ACCURACY OF PREDICTION OF LEAN YIELD, LOIN EYE AREA AND MARBLING FROM LIVE MEASUREMENTS ON PIGS

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SUMMARY

680 hogs have been probed to measure their fat and loin depth. These measures have been compared to measures on the carcasses at the slaughterhouse. 108 carcasses had a full cutout to determine the real lean meat yield. A-mode and B-mode ultrasound machines gave a better prediction of the lean meat yield than the probe at the slaughterhouse. The loin eye area can be predicted as well with a B-mode than an A-mode ultrasound machine. Marbling cannot be predicted from live measurements but this could be improved.
Keywords : swine, lean yield, ultrasounds.

INTRODUCTION

Canada's swine genetic improvement program is based on three main components : adjusted backfat at 100 kg, age at 100 kg and total number piglets born. Adjusted backfat is used to predict lean meat yield.

The selection is more accurate when you measure the trait itself and not another trait (except if the correlation between the two is very high). Since the pigs are leaner than before, it should be considered that the correlation between fat thickness and lean meat yield for these leaner pigs may be not the same as for fatter ones. Thus, it is important to look at other ways of predicting lean meat yield.

Lean meat yield can be evaluated from carcass measurements at the slaughterhouse or can be obtained indirectly from the measure of the backfat on live animals (Sather *et al.* 1987), while loin eye area and marbling are mainly obtained on carcasses.

Even though ultrasound has been used for evaluating live animals for many years (Stouffer *et al.* 1961) its main use in hogs is still to measure the backfat of live animals. However, new technologies and more knowledge will increase the use of ultrasound equipment to measure other traits on live pigs and will improve the prediction of lean meat yield.

MATERIALS AND METHODS

At the CDPQ test station, 680 hogs were probed prior to slaughter at an average live weight of 106 kg. The first ultrasound equipment used was a B-mode type. It consisted of an Aloka model 500 with a 126 mm-3.5MHz transducer. Two scans have been taken on the left side of each hog : one cross sectional between the third and fourth last ribs (CROSS) and one longitudinal over the last four or five ribs at 5 cm off the back midline (LONG).

The images were stored on a computer and a VCR for subsequent analysis. The longitudinal images have been analyzed for lean meat yield and loin eye area predictions from fat and loin depth measurements with AUSKey AUTOD (Lin 1994). The cross sectional images have been manually analyzed to determine the lean meat yield and loin eye area. The AUSKey AUTOQ has been used to determine the loin marbling from cross sectional and longitudinal images.

The second ultrasound equipment used was an A-mode type. It consisted of a Krautkramer USM2. Animals have been probed between the third and fourth last ribs, 5 cm off the back midline, average of the fat of both sides of the animal (FAT34) and average of the loin depths of both sides of the animal (MUSC34).

All the animals have been slaughtered and the loin and fat depth measured with a Hennessy probe on the carcass have been recorded and the lean meat yield has been calculated according to the equation currently used in Quebec plants using a Hennessy probe.

A loin eye trace was done at the plant to calculate the loin eye area and visual marbling score has been determined for each animal on a cut of the loin between the third and fourth last ribs. Scoring of the marbling was done using the Agriculture Canada standard on a 5 point scale with 1 = trace, 2 = slight, 3 = small, 4 = moderate and 5 = abundant.

108 animals had a full cutout to determine their precise contents in lean, fat, bone and skin. A cutout lean meat yield has been determined using the following equation (Jones *et al.* 1994a) :

% lean yield = (boneless loin + tenderloin + boneless and defated ham + boneless and defated shoulder + skinned belly + side ribs) / weight of the half carcass x 100

The data have been analyzed with procedures CORR and GLM from SAS (SAS Institute 1988). The effects used in the analysis model were sex (gilts and barrows) and crossbred types. Animal weight and prober were not considered since all animals have been probed at about the same weight by the same technician. Probing date was non-significant.

RESULTS AND DISCUSSION

Lean yield. Prediction of the lean yield from the A-mode, B-mode, slaughterhouse and cutout measures have been compared to each others (Table 1). Live measures were more accurate than the Hennessy probe to predict lean yield as obtained from the cutout.

Table 1 - Accuracy (R-square) of the prediction of the lean meat yield from the different types of measures

	Hennessy lean yield (%)	Cutout lean yield (%)	Loin eye area (cm^2)
Aloka (B-mode ultrasounds)			
CROSS	0.83	0.74	0.57
LONG	0.83	0.73	0.61
Krautkramer (A-mode ultrasounds)			
FAT34 and MUSC34	0.80	0.77	0.62
Hennessy	-	0.70	-
Cutout	0.70	-	-

All prediction significant at $P<0.05$.

As already reported (Jones *et al.* 1994b ; Stouffer 1996), B ultrasound equipment usually predicts more accurately the lean yield than the probes used in the slaughterhouses (Hennessy or Destron). The relation between the prediction from the Hennessy probe and the cutout was higher than the 1992 national cutout (R2=0.64) while A-mode, B-mode (LONG) and B-mode (CROSS) had accuracy of 0.77, 0.73 and 0.74 respectively.

Thus, from this trial, the best measurements to predict lean meat yield were the measures taken with A-mode ultrasound equipment between the 3rd and 4th last ribs.

Loin eye area. For the loin eye area, the best prediction was also obtained with the A-mode ultrasound equipment.

Marbling. Marbling has been predicted from the B-mode cross sectional and longitudinal scans. It has been compared with visual evaluation on the loin of the carcass as previously explained. The accuracy of prediction is essentially zero (R2=0.01).

When the distribution of the frequency of the number of observations is plotted with the marbling score, we can note that CROSS and LONG scores follow about the same distributions (Figure 1). However, these measures overestimate the number of animals classified visually in score 1 and underestimate the number of animals classified visually in score 2.

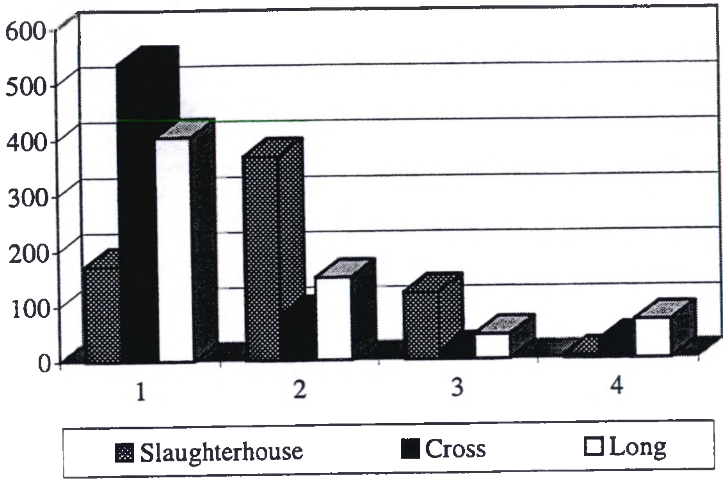

Figure 1. Relation between marbling determined on the live animal and visually on the carcass.

The marbling cannot yet be predicted by live scans, but even if the correlations are quite low, it seems possible, with more development practice, to be able to determine it.

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