

EFFECT OF FAT LEVEL ON PREMATURE BROWNING OF MARBLING BEEF

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I. OBJECTIVES

The problem of premature browning (PMB) leads to consumers' wrong judgment on the endpoint of cooking and can cause food safety problems. Highly marbled beef has more intramuscular fat, and the lipid oxidation is more severe during storage and cooking. Lipid oxidation will probably cause more PMB in cooked meat. However, very little of the literature can be found that focuses on the impact of lipid level on PMB in cooked beef. Therefore, the objective of this study was to investigate the effect of lipid level on PMB in marbled beef.

II. MATERIALS AND METHODS

Longissimus lumborum muscles with 2 different Japanese marbling levels, A1 (Fat % = 8.08 ± 1.15) and A3 (Fat % = 15.81 ± 2.28), were collected from Angus × Black Waygu crossed cattle (28 mo) in an abattoir. The cattle were fed with the same fodder using the same farming practices. Six *Longissimus lumborum* muscles were collected for each marbling level from 6 different cattle after grading, and 12 *Longissimus lumborum* were obtained in total. Then, the muscles were vacuum packaged and transported to the laboratory within 2 h in boxes on ice. Muscles were divided into steaks of 2.54 cm, and all were packaged under high-oxygen packaging (80% O₂ + 20% CO₂) and stored in a dark environment of 0°C–4°C for 0 d, 5 d, and 10 d. Four steaks from each cattle were prepared for each sampling day, and thus 72 steaks from 6 cattle were used in each treatment. On each day, the steaks were cooked to a central temperature of 55°C, 66°C, and 72°C, respectively, and the center cooked color was recorded immediately using an X-Rite spectrometer (SP62, 8 mm diameter aperture, Illuminant A, 10° observer, Grand Rapids, MI).

Table 1.

Effect of fat level on the cooked color (a^* values) of beef steaks

Grade	Center temperature (°C)	Storage time (day)			SE
		0	5	10	
A1	55	14.65 ^{aAX}	14.31 ^{aAX}	11.26 ^{bAX}	0.2007
	66	13.68 ^{aAX}	7.31 ^{bAY}	7.04 ^{bAY}	
	72	10.54 ^{aAY}	6.85 ^{bAZ}	6.57 ^{bAY}	
A3	55	13.29 ^{aBX}	11.02 ^{bBX}	9.15 ^{cBX}	0.4439
	66	10.99 ^{aBY}	6.51 ^{bAY}	6.52 ^{bBY}	
	72	8.56 ^{aBZ}	6.59 ^{bAY}	6.38 ^{bAY}	

a–b Within the same grade, the same temperature with different letter differ between storage times at $P < 0.05$.

A–B Within the same storage time, the same temperature with different letter differ between fat levels at $P < 0.05$.

X–Y Within the same storage time, the same fat level with different letter differ between different temperatures at $P < 0.05$.

III. RESULTS

There was a significant interaction of fat level, storage time, and center temperature on the cooked color of a^* values ($P < 0.05$, Table 1). As the central temperature increased, the central a^* values of both fat levels decreased significantly. And with the extension of storage time, the a^* values decreased as well. Significant differences were observed between 2 fat levels. On day 0, the a^* values were much lower in high fat level compared to the lower fat level. This indicated that steaks with a high fat level had more PMB problem even on day 0 of storage. When stored to day 5 and day 10, PMB was observed in steaks from both marbling levels, but it was more obvious in A3 steaks. The fat level showed no significant impact on L^* values and b^* values ($P < 0.05$, data not shown).

IV. CONCLUSION

Fat levels impacted PMB in high-oxygen packaging.

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