

## SARCOMERE LENGTHS, Z-LINE WIDTHS AND pH OF KOREAN BEEF ACCORDING TO MEAT QUALITY GRADES

JONG-OK KANG<sup>a</sup>, SANG-JUN OI<sup>a</sup>, CHIEON-JEI KIM<sup>b</sup>, KYUNG-CHUL KOH<sup>c</sup><sup>a</sup> Dept. of Animal Science, Dankook Univ. & Animal Resources Research Center, Kon Kuk Univ.; <sup>b</sup> Animal Resources Research Center, Kon Kuk Univ., <sup>c</sup> Animal Products Grading Service, Seoul, Korea**Keywords** : sarcomere, Z line, meat quality grades, Hanwoo beef**INTRODUCTION**

Sarcomere lengths and Z line widths of Hanwoo (Korean cattle) beef were found longer and wider than those of the imported beef (Kang, 1992; 1995). In this study, sarcomere lengths and Z line widths were investigated in relation to beef quality grades with *M. longissimus thoracis* (LT) at the 13th thoracic vertebra and *M. biceps femoris* (BF) of Hanwoo beef.

**MATERIALS AND METHODS**

*M. longissimus thoracis* and *M. biceps femoris* were obtained from Hanwoo carcass of Korean quality grade (QG) 1, 2 and 3 (commonly of yield grade B) weighing approximately 300kg. The pH was measured by homogenizing samples of 2g at 10,000 rpm for 3 min in the 5 mM sodium iodoacetate 0.15M potassium chloride solution.

For transmission electron microscopic (TEM) study, samples were fixed in 3% glutaraldehyde 0.12M sodium cacodylate buffer at pH 7.2 overnight, and then rinsed twice for 30 min in the same buffer, followed by fixation in 1.33% osmium tetroxide 0.12M sodium cacodylate at pH 7.2 for 3 hr. After fixation, samples were dehydrated in an acetone series (from 65% 100%) and embedded in epon 812 mixture. Thin sections were made with an ultramicrotome (LK1B 2088) using a diamond knife, and stained with 1% uranyl acetate dissolved in 50% ethanol and with undiluted lead citrate [2.66%  $\text{Pb}(\text{NO}_3)_2$  and 3.52%  $\text{Na}_2(\text{C}_2\text{H}_3\text{O}_2)_4$ ]. Electron micrographs were obtained with JEM 100 CX II electron microscope operated with an accelerating voltage of 80 KV.

Samples for scanning electron microscope (SEM) were prepared by the same method as TEM up to fixation, and then dehydrated to the critical point. After being wrapped with aluminium foil and carbon tape attached, samples coated with Eiko IB3 were observed using a HITACHI S 520.

**RESULTS AND DISCUSSION**

Sarcomere lengths of LT and BF were measured by TEM to be 1.39  $\mu\text{m}$  and 2.39  $\mu\text{m}$  for the QG 1, being 1.78  $\mu\text{m}$  and 2.56  $\mu\text{m}$  for the QG 2 and 1.52  $\mu\text{m}$  and 1.93  $\mu\text{m}$  for the QG 3, respectively.

Sarcomere lengths of LT and BF shown by SEM were 1.1  $\mu\text{m}$  and 1.7  $\mu\text{m}$  for the QG 1, being 1.02  $\mu\text{m}$  and 1.16  $\mu\text{m}$  for the QG 2 and 1.62  $\mu\text{m}$  and 0.96  $\mu\text{m}$  for the QG 3, respectively.

Sarcomere lengths measured by TEM and SEM were not identical, but showed similar tendency.

**CONCLUSIONS**

Sarcomere lengths of BF were longer than those of LT.

When sarcomere lengths were longer, the widths of Z line were wider.

The pH was higher for BF than for LT irrespectively of QG (table 1).

The lower the QG, the higher the pH was, especially for BF.

**REFERENCES**

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Table 1. The pH of different muscles

Quality grade	Muscle	pH
1	LT	5.60 $\pm$ 0.068 <sup>a</sup>
	BF	5.73 $\pm$ 0.124 <sup>b</sup>
2	LT	5.65 $\pm$ 0.134 <sup>ab</sup>
	BF	5.95 $\pm$ 0.237 <sup>c</sup>
3	LT	5.61 $\pm$ 0.043 <sup>a</sup>
	BF	6.01 $\pm$ 0.196 <sup>c</sup>

<sup>abc</sup> Means in the same column with different letters are significantly different ( $P < 0.05$ )

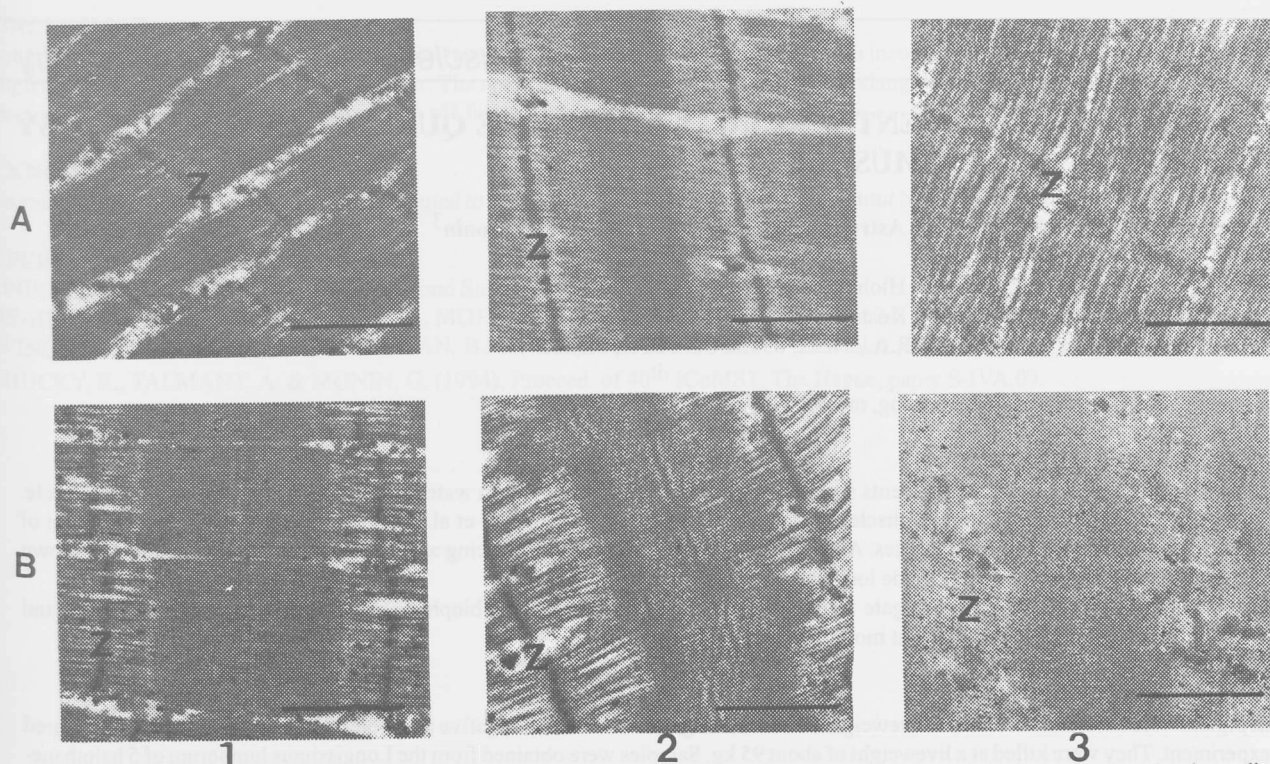


Fig. 1. Transmission electron microscope (TEM) micrographs of longitudinal section according to Korean beef quality grades. A, *M. longissimus thoracis*; B, *M. biceps femoris*. The sarcomere lengths of *M. biceps femoris* were longer and wider than those of *M. longissimus thoracis*. Z, Z line; Magnification,  $\times 20,000$ . The line represents 1  $\mu\text{m}$ .

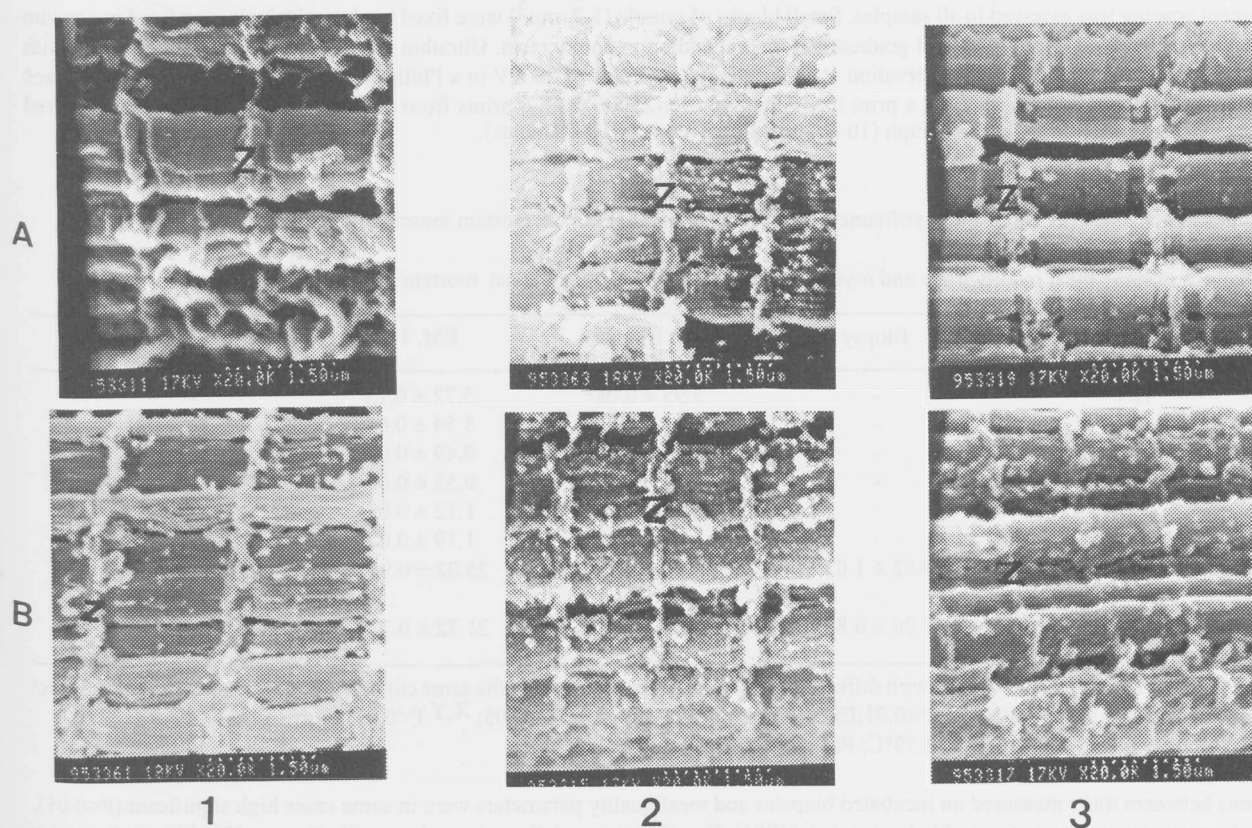


Fig. 2. Scanning electron microscope (SEM) micrographs according to Korean beef quality grades. A, *M. longissimus thoracis*; B, *M. biceps femoris*. When the sarcomere lengths were longer, the widths of Z line were wider. However, the sarcomere lengths measured by TEM and SEM were not identical. Magnification:  $\times 20,000$ .