COMPARISON OF INTRAMUSCULAR FAT CONTENT IN THE FIRST FARROWING GILTS AND IN THE FATTENING GILTS

PORÓWNANIE ZAWARTOŚCI TŁUSZCZU ŚRÓDMIĘŚNIOWEGO U LOSZEK PIERWIASTEK I LOSZEK TUCZNIKÓW

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ABSTRACT

The aim of the study was to compare the slaughter value and meat quality of the first farrowing gilts with normal fattening gilts. The study was carried out on 30 primiparous gilts (A) and 39 fattening gilts (B). Age of A gilts at slaughter was 371.03 days and that of B gilts was two times lower and attained 179.64 days. However carcass fatness of the younger B gilts was higher than of primiparous gilts ($P < 0.05$) and carcass lean content was high in both gilt groups. Meat characteristics were determined in longissimus lumborum muscle. Some differences between the compared gilt groups were stated in muscle colour, WHC, protein and intramuscular fat content. Higher IMF content was found in primiparous gilts (1.88 ± 0.50 versus $1.19 \pm 0.39\%$; $P< 0.01$).

KEYWORDS: primiparous gilts, fattening gilts, meat quality traits

DETAILED ABSTRACT

Tłuszcz jest ważnym składnikiem pożywienia i jego ilość i jakość może determinować wartość odżywczą produktu. Odpowiednia zawartość tłuszczu w mięsie (IMF) decyduje o jego smakowitości, jest też korzystnie związana z innymi cechami jakości mięsa takimi jak barwa i wodochłonność. Zatem ocena przydatności konsumpcyjnej mięsa loszek jednorazówek powinna też ujmować oznaczenie IMF. W doświadczeniu szczegółowej analizie poddano wartość rzeźną dwóch grup loszek – jednorazówek (ubijanych po odchowaniu pierwszego miotu – 30 sztuk) oraz tuczników ubijanych w wieku standardowym (39 sztuk). Po uboju przeprowadzono pomiary i rozbiór tusz według zasad obowiązujących w przemyśle mięsnym [26]. Dokonano ich oceny a także porównania szeregu właściwości mięsa na podstawie oceny fizykochemicznej mięśnia Longissimus lumborum. Jedym z najważniejszych elementów przeprowadzonej oceny było określenie zawartości tłuszczu śródmięśniowego przy użyciu półautomatycznego urządzenia do ekstrakcji ANKOM XT 10. Wyliczono też korelacje wewnątrzgrupowe między poziomem tłuszczu śródmięśniowego a innymi cechami tuszy i mięsa. Umięśnienie tuszy było ujemnie skorelowane z IMF. Natomiast barwa mięsa oraz wodochłonność były korzystnie skorelowane z IMF. Cechy takie jak zawartość białka i tłuszczu była ze sobą ujemnie skorelowane. Siła cięcia (twardość) była mniejsza przy większej zawartości IMF. W konsumenckiej ocenie sensorycznej smakowitość mięsa była istotnie skorelowana z IMF. Poziom tłuszczu kształtował się ogólnie na niskim poziomie i w mięsie loszek jednorazówek był istotnie wyższy niż u tradycyjnych tuczników i wynosił 1,88%.

INTRODUCTION

The fat is a very essential, with a high calorie content component of the food, necessary to the correct human feeding. However the excess of animal fat in diet can be a reason for circulatory system diseases. Therefore, for safe feeding, the content of animal fat should be under control.

Many environmental and genetic factors affect on the animal intramuscular fat (IMF) content. These factors depend on the breeder [3]; [5]; [12]; [18]. Such factors belong to them: age of animals at slaughter, kind and intensity of feeding, the way of fattening and treatment of pigs. Large influence on the fat content in meat have genetic factors concerned the breed of pigs [8]; [14]; [15] and the polymorphism of some genes connected with pig fatness [20]; [19].

The suitable level of the intramuscular fat has large affect on the meat taste and decides about the consumer preferences of which kind of meat or the given assortment to choose. Some authors suggest that when the intramuscular fat content will be on the level 2,0 - 3,0% [11]; [16], than meat will have optimum value of taste. The results of the other authors [2]; [6]; [7] show dependence between fat content and other estimation indicators of consumer opinion concerning meat quality.

The aim of research was the detailed analysis of the intramuscular fat content in two groups of gilts - primiparous gilts (slaughtered after rearing first litter) and fattening gilts slaughtered in standard age (at the body weight 100 - 110 kg).

MATERIAL AND METHODS

The experiment was carried out on 69 crossbreed gilts F_1 (Polish Landrace x Polish Large White) called primiparous gilts (group A, n = 30) and fattening gilts (group B, n = 39). Gilts (group A) after pregnancy, farrowing and rearing piglets (lactation 28 days) and dry up (14 days) were slaughtered. Fattening gilts were slaughtered at the live weight about 106 kg (group B). After slaughter the evaluation of carcass lean content with standard method by ULTRA-FOM 100 was made, carcass dissection was made according to meat industry rules [21]. Characteristics of meat quality was done on longissimus lumborum (LL) muscle. Value of pH_1 was measured by pH-meter (R. Mathäus) and pH_u was measured in meat-water slurry 48h after slaughter. Water holding capacity (WHC) was determined according to the Grau and Hamm filter press method [9] with modifications introduced by Pohja i Niinivara [22]. Drip loss recorded during stored was determined according to Honikel [10]. Colour of meat was determined by using spectrophotometer Spekol 11 [23] and colorimeter Minolta CR 310 gives L*, a*, b* according to CIE system [4]. Meat tenderness was determined by instrumental method by using Warner Bratzler attachment to the INSTRON 3342 [25]. Basic chemical components of meat were determined: water, total protein, intramuscular fat and ash content [1] and also fraction of soluble protein [17].

Obtained results were statistically elaborated. Significant differences estimated by using T test. Calculations were carried out using the computer programme STATISTICA 7.1 PL [24].

RESULTS AND DISCUSSION

Compared two groups of gilts were significantly differ of many factors like age, body weight, carcass tissue composition. The reason is that gilt from A group had farrowed and suckled piglets. It had an influence on the characteristics lean content and fatness of carcass and property of meat. Factor which especially differentiated these two groups of gilts was the body weight loss of primiparous gilts during lactation. It was made by output of energy and nutritious component for the milk production. It concern mainly decrease reserve of fat from body what is reason of higher lean and less fatty content in carcasses, than in carcasses from fattening gilts in the same body weight. These data are shown in Table 1.

Primiparous gilts were older twice than fattening gilts at slaughter and were 371.03 versus 179.64 day of life ($P < 0.01$). Live weight at slaughter and carcass weight was respectively 153.50 and 106.77 kg ($P < 0.01$); 123.10 and 85.07 kg ($P < 0.01$). Carcass lean content was high and similar in both of groups and approximated 53.36% in group A and 54.77% in B. Loin eye area was slightly bigger in group of primiparous gilts. Backfat thickness was significantly thinner ($P < 0.05$) in gilts A and approximated 2.01 cm versus 2.36 cm in gilts B.

Table 2 shows results concerning composition of characteristics of meat quality both group of gilts.

Table 2 shows the decrease of meat pH_1 value in the first hour after slaughter to the level 6.46 and 6.44 pH units. It indicated very reasonable and correct course of glycolytic processes responsible for good meat quality. Drip loss was on the low level and there were not significant differences between groups (2.21 and 2.79% of sample weight). Water holding capacity (WHC) was significant differ in two groups of gilts ($P < 0.01$). Meat of prmiparous gilts had more loose water (23.97% versus 19.74%) although it was not meat with visible exudation.

In Table 2 placed results concerning detailed estimation of colour of meat by using two different measurement device – spectrophotometer Spekol and electronic colorimeter Minolta.

From the first device three parameters were obtained: dominant wavelength, colour saturation and lightness.

Table 1 Slaughter value of primiparous gilts and fattening gilts
Charakterystyka rzeźna loszek jednorazówek I loszek tuczników

Trait investigated Badana cecha	Group Grupa	
	A primiparous gilts loszki jednorazówki	B fattening gilts loszki tuczniki
Number of gilts, n Liczebność, n	30	39
Age at slaughter, days Wiek w dniu uboju, dni	$371,03^{A} \pm 20,29$	$179,64^{B} \pm 10,26$
Live weight at slaughter, kg Masa ciała przed ubojem, kg	$153,50^{A} \pm 18,03$	$106,77^{B} \pm 6,57$
Warm carcass weight, kg Masa tuszy ciepłej, kg	$123,10^{A} \pm 15,85$	$85,07^{B} \pm 6,02$
Loin eye area, cm^2 Powierzchnia przekroju polędwicy, cm^2	$54,99 \pm 11,29$	$51,43 \pm 6,82$
Mean backfat thickness from 5 measurements, cm Średnia grubość słoniny z 5 pom., cm	$2,01^{a} \pm 0,68$	$2,36^{b} \pm 0,51$
ULTRA-FOM, carcass lean content, % ULTRA-FOM, mięsność, %	$53,36 \pm 4,18$	$54,77 \pm 5,14$

A, B – $P < 0,01$; a, b – $P < 0,05$

Table 2 Quality and meat chemical composition of primiparous and fattening gilts
Jakość i skład chemiczny mięsa loszek jednorazówek i loszek tuczników

Trait investigated Badana cecha	Group Grupa	
	A primiparous gilts loszki jednorazówki	B fattening gilts loszki tuczniki
pH_1	6,46 ± 0,26	6,44 ± 0,28
pH_u	5,52 ± 0,80	5,53 ± 0,10
Drip loss, % Swobodny wyciek soku, %	2,21 ± 1,44	2,79 ± 2,35
WHC, % of loose water WHC - % wody luźnej	$23,97^{A}$ ± 3,18	$19,74^{B}$ ± 2,28
Dominant wavelength, nm Dominująca długość fali, nm	$587,84^{A}$ ± 4,66	$583,43^{B}$ ± 1,88
Colour saturation, % Nasycenie, %	$24,75^{A}$ ± 4,72	$18,67^{B}$ ± 3,17
Colour lightness, % Jasność, %	20,78 ± 3,70	21,95 ± 2,20
L*	53,16 ± 2,53	54,08 ± 3,00
a*	16,56 ± 1,28	16,24 ± 1,23
b*	$4,98^{A}$ ± 1,68	$6,69^{B}$ ± 0,87
Water, % Woda, %	$76,07^{A}$ ± 0,73	$74,99^{B}$ ± 0,55
Total protein, % Białko ogólne, %	$20,60^{A}$ ± 0,98	$23,04^{B}$ ± 0,54
Intramuscular fat, % Tłuszcz śródmięśniowy, %	$1,88^{A}$ ± 0,50	$1,19^{B}$ ± 0,39
Ash, % Popiół, %	1,14 ± 0,15	1,16 ± 0,04
Soluble protein, g/100g Białko rozpuszczalne, g/100g	$5,53^{A}$ ± 0,44	$6,50^{B}$ ± 0,30
WB shear force, N/cm^2 Siła cięcia, N/cm^2	$55,32^{B}$ ± 12,16	$47,30^{A}$ ± 10,62

A, B – P < 0.01

Obtained higher value of dominant wavelength showed more red colour of meat which is result of higher content of muscle pigments [13]. Meat of primiparous gilts had nice and pure colour which depends on higher value of colour saturation (24.75% versus 18.67%; P < 0.01).

In these two groups of gilts no significant differences in colour lightness were observed. Confirmation of this was colour measurement made by using Minolta. Value L* describing lightness was similar in two cases (53.16 and 54.08). Value b* characterizing participation of yellow colour was significantly lower in meat of primiparous gilts (P < 0.01).

Table 2 shows results of basic chemical composition of meat: water, sum of mineral components expressed as ash and participation of water soluble proteins. In except of ash, the differences for all constituents were significant between group of primiparous gilts and fattening gilts. Meat of primiparous gilts contained more water

(76.07% versus 74,99%; $P < 0.01$) and more fat (1.88% versus 1.19; $P < 0.01$). Level of total protein in meat of primiparous gilts was significantly lower (20.60% versus 23.04%; $P < 0.01$), and soluble protein was significantly lower too (5.53 g/100g versus 6.50 g/100g; $P < 0.01$). This decreasing of protein level in meat could be made by loss of body weight components during lactation.

Meat tenderness determined by instrumental method shows that meat of primiparous gilts were tougher than meat of fattening gilts but not significantly. That is obvious, because meat from older animals contain more collagen and its hydrothermal stability is higher because of thicker net of collagen, so it can be reason of decrease tenderness of meat in older animals.

SUMMARY AND CONCLUSIONS

1. Slaughter value of primiparous gilts (slaughter after first farrowing and rearing piglets) is very high. Carcass lean content is on good level with little fattness.

2. Meat of primiparous gilts shows a slightly different properties than meat of normal fattening gilts. It has correct pH value, higher intramuscular fat content and more acceptable colour.

3. Slaughter utilisation of gilts after the first farrowing may be a system worthy to recommendation.

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