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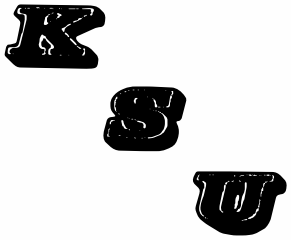
Abstract

Three studies were conducted to evaluate the economics and quality of hot-processed beef. Study I compared two hot-processing techniques to conventional chilling and processing to determine efficiencies of energy, labor, and other resources. Substantial savings occurring with hot processing techniques include: 32 to 42% less energy need, significantly less cooler space requirement, eliminating the need to shroud carcasses, less labor, and reduced carcass shrinkage resulting in savings of $2.36 to $2.75 per head slaughtered. Study II compared the color and eating qualities of electrically stimulated and hot-processed beef with conventionally processed beef. Electrically stimulated and hot-boned loineye steaks were similar or superior to conventionally treated counterparts for shear force, taste panel, and color characteristics. However, electrically stimulated and hot boned inside round steaks were less tender (though still acceptable) than conventionally processed steaks. Color was similar for all treatments. Study III compared microbial aspects of hot-processed with conventionally processed beef, in an attempt to establish minimum chilling rates required to produce an acceptable hot-processed product. Beef that is hot processed 1 hr postmortem and vacuum packaged must be chilled to 21 C within 9 hr and then chilled to 2 C to be microbially acceptable. This is the minimum acceptable chilling rate, but more rapid chilling would be more desirable from a microbiological standpoint provided it does not toughen the product by such changes as cold shortening.

Keywords

beef cattle



Hot Processing--Potential for Application in the Beef Processing Industry

Summary

Three studies were conducted to evaluate the economics and quality of hot-processed beef. Study I compared two hot-processing techniques to conventional chilling and processing to determine efficiencies of energy, labor, and other resources. Substantial savings occurring with hot-processing techniques include: 32 to 42% less energy need, significantly less cooler space requirement, eliminating the need to shroud carcasses, less labor, and reduced carcass shrinkage resulting in savings of $2.36 to $2.75 per head slaughtered. Study II compared the color and eating qualities of electrically stimulated and hot-processed beef with conventionally processed beef. Electrically stimulated and hot-boned loineye steaks were similar or superior to conventionally treated counterparts for shear force, taste panel, and color characteristics. However, electrically stimulated and hot boned inside round steaks were less tender (though still acceptable) than conventionally processed steaks. Color was similar for all treatments. Study III compared microbial aspects of hot-processed with conventionally processed beef, in an attempt to establish minimum chilling rates required to produce an acceptable hot-processed product. Beef that is hot processed 1 hr postmortem and vacuum packaged must be chilled to 21 C within 9 hr and then chilled to 2 C to be microbially acceptable. This is the minimum acceptable chilling rate, but more rapid chilling would be more desirable from a microbiological standpoint provided it does not toughen the product by such changes as cold shortening.

Introduction

Current beef processing technology involves animal slaughter, carcass chilling, then carcass fabrication. An alternate process, called hot boning or hot processing, is gaining increased interest because of its potential economies. Hot processing is the removal of muscle from the carcass before conventional chilling. Therefore, excess fat and bone are not chilled.

However, beef muscle removed from the carcass and chilled or frozen before rigor mortis can toughen due to cold shortening, thaw rigor, and because muscles are not restrained from contracting by the skeleton. Prerigor muscle can freely contract unless restrained. Cold shortening is cold-induced shortening resulting in toughening of prerigor muscle. Thaw rigor is toughening when muscle frozen prerigor is thawed. Because of these toughening effects, careful processing techniques must be utilized to insure successful hot processing of beef steak and roast items.

Two approaches have been successful in producing quality products.

Carcasses have been hot processed 1 to 2 hr postmortem, and muscles and muscle systems vacuum packaged 24 to 48 hours at 15 C or aged 8 days at 1 C. Alternatively, carcasses were held at 15 to 16 C for 5 to 8 hours postmortem, then processed. Both techniques generally produce equal or superior product compared to conventionally processed counterparts in terms of eating quality, yield, color, and microbial acceptability.

Application of an electrical stimulus to the carcass soon after slaughter can significantly speed the onset of rigor mortis. Therefore, electrical stimulation may facilitate hot processing by eliminating or reducing the need for carcass or muscle conditioning or aging as previously discussed. Consequently, electrical stimulation may allow hot-processing techniques that coincide more closely with current industry practices than do carcass or muscle conditioning.

Economic and quality studies have been conducted at Kansas State University to determine if hot processing compares favorably with conventional processing. The following studies evaluated 1) the economics of hot processing, 2) the eating characteristics of hot vs. conventionally processed beef, and 3) the microbial characteristics of hot-processed beef.

Beef Display Color

Color of beef cuts in retail store display has an important influence on which cuts the buyer chooses.

Customers have "learned" that a bright cherry red meat color assures good meat. They are turned off by dark red or brownish discoloration, even though such products may still have acceptable eating characteristics. Discoloration results from too long a time in display, poor sanitation, a too warm display case, improper lighting and is also influenced by feeding and pre-display processing.

We study color stability by packaging beef muscles in packages like those used for retailing, and displaying them under controlled lighting and temperature. Color is scored visually by experienced observers and by electronic reflectance measurements before display begins and after various display periods.

Retailers estimate that color changes cause 3 to 5% of all retail beef cuts to become unsaleable, be trimmed and repackaged, or the price discounted. Therefore, we need to know if animal or carcass treatments degrade appearance of beef cuts under conditions in which most beef products are sold.