POSTMORTEM PHYSICOCHEMICAL CHANGES AND MEAT QUALITIES OF HOT BONED CHICKEN BREAST AND LEG MUSCLES DURING STORAGE AT 20□

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1. Introduction

Muscles consist of different fibres which possess diverse chemistry and physical characteristics. Normally, red muscle contains more water, fat and less protein than white muscle, and shows higher final pH (Vega-Warner *et al.*, 1999). Moreover, white muscle contains more glycolysis enzyme which can stimulate reaction rapidly, speed up pH decline and accelerate meat into rigor mortis. (Farouk and Lovatt. 2000). But, Geesink et al (1995) reported that the decrease rate of pH was not only related with variety of myofibrils, bat also related with decrease rate of muscle temperature. In chicken meat, breast muscle contains higher ratio of white fibres, but leg muscle comprises of higher contents of red fibres. From the previous report, there are many researches conducted on hot-boned pig, beef, sheep and turkey (van Laack and Smulders, 1992; Molette, et al., 2003; Toohey and Hopkins, 2006; White, et al., 2006), but, only a few reports were found on chicken meats. Hence, the experiment was carried out in order to understand the effect of storage on hot-boning chicken breast and leg muscle and meat quality at 20℃.

Materials and methods

Fifty six broiler chickens (6 week, 1.5-2.0 kg live weight) were used in this experiment. After slaughter, skins were immediately peeled off from chickens, breast and leg muscles of carcasses were dissected within 15 min postmortem (PM) and the samples were divided into 4 portions, respectively. The first portion was used in determination of physicochemical characters within 30 min after slaughter. The remains were packed with polyethylene bag respectively, and placed at 20℃ until 24 h postmortem. The physicochemical properties were evaluated at 6, 12 and 24 h postmortem, respectively. The pH of muscle samples was determined by Jeacocke (1977). Glycogen measurements were carried out as described by Dreiling et al., (1987). Water holding capacity (WHC) was determined by the method of Grau and Hamm (1953). Sarcomere length was determined using the Helium-Neon-Laser diffraction (spectra-physics, Model No.212-2, USA). Myofibrillar proteins were obtained according to the method of Olson et al. (1976). Shear force as evaluated by Texture analyser (TA-XT2*i*, Stable Micro Systems, England). The Statistical Analysis System (SAS, 1996) was used to determine means, standard errors and analysis of variance. Duncan's multiple range test was used to compare the significant differences among means ($P < 0.05$).

Results and discussion.

Changes of pH, glycogen contents, water holding capacity of hot-boned chicken breast and leg muscles during storage at 20□ are showed in Table 1.

pH values of breast and leg muscles were significantly decreased from 6.32 and 6.33 at 0.5 h postmortem to 5.82 and 6.18 after 6 h post-mortem, respectively. pH of leg at 6, 12 and 24 h was significantly higher than that of breast muscle. This result indicated that pH of breast muscle, which contain higher proportion of white fibrils, was rapidly declined than that of leg muscle, and it was in agreement with the previous study (Farouk and Lovatt, 2000).

Glycogen contents in breast and leg muscles were decreased sharply until 6 h postmortem ($P < 0.05$), and then decreased slowly. The content of glycogen in breast muscle was relatively higher than in leg muscle until 6 h postmortem. This result was similar with research of Mckee and Sans (1998).

Water holding Capacity (WHC) of breast and leg muscles were the highest when slaughtered, and significantly decreased until 6 h postmortem (Fig. 1). The WHC was not significantly changed. However, WHC of breast muscle was higher than leg muscle ($P < 0.05$). In addition, WHC was the lowest at 6 h postmortem for both breast and leg muscles.

Sarcomere lengths of breast and leg muscles following immediately slaughter were longest ($P < 0.05$), but no significant changes occurred after 6 h postmortem (Fig. 2). In addition, sarcomere length of leg muscle was longer than breast muscle ($P < 0.05$).

Shear force value was measured in order to estimate meat tenderness. Shear forces of both breast and leg muscles were decreased during 24 h postmortem (Fig.3). In breast muscles, shear forces has no differences between at 0.5 h and 6 h, 12h and 24 h postmortem ($P > 0.05$), respectively. In leg muscles, there were

significant differences at 0.5 h, 6 h and 12 h postmortem, but there had no significant difference between at 12 h and 24 h postmortem. Overall, shear force of leg muscle was lower than that of breast muscle.

Myofibrillar fragmentation index (MFI) of both breast and leg muscle increased along with storage time. In breast muscle, not significant difference between at 12 h and 24 h postmortem, in contrast, significant difference existed in leg muscle. In addition, MFI of leg muscle was significantly lower than that of breast muscles in all measured times ($P < 0.05$).

Table 1. Changes of pH, glycogen contents, water-holding capacity (WHC), sarcomere length, shear force and myofibrillar fragmentation index (MFI) of hot-boned chicken breast and leg muscles during storage at 20□

Traits		Postmortem time (h)			
		0.5	6	12	24
pH	Breast[1]	6.32 ± 0.06^{a}	$5.82 \pm 0.04^{b,y}$	$5.71 \pm 0.03^{b,y}$	$5.73 \pm 0.02^{b,y}$
	Leg[2]	6.29 ± 0.03^{a}	$6.18 \pm 0.04^{b,x}$	$6.15 \pm 0.04^{b,x}$	$6.15 \pm 0.04^{b,x}$
Glycogen (mg/g)	Breast	$3.25 \pm 0.10^{a,x}$	$1.01 \pm 0.03^{b,x}$	0.74 ± 0.03^{c}	0.72 ± 0.03^{c}
	Leg	$1.28 \pm 0.04^{a,y}$	$0.81 \pm 0.02^{b,y}$	0.78 ± 0.02^{b}	0.77 ± 0.03^{b}
WHC	Breast	$62.88 \pm 2.08^{a,x}$	$50.17 \pm 1.76^{bc,x}$	$52.41 \pm 2.13^{b,x}$	45.37 ± 1.91^{c}
	Leg	$48.14 \pm 1.58^{a,y}$	$42.53 \pm 1.67^{b,y}$	$43.02 \pm 1.92^{ab,y}$	44.56 ± 1.83^{ab}

[a-c] Means in the same row with different superscripts differ significantly ($p<0.05$).
[x,y] Means in the same column with different superscripts differ significantly ($p<0.05$).
[1] Total pigment of breast muscle was 4.25 ppm. [2] Total pigment of leg muscle was 10.43 ppm.

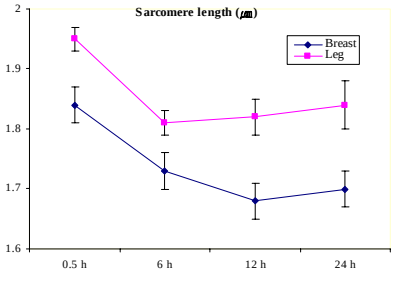

Fig. 1.

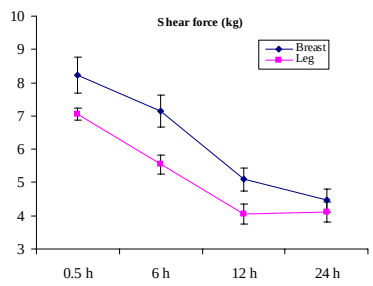

Fig. 2.

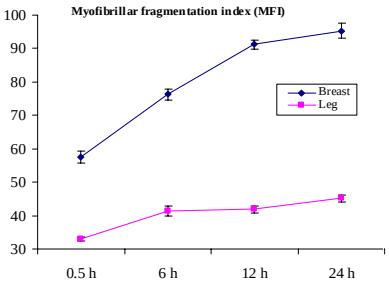

Fig. 3.

Conclusions

The findings substantiated glycogen contents, WHC and shear force of breast muscle were higher than those of leg muscle, early postmortem, and the myofibrillar fragmentation were rapidly go along in the breast muscle. However, ultimate pH and MFI of leg muscle were higher than those of the breast muscle as well as, sarcomere length of leg muscle was longer than that the of breast muscle at 20□ .

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