Effect of temperature during transport of broiler chickens on breast meat quality

Introduction

Previous research has shown that transport and handling prior to slaughter may increase stress on broilers, which can affect the resultant meat quality. Cold temperatures may be one factor contributing to the overall stress of transport. In this study the effect of temperature during transportation of broiler chickens on quality of the meat was studied.

Methods

Broilers were transported in a test trailer having a capacity of approximately 2900 birds. Six loads were transported at ambient temperatures of -27, -22, -17, -5, +4, and +11°C. Temperatures within different parts of the trailer were recorded to determine the actual temperatures experienced by birds in different areas of the load. Based on these measurements, birds were classified as having been exposed to -16 to 0°C, 0 to 10°C, 10 to 20°C, or 20 to 30°C. Ninety birds in each load, distributed throughout the trailer, were given internal sensors to record their core body temperature during transport. Breast meat samples from these birds were tested for several meat quality parameters. These measurements included:

1. Drip Loss – the percentage of weight lost during 24h of refrigerated storage.
2. Colour of the meat samples – assessed in terms of lightness (L*), redness (a*) and yellowness (b*).
3. Ultimate pH – the pH of the meat 30 hours after the birds were slaughtered.
4. Thaw loss – the difference in sample weight between before freezing and after thawing.
5. Cook loss – the percentage of weight lost during cooking.

Results

The normal body temperature of broilers is between 40.5 and 42.5°C. When exposed to temperatures below 10°C there was considerable decrease in their body temperatures.

![Graph showing variation in body temperature of broilers with exposure temperature (°C).](image)

Following transport, the ultimate pH of meat samples from birds exposed to colder temperatures was higher compared with those exposed to warmer temperatures.

![Graph showing variation in ultimate pH of meat samples from birds exposed to different temperatures (°C).](image)

Temperature during transport had a significant effect on meat colour. Breast meat from birds exposed to temperatures below 0°C was darker and redder than from birds exposed to temperatures above 0°C. Meat from birds exposed to temperatures between 0 and 20°C was redder than from birds exposed to higher temperatures. Breast meat lightness from birds exposed to temperatures above 0°C was similar. No significant difference or trend was observed for (yellowness) of
breast meat from birds exposed to different temperatures during transport.

Drip loss and cook loss values did not show any significant difference based on temperature groupings. However, thaw loss was significantly higher for meat from birds exposed to temperatures above 20°C.

**Implications**

The temperature immediately surrounding the broilers during transport was shown to affect the quality of their meat.

Cold temperature exposure during transport causes glycogen depletion in the muscle of the birds due to increased energy consumption to maintain normal body temperature under these conditions. As a result, these birds have less muscle glycogen at the time of slaughter to convert to lactic acid and lower the pH of the meat.

Meat with higher pH can hold water more tightly; as a result, it looks darker and redder due to less light scattering from the surface.