Comparison of backfat depth probes for use in pig carcass grading

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ABSTRACT

Depth of subcutaneous fat plus skin was measured by Fat Depth Indicator and Introscope on 95 'backed down' hot carcasses from entire males and gilts slaughtered at 70 and 90 kg live weight. Measurements were taken 4 and 6.5 cm lateral to dorsal midline immediately posterior to the last rib.

Both probes predicted percentage fat with similar accuracy at the 4 cm site (rsd 2.4%), but at 6.5 cm the Introscope was slightly the more accurate (rsd 2.3%). Allowing for different sex intercepts improved the accuracy of predictions. Accuracy of predicting corresponding fat depths on the chilled carcass varied with probe and site.

Linear regression relationships of Introscope on Fat-Depth Indicator fat depths gave residual standard deviations of 1.5 mm and 1.4 mm at the 4 and 6.5 cm sites respectively.

INTRODUCTION

Recently major developments have taken place in methods of pig carcass grading and classification and there has been increasing interest in automatic recording instruments. One such instrument is the Fat Depth Indicator (FDI) (Hennessy-Chong Ltd, Auckland) which detects the colour difference between muscle and fat.

Grading of pig carcasses in New Zealand includes the measurement of backfat depth 4 cm lateral to the dorsal midline, immediately posterior to the last rib. This site was based on the results of Buck *et al.* (1962) and Joblin (1966). However, in both Britain and Australia the preferred site is 6.5 cm lateral to the midline (Kempster *et al.*, 1979; Wilson, 1976).

Although the Introscope (I/S), an optico-mechanical probe, is specified for use in pig carcass grading (NZS, 1973), it has some limitations. Its use involves subjectivity in both defining the lean-fat boundary and in the degree of pressure applied through the measuring barrel. Further it cannot be used in automated fat depth recording systems which offer potential labour savings.

The aim of this work is to compare the precision of the FDI against the I/S at 2 measurement sites.

MATERIALS AND METHODS

Ninety-five carcasses were used from pigs slaughtered at 70 and 90 kg live weight (Table 1). There were approximately equal numbers of entire males and gilts within slaughter weights.

Fat depths were taken with each instrument on the right-hand side immediately posterior to the last rib, both 4 and 6.5 cm from the dorsal midline. Measurements were taken within 45 minutes of slaughter. Before probing, measurement sites were marked and the carcass was 'backed down' (cut) to expose the vertebral spines on the dorsal surface. Caliper measurements were taken on the cut surface of the chilled carcass 24 hours after slaughter. Measurements by I/S were always 0.5 cm posterior to those by FDI. The side, less head, fore and hind feet was dissected into fat (rind + subcutaneous fat + flare fat) and lean body mass.

TABLE 1 Means and standard deviations of right side weight and fat percentage

	Live weight group (kg)					
	70		90		Overall	
	Mean	sd	Mean	sd	Mean	sd
No. carcasses	16		79		95	
Side weight (kg)	23.36	0.72	30.70	0.97	29.47	2.93
Fat (%)	27.27	4.29	29.52	3.66	29.14	3.84

RESULTS AND DISCUSSION

The precision of predicting percentage fat from fat depths measured hot by FDI and I/S and cold by caliper, was examined overall (model i) and by fitting separate intercepts for sex but with common slopes (model ii) (Table 2). At the 4 cm site there were no differences in the precision with which the FDI and I/S predicted percentage fat. However, at the 6.5 cm site the I/S was marginally more accurate. In contrast to this latter result, Kempster *et al.* (1981) found no difference between these two instruments at the last rib. For both the FDI and I/S the use of separate sex constants reduced residual variation (model ii, Table 2). No significant reduction by including sex was found using caliper measurements.

TABLE 2 Residual standard deviations for predicting precentage carcass fat from fat depths

Site (cm)	Model	FDI	I/S	Caliper
4	i	2.44	2.43	2.07
	ii	2.39*	2.38*	2.07 ns
6.5	i	2.47	2.36	2.05
	ii	2.38**	2.29*	2.03 ns

In addition to carcass composition, other important aspects were the relationships between hot and cold fat depths with type of probe, and the relationships between probed hot depths by different instruments.

Average fat depth taken by I/S at the 4 cm site was larger than that measured both by the FDI and caliper, which were very similar (Table 3). However, as reported by Kempster *et al.* (1981) there were no differences in fat depths between the FDI, I/S or caliper at the 6.5 cm site.

TABLE 3 Mean fat depths taken with probes and on the cold, cut surface

Site (cm)	FDI	I/S	Caliper	SE of diff.
4	18.5a	19.5b	18.1a	0.31
6.5	19.1a	19.0a	18.9a	0.31

TABLE 4 Prediction of cut-surface measurements from corresponding probe measurements

Site		FDI			I/S		
(cm)	Model	b	P	rsd	b	P	rsd
4	i	1.05	ns	1.47	0.89	*	1.70
	ii	1.03	ns	1.43*	0.87	**	1.66*
6.5	i	1.11	*	1.57	1.05	ns	1.45
	ii	1.10	*	1.53*	1.04	ns	1.43†

P = sig. diff. from unity.
†P < 0.10

The precision with which cold caliper fat depths could be predicted from corresponding hot carcass fat depths varied with probe type and site (Table 4). At the 4 cm site the FDI gave the more accurate prediction, whereas the I/S was slightly more accurate at the 6.5 cm site. At the latter site similar findings were reported by Kempster *et al.* (1981) and Pommeret *et al.* (1981). While pale muscle presented no problems there was 1 occasion where a pinhead sized blood spot in the subcutaneous fat gave an erroneous reading. This latter problem was also found by Pommeret *et al.* (1981) but not by Kempster *et al.* (1981).

TABLE 5 Prediction of I/S fat depths from corresponding FDI measurements

Site (cm)	Model	b	P	rsd
4	i	1.03	ns	1.53
	ii	1.03	ns	1.54 ns
6.5	i	0.97	ns	1.52
	ii	0.96	ns	1.52

P = sig. diff. from unity

As either the FDI or I/S could be used at a meat works the relationship between measurements taken by these instruments is of some importance. The regression of I/S fat depths on those taken by FDI had slopes which did not differ from unity and were not affected by sex at either site. Residual standard deviations were similar to those found by Kempster *et al.* (1981).

Differences in precision between the FDI and I/S were small and seem unlikely to be of sufficient practical importance to influence the choice of instrument to use in grading of pig carcasses.

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