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Meat and Muscle Biology™

Effect of Different Photoperiods on Quality Attributes and Oxidative Stability of Breast Meat (*M. Pectoralis Major*) from Broilers

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Objectives

In the broiler industry, high photoperiod (the duration of light exposure per day) regimes have traditionally been utilized to increase yield of breast meat, as well as maximize feed intake and growth rate in the growing period. However, recent literature reports this practice may have adverse effects on broiler welfare, resulting in impaired mobility and increased incidence of leg abnormalities. However, little information available in the current literature regarding effects of photoperiod on meat quality attributes and oxidative stability of broiler meat. Thus, the objective of this study was to evaluate the quality characteristics and lipid/protein oxidative stability of breast meat from broilers that were exposed to different photoperiod combinations.

Materials and Methods

A total of 432 Ross 308 broiler chicks were allocated among 4 rooms each subjected to one of the following photoperiod treatments (hours Light: Dark): 20L:4D, 18L:6D, 16L:8D and 12L:12D, with 6 pens per treatment. At d 42, 2 broilers per pen (12 broilers/treatment) were randomly selected, harvested and air chilled for 24 h at 2°C. At 1 day postmortem, paired breast muscles (*M. pectoralis*) were collected for the meat quality analyses such as, water-holding capacity (drip/purge/cook loss), Warner-Bratzler shear force (WBSF), and display color for 7 d under fluorescent light (1450 lx). Lipid oxidation was assessed via the TBARS assay and protein oxidation by thiol content measured at d 1 and d 7 of display. The experimental design was randomized complete block design. Data were analyzed using the PROC MIXED procedure of SAS, and means were separated using least significant differences ($P < 0.05$).

Results

Photoperiod had no effect on fillet yield and pH ($P > 0.05$). No significant difference in WBSF was found between treatments, although 12L:12D had a trend of higher WBSF ($P = 0.08$). Higher moisture loss during carcass chilling was found in carcasses from 20L:4D compared to 16L:8D and 12L:12D treatments ($P < 0.05$). No other measure of water-holding capacity was affected, though the 16L:8D treatment demonstrated a trend of higher freezing/thawing loss compared to other treatments ($P = 0.06$). Proximate moisture, protein and lipid contents were unaffected by photoperiod ($P > 0.05$), but higher ash was observed in 16L:8D over 20L:4D and 18L:6D ($P < 0.05$). Different photoperiod combinations affected color stability of breast meat during display ($P < 0.05$). Of note, fillets from 20L:4D maintained highest L* and hue angle, and least a* values ($P < 0.05$), indicating inferior color stability compared to other treatments. Oxidation increased with display, and fillets from 20L:4D and 18L:6D had higher TBARS over 12L:12D ($P < 0.05$); no photoperiod effect was observed in thiol content ($P > 0.05$).

Conclusion

Results suggest 20L:4D photoperiod regimes may be detrimental to meat quality, as carcasses from this treatment group had higher moisture loss during chilling, and color measurements characterized these fillets as being paler and more discolored than other treatments. Fillets from 12L:12D maintained lower TBARS than 20L:4D and 18L:6D, suggesting photoperiod regimes allowing more hours of dark may be beneficial in improving oxidative stability. Further studies determining the effects of photoperiod on quality and protein functionality of chicken meat for processing technological would be highly warranted.