

EFFECT OF PRE-SLAUGHTER HOLDING TIME ON PORK YIELD AND QUALITY

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SUMMARY

Carcass yields of pigs slaughtered after 2 hour holding were 1,4 % higher than those of pigs held for 24 hours. Yields diminished with further fasting at a rate of 0,5 % per day up to 96 hours holding.

Liver yields were most affected during the first 48 hours and average meat yield was lowered 2 % by 72 hours fasting, whereas fat yield was not significantly affected.

Average quality indexes remained within normal limits: pH₁ varied from 6,3 to 6,5; pH_u from 5,5 to 5,6 and WHC - rather low in all cases - increased from 58,2 to 66,5 %; Hunter lightness L, varied from 48 to 45, and fasting.

It is recommended to hold the pigs for the shortest possible time before slaughter.

INTRODUCTION

Ante-mortem treatment of pigs has been thoroughly studied from the point of view of its effect on meat yield and quality. Slaughtering pigs immediately after arriving to the slaughterhouse gives carcass 0,5 to 1 % higher than holding them for 24 hours (1-5).

There is some experimental evidence, however, that the meat of such pigs is more PSE-prone, whereas prolonged fasting increases the incidence of the DFD condition (6,7). Holding times from 2 to 6 hours have been recommended as beneficial to meat quality (8,9).

It is of interest to evaluate the effect of different pre-slaughter holding and fasting times on pork yield and quality in our conditions, as both the genetic predisposition of the pig (10) and the effect of the environment have their influence on the result. That is the aim of this paper.

MATERIALS AND METHODS

125 Yorkshire Landrace X Duroc barrows and gilts, ca. 247 days old, were brought to the slaughterhouse from a farm 5 km away, in groups of 25, and slaughtered after holding and fasting for 2; 24; 48; 72 and 96 hours. Electrical stunning was used: 80 V, 60 Hz for 5 seconds.

Live weight was recorded daily. After slaughter, the liver and the hot carcass were weighed, and after 24-hour refrigeration, carcasses were boned and total meat and fat weights were determined. All yields were calculated on the basis of live weight at arrival.

A portion of M. L. dorsi from the area of the 11th-12th dorsal vertebrae was taken and pH₁ measured 45 minutes post-mortem, using iodoacetate buffer (11). Fiber Optic Probe (TBL, Leads, U.K.) values were measured in the M. L. dorsi of refrigerated carcasses, in the region of the 8th to 12th dorsal vertebrae.

For color measurement, a cross-section cut of M. L. dorsi, 15-20 mm thick, was taken from the region of the 9th-10th dorsal vertebrae and bloomed in air at 0 °C for 1 hour in a covered Petri dish, to avoid surface desiccation. CIE Y was measured in a Mom-

color (MOM, Budapest) tristimulus color meter and Hunter lightness L was calculated therefrom.

The remaining portion of M. L. dorsi (8th - 12th dorsal vertebrae), was trimmed free of visible fat, homogenized by mincing 3 times through a 3 mm plate and used in the determination of pH_u (24 hours post-mortem) and WHC by a modification of the method of Grau and Hamm (12). WHC was expressed as percentage of the total water content of muscle.

Pork was considered PSE if L > 55, pH₁ < 5,8 and FOP value > 155. DFD limit was considered to be pH_u > 6,2.

Data were processed by analysis of variance and Duncan's multiple F test.

RESULTS AND DISCUSSION

Table 1 shows the results of weights and yields at slaughter and boning. Weight at slaughter decreased with fasting time, the largest decrease occurring during the first 24 hours (5,4 %), levelling off afterwards 1 % daily. This was to be expected, since the largest losses of gastrointestinal content occur during the first hours of fasting.

Both liver weight and yield decreased significantly with fasting. The decrease is abrupt during the first 48 hours, liver weight losses averaging 0,5 % per hour during the first 24 hours and 0,4 % per hour during the second 24-hour period. After that, the rate was rather slow. Warriss and Brown found an average decrease of 0,7 % per hour during the first 24 hours and a tendency towards stabilization later on.

Hot carcass yields also experienced a sharp decrease of 1,4 % during the first 24 hours of fasting, but this rate levelled off afterwards at ca. 0,4 % per day, similar to data in other reports (2,3,5,15-18).

Boning results clearly show that losses in carcass yield are at the expense of meat yield. The latter decreases almost by 1 % during the first 24 hours, but only an extra 1 % during the following 72 hours. The data trend is somewhat obscured by the fact that the group of pigs slaughtered at 48 hours fasting happened to be leaner than the rest.

Carcass fat weight showed a generally consistent, although not statistically significant, decrease, except for the discontinuity caused by the group of leaner pigs. Lack of statistical significance is due to a larger scatter in fat weights as compared with meat weights.

Table 2 shows quality indexes of the meat from these carcasses. Average pH₁ values were in the normal range, only ca. 5 % of the carcasses showing pH₁ 5,8. Surveys carried out before in Cuba have shown similarly low proportions of carcasses with low L. dorsi pH₁: 0,6 % (19) and 8 % (20).

Average pH_u values were also normal, only 2 out of the 125 carcasses showing pH_u 6,2. Both cases were from the 96 hours fasting group.

Hunter lightness L values did not indicate any clear PSE cases. Average values showed a tendency to decrease with fasting time, as expected, reaching a significant difference (P < 0,05) after 72 hours holding. All average values however, were comparable to those obtained by Cruz-Bustillo et al. (21) in carcasses sampled from commercial slaughter lines in Cuba.

FOP values also indicated normal pork, although in 2 hours holding group one value close to the limit for PSE meat was measured. FOP values followed the same

Table 1. Average live weights and yield data obtained. Mean values for groups of 25 pigs each

	Fasting time (h)					Standard error of the mean
	2	24	48	72	96	
Weight at arrival (kg)	85,2 a	86,1 a	84,7 a	84,2 a	86,3 a	1,15 (ns)
Weight at slaughter (kg)	85,2 a	81,4 b	78,4 bc	76,6 c	77,9 c	1,11 **
Daily weight loss (%)	-	5,4 a	1,9 b	1,0 c	1,3 c	0,19 ***
Liver yield * (%)	1,68 a	1,50 a	1,38 c	1,37 c	1,30 c	0,041 ***
Hot carcass yield * (%)	70,8 a	69,4 b	68,9 bc	68,4 c	68,0 c	0,34 ***
Meat yield * (%)	28,5 a	27,6 b	27,6 b	26,7 c	26,6 c	0,32 **
Fat yield * (%)	26,3 a	26,0 a	24,4 a	25,3 a	25,5 a	0,58 (ns)

* All calculated on the basis of weight at arrival

** P < 0,01

*** P < 0,001

a,b,c, Mean values in the same line without a letter in common differ at P < 0,05 (Duncan's test)
(ns) - not significant

Table 2. Average quality indexes, measured in the M L. dorsi. Mean values for groups of 25 pigs each.

	Fasting time (h)					Standard error of the mean
	2	24	48	72	96	
pH ₁ (45 min post-mortem)	6,52 a	6,35 b	6,32 b	6,32 b	6,33 b	0,136 *
pH _u (24 h post-mortem)	5,47 a	5,48 a	5,47 a	5,48 a	5,58 a	0,071 (ns)
Hunter lightness, L	47,9 a	46,6 a	46,5 a	44,9 b	45,1 b	2,209 *
Water holding capacity (%)	58,2 a	60,1 ab	62,5 b	63,7 c	66,5 c	2,788 *
FOP value	153 a	149 ab	147 ab	144 b	144 b	5,33 *

(ns) - not significant

* - P < 0,05

abc - Mean values in the same line without letter in common differ at P < 0,05 (Duncan's test)

pattern of variation with holding time as L values. This was to be expected, as both indexes are closely related to meat opacity (22).

WHC was rather low in all samples, increasing slowly with holding time. Although these values are close to results reported by Kauffman *et al.* for PSE pork (23) other evaluations of meat from similar animals (19,21,24) indicate WHC values below 70 % in pork of generally normal characteristics. WHC values measured seem to be typically low in these animals, regardless of the experimental situation.

Taking results as a whole, fasting did not seem to affect pork quality, except for a fairly low incidence of DFD meat after prolonged fasting (8 % in the 96 hours group). PSE occurrence was not related to fasting and in general, quality indexes were very similar to those in other studies of Cuban pork (19-21, 24).

CONCLUSIONS

Pigs slaughtered soon after arrival (only 2 hours holding) showed the highest slaughter and boning yields. As pork quality was only marginally affected by fasting time, 2 hours seems to be the best option.

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