

ELABORATION OF THE REGRESSION EQUATION FOR THE ESTIMATION OF THE MEAT CONTENT IN SWINE CARCASSES USING A NEW POLISH OPTIC-NEEDLE APPARATUS IM-03

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Introduction

The investigations associated with the classification of swine carcasses in the EUROP system were initiated in Poland in 1993 when the Danish ultrasound apparatus ULTRA-FOM 100 was applied for the first time (Borzuta et al., 1998). However, it was only when Poland formally became the member of the European Union (EU) that scientific research gained pace and, from among a considerable number of apparatuses available on the market, three devices fulfilling the EU requirements were selected. These included: AUTOFOM, ULTRA-FOM 300 and CGM (Borzuta et al., 2004). However, it soon turned out that, due to the specific structure of slaughterhouses in Poland, a cheaper appliance, suitable for work in small and medium slaughterhouses, was needed in Poland. That is why, soon a new optic-needle device IM-03 was elaborated with the structure different from the equipment of this type employed so far. The objective of this research project was to develop a regression equation for the estimation of the meat content in swine carcasses with the assistance of the above-mentioned new device.

Material and Methods

The investigations were carried out on 126 swine half-carcasses (69 sows and 57 hogs) selected on the basis of the natural selection procedure elaborated earlier (Causeur et al., 2006) and based on the analysis of variability of the biological material. Carcasses were measured on the slaughter line with using the IM-03 apparatus in three places: behind the last rib, between the 2nd and 3rd rib and between the 3rd and 4th rib, counting the ribs from the end. All the measurements were performed at the distance of 6 cm from the central carcass line, parallel to the line of cutting of the spinal column. Measurements were carried out by three experienced graders who changed every ten carcasses. Next, carcasses were transferred to a selected meat processing plant in the region of Wielkopolska, where ten trained butchers carried out dissection in accordance with the method of Walstra and Merkus (1996).

Results and Discussion

The determined mean meat content in the carcasses of the examined fatteners was 51.12%, while the weight of the carcass – 82.9 kg and these values were similar to the national mean (Lisiak et al., 2005). In the course of the analysis, it turned out that in order to achieve the required RMSE accuracy below 2.5, one measurement with the device was sufficient. The remaining variables were so strongly correlated with each other that their inclusion in the equation did not increase significantly the accuracy of the result. This allowed the authors to elaborate an equation containing only two variables: back fat thickness X_1 and the thickness of the LD muscle X_2 between rib 3 and 4. The estimation error RMSE is 2.326, determination coefficient R^2 0.885 and the mean estimated meatiness of the population 51.12%. It is very important to check the equation on the basis of the obtained residues, i.e. differences between the observed and predicted variables (Causeur et al., 2006). Figure 1 presents a probabilistic curve of meatiness assessment with the new device. The estimated meatiness of individual swine carcasses is located close to the straight determined for the real meatiness resulting from the performed dissection. No outliers observations were recorded, i.e. results characterised by a high estimation error (Causeur et al., 2006). This is also apparent on the residue diagram, i.e. differences between the dissection and estimated meatiness (Fig. 2). The uniform distribution of these residues above and below the zero point indicates the appropriate distribution of the estimated values of the regression equation elaborated for this device.

With regard to the estimation error, the elaborated regression equation is comparable not only with the apparatuses used in Poland but also with those employed in other EU countries (Borzuta et al., 2004; Olsen et al., 2007; Daumas et al., 1998).

Conclusions

1. The linear regression equation elaborated for the IM-03 device to estimate meatiness of swine carcasses takes into account two measurement traits and is characterised by the estimation error RMSE = 2.326 and determination coefficient of $R^2 = 0.885$.
2. No outliers from the examined population were found and the analysis of residues revealed good fit of the variables in the equations to the real results.

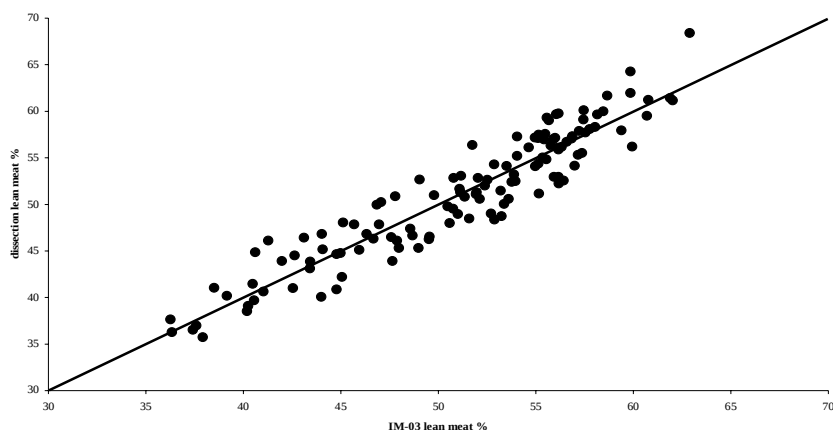


Figure 1. Relationship between calculated lean meat % by IM-03 and dissection lean meat

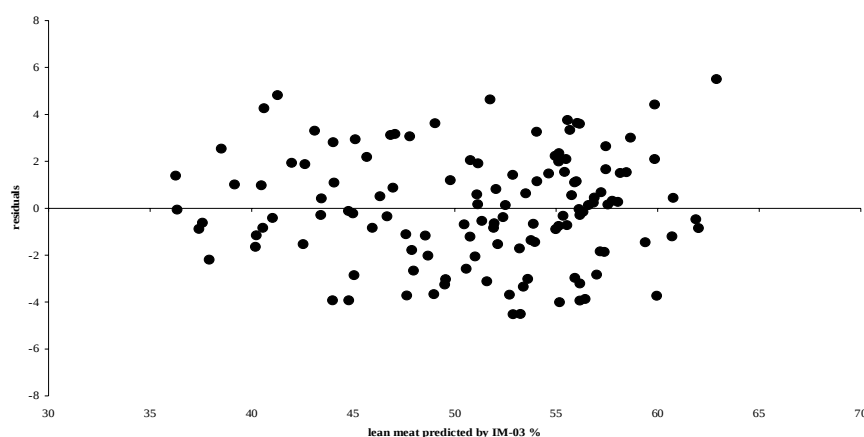


Figure 2. Variability of residual calculated for regression equation of IM-03

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