Title Improving the shelf-life of ground beef with antioxidants, antimicrobials, and irradiation

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Abstract

The United States produces 3.6 billion kg of ground beef per year, grossing approximately $12 billion. One of the major limitations of ground beef is that it has relatively short shelf-life of about 1 to 2 d without modified atmosphere packaging. The 3 things that shorten ground beef shelf-life are microbial contamination, color degradation, and lipid oxidation. The objective of this experiment was to extend the amount of time ground beef can be displayed in a retail meat case through synergistic effects of antioxidants, antimicrobials, and irradiation treatments. Ground beef patties were treated with butylated hydroxyanisole/ butylated hydroxytoluene with (1) ascorbate; (2) trisodium phosphate; (3) erythorbate; (1) and (2); (1), (2), and (3); and a control, C, was untreated. The samples were irradiated with 2.0 kGy after antioxidant treatment and stored under atmospheric conditions. Samples were evaluated for total aerobic plate count, thiobarbituric acid reactive substances (TBARS) analysis for lipid oxidation, and instrumental color after 0, 3, 6, and 9 d of simulated retail storage display (SRD). The control had the highest ($P<0.05$) lipid oxidation value and the lowest ($P<0.05$) redness, oxymyoglobin content, and vividness color values. Irradiation produced an initial 3 log10 microbial reduction but slightly increased lipid oxidation and decreased ($P<0.05$) color values. The chemically treated samples had little ($P<0.05$) or no difference among each other, but all were better ($P<0.05$) than the control. Irradiation and the chemical treatments did what they were supposed to without interfering with each other. The irradiation and antioxidant treatments were synergistic and increased the shelf-life to almost 9 d. Extension of the shelf-life of ground beef with irradiation and these chemical treatments will help the meat industry boost their revenue.