A COMPARATIVE ANALYSIS OF PRIMAL CARCASS CUTS ESTIMATION ACCURACY PERFORMED USING AN OPTICAL-NEEDLE DEVICE AND BASED ON CHOSEN MANUAL PORK CARCASS MEASUREMENTS

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I. INTRODUCTION

The pork carcass classification system SEUROP introduced in Europe has led to such a high level of lean meat content in pork carcasses that according to many scientists and practical users, it should no longer be continued [3,5]. Too high lean meat content brings a risk to important meat quality traits like meat tenderness, juiciness and palatability [4]. In many EU countries the average lean meat content has reached approx. 58% and there is no need to increase this parameter [6]. As a consequence this parameter is no longer needed to make a settlement between the supplier and the slaughterhouse. In some countries e.g. Denmark and Germany an additional trait has been used for many years now to make the settlements between the suppliers and slaughterhouses i.e. the basic carcass cuts weight estimated using the Auto-fom device [2]. The aim of the study was search for the other methods of basic carcass cuts weight estimation using e.g. manual optical-needle devices or simple carcass measurements and a comparative analysis of both methods.

II. MATERIAL AND METHODS

The experiment was performed on 221 fatteners; half were gilts and half castrates, with the average warm carcass weight of 94.73 kg and 55.66% average lean meat content. The lean meat content was estimated on warm carcasses using the optical-needle device IM-03 with regression equations [1] in which the back fat thickness and LD muscle thickness measured on the 3/4 rib from the carcass end, 6 cm from the cutting line, was included. Next, was 22 manual carcass measurements from the outside such as length, circuit, width and thickness of different carcass levels and sections were taken with 5 mm accuracy. After chilling the right carcasses were commercially cut into main cuts and then the tissues were segregated. All the basic cuts and the cut off tissues were weighed on an electronic scale with 1 g accuracy. Based on the obtained results the regression equations were developed to estimate the weight of the basic carcass cuts. The progressive linear regression analysis was used to develop the regression equations.

III. RESULTS AND DISCUSSION

The calculated regression equations for estimating the weight of carcass cuts are of the highly significant F index. The index is a few times higher in each carcass cut when estimated using 9 to 13 manual measurements than using the IM-03 device (Table 1). This is due to adequate differences in the determination factor that ranges from approx. 0.6 to 0.8 depending on the cut kind in manual measurements. In the case of the optical-needle method the determination factor ranges from 0.16 to 0.49. The estimation error RSD was also lower in the manual measurements method by 475g in ham, by 198 g in shoulder, by 55g in loin, by 108g in neck and 186 g in belly weight. This means that the error share in the cuts' weight is also a few points higher in the optical-needle device method and ranges from 9.85 to 13.30 % of these carcass cuts weights (Table 2). It seems that estimating carcass cuts weights using the device is less precise and it is recommended to improve the manual measurements techniques with elements of automation.

Table 1. Characteristics of regression equations estimating the mass of primary cuts using an optical-needle device and the manual dimensions of the main carcass

Estimated main cut	Method of estimation	Number variables in equation	F	P	R²	RSD (g)
Ham	IM-03	2	2.21	0.00	0.36	1107
	manual measurements	11	11.20	0.00	0.80	632
Ham 4D without bones and backfat with skin	IM-03	2	2.21	0.00	0.44	968
	manual measurements	10	10.20	0.00	0.63	798
Shoulder	IM-03	2	2.21	0.00	0.32	714
	manual measurements	9	9.20	0.00	0.65	516
Shoulder 4D without bones and backfat with skin	IM-03	2	2.21	0.00	0.32	530
	manual measurements	9	7.20	0.00	0.56	434
Loin	IM-03	3	3.21	0.00	0.49	538
	manual measurements	13	13.20	0.00	0.61	483
Neck	IM-03	2	2.21	0.00	0.22	397
	manual measurements	10	10.20	0.00	0.60	289
Belly	IM-03	2	2.21	0.00	0.16	602
	Manual measurements	13	13.20	0.00	0.62	416

Table 2. Contribution of the RSD estimation error in the total weight of main cuts of half carcass

Main cut	Average weight, g	SD	% contribution of RSD error in weight of cut	
			IM-03	Manual measurements
Ham	11238	1375	9.85	5.62
Ham 4D without bones and backfat with skin	7906	1283	12.24	10.09
Shoulder	6828	859	10.46	7.56
Shoulder 4D without bones and backfat with skin	4441	637	11.93	9.77
Loin	4759	746	11.30	10.15
Neck	3341	445	11.88	8.65
Belly	4527	653	13.30	9.19

IV. CONCLUSIONS

The research showed that the developed regression equations to estimate carcass cuts weight were more accurate when based on the carcass dimension measurements than when using an optical-needle device for measuring backfat and LD muscle thickness. This fact was confirmed by the higher determination factor and lower estimation error. The research results might be useful in constructing an automatic device for a modern pork carcass classification system that would use carcass dimension measurements described within this paper.

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