Some characteristics of ham segments

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Examinations done in this work are the continuation of the examinations presented in the paper titled »Some characteristics of the largest muscles of ham».

Existing differences in properties of ham muscles most evidently reflect upon the uniformity of the quality of ham muscles in individual segments.

For real estimation of importance of these differences for the ham quality, it is necessary to know the range in which vary the properties of muscles in certain cut or segment.

To reach particularly this, we decided to determine total weight of every segment, as well as weight of muscles, of bone and of intermuscular fat and connective tissue, then colour of some muscles in segments, as well as the intramuscular connective tissue content and water holding capacity (WHC) of muscles of segments.

EXPERIMENTS

Material

Five hams of white fleshy pigs, aged from 7 to 9 months, live weight of 100 to 120 kg have been taken for the examination. Pigs were electrically stunned, bled and dressed in an usual manner. The ham were taken from cooled carcasses 24 hours after slaughter.

The skin and superficial fat tissue were removed befor cutting. Each ham was cutted with 8 parallel cuts in 7 segments, thick 4 cm. Fourth cut passed through the knee joint and seventh one through the coxo-femoral joint.

After weighing of segments and the estimation of muscle colour, muscles, bone and intermuscular fat and connective tissue were separated and weighed. Muscles of individual segments were ground and mixed, and the samples for determination of connective tissue proteins and WHC were taken. WHC has been determined 24 and 48 hours post mortem.

In separated intermuscular fat and connective tissue the fat content was determined and the residue was presented as an intermuscular connective tissue.

Methods

The colour of the muscles in segments was estimated on the upper(proximal) surface by means of »Meat Grading Lighting Cabinet» (Tintometer Sales LTD). The colour of two-tonned muscles was estimated on the lightest and the darkest part.

For WHC determination the centrifugation method was used. Twenty grams of ground sample were mixed with 10 ml of water and left 60 min.; after that it was centrifugated 10 min. at 3000 r.p.m. WHC was expressed as a volume of separated liquid in ml.

The content of connective tissue proteins was determined on the bases of hydroxyproline content. The factor 8,07 was used for the calculation.

The content of intermuscular fat was determined using Krol-Meesters procedure.

RESULTS AND DISCUSSION

Average weight of segments of the examined hams varied from 410 g (I segm.) to 1016 g (IV) (Table 1). The amount of muscles in segments was increasing almost identically with total weight of segments, while the amount of bone and intermuscular fat and connective tissue was independent of this. Amount of bone varied from 33,0 g (IV) to 116,8 g (VI), amount of fat from 26,2 g (I) to 63,1 g (VI), and the amount of intermuscular connective tissue from 8,0 g (IV) to 27,6 g (VII). From the obtained results it is evident that the segment IV is the best part of ham, because it contained the largest amount of muscles (93,2 % of the total weight of segment), and the smallest amount of bone and fat, and almost the least of connective tissue. The segment V was of somewhat lower quality. These two segments contained the largest amount of muscles (41,3 % of total weight of muscles in all 7 segments) and the lowest amount of bone and of intermuscular fat and connective tissue (16,4 %, 18, 1 % and 17,6 % of the total weight of each tissue, respectively). These segments represent the most qualitative part of ham; segments III and VI were of somewhat lower quality, according to the content of the measured tissues. Segments I and II contained the smallest percentage of muscles and largest one of bone and fat.

According to the determined amount of intermuscular connective tissue (Table 2) one can see that the segments I and II were of lower quality, because they contained more connective tissue (0,59 % and 0,77 %) than the segments III, IV, V and VI, which contained less connective tissue (0,4 % to 0,49 %).

The results obtained by measurment of WHC are shown in Table 2. One can see that segments III, IV and V had the lowest WHC (7,9 to 8,1 ml), although the differences in WHC among the segments were not significant.

Table 1. *Average weights of muscles, bone, fat and connective tissue in ham segments.*

Number of segment	*Segment*		*Weight of Muscles*		*Bone*		*Fat*		*Conn.tissue*	
	g	%*	g	%	g	%	g	%	g	%
I	416± 31,2	7,7	303,3± 27,6	72,1	76,8±15,8	18,5	26,2± 5,8	6,3	12,7± 4,3	3,1
II	605± 32,0	11,2	420,1± 35,6	69,4	116,6±13,2	19,2	51,9± 8,5	8,6	16,5± 5,9	2,8
III	869± 32,8	16,0	697,1± 48,9	80,2	104,0± 9,1	12,0	50,2± 8,4	5,8	17,8± 5,8	2,0
IV	1016±103,6	18,5	944,6±116,2	93,2	33,0± 1,6	3,2	27,3± 4,9	2,6	11,1± 6,1	1,0
V	981± 95,2	18,1	880,4± 96,2	89,7	65,4% 5,1	6,6	27,2± 6,7	2,8	8,0± 3,4	0,9
VI	871± 81,2	16,1	679,4± 96,0	77,7	116,8± 7,7	13,4	63,1±17,4	7,2	14,9± 5,1	1,7
VII	669± 39,6	12,4	498,3± 41,6	74,6	88,3± 7,8	13,2	54,8±17,0	8,2	27,6±13,8	4,0
Total	5.427,0	100,0	4.417,2		600,9		300,7		108,6	

* Percentage of total weight.

Table 2. *Content of connective Tissue proteins and WHC of ham segments.*

	Hours post mortem	*Segment I*	*II*	*III*	*IV*	*V*	*VI*	*VII*
Content of connective tissue proteins	24	0,77±0,17	0,59±0,10	0,49±0,14	0,43±0,10	0,44±0,08	0,43±0,06	0,53±0,06
Water holding capacity	24	7,3 ±0,2	7,4 ±0,5	8,0 ±0,3	7,9 ±0,3	8,1 ±0,6	7,5 ±1,0	7,8 ±1,1
	48	7,8 ±1,0	8,1 ±0,9	8,4 ±0,7	8,3 ±0,6	8,3 ±1,1	8,1 ±1,5	8,3 ±1,2

WHC measured 48 hours was lower in all segments than this obtained 24 hours post mortem. On the bases of these results one see that there were not significant differences in WHC between examined segments in spite of different amount of connective tissue.

Table 3. *Colour scores of some muscles of ham segments.*

Muscle	*I*	*II*		*III*		*IV*		*V*		*VI*		*VII*
		b.	*d.*	*b.*	*d.*	*b.*	*d.*	*b.*	*d.*	*b.*	*d.*	
1. Biceps	4,6	3,4	5,0	3,0	5,2	3,2	5,2	3,2	5,0	3,0		
2. Semitendineus	4,6	2,4	5,6	2,2	6,0	2,0	6,2	3,0				
3. Semimembranaceus		2,6	4,6	2,0	6,0	2,0	4,4					
4. Gracilis			4,8		5,4		5,8					
5. Soleus	5,4		4,8									
6. Flex. dig. prof.			6,6									
7. Gastrocnemius	5,6		4,8									
8. Vastus med.					6,2		6,0		6,8			
9. Vastus intermed.							6,4		5,6			
10. Vastus lat.					5,8		5,0	3,2	5,2	3,4	5,4	
11. Rectus femoris						3,4	6,2	2,8	6,0	3,0	5,4	
12. Pectineus							5,4		5,0			
13. Adductor							5,2	5,0	5,4			
14. Gluteus prof.												6,4
15. Gluteus med.												4,4
16. Gluteus superfic.												3,8
17. Iliopsoas												6,0
18. Tensor fasc. latae												3,2

b = brighter part
d = darker part

Scores of the colour of muscles on the surface of segments are presented in Table 3. in average values. From these results one can see that the individual muscles differed among themselves in colour (from 2,0 to 6,8), as well as that there were great differences at different parts of the same muscle (m. semitendineus, from 2,0 to 6,2). The muscles of the segment I were of the most uniform colour (from 4,6 to 5,6), somewhat less uniform were segment VI (from 3,0 to 5,4) and VII (from 3,2 to 6,4). The greatest differences in colour of the muscles were found on the surface of segments III and IV (from 2,0 to 6,2) and V (from 2,8 to 6,8).

Presented results are the average values, and therefore the extreme disagreements between the individual values can not be seen.

While the individual differences can greatly influence the quality of meat, it is interesting to analyse them. One muscle was scored with score I only once (m. semimembranaceus) and with score higher than 7 another one, also once. (vastus lat.).

In two-tonned muscles the greatest differences in colour in the same muscle were found in m. semitendineus (from 2 to 7, in segment IV) and in m.

semimembranaceus (from 1 to 6, in segment III). It should be mentioned that there was a succeeding change in colour from the brightest to the darkest part.

M. semitendineus and semimembranaceus were scored with 2 at least once in every sample, mostly in segments III and IV. At the same time these muscles in the same segments were scored with 6 and 7 in four samples. Somewhat less aberrances were found in mm. rectus femoris, biceps femoris and vastus lateralis, mostly in segments III, IV and V. Such findings were not often. They made 46,4 % of total ham weight.

These results show that great differences in colour were mostly found in muscles in segments III, IV and V, which contained the largest amount of muscle tissue.

Uneveness of the colour on the surface of segments was significantly influenced by dark muscles as vastus medialis (III, IV and V) and vastus intermedius (IV and V), gluteus profundus and flexor dig. profundus which were scored mostly with 6 and 7 (80 % of measurments).

Asking for possibilities how to reduce these differences, in order to obtain more uniform colour of ham cuts, it could be applied the cutting out the darkest muscles, since they made only of total ham weight.

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