SEPARATE PREDICTION OF THE LEAN MEAT CONTENT IN THE CARCASSES OF GILTS AND BARROWS

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Abstract

Simplified detailed dissections were carried out in two sets of pig carcasses (gilts I, n = 120; barrows II. n = 120). The results were used to establish the regression formulae for the apparatus HGP. The lean meat content in gilts (y_p) and barrows (y_v) can be predicted using the following formulae:

$Y_p = 60.76553 – 0.78012*S + 0.11894*M$ (r = 0.83; se = 2.20);
$Y_v = 59.07731 – 0.75232*S + 0.13500*M$ (r = 0.82; se = 2.20)

To increase the accuracy of the prediction formulae, carcass weight was included into calculation. The prediction accuracy parameters r and s_e did not practically change. It is therefore concluded that the inclusion of carcass weight in the prediction formulae does not improve the prediction accuracy.

Introduction

As described by Branscheid et al. (1987), Lagin et al. (1995), and Causer and Dhorn (2003), the establishment of formulae for the prediction of the carcass lean meat content involves the following steps:

- selection of a representative sample of pigs
- determination of anatomic measurements according to the used method
- detailed carcass dissection - separation of different tissues in the sampled carcasses (n≥120).

The reference base for prediction methods is the lean meat content determined directly, i.e. by detailed dissections of the representative sample of pig carcasses. The stress is put on the correct representation of different hybrid combinations and on equal numbers of gilts and barrows. The correlation coefficient between the lean meat content predicted indirectly (by approved classification methods) and directly (by dissections) has to be higher than r = 0.8. It corresponds to the coefficient of determination of R^2 = 0.64. The residual standard deviation (s_e) has to be below 2.5. This criterion indicates the reliability of the lean meat content values estimated using a regression formula and evaluates the biases from reference dissection values. Ninety-five percent of all estimates are within the interval ± $2s_e$ of the regression line.

The accuracy of prediction can be improved by several approaches. For example, a higher number of measurements can be taken on a carcass. Hulsegge et al. (1994) and Šprysl et al. (2007) compared the accuracy of the prediction using multiple site measurements. They accordingly concluded that under practical conditions of slaughterhouses such number of measurements is sufficient that would not reduce the speed of currently used slaughterlines (120 to 140 pigs per hour) and fulfil the required prediction accuracy. The second method of improving accuracy is based on the prediction of the lean meat content within individual subpopulations.

The muscle content is highest in boars, moderate in gilts, and lowest in barrows. Therefore, there have been efforts to establish separate formulae for gilts, barrows, or even boars (Engel and Walstra, 1993; Daumas et al., 1998).

Similarly to the other EU countries, the pig carcass classification in the Czech Republic is performed on the basis of the results from detailed dissections of the representative sample of pigs. The set consisted of equal numbers of gilts and barrows (Pulkrábek et al., 2004).

The objective of the study was to assess the possibility to predict the lean meat content separately for gilts and barrows. The additional aim was to improve the accuracy of the prediction formula by the inclusion of carcass weight.

Material and methods

Two sets of pigs were analysed. Set I consisted of 120 gilts and Set II consisted of 120 barrows. The animals were sampled according to the same criteria. As required, the genotype of the pigs corresponded to the most frequent hybrid combinations used in the Czech Republic and the carcass weight ranged from 60 to 120 kg. The selection of carcasses used in the dissection trial took in the most frequent genotypes of slaughter pigs – a representative sample of the pig population in the Czech Republic.

The pigs were fattened under conditions common in the Czech Republic. They were slaughtered in selected slaughterhouses and the following traits were recorded:

45 min *post mortem*

- thickness of fat and skin measured between the second and third from the last rib 70 mm from the midline (S-mm)
- depth of muscle measured between the second and third from the last rib 70 mm from the midline (M-mm)

24 hours *post mortem*

- carcass weight
- left carcass side weight (L/2) prior the detailed dissection

The left carcass side was divided into primal cuts according to Scheper and Scholz (1985). Detailed carcass dissections were performed according to the reference method of the European Union (Walstra and Merkus, 1996) which is based on the separation and weighing of different tissues (muscle, intermuscular fat, subcutaneous fat including skin, and bones) from leg, loin, shoulder, and belly with bones. The weight of filet considered as the weight of muscle was added.

Data were analysed using the REG, CORR, GLM, and MEANS procedures of SAS (SAS Institute Inc., 2001). To construct regression equations, multiple regressions of the measurements S and M on the lean meat content obtained by dissections were used.

Results and discussion

Basic statistics of the values important for the prediction of the lean meat content are given in Table 1. The measurements obtained by a probe device and from dissections are presented separately for both datasets (gilts I, barrows II).The average fat thickness was 18.84 and 16.34 mm for gilts and barrows, respectively. Similar results are also reported by Branscheid et al. (1987) and Lagin et al. (1995). The average thickness of muscle was greater in gilts (63.58) than in barrows (61.59 mm). These results indirectly confirm higher meatiness of gilts compared to barrows. This is also evidenced by the dissection data. The average lean meat proportion was 56.21 % in gilts while only 55.38 % in barrows. On the other hand, the difference of 0.83 percent points is lower than the difference 2.53 percent points reported by Kernerová et al. (2004).

The following formulae were constructed for the prediction of the lean meat content:

Gilts:

$Y_p = 60.76553 - 0.78012*S + 0.11894*M$ (1)
(r = 0.83; se = 2.20)

$Y_p = 61.69671 - 0.74647*S + 0.14957*M - 0.03684*H$
(r = 0.83; se = 2.18) (2)

Barrows:

$Y_v = 59.07731 - 0.75232*S + 0.13500*M$ (3)
(r = 0.82; se = 2.20)

$Y_v = 59.27411 - 0.74020*S + 0.14288*M - 0.00976*H$
(r = 0.82; se = 2.20) (4)

Where:
Y – lean meat content in carcass (%)
S – fat thickness measured on the left side at P2 (mm)
M – muscle thickness measured on the left side at P2 (mm)
H – carcass weight (kg)

The prediction ability of formulae was evaluated on the basis of the correlation coefficient (r) between the values predicted by the regression formula and the real values determined by the detail dissection and the prediction error s_e. The results indicate that all formulae met the required criteria of statistic accuracy, i.e. the correlation coefficient was always higher than 0.8 and the prediction error was lower than 2.5. A similar level of s_e 2.13 is reported e.g. by Desmoulen et al. (1986).

Two formulae were established for each gender. The first formula was constructed using the measurements of fat (S) and muscle (M) at P_2. An additional measurement of carcass weight (H) was used for the construction of the second formula. The values of r and s_e indicate that the inclusion of H did not result in a significant improvement of the prediction accuracy. In the case of the formulae for barrows, the accuracy parameters were the same. Therefore, the inclusion of carcass weight (H) in the regression formula did not increase the prediction of the lean meat content. The prediction ability of the formulae (1, 3) is shown in Figure 1 (gilts) and 2 (barrows).

Figure 1: Regression formula for the prediction of the lean meat content in gilts

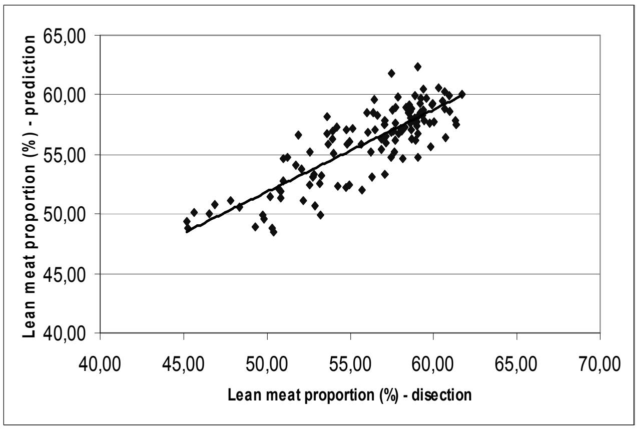

Figure 2: Regression formula for the prediction of the lean meat content in barrows

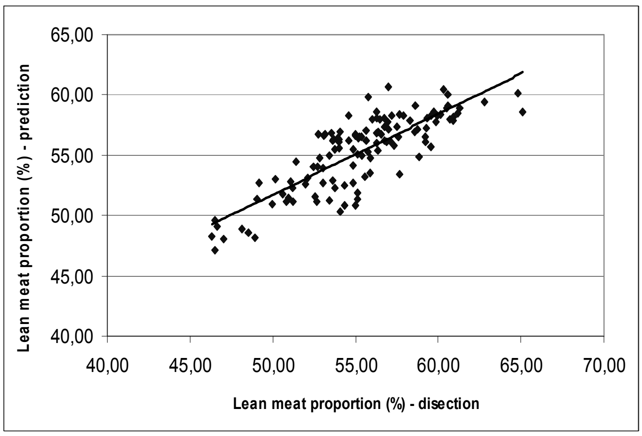

Table 1: Basic statistic parameters of the measurements used to predict the lean meat content in gilts (n =

	Measurement			
	Fat thickness S (mm)	Muscle thickness M (mm)	Carcass weight (kg)	Lean content from dissections (%)
Set I – gilts				
$\bar{x}$	15.84[a]	63.58[a]	92.75[a]	56.21[a]
x min.	8.00	45.20	69.85	47.39
x max.	28.00	81.00	113.56	61.69
median	14.70	63.80	93.14	57.09
s	4.277	6.323	10.195	3.377
Set II - barrows				
$\bar{x}$	16.34[a]	61.59[a]	90.27[a]	55.38[a]
x min.	8.60	42.00	66.34	48.14
x max.	25.40	79.60	113.48	61.41
median	15.50	61.10	90.25	55.36
s	3.816	6.917	11.290	3.135

Means within a row different superscripts differsignificantly (P<0.05)

In agreement with the studies of Chiba (1992) and Daumas et al. (1998) it is concluded that the construction of separate regression formulae for each pig gender moderately increase the prediction accuracy. However, it does not apply to the inclusion of carcass weight in the prediction formula as it has no positive effect on the accuracy. In practice, the number of slaughtered gilts and barrows is approximately equal and the differences are therefore eliminated. As a consequence, special formulae for different genders are not commonly applied (Causer and Dhorn, 2003).

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