MUSCLE, CARCASS WEIGHT AND SEASON AFFECTED PORK TEXTURE AND COMPOSITION

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I. INTRODUCTION

Muscle, live weight and season affected the chemical compositions of pork and thus may influence eating quality [1, 2]. However, most studies investigating live weight effects on pork eating quality only involved the loin muscle [2]. Muscles such as *Triceps brachii* was favoured by consumers in several sensory attributes, but it has been less studied [1, 3]. Therefore, this study aimed to investigate the effects of muscle, hot carcass weight and season on pork texture and chemical composition and whether chemical composition affect pork texture.

II. MATERIALS AND METHODS

Pigs from three supply chains were slaughtered (n=10 for each supplier, female and castrated male) in an Australian summer (February). Within each supplier, pigs from two hot carcass weight groups: high (95.0 – 100.0 kg, n=5) and low (75.0 – 80.0 kg, n=5) were sourced. From each pig, the *M. Biceps femoris* (BF), *Longissimus thoracis et lumborum* (LTL) and *Triceps brachii* (TB) were excised at 24h post-mortem, vacuum packed, frozen and transported to The University of Melbourne. The same collection was repeated in winter (August). Upon analysis, muscles were cut frozen to around 75g for freeze-drying and a 5.0 x 5.0 x 5.0 cm^3 cube for cooking loss and texture from BF and LTL only because of muscle sample size constraints. The cubes were cooked in a waterbath at 75 °C until internal temperature reached 70°C. Then, cooking loss, Warner-Bratzler shear force (WBSF) and texture profile analysis (TPA, chewiness, cohesiveness, hardness, resilience and springiness) were measured [4]. Freeze-dried pork was used to determine collagen content and solubility and intramuscular fat (IMF) content [4]. Data was analysed in GenStat (16th edition, VSN International) with restricted maximum likelihood. The fixed model was constant + muscle + sex + weight group and random factor was supplier. Generalised linear model was used to analyse the effects of chemical compositions. The model was: y = constant + collagen content + collagen solubility + IMF + muscle + season + sex + weight group, where y = WBSF or TPA results and random factor was supplier.

III. RESULTS AND DISCUSSION

As shown in Table 1, the BF showed higher (P<0.001) chewiness, cohesiveness, cooking loss, hardness, resilience and springiness than the LTL. They did not differ in WBSF. When comparing between seasons, samples collected in winter exhibited higher (P<0.05) chewiness, cooking loss, hardness and springiness than samples from summer. The effect of weight group was insignificant.

Table 1. Effects of muscle, season and weight group on cooking loss and texture of pork

	Muscle (M)[1]			Season (S)			*P*-value	
	BF	LTL	sed[2]	Winter	Summer	sed	M	S
N	60	60		60	60			
Chewiness (N)	15.7^a	12.5^b	0.45	14.7^x	13.6^y	0.45	<0.001	0.009

Cohesiveness	0.456^{a}	0.431^{b}	0.0047	0.443	0.445	0.0047	<0.001	0.67
Cooking loss (%)	23.0^{a}	19.6^{b}	0.468	22.1^{x}	20.5^{y}	0.468	<0.001	<0.001
Hardness (N)	41.6^{a}	36.7^{b}	1.05	40.5^{x}	37.8^{y}	1.05	<0.001	0.011
Resilience	0.465^{a}	0.432^{b}	0.0054	0.451	0.446	0.0054	<0.001	0.37
Springiness	0.830^{a}	0.785^{b}	0.0092	0.818^{x}	0.797^{y}	0.0092	<0.001	0.021
WBSF[3] (N)	35.6	33.4	1.32	34.6	34.4	1.32	0.11	0.87

$^{a, b, c}$ Data with different superscripts differ significantly between muscles (p<0.05); ^{x,y} Data with different superscripts differ significantly between season (p<0.05); [1] BF = *Biceps femoris*, LTL = *Longissimus thoracis et lumborum*; [2] sed = standard error of difference; [3] WBSF = Warner-Bratzler shear force

pH was the highest in TB and lowest in BF (*P*<0.001, Table 2). A similar trend was also observed in collagen content. IMF content was higher in TB than BF and LTL. As for the effect of seasons collagen solubility was higher in winter samples. There was no significant difference between weight groups but pork from high weight group tended to have a higher IMF content than the low weight group (*P*=0.054).

Table 2. Effects of muscle, season and weight group on pH, collagen characteristics and intramuscular fat (IMF) content of pork

	Muscle (M)[1]				Season (S)[2]			Weight group (W)[3]			*P*-value		
	BF	LTL	TB	sed[4]	Win	Sum	sed	High	Low	sed	M	S	W
N	60	60	59		89	90		90	89				
pH	5.77^{b}	5.67^{c}	5.92^{a}	0.023	5.77	5.80	0.019	5.80	5.77	0.019	<0.001	0.12	0.089
Collagen content (mg/g)	5.88^{b}	4.07^{c}	7.31^{a}	0.201	5.60	5.91	0.164	5.64	5.87	0.165	<0.001	0.056	0.16
Collagen solubility (%)	5.77	6.44	6.05	0.283	7.00^{x}	5.18^{y}	0.231	6.16	6.01	0.232	0.058	<0.001	0.52
IMF (%)	1.18^{b}	1.08^{b}	2.43^{a}	0.095	1.57	1.55	0.078	1.64	1.49	0.078	<0.001	0.72	0.054

$^{a, b, c}$ Data with different superscripts differ significantly between muscles (p<0.05); ^{x,y} Data with different superscripts differ significantly between season (p<0.05); [1] BF = *Biceps femoris*, LTL = *Longissimus thoracis et lumborum*, TB = *Triceps brachii*. [2] Win = winter, Sum = summer; [3] High hot carcass weight = 95.0 – 100.0 kg, low hot carcass weight = 75.0 – 80.0 kg; [4] sed = standard error of difference

Considering BF and LTL, IMF content was negatively related to chewiness (slope = -1.44 ± 0.532, *P*=0.008), hardness (slope = -4.28 ± 1.22, *P*<0.001), and WBSF (slope = -4.77 ± 1.35, *P*<0.001), while collagen solubility negatively contributed to WBSF (slope = -2.51 ± 0.461, *P*<0.001).

IV. CONCLUSION

The pork BF was tougher than LTL with higher collagen content. TB showed the highest pH, collagen and IMF content. Pork collected in winter was tougher than those collected from summer but they had higher collagen solubility. IMF and collagen solubility affected pork texture.

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