ESTIMATING OF THE CONTENT OF MAIN MEATY PARTS IN THE PIG CARCASS DEPENDING ON SELECTED CHARACTERISTICS

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Abstract

The aim of the work was to estimate the content of main meaty parts (MMP) in the pig carcass. The group of 42 carcasses was selected with regards to the representative lean meat content and equability of sex. All measurements were done on the left carcass half. One day after slaughter were all carcasses divided into primal cuts and the content of MMP has been determined in the amount of 53.78 %. The average lean meat content was 57.23 % and the average carcass weight 93.5 kg. In the first model was calculated the regression formula using the fat thickness and meat thickness measured with the FOM: Y = 58.18877 – 0.66022S * 0.08448M. The RMSE reached 1.63 and the correlation coefficient 0.91. The second model is using three most correlative characteristics (concerning the content of MMP) and the following regression formula was worked out: $Y = 64.54473 - 0.14908S_1 - 0.22948ZPS_1 - 0.11336\ ZPS_2$. (RMSE = 1.86; r = 0.88). Both regression formulae fulfil the statistical requirements for the accuracy of the estimation.

Keywords: Pig carcass composition, main meaty parts, carcass value

The carcass value is determined by many characteristics. Some of them are used in practice. The most important characteristic of the carcass is the lean meat content which serves as the main carcass grading criterium in the SEUROP-system (Hulsegge et al. 1994; Pulkrábek et.al. 2004).

Except this main criterium are very useful also other carcass characteristic. Very important and used in practice is the content of the main meaty parts (MMP). In the Czech Republic it means the content of ham, loin, shoulder and neck (Šafránek, Pavlík, Šiler, 1977). These important parts have the main share on the whole carcass value.

Many authors describe the content of MMP as one of the most important carcass characteristics. The described values show differences from 53.01 to 54.42% depending on the breed and hybrid combination (Bučko et al. 2006a; Pulkrábek 2006). Differences are also significant between gilts and barrows as describe Kernerová et al. (2006); Bučko et al. (2006b); Matoušek et al. (2004). A lower rate of the MMP content found out Kernerová et al. (2002) – only 48.54%.

For the correct use of the content of MMP as a valuable carcass characteristic it is necessary to have a quick and objective method to determine this characteristic. Analogical regression formulae (as for the lean meat content in the whole carcass) used for the estimation of the share of MMP are already needed (Pulkrábek, Pavlík, Smital, 1997).

Material and methods

A set of 42 slaughter pigs was analysed. The pigs were fattened under conditions common in the Czech Republic and selected in standard slaughter conditions with regard to representativity of the selected sample. The ratio of gilts and barrows was 1:1, the average carcass weight and average lean meat content corresponded with the average values of the whole slaughter pig population. Also as required in the condition of the SEUROP-system, the carcass weight ranged from 60 to 120 kg.

Following traits were recorded:

45 minutes *post mortem*:

- thickness of fat and skin (S) between the second and third last rib, 70 mm from the midline (P_2) – measured with the FOM device
- thickness of muscle (M) between the second and third last rib, 70 mm from the midline (P_2) – measured with the FOM device
- thickness of fat and skin with the ZP method (ZPS_1) and meat (ZPM) and the thickness of fat with skin on the cranial end of the mesogluteus - (ZPS_2)
- thickness of the dorsal fat in the midline on three different places (S_1,S_2,S_3) – above the second thoracal vertebra, above the last thoracal vertebra and above the first sacral vertebra
- carcass weight

two carcass lenghts – from pubic symphysis to the first cervical vartebra ($DJUT_1$), and from pubic symphysis to the first rib ($DJUT_2$)

One day after slaughter were all carcasses divided into primal cuts according to the czech method (Beneš, 1995). All primal cuts were weighed and the content of the main meaty parts (MMP) was worked out.

All results and regression formulae were computed using the SAS system (SAS Institute Inc., 2001).

Results and discussion

Basics statistics for the measured values are given in Table 1. For estimating the MMP content were tested two regression models using selected charasteristics. For a satisfactory accuracy of the estimation formula were also observed the values root mean square error (RMSE; s_e) and the correlation coefficient (r).

MODEL I

The first model is based on the measurements S and M (FOM). These two parameters are standardly measured on the slaughter line during the grading process.

The following formula was constructed for the prediction of the MMP content:

$$\mathbf{Y = 58.18877 - 0.66022*S_{FOM} + 0.08448*M_{FOM}} \quad \mathbf{(1)}$$

$$\mathbf{(r = 0.91; s_e = 1.63)}$$

Where:

Y – content of MMP (%)

S_{FOM} – fat thickness measured on the left half at P_2 (mm)

M_{FOM} – muscle thickness measured on the left half at P_2 (mm)

The accuracy of the prediction was evaluated on the basis of the coefficient of correlation (r) between the MMP content estimated by the use of the prediction formula and the real MMP content determined by the dividing process. This coefficient is quite very high (0.91), and also the

MODEL II

For the second model were chosen three of the others measured parameters. These parameters were selected depending on their correlation with the real MMP content. The values for the correlation coefficients shows Table 2.

The lowest value of the correlation coefficient showed the muscle thickness ZPM – only 0.18. Slightly higher value reached it for the lenghts $DJUT_1$ and $DJUT_2$ (-0.33; -0.34). Compared to that the highest value reached the characteristics ZPS_1, ZPS_2 and S_1 – (-0.83; -0.80; -0.80).

Depending on this highness of the correlation coefficient were these three characteristics chosen as the regressors for the second model. The following formula was constructed in the second model:

$$\mathbf{Y = 64.54473 - 0.14908*S_1 - 0.22948*ZPS_1 - 0.11336*ZPS_2} \quad \mathbf{(2)}$$

$$\mathbf{(r = 0.88; s_e = 1.86)}$$

Where:

Y – content of MMP (%)

S_1– thickness of the dorsal fat in the midline above the second thoracal vertebra (mm)

ZPS_1 – thickness of fat measured according to the ZP-method

ZPS_2 – thickness of fat measured above the cranial end of the mesogluteus

Table 1. Basic statistic parameters of the measurements

Carcass characteristic	Statistical parameter			
	$\bar{x}$	x_{min}	x_{max}	s
S_{FOM} (mm)	14.79	7.00	30.00	4.892
M_{FOM} (mm)	63.38	53.00	81.00	6.347
Car. weight (kg)	93.50	69.38	116.62	11.551
ZPS_1 (mm)	13.70	4.50	37.80	6.634
ZPS_2 (mm)	24.28	7.50	43.10	7.737
ZPM (mm)	75.62	49.80	92.70	7.797
S_1 (mm)	32.65	15.10	54.70	7.834
S_2 (mm)	20.26	6.90	38.70	7.037
S_3 (mm)	14.88	4.30	41.60	7.414
$DJUT_1$ (cm)	100.00	91.00	110.00	4.261
$DJUT_2$ (cm)	85.00	80.00	92.00	3.406
MMP (%)	53.78	45.02	60.26	3.742

Table 2. Correlation between the MMP content and other measured characteristic

Carcass characteristic	r
Carcass weight (kg)	**- 0.62**
ZPS_1 (mm)	**- 0.83**
ZPS_2 (mm)	**- 0.80**
ZPM (mm)	**0.18**
S_1 (mm)	**- 0.80**
S_2 (mm)	**- 0.79**
S_3 (mm)	**- 0.74**
$DJUT_1$ (cm)	**- 0.33**
$DJUT_2$ (cm)	**- 0.34**

Just as in the first model, the accuracy of thr regression formula was characterised using the RMSE and the correlation between the real and the estimated content of the MMP. As well as in the first model is the correlation very high (r = 0.88) and the RMSE satisfactorily low (s_e = 1.86).

Both regression formulae for the MMP content estimation have good accuracy. The regressors used in the two models are very easy measurable in common slaughter conditions, especially the first model use only the parameters standardly measured by the carcass grading process. For larger use in practice it should be verified on a bigger sample.

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