55th Annual Meeting of the European Association for Animal Production

Bled, Slovenia, September 5th – 9th, 2004

Determination of carcass quality in pigs

Pulkrábek, J., Pavlík, J., Vališ, L., Vítek M;

Research Institute of Animal Production, Pøátelství 815, 104 01, Prague 10 – Uhøínì ves, Czech Republic;

mail to:pulkrabek@vuzv.cz

**This study was supported by NAZV (QC 1231), Czech Republic*

Abstract

To evaluate the predictive ability of different carcass traits, the data of 126 pig carcasses from common pig operations in the Czech Republic were analysed. The relationships between different carcass measurements and the carcass lean meat proportion determined on the basis of simplified dissections were investigated.

As expected, the correlation between carcass weight and lean meat proportion was negative. However, a relatively low correlation coefficient indicates the ability of currently used final hybrids to produce heavier carcasses with still a high proportion of lean meat. High correlation coefficients r_1 = 0.82 ± 0.052 and r_2 = 0.83 ± 0.050 were determined for lean meat proportions estimated by regression equation RG1 and RG2, respectively. A similar predicative ability of both the equations RG1 and RG2 is evidenced by practically identical estimates of lean meat proportions 54.58 ± 0.365 and 54.63 ± 0.331 %, respectively. High correlations with the dissection-determined lean meat proportion were generally observed in case of fat thickness measured at different points. Particularly it refers to the average value of the three fat thickness measurements (FS) (r = -0.77 ± 0.058). Based on these results it seems appropriate that this trait should be further investigated in relation to pig carcass quality estimation. Only low correlation coefficients were observed for the traits characterising carcass length. Therefore, quality differences among carcasses of the currently used pig final hybrids cannot be determined using these measurements.

Key words: pig, carcass, measurement, carcass dissection, correlation

Final products of pork producers have for years been assessed on the basis of quantitative traits such as animal live weight or carcass weight. A quality-based evaluation of carcass reflecting the ratio of produced meat and fat was usually rather inaccurate. For this reason, a number of auxiliary simple measurements were used.

A significant improvement was reached after the introduction of objective classification methods based on estimating lean meat proportion in whole carcasses by different approaches and apparatuses. Basic information is given in the reports of Branscheid et al. (1987) and Engel and Walstra (1991). In the Czech Republic the problem was first studied by Pulkrábek et al. (1994) and later by Matoušek et al. (1995), Pulkrábek et al. (1999) and Pulkrábek et al. (2000).

The objective of the present study was to analyse the predicative ability of some measures earlier used for the evaluation of pig carcasses and two regression equations used for estimation of lean meat proportion in carcass. The obtained results were compared with the lean meat proportion determined by detail analyses of evaluated carcasses.

Material and methods

Totally 126 pig carcasses were included in the analysis. The used animals were fattened under conditions common in pig operations in the Czech Republic. The animals were final hybrids from crossbred Large White x Landrace sows sired by purebred or crossbred boars imported from Belgium, the United States and Great Britain.

Immediately after slaughter, following measurements were recorded:

- M_1 value, i.e. muscle depth in mm measured 70 mm from the line of the splitting cut between 2^{nd} and 3^{rd} ribs (counted from the last rib towards cranium)
- S_1 value, i.e. fat thickness including skin in mm measured at the same point as M_1
- M_2 value, i.e. muscle depth in mm measured in the lumbar area as the shortest distance between the dorsal edge of the vertebral canal and the cranial edge of *musculus gluteus medius*
- S_2 value, i.e. fat thickness including skin in mm measured in the lumbar area at the point of the lowest thickness above the middle part of *musculus gluteus medius*

  With the use of these measurements, following regression equations were used to estimate carcass lean proportion:
  - regression equation RG 1

    $y_1 = 81.8909 + 0.2006M_1 – 1419144 \ln S_1$
  - regression equation RG 2

    $y_2 = 76.6722 – 1.0485M_2 + 0.000794M_2^2 – 0.002884 S_2^2 + 9.0151 \ln (M_2 / S_2)$
- carcass length 1 (CL1) – from the cranial edge of pubic symphysis *(symphysis pelvina)* to the cranial edge of the first cervical vertebrae (*atlas*)
- carcass length 2 (CL2) - from the cranial edge of pubic symphysis *(symphysis pelvina)* to the cranial edge of the first rib *(costa I)*
- number of thoracic and lumbar vertebrae
- fat thickness I (FT I) – above the first thoracic vertebra
- fat thickness II (FT II) – above the last thoracic vertebra
- fat thickness III (FT III) – above the first sacral vertebra
- fat thickness (FT) – average of the three measurements

The values M_1, S_1, M_2 and S_2 were measured using the FOM apparatus.

Carcass muscle proportion was determined on the basis of the simplified detailed carcass analysis. This trait is considered the most accurate estimate of pig carcass value.

To evaluate existing relationships, correlation coefficients (r) were calculated between different carcass measurements and lean meat proportion determined by detailed carcass dissections.

Results and discussion

Carcass measurements and carcass lean proportions estimated by different regression equations are shown in Table 1. The mean carcass weight (90.5 kg) and the carcass lean meat proportion estimated by dissections (55.37 %) were slightly higher than the averages reported by Václavovský et al. (1997).

Similar results were reached when estimating lean meat proportion by two different equations. The difference between the results obtained using RG1 and RG2 was only 0.05 %. Such a difference is in agreement with that reported by Pulkrábek et al. (2000).

The ability of different carcass measurements to estimate carcass lean meat proportions is given in Table 2 summarising correlations between carcass traits and the lean meat proportion determined by dissections. The correlation coefficient determined for carcass weight confirmed the tendency towards decreasing lean proportion with increasing carcass weight. However, the value of this coefficient was rather low indicating that the currently used type of final hybrids may be able to produce heavier carcasses with quite a high lean meat proportion. Particularly for pig producers this would be of great importance due to the positive effect on the production efficiency (Pavlík, 1993).

The correlation coefficients between carcass lean proportions estimated by both regression equations (RG1 and RG2) and the lean proportion determined on the basis of carcass dissections were similar and in both cases exceeded 0.80. This value is usually considered a limit when determining reliability for these predictive equations. It is also interesting that the lean meat proportion was more accurately predicted by fat thickness than muscle depth. While the correlation coefficients for S_1 and S_2 were -0.81 and -0.78, respectively, the correlation coefficients found for M_1 and M_2 were 0.25 and 0.31, respectively.

The measurements of carcass length and the number of thoracic and lumbar vertebrae were only lowly correlated with the carcass lean meat proportion. The observed correlation coefficients ranged from r = 0.00 to r = -0.12. These traits used to be discussed in the past when the meaty type of pigs was not as explicitly differentiated as it is at present. At that time, longer carcasses of Landrace pigs were related to a higher meat yield (Pavlík, 1985). It was clearly confirmed that these measurements were in no significant relationship with the parameters of pig carcass quality in the currently used pig types.

The correlations between the values of fat thickness measured at different points (FT I, FT II and FT III) and the carcass lean meat proportion were similar to the correlations found for the S_1 and S_2 fat thickness values used in the regression equations. All the observed correlation coefficients were high and negative. The highest correlation coefficient r = -0.77 was calculated for the average fat thickness (FT). Based on these results it is suggested that further investigations should be focused on the utilisation of this trait for the estimate of pig carcass quality.

Table 1: Carcass traits

Trait	$\bar{x}$	s
Carcass weight (kg)	90,5	10,227
Carcass lean meat proportion determined by dissection (%)	55.37	0.385
Carcass lean proportion estimated by RG1 (%)	54.58	4.098
Carcass lean proportion estimated by RG2 (%)	54.63	3.716
S_1	17.4	4.554
M_1	64.3	6.851
S_2	18.5	5.353
M_2	74.1	5.392
Carcass length 1 (mm)	988.3	41.570
Carcass length 2 (mm)	833.9	33.180
Number of thoracic and lumbar vertebrae	21.5	0.597
Fat thickness FS I (mm)	36.3	5.066
Fat thickness FS II (mm)	22.0	4.935
Fat thickness FS III (mm)	18.9	5.570
Fat thickness – average (mm)	25.7	4.497

Table 2: Relationships between carcass traits and lean meat proportion determined by dissections

Trait	lean meat proportion determined by dissections
Carcass weight (kg)	-0.25
Carcass lean proportion estimated by RG1 (%)	0.83
Carcass lean proportion estimated by RG2 (%)	0.82
S_1	-0.81
M_1	0.25
S_2	-0.78
M_2	0.31
Carcass length 1 (mm)	-0.12
Carcass length 2 (mm)	-0.08
Number of thoracic and lumbar vertebrae	0.00
Fat thickness FS I (mm)	-0.67
Fat thickness FS II (mm)	-0.59
Fat thickness FS III (mm)	-0.73
Fat thickness – average (mm)	-0.77

References

Branscheid, W., Sack, E., Scholz, W. (1987): Apparative Klassifizierung von Schweineschlacht - körpern. Marktprobleme und Wege zu ihrer Lösung. Züchtungskunde, 59, 430 - 442.

Engel, B., Walstra, P. (1991): A simple metods to increase precision or reduce expense in regresion experiments to predict the proportion of lean meat of carcasses. Anim. Prod., 53, 353 - 359.

Matoušek V., Kernerová N.,Václavovský J., Vejèík A.(1995): Aparativní tøídìní jateèných tìl hybridních prasat. Sborník Jihoèeské university zemìdìlské fakulty, Èeské Budìjovice, zootechnická øada, 1 - 12.
Pavlík J. (1993): Kvantifikace hlavních biologických vlivù pùsobících na ekonomiku výkrmu prasat. Živoèišná výroba, 38, 567 – 573.
Pulkrábek J., Pavlík J., Wolf J. (2000): Estimation of lean meat content in pig bellies. Wageningen Pers EAAP, 332.
Pulkrábek, J., Fiedler, J., Smital, J., Houška, L., Adamec, T. (1994): Podíl tkání v jateèném tìle u plemen prasat chovaných v Èeské republice. Živoèišná výroba, 39, 743 - 751.
Pulkrábek, J., Pavlík, J., Smital, J.(1999): Progresive tendency of lean- meat percentage in carcasses of pigs in the Czech republic, Scientia Agriculturae Bohemica, 30, (3): 231 -237.
Václavovský J., Vejèík T., Kernerová N.(1997): Kvalita jateèných tìl hybridních prasat z pohledu EUROP - systému. Sborník referátù z mezinárodní konference AGROREGION 97, Èeské Budìjovice, 1997, 183 -184.