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EFFECTS OF PROCESSING VARIABLES ON IRIDESCENCE IN PRECOOKED BEEF

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Summary

Beef semitendinosus (ST) muscles with injected water (3 or 10% of raw muscle weight) and phosphate (0.3%) were cooked to final internal temperatures of 130 (held at 130 for 121 min), 140 (held at 140 for 12 min), 145, or 155°F, then sliced at 30, 45, 120, 130, or 145°F by either a dull or a sharp slicer. Biceps femoris (BF) muscles had the same treatment but only at 3% water addition. Controls were uninjected muscles from the opposite side of the carcass. For ST muscles (all with 0.3% added phosphate), 3% added water resulted in less iridescence than controls and those containing 10% added water. Iridescence was also lowered by cooking to 130°F (held for 121 min), slicing at 30°F, or slicing with a dull slicer blade. Iridescence varied ($P<.05$) among muscles from different carcasses under the same cooking and slicing conditions. BF muscles had much less iridescence than ST muscles. Our results show that processing-cooking-slicing alterations can help reduce iridescence, especially for the ST (eye of round) muscle.

(Key Words: Iridescence, Phosphate, Internal Temperature, Cooking Temperature, Slicing Temperature, Slicer Blade.)

Introduction

Iridescence is an unusual, brilliant, mother-of-pearl or rainbow appearance in nature and is due to a physical effect on light rays. The most common colors of iridescence in precooked beef, corned beef, or pastrami are green, yellow, or orange-red. Because iridescence is very similar to discoloration caused by metabolic by-products of microorganisms, meat purchasers and quality control personnel sometimes mistake iridescence for microbial deterioration and reject the products. For example, green iridescence has been confused with the green derivatives of myoglobin that may be caused by hydrogen sulfide or hydrogen peroxide from microorganisms.

Our objective was to determine the influence of processing variables (added water and phosphate, final internal temperature, slicing temperature, and sharpness of slicer blade) on iridescence in precooked beef.

Experimental Procedures

In the first study, using five pairs of ST muscles, one muscle in each pair was injected with 3% water plus .3% phosphate based on raw muscle weight. The other muscle was a control (no added water or phosphate). Curafos 11-2 (90% sodium tripolyphosphate and 10%

sodium hexametaphosphate, pH 8.9 to 9.8), a commercial food phosphate, was used. In the second study, using four pairs of ST muscles, the injection levels of water and phosphate were 10% and 0.3%. Samples were stored at 40°F for 3 d after injection to obtain a uniform distribution of solution. Four pairs of BF muscles were treated in the same way, but with only 3% water.

Each muscle pair was cooked in a smokehouse at 100 to 165°F and 80% relative humidity with a randomly selected transverse slice of each muscle cooked to a final internal temperature of 130 (held at 130 for 121 min), 140 (held at 140 for 12 min), 145, or 155°F. Holding times are required by federal regulations.

Cooked meat was sliced at five different temperatures: 30, 45, 120, 130, or 145°F. Samples were not sliced if the final internal temperature of meat was lower than the assigned slicing temperature. Two slicers were used, one with a sharp blade and the other with a dull blade. Cooked meat pieces were randomly assigned to the sharp or dull blade. Sliced samples were vacuum packaged.

Iridescence was scored (6-point scale) by eight panelists, based on both intensity and area of iridescence, with a higher score meaning more intense or a larger area of iridescence. The final score for each slice was the average of the scores for intensity and area.

Results and Discussion

With phosphate constant at 0.3%, the average iridescence score of ST muscle was lower ($P<.05$) for 3% than 10% added water or the control, which had not been injected (Figure 17.1). The lowest temperature (130°F, held for 121 min) resulted in less iridescence than other cooking temperatures (Figure 17.2).

Samples sliced at 30°F or 145°F had less iridescence than those sliced at intermediate temperatures (Figure 17.3).

Meat sliced by a sharp blade had more ($P<.05$) iridescence than that sliced by dull blade (Figure 17.4).

Iridescence differed ($P<.05$) among the ST muscle sets from different carcasses under the same cooking and slicing conditions (Figure 17.4). BF muscles had much less iridescence than ST muscles under the same cooking conditions.

Our results show that processing alterations can help reduce iridescence, especially in ST muscle.

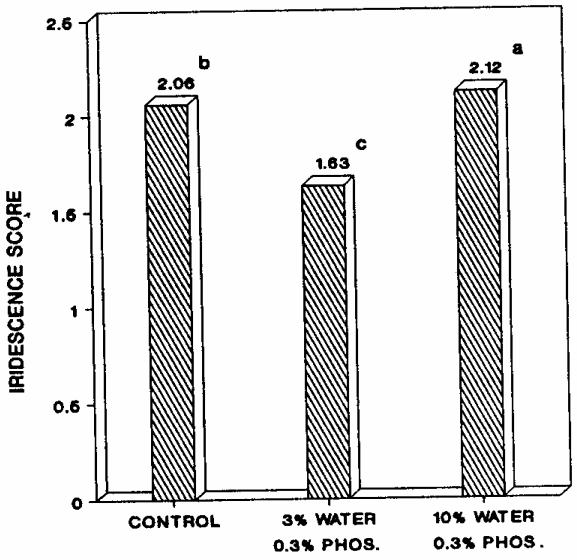

Figure 17.1. Effect of Added Water and Phosphate (ST Muscle)

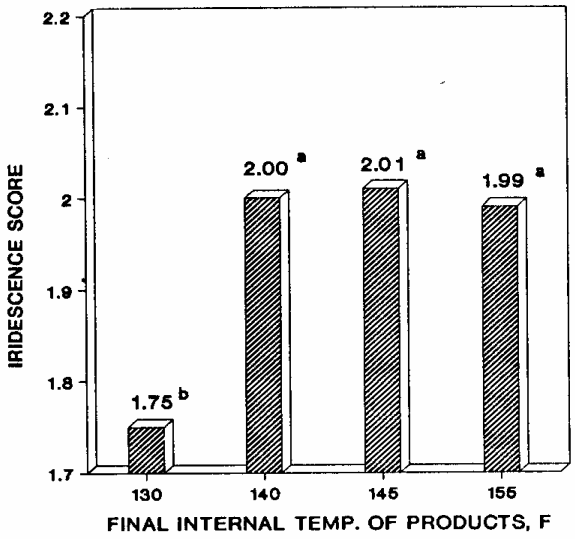

Figure 17.2 Effect of Final Internal Cooking Temperature (ST Muscle)

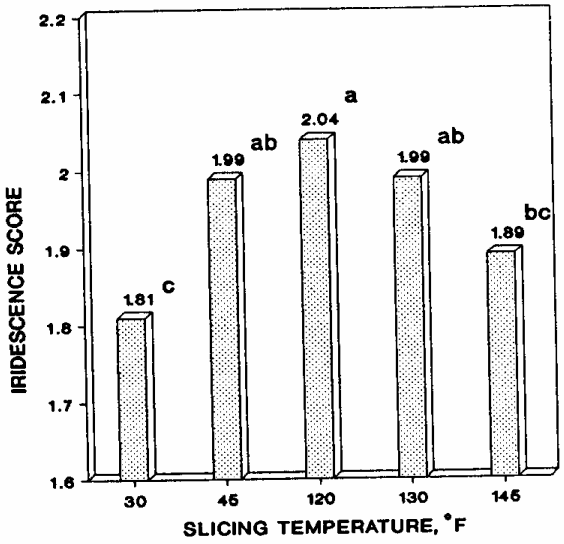

Figure 17.3. Effect of Slicing Temperature (ST Muscle)

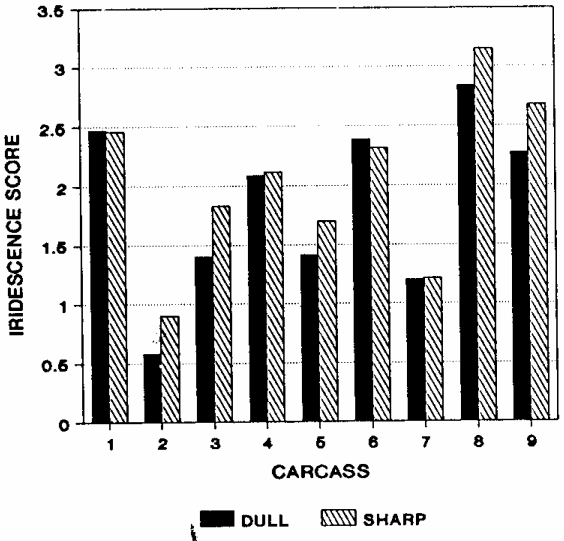

Figure 17.4. Effect of Sharpness of Slicer Blade (ST Muscle)