

# The Equation for Prediction of Lean Meat Percentage by Hennessy Grading Probe in Croatia

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## Summary

The dissection experiment was carried out on 120 swine carcasses slaughtered in several Croatian slaughterhouses. The carcasses were selected on the basis of rather large sample of backfat measurements obtained by method for lean percentage prediction approved in Croatia, regardless of the carcass weight. After 24 hours of cooling, left sides of the carcasses were dissected according to EU reference methods (Commission Regulation No 3127/94; Walstra and Merkus, 1996). Dissected lean percentage was assessed according to the Commission Regulation (EC) No 1249/2008. The aim of the present study was to construct a formula for online classification of the pig carcasses by Hennessy Grading Probe (HGP), an approved referent device in Republic of Croatia. The formula for HGP device was assessed according to the prediction ability i.e. the standard error of prediction-RMSEP (root mean square error of prediction) that is estimated using cross-validation “leave-one-out”. The obtained equation was:  $M\% = 59.603676 - 0.864 * S + 0.192 * M$ , having RMSEP 2.21 that is satisfactory according to European regulations. Mean values of the fat depth and muscle thickness in the data set used for the construction of the formula was  $16.41 \pm 4.11$  mm and  $61.19 \pm 9.05$  mm, respectively. Mean lean percentage obtained by dissection was  $57.17 \pm 4.86\%$  that did not differ statistically from the lean percentage estimated by the formula which was  $57.72 \pm 4.38\%$ .

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## Key words

pigs, lean meat percentage, prediction, HGP probe

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## Aim

As prescribed in EU regulations (Commission Regulation No 1249/2008), for the construction of sufficiently precise formula to be used in prediction of lean percentage in pig carcasses, it is necessary to conduct a comprehensive dissection experiment. This experiment should be performed on at least 120 pig carcasses. The pig carcass classification system should be based on the objective “on-line” methods that are tested against the dissection results; the criterion of accuracy being RMSEP or root mean standard error of prediction that should be less than 2.5 when estimated by “leave-one-out” cross-validation method (Engel et al. 2006; Pulkrabek et al. 2006; Šprysl et al. 2007; Vitek et al. 2008). Since in Croatia only two points method of pig carcass lean percentage estimation was validated in such manner, the aim of this paper was to do the same for the instrumental method using Hennessy Grading Probe device (HGP-GP7).

## Material and methods

This investigation was performed on 120 swine carcasses selected in accordance with backfat measures obtained by “Two Points”- method, approved in Croatia, namely: fat thickness - S (mm) measured as the minimum thickness of subcutaneous fat (with skin) at the split of the carcass, above *m. gluteus medius* and muscle depth measured as the shortest connection between the cranial end of the lumbar muscle and dorsal edge of the vertebral canal.

**Table 1.** Stratification of pig carcasses according to fat thickness

Class	Number of carcasses
≤ 11	30
12 – 14	30
15 – 17	30
≥ 18	30

There was no stratification according to the carcass weight. Pigs were slaughtered in several Croatian slaughterhouses. One day after slaughter left sides of the carcasses were dissected using an EU referent method (Walstra and Merkus, 1996). Four main parts (ham, shoulder, loin and ribs) were dissected into muscles, bones, intramuscular and subcutaneous fat with skin. The tender loin was taken into calculation as a separate part. The reference lean meat percentage was calculated by equation from the current European regulations (No 1249/2008):

$$Y^{**} = 0.89 \times 100 \times \frac{\text{weight of tender loin} + \text{weight of lean (fascia included) in shoulder, loin, ham and belly}}{\text{weight of tender loin} + \text{weight of dissected cuts}}$$

Before the dissection, backfat thickness and muscle depth were measured using HGP – GP7 device, between 2<sup>nd</sup> and 3<sup>rd</sup> rib, 70 mm laterally from the midline. On the basis of the data obtained in such manner, the equation for lean percentage estimation by HGP-GP7 device was obtained using MLR procedure from program The Unscrambler v9.7 (CAMO Software AS, 2007).

## Results and discussion

Measurements relevant for the estimation of lean percentage in pig carcasses collected at the slaughter line are presented in Table 1. On the basis of these, the prediction equation was obtained.

**Table 2.** Measures taken at the slaughter line for the purpose of setting the equation for lean percentage estimation (n=120)

Trait	Mean	Standard Deviation
Cold carcass weight (kg)	88.81	12.98
Fat thickness for Two Points method (mm)	15.14	5.25
Muscle depth for Two Points method (mm)	72.97	7.88
Fat thickness by HGP device (mm)	16.41	4.11
Muscle depth by HGP device (mm)	61.19	9.05
Predicted lean by Two Points method (%)	58.06	4.30
Dissected lean by EU reference method (%)	57.17	4.88

The calibration formula is assessed according to the prediction ability i.e. the standard error of prediction (RMSEP). The RMSEP is the root of the average squared difference between the actual lean percentage and its prediction. The RMSEP is estimated using so called leave-one-out cross-validation. In addition, all of the outliers were included in the calculation of RMSEP. On the basis of such calculations following prediction equation was obtained:

$$M\% = 59.603676 - 0.864 * S + 0.192 * M;$$

The resulting regression line and its main parameters are presented in Figure 1.

This equation satisfy the RMSEP criterion prescribed in European regulations as it was obviously less than 2.5, precisely it was 2.205729. Mean leanness obtained by dissection was 57.17 ± 4.86%; it did not differ statistically from the leanness estimated by the formula that was 57.72 ± 4.38%.

## Conclusions

In European Union classification of pig carcasses that prescribes a method for leanness determination as a basis for device calibration, as well as methods for its estimation, has been used for a long time. Although EU referent method, prescribed by Commission Regulations, is time consuming and laborious, it is necessary for calibration of methods that are carried out through a number of statistical operations. Although Croatia is not yet an EU member, and thus EU laws are not binding, both methods

were prepared according to the EC regulation. This short communication has described a procedure for obtaining a formula for “one point” method of carcass leanness estimation, which is performed by HGP-GP7 device.

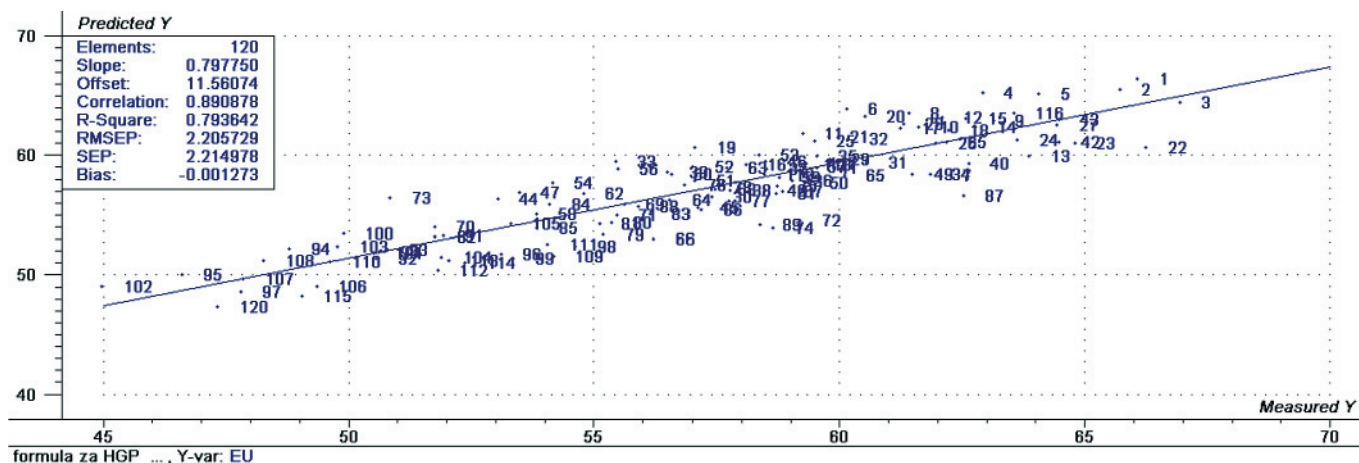


Figure 1. Regression line and the parameters of the prediction equation

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