were used to determine display color stability when packaged in oxygen-permeable (polyvinylchloride, PVC) film and when vacuum packaged. Color scores were different at all times when evaluation was done under display lighting, with poorest color under Cool White and most desirable color under NAFA or Grolux Wide Spectrum. Since differences were minor or non-existent when evaluation was under a common light, we conclude that a different color rendition caused the differences noted and no photochemical effect occurred.

Introduction

A conversation with a meat packer representative, who reported that unattractive lighting resulted in rejection of a new product by a potential customer, prompted us to study effects of seven lighting systems. The results can also be applied to retail lighting.

Procedures

Seven pork loins were cut into chops (1 in thick), from the 7th rib to the 5th lumbar vertebral location. Care was taken to reduce effect of anatomical location when assigning chops to the treatments.

Chops were quickly packaged as predetermined, either on a polystyrene tray overwrapped with polyvinylchloride (PVC) oxygen-permeable film or vacuum packaged in a skin-tight, oxygen-barrier film. Cuts were kept chilled but protected from light until all 0 time color evaluations were completed.

Color was scored using a five-point scale (see tables 1 and 2) by four experienced evaluators, both under a display light and under a common light, GE Natural. At the same time, reflectance was determined with a Hunterlab reflectance spectrophotometer to determine redness (A value) and proportion of pigment forms, including oxymyoglobin (bright pink) and metmyoglobin (brown).

For the oxygen-permeable film, color was determined before display (0 day) and after 1, 3, and 5 days of display. For the oxygen-barrier film, color was evaluated at 0, 7, and 14 days. The product was displayed 24 hr/day. Lighting systems compared are listed in table 1.

Data were analyzed by analysis of variance within display time and

packaging, and least significant differences were used to determine differences between lighting systems.

Results and Discussion

Visual color scores of PVC-packaged pork longissimus (loin eye) muscle were affected by lighting systems (table 1) when color was evaluated under display lighting. Cool White resulted in the darkest color score at 0 time and after 1, 3, and 5 days of display, with an unsaleable color at 5 days. NAFA lighting resulted in a lighter pink color than all other lighting systems, except Grolux Wide Spectrum at 0 time and after 1 day of display. It also showed a lighter pink color than Incandescent Fluorescent, Deluxe Warm White, and Deluxe Cool White lights after 3 and 5 days of display.

When all samples were evaluated under a common light, GE Natural, no difference was noted between lights at any evaluation time. This means the lighting systems did not have a different photochemical effect, and no permanent difference was found by reflectance measurements of the samples. The difference in appearance when samples were scored under different lights was due to differences in color rendition, because the lights differed in proportions of red and blue.

Similar results were noted for vacuum-packaged pork longissimus when scored under display lighting (table 2). However, we also found differences between muscles displayed under different lights when all chops were scored under GE Natural, especially after 14 days of display. At this time, Grolux Wide Spectrum and NAFA resulted in more desirable color than Cool White. These differences were small and were not supported by reflectance measurements of color. The longer time of vacuum display allowed for slight photochemical effects.

Table 1. Display Lighting Effects on Polyvinylchloride and Vacuum-Packaged Pork Longissimus Visual Color Score[a]

Lighting System[b]	Scored under Display Lighting — Display Day 0	1	3	5	Scored under GE Natural Lighting — Display Day 0	1	3	5
N	1.76^{d}	2.11^{d}	2.43^{def}	2.79^{fg}	1.75	1.98	2.48	2.77
GWS	1.69^{de}	1.80^{fg}	2.32^{ef}	2.63^{fg}	1.80	1.91	2.45	2.79
NAFA	1.55^{e}	1.64^{g}	2.25^{f}	2.46^{g}	1.83	1.91	2.54	2.89
IF	1.83^{d}	1.88^{ef}	2.54^{de}	2.82^{def}	1.80	1.93	2.45	2.86
DWW	1.82^{d}	2.00^{de}	2.57^{d}	3.02^{d}	1.78	1.96	2.54	2.89
DCW	1.82^{d}	2.09^{d}	2.54^{de}	2.88^{de}	1.79	1.98	2.54	2.86
CW	2.26^{c}	2.59^{c}	3.21^{c}	3.63^{c}	1.80	2.07	2.55	2.91
Prob. <	0.01	0.01	0.01	0.01	0.81	0.38	0.79	0.39

[a]Visual Score: 1 = Very bright pink, 3 = sl. dark pink, 5 = very dark pink or brown.

[b]Lighting system: N = GE Natural, GWS = Sylvania Grolux Wide Spectrum, IF = Sylvania Incandescent Fluorescent, DWW = GE Deluxe Warm White, DCW = GE Deluxe Cool White, and CW = GE Cool White.

[c-g]Means in a column with the same superscript letter are not different (P>.05).

Table 2. Display Lighting Effects on Vacuum-Packaged Pork Longissimus Visual Color Score[a]

Lighting System[b]	Scored under Display Lighting — Display Day 0	7	14	Scored under GE Natural Lighting — Display Day 0	7	14
N	1.54^{de}	2.36^{ef}	2.73^{ef}	1.54^{c}	2.32	2.70^{de}
GWS	1.49^{ef}	2.23^{f}	2.55^{f}	1.52^{cd}	2.45	2.60^{e}
NAFA	1.30^{f}	1.93^{g}	2.27^{g}	1.53^{cd}	2.41	2.62^{e}
IF	1.67^{de}	2.54^{de}	2.82^{e}	1.45^{de}	2.39	2.77^{cd}
DWW	1.65^{de}	2.57^{d}	2.93^{e}	1.40^{e}	2.39	2.83^{cd}
DCW	1.74^{d}	2.57^{d}	3.20^{d}	1.45^{cde}	2.43	2.81^{cd}
CW	2.20^{c}	3.48^{c}	4.00^{c}	1.47^{de}	2.48	2.84^{c}
Prob. <	0.01	0.01	0.01	0.04	0.58	0.01

[a]Visual Score: 1 = bright purplish pink, 3 = sl. brownish pink, 5 = brown.

[b]Lighting system: N = GE Natural, GWS = Sylvania Grolux Wide Spectrum, IF = Sylvania Incandescent Fluorescent, DWW = GE Deluxe Warm White, DCW = GE Deluxe Cool White, and CW = GE Cool White.

[c-g]Means in a column with the same superscript letter are not different (P>.05).