DETERMINATION OF VARIANCE IN PIG CARCASS COMPOSITION WITH REGARD TO DIFFERENT LEVELS OF LEAN MEAT PROPORTION*

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Carcasses of 38 gilts and 38 barrows were dissected into commercial cuts and further separated into individual tissues. The used animals were final hybrids originating from common commercial pig operations. The fattening scheme met the requirements for representativeness of data used for derivation of regression equations when estimating the lean proportion (Branscheid et al., 1987). The carcasses were classified according to the proportion of carcass lean. This proportion ranged from 40.0 to 65.0% in individual classes, while the class interval was 5%. Different lean proportions appeared to be connected with a considerable difference in percentages of individual cuts. A similar tendency was found in the distribution of tissues between the cuts, especially in fat and lean proportions of both fatty and meaty cuts. To determine these differences, regression curves were estimated using the least square method and respective equations were derived. For example, the change of meaty cuts proportion with regard to different carcass lean proportion is characterized by the following equation:

$y = 29.19 + 0.1314x + 0{,}004749x^2$

Similarly, the equation for the lean proportion in these carcass cuts is following:

$y = 8.80 + 2.143x - 0.015433x^2$.

pig; lean proportion; carcass composition

INTRODUCTION

The evaluation of pig carcass according to the SEUROP system currently being introduced in the Czech Republic will presumably improve the relationship between producers and the processing industry. Eventually, the position of consumer will be affected as well.

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Relationships between the subjects mentioned above were also studied by P o u r (1999). The method of pig carcass evaluation according to lean proportion is based on the studies of S a c k (1982), B r a n s c h e i d et al. (1987) and O s t e r et al. (1987). These studies were focused mostly on the development of methods estimating lean proportion in the entire carcass.

The application of mentioned evaluation methods in the Czech Republic was investigated by P u l k r á b e k et al. (1992), V r c h l a b s k ý , P a l á s e k (1992), and M a t o u š e k et al. (1995). We may also mention Slovak authors D e m o , P o l t á r s k y (1994) and L a g i n et al. (1995).

The objective of the present study was to determine the variance in individual cuts of pig carcass and in the tissue distribution between these cuts in relationship to the different proportion of lean in carcass. Our experiment was based on current conditions of pig fattening in the Czech Republic.

MATERIAL AND METHODS

Thirty eight gilts and 38 barrows were used in the trial. The final hybrids originated from common commercial operations specialized on pig fattening. The fattening scheme met the requirements for representativeness of data used for derivation of regression equations when estimating the lean proportion (B r a n s c h e i d et al., 1987).

After slaughter, all carcasses were divided into individual cuts which were further dissected into lean, bone, fat and skin.

For purposes of further analysis, the cuts were grouped according to the prevailing tissue as follows:
- meaty cuts (neck, loin, shoulder and ham)
- fatty cuts (belly, ventral part of belly, cheek, trim)
- fat (fat and skin from neck, loin, shoulder and ham, flare fat)
- bony cuts (head, shank, feet, *os sacrum*).

The weight of individual groups is expressed as percentage of carcass weight.

The animals were classified according to the proportion of carcass lean. This proportion ranged from 40.0 to 65.0% in individual classes, while the class interval was 5%.

Results obtained within the groups of cuts and classified according to lean proportion were statistically analyzed. To determine the tendency in carcass composition differences, regression curves were estimated using the least square method. The evaluation of the differences is based on the equations derived from these curves.

Records of the detailed dissection of individual cuts were also analyzed within the groups of cuts classified according to the prevailing tissue. In this case, lean, fat, bone, and skin weights are expressed as percentage of the respective group of cuts. This analysis describes the composition of the given cuts and completes information about previously mentioned differences in proportions of the groups of cuts.

Due to necessary conciseness only the equations derived from respective curves are given and the different percentages of the groups of cuts within individual classes according to lean proportion are discussed.

RESULTS AND DISCUSSION

To characterize the observed set of animals, average slaughter weights and carcass lean proportions are given. The obtained values were 108.4 ± 1.811 kg and 55.66 ± 0.741%, resp., for gilts, and 114.3 ± 2.265 kg and 51.91 ± 0.712%, resp., for barrows. The level of slaughter weight is similar to the average of the Czech Republic, which is in agreement with M a t o u š e k et al. (1995). Basic characteristics of the observed set of animals classified according to lean proportion are given in Table I.

Most animals were classified in the middle class (50.0–54.9% of lean). Towards both extreme classes the proportion of animals decreased. P u l k r á b e k et al. (1998) found similar relations in the proportion of pigs classified according to the slaughter weight. Castration affected meatiness of animals considerably. The proportion of barrows in the class with the lowest lean proportion was significantly higher than the number of gilts. The proportion of both gilts and barrows in individual classes changed with increasing lean percentage in carcass. In comparison with barrows, the proportion of gilts classified in the class with the highest lean proportion was considerably greater.

Proportions of cuts grouped according to the prevailing tissue are given in Table II.

Differences in the proportion of individual groups corresponded with the classification according to carcass lean proportion. Increasing lean proportion

I. Basic characteristics of pig carcasses classified according to lean proportion

Characteristic	Carcass lean proportion (%)				
	40.0 to 44.9	45.0 to 49.9	50.0 to 54.9	55.0 to 59.9	60.0 to 64.9
Proportion of animals (%)	6.5	15.8	38.2	30.3	9.2
Proportion of gilts (%)	20.0	33.3	44.8	65.2	71.4
Proportion of barrows (%)	80.0	66.7	55.2	34.8	28.6

II. Proportions of cuts grouped according to the prevailing tissue in classes with different carcass lean proportion

Proportion of cuts (% of carcass weight)	Carcass lean proportion (%)				
	40.0 to 44.9	45.0 to 49.9	50.0 to 54.9	55.0 to 59.9	60.0 to 64.9
	$\bar{x}$ / $s_{\bar{x}}$	$\bar{x}$ / $s_{\bar{x}}$	$\bar{x}$ / $s_{\bar{x}}$	$\bar{x}$ / $s_{\bar{x}}$	$\bar{x}$ / $s_{\bar{x}}$
Meaty cuts	43.93[a]	45.99[b]	49.84[c]	52.68[d]	55.03[e]
	0.938	0.520	0.348	0.391	0.709
Fatty cuts	25.29[a]	25.34[a]	24.14[a]	23.50[b]	22.72[b]
	0.679	0.376	0.252	0.283	0.513
Fat	19.65[a]	17.01[b]	13.68[c]	11.04[d]	9.24[e]
	0.791	0.439	0.294	0.330	0.598
Bony cuts	11.13[a]	11.66[a]	12.34[a]	12.78[b]	13.01[b]
	0.504	0.280	0.187	0.210	0.381

Means followed by different letters differ significantly ($P < 0.05$)

was connected with higher proportions of meaty cuts and lower proportions of fat and fatty cuts. Differences of means in individual classes for meaty cuts and fat were always significant. A similar tendency as for fat was found for fatty cuts but the differences of means were not significant. We may assume that decreasing lean proportion resulted in higher proportions of fat and fatty cuts. Proportions of bony cuts tended to change similarly as meaty cuts. However, the differences were rather small.

Generally, this study proves the necessity to classify pig carcasses according to lean proportion. In agreement with Vrchlabský, Palásek (1992) and Pour (1999), it is necessary to emphasize the introduction of this kind of carcass evaluation throughout the meat industry of the Czech Republic.

Values shown in Table II are further characterized by the equations of curves estimated using the least square method. The equations are as follows:

– proportion of meaty cuts

$y = 29.19 + 0.1314x + 0.004749x^2$

– proportion of fatty cuts

$y = 10.49 + 0.7059x - 0.008365x^2$

– proportion of fat

$y = 50.97 - 0.8197x + 0.002249x^2$

– proportion of bony cuts

$y = 2.23 + 0.2751x - 0.001611x^2$

Based on these equations we may determine the changes in individual groups of cuts for the interval 40.0–65.0% of lean in carcass:

– 15.7% increase of meaty cuts
– 3.7% decrease of fatty cuts
– 14.6% of fat
– 2.6% of bony cuts

Less known and in their extent less assumed are the differences in composition of individual cuts in relation to changing carcass lean proportion. These differences resulted from the detail carcass dissection. Their quantification is also based on equations derived from regression curves. According to our opinion, a different composition of individual cuts should be reflected in their classification or directly in their price. Above all, meaty and fatty cuts should be concerned. Their price should be determined according to the carcass class.

The equations, describing the proportions of different tissues in meaty cuts, are as follows:

– lean

$y = 8.80 + 2.1434x - 0.015433x^2$

– fat

$y = 73.34 - 1.9700x + 0.014114x^2$

– bone

$y = 17.86 - 0.1734x + 0.001319x^2$

It means that in pig carcasses with overall lean proportion ranging from 40.0 to 65.0% the proportion of lean in meaty cuts increases by 13.0%, the proportion of fat decreases by 12.2% and the proportion of bone decreases by 0.8%.

The equations for fatty cuts are as follows:

– lean

$y = 27.55 - 0.4227x + 0.014890x^2$

– fat

$y = 63.56 + 0.4842x - 0.018329x^2$

– bone

$y = 6.26 - 0.1388x + 0.002589x^2$

– skin

$y = 2.63 + 0.0773x + 0.000850x^2$

Between the carcasses with the highest and lowest lean proportion the differences in individual tissues of fatty cuts are extreme. Particularly, lean and fat proportions differed considerably (28.6 and 36.0%, respectively). Lean proportion ranged from one third to almost two thirds. A similar tendency was found in proportions of bone and skin (3.3 and 4.1%, respectively).

The equations for fat composition are as follows:

– fat

$y = 61.53 + 1.7225x + 0.025245x^2$

– skin

$y = 38.47 - 1.7225x + 0.A025245x^2$

In this case the proportion of fat and skin changed by 25.2%.

Finally, the composition of bony cuts in relation to carcass lean proportion was evaluated. The composition is characterized by the following equations:

– lean

$y = 39.11 - 0.610x + 0.007767x^2$

– fat

$y = 37.00 - 0.8734x + 0.006286x^2$

– bone

$y = 16.48 + 1.1475x - 0.010574x^2$

– skin

$y = 6.38 + 0.3800x - 0.003910x^2$

In this case the observed differences were lowest. In spite of that, with increasing carcass lean proportion the content of lean and bone in these cuts tended to increase and the content of fat and skin tended to decrease.

Mentioned changes in the composition of carcass and individual carcass cuts validate the effort to increase the level of pig carcass meatiness. It should be reflected in future measures taken in breeding and hybridization programs for pigs. It is in agreement with many authors, among others Matoušek et al. (1993).

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Kvantifikace změn jatečného těla prasat s ohledem na různý podíl svaloviny.

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U 38 prasniček a u 38 vepříků byl po jejich porážce uskutečněn jatečný rozbor, přičemž se postupovalo podle jednotlivých jatečných partií. Šlo o finální hybridy z běžných podmínek produkce jatečných prasat. Jejich výkrm odpovídal požadavkům na reprezentativnost vzorku pro tvorbu regresních rovnic při odhadu podílu svaloviny (Branscheid et al., 1987). Výsledky byly zpracovány při třídění podle podílu svaloviny v celém jatečném těle. Tyto třídy zahrnovaly rozmezí podílu svaloviny od 40,0 do 65,0 %, interval třídy byl 5,0 %. S ohledem na měnící se podíl svaloviny v celém jatečném těle se prokázala značná odlišnost v zastoupení jednotlivých partií v jatečném těle. Totéž se týkalo složení těchto partií, především pak podílu svaloviny

a sádla v masitých a protučnělých částech. Pro kvantifikaci těchto změn byly údaji dosaženými v jednotlivých třídách proloženy metodou nejmenších čtverců křivky a stanoveny příslušné rovnice. Tak např. změny v podílu masitých částí s ohledem na měnící se podíl svaloviny v celém jatečném těle charakterizuje tato rovnice křivky:

$$y = 29{,}19 + 0{,}1314x + 0{,}004749x^2$$

Podobně pro podíl svaloviny v těchto jatečných partiích to byla tato rovnice křivky:

$$y = 8{,}80 + 2{,}1434x - 0{,}015433x^2.$$

prase; podíl svaloviny; jatečná partie

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