PREDICTION OF LEAN MEAT PERCENTAGE IN PIGS USING TOBEC

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Keywords: TOBEC; pigs; lean meat prediction; grading

BACKGROUND

TOBEC uses electromagnetic scanning technology to sense the lean content of a body being passed through it. It has been used in the U.S.A. to predict lean meat percentage in hot pig carcasses to accuracy levels of 86% (Forrest, 1995). In the National Food Centre dissection of pigs is being carried out on an ongoing basis on pigs from seven breeding companies to evaluate their breeding stock. It was therefore an ideal opportunity to see what level of accuracy of prediction of lean meat percentage from TOBEC data could be achieved with Irish pigs and how this would compare with USA results and also with the Hennessy Grading Probe (HGP), the method currently used in most Irish factories to predict lean meat percentage.

OBJECTIVES

To evaluate TOBEC as a means of predicting lean meat percentage in Irish pigs and compare it to the Hennessy Grading Probe.

METHODS

Ninety-eight pigs were brought to the National Food Centre in batches of 4 or 6 for slaughter. When carcass dressing was complete they were scanned with TOBEC prior to chilling. The peak of the scan curve (PMA), the area under the curve and the scan length were recorded. The surface and deep muscle temperatures were also recorded just prior to scanning. Pigs were scanned in both directions, i.e. head first and tail first. They were also graded with the Hennessy Grading Probe at this time. Other measurements taken included carcass weight, carcass length, leg length and ham circumference. After chilling overnight at 0°C, the left side was passed through the TOBEC and the same data including temperatures were recorded. In order to determine the lean content of the pigs, dissection of the left sides was carried out according to the EU reference method and all weights were recorded (Walstra and Merkus, 1995). Regression was then used to predict lean meat percentage from the following model types for hot carcasses: (1) carcass weight and dimensions; (2) HGP fat and muscle depth; (3) carcass weight, dimensions and TOBEC; and for cold sides: (1) side weight and dimensions; (2) side weight, dimensions and TOBEC.

RESULTS AND DISCUSSION

Models were fitted separately for male and female pigs to determine whether a lower RSD could be achieved within sexes. In all cases higher R^2 were achieved for male models (Tables 2 & 3) but not necessarily lower RSDs for hot carcass models. It was noted that the weights for male pigs were more variable than for female pigs. This may account for the higher R^2 achieved in all models which include weight as a predictor. An RSD of 2.34 for the HGP model is within the criteria laid down by EU regulations. However the R^2 is low compared to the criterion on 0.65 but the lack of a properly weighted sample could account for this. The orientation of the pig entering the TOBEC proved important since data from scans where the pigs entered the chamber head-first did not give accuracy as good as data from tail-first scans. For all categories TOBEC had higher RSDs than the corresponding HGP model which questions the value of TOBEC for grading of hot pig carcasses.

Predictions did not improve using side weight rather than hot weight (Table 3). Separating sexes again improved R^2 and lowered RSD for male but not for female pigs. TOBEC readings are highly dependant on the temperature of the product passed through it. However it did not feature as a predictor in any of the hot carcass prediction models due to lack of variability (40±1.3). In the cold side models, surface temperature was included since delays between sides exiting chills and entering TOBEC along with seasonal factors caused greater variability (10±2.5). The reduction in residual standard deviation by using TOBEC in addition to weight and dimensions was much greater for predictions of cold sides than for hot carcasses. There was a great reduction in RSD when TOBEC data of the cold sides were added into the models compared to the corresponding hot carcass models.

CONCLUSIONS

For prediction of lean meat percentage in hot pig carcasses in this sample of pigs, TOBEC had lower precision than the current HGP method. However, for prediction of lean meat percentage of cold sides, TOBEC proved to be more valuable.

REFERENCES

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TABLE 1A **Summary statistics of non-TOBEC variables used in the best fit model types for the prediction of lean meat percent**

	Meat percent	Hot Weight	Side Weight	Carcass Length	Leg Length	Ham Circum	HGP Fat	HGP Muscle
	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd
All Pigs	53.4±2.9	77.1±7.6	33.7±3.4	83±3	38±2	69±4	13.6±3.1	46.1±7.6
Male Pigs	53.1±3.0	78.9±8.4	34.6±3.7	83±3	38±2	69±5	14.1±3.7	45.5±8.0
Female Pigs	53.7±2.8	75.3±6.3	32.9±2.8	82±3	37±2	68±3	13.0±2.2	46.8±7.2

TABLE 1B **Summary statistics of TOBEC variables used in the best fit model types for the prediction of lean meat percent**

	PMA Carcass	Area Carcass	PMA Side	Scan Length Side	Area Side	Surface Temp side
	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd	mean±sd
All Pigs	767±172	*16493±3841*	70±13	382±27	2087±279	10.0±2.5
Male Pigs	*791±184*	16735±3933	75±13	385±31	2171±289	10.0±2.5
Female Pigs	744±158	16260±3777	*66±11*	*379±22*	2007±246	10.1±2.5

Italics - These variables were not part of any of the best fit models

TABLE 2 **Summary statistics for best fit models for the prediction of lean meat % in hot pig carcasses using various model types.**

Model type	Variables used (see bold letters - Tables 1A&B)	N	R^2	R.S.D.
Carcass wt & dimensions (all)	**HW, CL, LL**	98	0.177	2.68
Carcass wt & dimensions (male)	**HW, LL**	48	0.295	2.58
Carcass wt & dimensions (female)	**HW, CL, LL, HC**	50	0.171	2.66
HGP fat & muscle depth (all)	**HGPF, HGPM**	95	0.357	2.34
HGP fat & muscle depth (male)	**HGPF, HGPM**	47	0.420	2.34
HGP fat & muscle depth (female)	**HGPF, HGPM**	48	0.277	2.40
TOBEC & carcass wt & dimensions (all)	**HW, CL, LL, PMAC**	98	0.246	2.58
TOBEC & carcass wt & dimensions (male)	**HW, LL, AC**	48	0.329	2.55
TOBEC & carcass wt & dimensions (female)	**HW, CL, LL, HC, PMAC, AC**	50	0.310	2.48

TABLE 3 **Summary statistics for best fit models for the prediction of lean meat % in cold pig sides using various model types.**

Model type	Variables used (see bold letters - Tables 1A&B)	N	R^2	R.S.D.
Side wt & dimensions (all)	**SW, CL, LL**	98	0.157	2.71
Side wt & dimensions (male)	**SW, LL**	48	0.300	2.57
Side wt & dimensions (female)	**SW, CL, LL, HC**	50	0.134	2.72
TOBEC & side wt & dimensions (all)	**SW, CL, LL, HC, PMAS, SLS, AS, ST**	98	0.579	1.97
TOBEC & side wt & dimensions (male)	**SW, CL, HC, PMAS, SLS, AS, ST**	48	0.698	1.79
TOBEC & side wt & dimensions (female)	**SW, CL, AS, ST**	50	0.524	2.02