EFFECTS OF POTASSIUM LACTATE AND DISPLAY LIGHTING ON SHELF-LIFE OF FRESH-PORK-SAUSAGE PATTIES

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Introduction

Potassium lactate (KL) is used as an antimicrobial in various meat products. Research demonstrates its effectiveness in promoting colour stability in enhanced pork (Jensen *et al.*, 2003) and enhanced beef (Kim *et al.*, 2005). A potential mechanism for this colour stabilizing effect has been presented (Kim *et al.*, 2005). Inclusion of KL in fresh-pork sausage decreased microbial counts, but has inconsistent effects on lipid oxidation and colour stability (Bradford *et al.*, 1993ab). However, those studies focused on refrigerated storage and not on lighted retail display. Our objective was to examine the effects of KL on aerobic plate counts, colour stability, and lipid oxidation of fresh-pork-sausage patties in lighted and unlighted display.

Materials and Methods

Fresh-pork-sausage patties were formulated with 0% or 3% KL, placed on Styrofoam trays, over wrapped with polyvinyl chloride film, frozen at -4 °C for 18 d, and were thawed in the dark at 4 °C for 24 h prior to display. Fat and pH were determined after thawing. Patties were displayed at 4 °C for 10 d in lighted display or for 7 d in unlighted display (covered by foil) followed by 3 d in lighted display. Instrumental (CIE L*a*b*, Illuminant A) and visual colour were evaluated on d 0, 1, 2, 4, 7, and 10 (lighted display) and d 0, 7, and 10 (unlighted display). Visual colour was evaluated as 1 = bright red, 2 = red, 3 = dull red, 4 = slightly dark red, 5 = reddish tan, 6 = tannish red, and 7 = tan/brown. Aerobic plate counts (d 0 and 10) and thiobarbituric acid reactive substances (TBARS; d 0, 7, and 10) were determined on patties in both lighted and unlighted display. The experiment (n = 3 replications) was analyzed using the mixed procedure of SAS.

Results and Discussion

Patties with 0% KL had 34.3% fat and pH of 5.9 while patties with 3% KL had 32.9% fat and pH of 6.4. Initial aerobic plate counts were similar ($P > 0.05$) for both KL levels, but on d 10, patties without KL had greater ($P < 0.05$) counts (7.8 logs cfu/g) than the patties with KL (5.9 logs cfu/g).

For all treatment combinations, redness (a*) decreased ($P < 0.05$) each day (Figure 1; data not shown for d 1 and 2). Patties displayed in the dark had greater a* ($P < 0.05$) than patties in the light on d 7 and 10. Patties with KL on d 0, 4, 7, and 10 were more red (greater a*; $P < 0.05$) than patties without KL. On d 10, patties with KL exposed to light for 10 d were similar in a* ($P > 0.05$) to patties displayed in the dark without KL. For all treatments, visual-colour scores increased ($P < 0.05$) during display indicating patties became less red (Figure 1; data not shown for d 1 and 2). Treatments with KL were more red (lower visual scores; $P < 0.05$) than patties without KL after d 0. On d 7 and 10, patties displayed in the light for 10 d were less red (lower visual scores; $P < 0.05$) than patties displayed in the dark for 7 d followed by 3 d in the light. When exposed to light, more pigment oxidation occurred, but this research shows KL can help avert myoglobin oxidation in fresh-pork sausage during lighted display.

Values for TBARS increased ($P < 0.05$) for all treatment combinations during display except for patties with 3% KL that were in the dark for the first 7 d ($P > 0.05$; Figure 2). Adding KL decreased ($P < 0.05$) TBARS values on d 7 for patties that had been in the light, and for patties with both KL levels on d 10 ($P < 0.05$). After exposure to light for 10 d, patties had greatly increased ($P < 0.05$) TBARS values, but KL limited the increase over 3-fold in patties displayed 10 d. In previous studies, 2% or 3% KL (Bradford *et al.*, 1993ab) did not influence lipid oxidation of fresh-pork sausage in refrigerated storage; however, they did not expose sausage to light which increases lipid oxidation.

Conclusions

Addition of 3% potassium lactate will prolong the shelf life of fresh-pork-sausage patties by lowering aerobic plate counts, promoting colour stability, and limiting lipid oxidation. Inclusion of potassium lactate can help protect against lighting's negative influence on myoglobin and lipid oxidation.

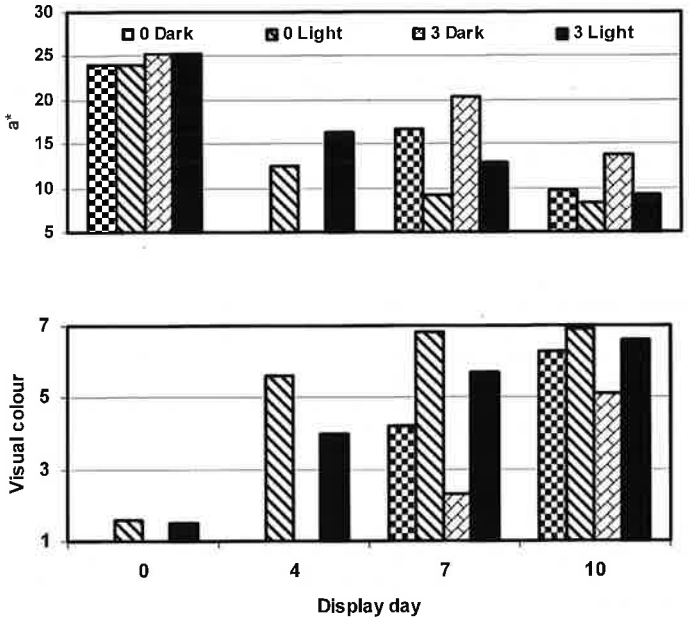

Figure 1: LS Means for a* and visual colour of fresh-pork sausage patties with 0% or 3% potassium lactate during lighted and unlighted retail display.

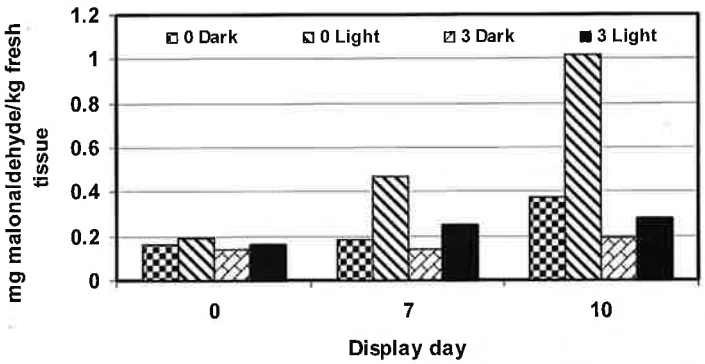

Figure 2: LS Means for thiobarbituric acid reactive substances of fresh-pork sausage patties with 0% or 3% potassium lactate during lighted and unlighted retail display.

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