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CHEMICAL COMPOSITION AND QUALITY OF MEAT FROM CULLED SOWS.

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Please refer to Folio 4.

INTRODUCTION

Chemical composition of the carcass of growing pigs is highly associated with back fat thickness and carcass weight (Siemens *et al.*, 1989) but the correlations between muscle quality and carcass characteristics are relatively low (Kempster *et al.*, 1984). Although back fat thickness and live weight were found to be accurate predictors of the chemical carcass composition of sows over a limited range (Whittemore and Yang, 1989), sows in the market are vary 3- to 9-fold in backfat depth within a weight class of 25kg interval (Aziz *et al.*, 1990). The objective of this study was to examine the effect of carcass weight and back fat thickness on chemical composition and meat quality in sow carcasses.

MATERIALS AND METHODS

Two-hundred four sows were selected in a stratified random sample for slaughter in seven weight classes from less than 99.9kg to more than 225kg carcass weight in 25kg increments with each weight class designed to consist of 30 sows. The sows also were classified into 11 fat classes from less than 9.9mm to more than 55mm backfat depth (probe fat) in 5mm increments. Live sows in each weight class were randomly sampled from all the sows available that day.

After the sows were slaughtered and dressed using commercial methods, hot carcass weight was obtained immediately after dressing. Backfat thickness (probe fat) and loin muscle depth (probe lean) measurements were made on the left side of the carcass between 3rd and 4th last rib 7cm from the midline within one hour post-mortem using a grading probe (Destron International, Markham, Ontario, Model PG-100). After the carcass was chilled for 24 hours at 4°C, the left side was dissected into muscle, fat and bone.

The colour measurements (L*, a*, b*) of the loin muscle between 3rd and 4th last rib were made using Minolta Chroma Meter (CR-200b). A duplicate, size-standardized sample (40-60g) was cut from the loin muscle to measure percentage of drip loss at 4-5°C during 48 hours.

The dissected muscles of the shoulder, loin and ham of 12 sows within each weight class was ground and analyzed for water content, crude protein (Kjedahl N x 6.25), ash and chemical fat (chloroform/methanol) using standard methods (AOAC, 1970).

All statistical analyses were performed using the General Linear Model (GLM) from the Statistical Analyses System Institute, Inc (1985). A factorial design, involving weight class (WC) and fat class (FC) and their interaction (WCxFC) was used. Correlation technique was used to determine the association between measurements.

RESULTS AND DISCUSSION

Chemical composition

The correlation coefficients between carcass measurements and the proportion of muscle protein, lipid, water and ash are presented in Table 1. Fat and water concentrations in the muscle were significantly correlated with carcass measurements whereas muscle protein and ash concentrations were poorly correlated with carcass measurements (Table 1). Generally, backfat thickness reflected the chemical muscle composition of sows better than any of the other measurements; fat class only had a significant effect on the proportion of fat and water in the muscle (Table 1). This confirms the work of Wood *et al.* (1986) who found a correlation of 0.56 between muscle lipid and P2 backfat thickness in pigs.

Means (SD), ranges and the probability of the F-test due to the effect of weight class (WC) and fat class (FC) on carcass characteristics are presented in Table 2. The increase of weight class and fat class was accompanied by an increase in the proportion of muscle fat by 84 and 434% and a decrease of the proportion of muscle water by 7 and 9%, respectively, whereas the proportion of protein and ash in the muscle was not affected (Figure 1). There were no significant interactions between WC and FC for the proportion of the chemical components in the muscle. These results are in agreement with those of Wood *et al.* (1986) who found that the concentration of the lipid in the m.*longissimus* increased as fat thickness increased and the concentration of water decreased in pigs slaughter with different fatness (lean, average, fat). Martin *et al.* (1980) also concluded that variation in carcass weight had no meaningful influence on percentage ether extract of *m.longissimus* in pigs grouped at approximately in 13kg intervals ranging from 73 to 137kg.

Meat quality

Although the sows in this trial varied widely in carcass weight and backfat thickness (Table 2), the degree of association between muscle quality characteristics and carcass measurements was very poor except that of the loin muscle lightness (L*) and redness (a*) which were significantly correlated with carcass weight (r=-0.16 and 0.34 respectively). Probe fat correlated significantly (r=0.24) only with muscle redness (Table 1). Kempster *et al.* (1984) also found poor correlations between meat quality characteristics and carcass characteristics. The correlation coefficients between the proportion of the chemical components in the muscle and loin muscle quality were relatively low (data not shown). Muscle colour components L*, a* and b* were significantly correlated to muscle fat (r=0.33, 0.30 and 0.45 respectively) and muscle water (r=-0.24, -0.25 and -0.35 respectively). The correlation coefficients between drip loss and muscle colour components L*, a* and b* were 0.61, 0.26 and 0.62 respectively indicating an association between drip loss and the lightness of the muscle.

The results in Table 2 show that loin muscle colour was affected by weight class but not fat class. There were no interactions between WC and FC for meat quality characteristics. Despite the poor correlations between loin muscle colour and carcass weight; loin muscle became darker, redder and more yellow as weight class increased (Figure 2). Martin *et al.* (1980) also found that heavier carcasses were associated with darker muscle. More recently, Sather *et al.* (1991) concluded that increased lean content in pigs carcasses might not significantly impair meat quality.

CONCLUSION

Chemical composition of sows was more related to fat class than weight class, because sows within each weight class differed widely in carcass fatness. Sows had a higher proportion of intramuscular fat and a lower proportion of water in their muscle as fat class increased. Loin muscle quality was a function of weight class which the muscle became darker, redder and more yellow as carcass weight increased.

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Table 1. Simple correlation coefficients+ between carcass traits.

Variable	Carcass weight	Probe fat	Probe lean
Muscle protein, %	0.15	0.11	0.14
Muscle fat, %	0.51	0.60	0.15
Muscle water, %	-0.50	-0.55	-0.20
Muscle ash, %	-0.07	-0.12	0.16
Loin colour			
L*	-0.16	-0.07	-0.11
a*	0.34	0.24	-0.-5
b*	0.10	0.11	-0.07
Drip loss, %	0.07	0.12	0.05

+ Correlation coefficients >0.15, P<0.05; >0.24, P<0.01; >0.48, P<0.001.

Table 2. Means (SD), range and probability of the F-test for selected carcass due to the effects of weight class (WC) and fat class (FC).

Variable	N	Mean±SD	Range	Effect of	
				WC	FC
Carcass wg, kg	204	163±50.7	72.6-279.4	0.0001	0.1401
Probe fat, mm	204	27.8±13.5	6.5-67.6	0.0426	0.0001
Probe lean, mm	204	52.7±9.4	25.5-68.5	0.0001	0.5251
Muscle protein, %	90	17.6±1.5	13.9-21.7	0.4800	0.4360
Muscle fat, %	90	7.3±2.7	1.1-13.8	0.8303	0.0001
Muscle water, %	90	74.8±3.1	66.5-81.4	0.8443	0.0002
Muscle ash, %	90	0.90±0.11	0.63-1.19	0.0001	0.2206
Loin colour					
L*	204	38.1±5.5	25.6-51.0	0.0001	0.2206
a*	204	8.8±2.1	3.5-15.1	0.0013	0.3658
b*	204	9.0±1.7	5.3-13.4	0.0003	0.2616
Drip loss, %	204	5.6±2.7	1.32-13.6	0.0984	0.1112