D/3 CARCASS COMPOSITION AND SOME QUALITY CHARACTERISTICS OF MUSCLE TISSUE AS AFFECTED BY THE AGE AND THE WEIGHT OF PIGS AT SLAUGHTER

by

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INTRODUCTION

In the last decades a number of research work have been done and published dealing with the influence of various factors on the fattening efficiency and the lean meat amount in the pig carcass. The results obtained from these investigations have remarcably contributed to the constant improvement in pork production when the quantity is concerned.

Much less has been done, however, on investigations of factors which affect the quality of pork, whether when quality characteristics are considered independently or contingent with carcass composition and other efficiency indicators of a successful pork production. There are opinions, therefore, which state that the ever higher gains reached by modern breeds under up to date conditions, which results in obtaining the wanted slaughter weight at ever younger age of pigs, seem to lower the quality of the pork produced. In other words, there are not few of those who thunk that an inferior pork quality is produced as a result of the success achieved by the selection and the present technology of pork production. But there are also opinions and results indicating that the negative consequences owing to the orientation concerning the quantity only, could be omitted if an equal attention would be paid both to the quality and the quantity in the future.

This work was undertaken in order to give a contribution for better understanding the age and the weight of pigs at slaughter as factors which may affect both the carcass composition and the quality characteristics of muscle tissue when pigs, of the same litter and sex reach the weight of 100 kgs at a considerably different age as well as when pigs of the same litter and sex are killed at considerably different slaughter weights but with a smaller variation in are.

MATERIAL AND METHODS

In the experiments 64 male crossbreed pigs F_1 (Belgian x Swedish landrace) were used and devided in five groups. For the investigation of the effect of the age as a factor, 28 pigs out of four litters were proportionally devided in two groups of 14 pigs in each. in order to have an uniformity concerning origin. The pigs of the first group were fattened ad libitum in order to reach the weight of 100 kgs with an ever younger age, while the pigs of the second group were on a restricted feeding in order to reach the same slaughter weight in about 50 days older age. The effect of different slaughter weights was studied on pigs of 6 litters, which were fattened ad libitum and proportionally slaughtered at different weights in order to reach a difference in carcass weight of about 5 kgs among three groups consisting of 12 pigs.

The necessary data were collected at slaughter and the chilled carcasses were dissected in order to find out the tissue ratio in the primal cuts as well as in the whole carcass. Samples of three muscle were used for the investigation of some quality characteristics as: chemical composition, amount of connective tissue proteins (by the method of Möhler, modified by Stegman), total amount of pigments (by the method of Hart), water binding capacity (by the method of Grau-Hamm), rate of pH fall in the first 6 hours and 24 hours after slaughter, muscle fiber diameter and finally the shrink during coo-

king (boiling in water and frying in fat) until 70°C has been reached in the center of the samples.

The obtained data have been elaborated by the usual statistical methods (Snedecor, Mulić).

RESULTS AND DISCUSION

I. CARCASS YIELD AND SOME CARCASS MEASUREMENTS AS AFFECTED BY THE AGE AND THE WEIGHT OF PIGS AT SLAUGHTER

1. The effect of different age of pigs of the same slaughter weight on the carcass yield and some carcass characteristics (tab. 1)

Pigs which reached a slaughter weight of 100 kgs in a younger age (176 days) were fattened ad lib. and had an average daily gain of 0,703 kgs in a fattening period of 106 days. On the other side the pigs which arrived to the same slaughter weight at an older age (229 days), were on a restricted plane of nutrition, having smaller daily gains (0,494 kgs) and longer fattening period (158 days). The difference in are was, therefore, highly significant, averaging 53 days between two groups of pigs having the same weight at slaughter.

The mentioned difference in age bear significant effect on the average back fat thickness and the loin fat area, while on the other carcass measurements the differences were not significant, although the expected tendencies were visible. Namely, pigs of younger age have had slightly greater dressing out percentage, smaller carcass length and less favourable index of lean : fat area in the loin cross-section, all in accordance with the mentioned significant differences.

Tab. 1. Carcass yield and carcass measurements of pigs with different age at the same slaughter weight

	Age group				Sign. of diff.
	Younger (n=14)		Older (n=14)		
	$\bar{X}$	Cv	$\bar{X}$	Cv	
1. Initial weight (kgs)	25,4	10,6	22,4	11,4	x
2. Weight at slaughter (kgs)	99,7	3,38	100,0	2,42	NS
3. Days fattening	106,4	5,97	158,6	7,06	-
4. Age at slaughter (days)	176,0	2,12	229,0	3,68	-
5. Av. daily weight gain (kgs)	0,703	8,82	0,494	6,97	-
6. Feed conversion (kgs)	3,31	6,35	3,44	10,7	NS
7. Chilled carcass weight (kgs)	75,8	4,02	75,3	4,60	NS
8. Dressing out percentage	80,2	2,96	79,2	2,47	NS
9. Carcass lenght:					
- os pubis-atlas (cm)	99,3	3,63	101,2	2,49	NS
- os pubis-I rib (cm)	83,6	2,84	84,3	3,43	NS
10. Av. backfat thickness (cm)	3,56	4,18	3,25	11,06	x
11. Cross-section area:					
a)- m.long. dorsi (cm^2)	31,35	12,9	32,20	17,0	
b)- loin fat area (m^2)	36,92	13,2	32,75	12,1	xx
- index (b : a)	1,20	12m3	1,09	25,1	NS

Our results are very similar to those published by Witt et al. (1964), Braude et al. (1967), Homle et al. (1967), Brooks (1967) and many other autors who have found that an intensive fattening, resulting in high daily gains

and younger age at slaughter, affects the carcass yield, back fat thickness and some other carcass characteristics.

2. The effect of different weight at slaughter on carcass yield and some carcass measurments (tab. 2)

The differences in some carcass measurements between three groups of pigs with different slaughter weights were significant with regard to the dressing out percentage, carcass length back taf thicknes and loin fat area, only when the light weight pigs are compared with the heavy weight ones, i.e. when a difference of 10 kgs in carcass weight was

Tab. 2. Carcass yield and carcass measurements of pigs with different weight at slaughter

	Weight group			Signif. of diff.		
	L (n=12)	M (n=12)	H (n=12)			
	$\bar{X}$	$\bar{X}$	$\bar{X}$	L:M	L:H	M:H
1. Initial weight(kgs)	29,50	26,58	28,58	NS	NS	NS
2. Weight at slaughter (kgs)	92,42	104,8	114,5	xx	xx	xx
3. Days of fattening	107,2	108,9	121,6	NS	xx	xx
4, Av. daily weight gain (kgs)	0,702	0,749	0,730	NS	NS	NS
5. Feed connversion (kgs)	3,53	3,39	3,52	NS	NS	NS
6. Chilled carcass weight (kgs)	76,00	81,08	86,43	xx	xx	xx
7. Dressing out percentage	78,91	77,35	76,91	NS	x	NS
8. Carcass lenght:						
-os pubis-atlas(cm)	99,6	100,4	102,1	NS	xx	NS
-os pubis-I rib(cm)	83,3	83,3	85,3	NS	x	x
9. Av,backfat thickness	31,6	34,7	37,2	NS	xx	NS
10. Cross section area:						
a)-m.long. dorsi (cm^2)	30,66	30,78	32,58	NS	NS	NS
b)-loin fat area (cm^2)	33,65	36,38	38,51	NS	x	NS
Index (b : a)	1,11	1,21	1,21	NS	NS	NS

reached. Namely, the differences in carcass weight of about 5 kgs between the groups seem not to be a factor which may considerably affect the carcass yield and some carcass measurements if other factors are not included.

II CARCASS COMPOSITION AS AFFECTED BY THE AGE AND THE WEIGHT OF PIGS AT SLAUGHTER

1. The effect of different age of pigs with the same slaughter weight on carcass composition (tab. 3)

The pigs of an older age, at the same slaughter weight had relatively heaver hams, more muscle tissue and less fat in them than the pigs of a younger age. The differences in lean and fat content in hams were significant but with regard to the bone content smaller variations were found. Very similar results have been obtained with regard to the tissue ratio of the shoulders where even a significant difference in bone content was found in favour of older pigs of the same weight. Tissue ratio in the loins of younger and older pigs of the same slaughter weights did not show significant differences although the same tendencies as in ham and shoulder may be seen when the relative average values are compared.

The results of the tissue separation of the whole carcasses (less heads and feet) demonstrate that the difference in age of pigs with the same slaughter weight, affects significantly the tissue ratio in the carcass. Namely, pigs of yougner are had a significantly lower percentage of lean and bone but a higher percentage of fat in the carcass than the pigs of older are at the same slaughter weight. With regard to the percentage of skin, head and feet the differences were not significant although on an average a smaler percentage of heads and feet was found with the younger pigs.

Tab. 3. Carcass composition of pigs with different age at the same slaughter weight

	Age group				Sign. of diff.
	Younger (n=14)		Older (n=14)		
	$\bar{x}$	Cv	$\bar{x}$	Cv	
1. Ham - untrimmed[1/] (%)	22,81	5,69	24,05	4,31	xx
- Lean (%)[2/]	63,37	3,59	67,81	4,92	xxx
- Fat (%)[2/]	20,83	13,82	16,48	2,82	xxx
- Bone (%)[2/]	9,50	9,10	9,51	6,25	NS
- Skin (%)[2/]	6,27	11,53	6,19	15,21	NS
2. Loin- untrimmed[1/] (%)	21,33	10,29	21,61	11,47	NS
- Lean (%)[2/]	46,61	6,07	48,49	7,80	NS
-Fat (%)[2/]	37,41	9,05	33,98	15,04	NS
- Bone (%)[2/]	11,18	9,90	11,85	7,88	NS
- Skin (%)[2/]	4,77	15,10	5,69	16,18	NS
3. Shoulder-untrimmed[1/] (%)	17,08	9,21	16,64	13,25	xx
- Lean (%)[2/]	58,31	4,55	61,22	4,71	xx
- Fat (%)[2/]	23,66	10,98	18,88	21,27	x
- Bone (%)[2/]	10,33	11,45	11,93	11,32	xx
- Skin (%)[2/]	7,69	12,88	7,96	12,59	NS
4. Whole carcass (%)	100	-	100	-	
- Lean (%)	50,34	4,34	53,55	4,87	xx
- Fat (%)	28,23	8,72	23,22	13,91	xxx
- Bone (%)	8,88	4,62	9,39	5,22	xx
- Skin (%)	5,93	5,75	5,12	8,60	NS
- Head (%)	4,63	5,75	5,12	8,60	NS
- Feet (%)	1,71	10,79	2,23	10,69	NS

1/ = carcass basis

2/ = untaimmed primal cut basis

Our results concerning the effect of age on the carcass composition are substantially in accordance with many published investigations. If same disaccordance may be found

they are primarily a result of other influences which affected the carcass composition.

2. The effect different weights of pigs at slaughter on the carcass composition (tab. 4)

Tab. 4. Carcass composition of pigs with different weight at slaughter

	Weight group			Sign. of diff.		
	L	M	H			
	$\bar{x}$	$\bar{x}$	$\bar{x}$	L:M	L:H	M:H
1. Carcass weight (kgs)	76,0	81,08	86,43	xx	xx	xx
2. Ham-untrimmed[1/] (%)	22,23	20,92	20,58	xx	x	NS
-Lean (%)[2/]	64,35	65,92	64,03	NS	NS	NS
-Fat (%)[2/]	21,12	19,74	22,05	NS	NS	x
-Bone (%)[2/]	8,68	9,02	8,90	NS	NS	NS
-Skin (%)[2/]	5,72	5,31	4,99	NS	NS	NS
3. Loin-untrimmed[1/] (%)	20,01	18,67	21,97	NS	NS	xx
-Lean (%)[2/]	45,68	46,32	42,24	NS	x	x
-Fat (%)[2/]	37,65	37,26	41,96	NS	xx	xx
-Bone (%)[2/]	11,19	11,81	10,45	NS	NS	NS
-Skin (%)[2/]	5,53	4,95	5,32	NS	NS	NS
4. Shoulder-untrimmed[1] (%)	18,29	18,6	17,41	NS	NS	NS
-Lean (%)[2/]	56,02	57,44	55,44	NS	NS	NS
-Fat (%)[2/]	26,97	26,83	27,99	NS	NS	NS
-Bone (%)[2/]	9,54	9,08	9,67	NS	NS	NS
-Skin (%)[2/]	7,40	6,73	6,76	NS	NS	NS
5. Whole carcass (%)	100	100	100			
-Lean (%)	48,34	48,35	46,62	NS	NS	NS
-Fat (%)	29,07	29,46	31,98	NS	x	x
-Bone (%)	8,73	8,38	8,42	NS	NS	NS
-Skin (%)	5,83	5,76	6,08	NS	NS	NS
-Head (%)	5,03	4,82	4,78	NS	NS	NS
Feet (%)	1,94	2,06	1,78	NS	NS	NS

1/ carcass basis
2/ untrimmed primal cut basis

When the data about the tissue ratio in the primal cuts and in the whole carcass are compared between the light weight, medium weight and heavy weight pigs, it may be seen that these weight differences affect more the fat content than the lean and bone content. It may be seen to that the differences are somewhat greater between the medium weight and heavy weight carcasses than between the light weight and the medium weight ones. In other words, a relatively greater difference in carcass composition have occured when the carcass weight has increased from 81 to 86 kgs than when it was increased from 76 to 81 kgs. This is in agreement with many autors who state that a optimum slaughter weight should be determined by taking in consideration many factors which may affect the carcass composition in which the slaughter weight is only one among them (Belić et al. - 1972, Schön - 1973, Ognjanović - 1973).

III CHEMICAL COMPOSITION OF MUSCLE TISSUE AS AFFECTED BY THE AGE AND THE WEIGHT OF PIGS AT SLAUGHTER

1. The effect of different age of pigs of the same slaughter weight on the chemical composition of the loin and the ham muscles (tab. 5)

The water content of the muscle tissue in the loin and the ham muscles was not significantly affected by the age of the pigs when slaughtered at the same weight, although a slightly greater amount of water has been found in all three tested muscles which derived from the younger pigs. The same indications may be found in the works of Boccard (1966), Janicki et al. (1970), Ostapčuk et al. (1971) and others who refer that the water content in the pig muscle tissue falls with the increase of age. A somewhat greater water content in the ham muscle than in the m. long. dorsi that we found in our analyses prove the findings of Lawrie et al. (1963), Tapel et al. (1966) and of many others.

Tab. 5. Chemical composition of muscle tissue of pigs with different age at the same slaughter weight

	Age group				Sign. of diff.
	Younger (n=14)		Older (n=14)		
	$\bar{x}$	Cv	$\bar{x}$	Cv	
1. Moisture (%):					
- m.long. dorsi	74,29	0,58	74,06	0,59	NS
- m.biceps fem.	75,01	0,85	74,77	0,97	NS
- m.rectus fem.	74,87	0,63	74,56	0,82	NS
2. Total proteins (%):					
- m.long. dorsi	22,06	0,63	22,67	2,30	x
- m.biceps fem.	21,45	1,57	22,14	1,52	x
- m. rectus fem.	21,46	1,79	22,27	3,11	x
3. Fat (%):					
- m.long. dorsi	2,65	14,65	2,19	13,33	x
- m.biceps fem.	2,48	24,05	2,13	23,48	x
- m.rectus fem.	2,55	15,39	2,10	23,10	x
4. Ach (%):					
- m.long. dorsi	1,02	13,99	1,09	12,64	NS
- m.biceps fem.	1,05	10,83	1,17	5,81	NS
- m.rectus fem.	1,09	10,08	1,12	5,52	NS
5. Conn. tissue proteins[1/] (%):					
- m.long. dorsi	2,29	12,82	2,16	10,02	NS
- m.biceps fem.	2,87	17,52	2,81	15,21	NS
- m. rectus fem.	3,42	24,68	3,18	11,42	NS

[1/] as % of total proteins

The total protein content in all three examinated muscles has been slightly but significant greater with the older pigs than with the younger ones. Othersides the amount of

connective tissue proteins have been also significant greater in all three muscles of the younger pigs than with the older ones. There are many references which demonstrate a ligher protein content in the m. long. dorsi than in the ham muscles and which are in accordance with our results.

A decrease of connective tissue proteins in the muscles, paralel with the increase of the age of pigs, were also assigned by Balešev (1969, 1970), Jones et al. (1968), Boccard et al. (1967) and others. Lawrie at al. (1963), Rahelić et al. (1969) have also found a difference in the amount of connective tissue proteins between loin and ham muscles as we did in these experiments.

The intramuscular fat content was significant greater in all three examinated muscles of younger pigs than in the older ones. Very similar results were obtained by Witt et al. (1966), Keljman et al. (1967) and others, while the results of Ljaskovskaja et al. (1962), Janicki et al. (1969) and Belić et al. (1972) should not be compared with our results because they refer to a greater amount of intramuscular fat by older pigs with considerably heavier weight.

The ash content was also slightly greater in the older pigs at the same weights at slaughter but in to one muscle were the differences significant. Boccard (1966) refers similar results to these.

2. The effect of different weights at slaughter on the chemical composition of the m. long. dorsi (tab. 6)

The water content in m. long. dorsi has decreased with the increase of the slaughter weight of pigs but the differences are significant only when light carcasses are compared with the heavy weight ones. The similar results but in oposite direction were found with regard to the fat content of the

same muscle. The differences in total protein content as well as in ash content of the same muscle, were rather small and not significant. But a significant difference was found regarding connective tissue amount between the light weight carcasses and the heavy weight ones.

Tab. 6. Chemical composition of m. long. dorsi of pigs with different weight at slaughter

	Weight group			Signif. of diff.		
	L (n=12)	M (n=12)	H (n=12)			
	$\bar{X}$	$\bar{X}$	$\bar{X}$	L:M	L:H	M:H
1. Moisture (%)	73,67	72,68	72,23	NS	xx	NS
2. Total proteins (%)	22,99	23,53	23,48	NS	NS	NS
3. Fat (%)	2,03	2,54	2,89	xx	xx	NS
4. Ash (%)	1,20	1,23	1,28	NS	NS	NS
5. Conn. tissue proteins (%)	0,65	0,56	0,53	x	x	NS

All these results indicate that the increase of the carcass weight affects more the fat and water content, less the amount of connective tissue and even less the total protein and ash content of m. long. dorsi.

IV SOME QUALITY CHARACTERISTICS OF PORK MUSCLES AS EFFECTED BY AGE AND WEIGHT OF PIGS AT SLAUGHTER

1. The effect of different age at the same weight on some quality characteristics of pork muscle tissues (tab. 7)

The data in tab. 7 show that only with regard to the water binding capacity significant differences have been found showing that in all the three muscles higher water

Tab. 7. Some quality characteristics of muscle tissue with pigs with different age at the same slaughter weight

	Age group				Sign. of diff.
	Younger (n=14)		Older (n=14)		
	$\bar{X}$	Cv	$\bar{X}$	Cv	
1. Water binding cap.(cm^2)					
- m.long. dorsi	13,45	12,04	11,20	6,63	x
- m. biceps fem.	12,63	13,37	11,60	5,48	x
- m. rectus fem.	12,88	10,32	11,76	6,05	x
2. Consistency (cm^2)					
- m. long. dorsi	6,81	14,84	6,23	12,56	NS
- m. biceps fem.	6,46	15,37	5,78	14,05	NS
- m. rectus fem.	6,60	12,91	6,05	16,51	NS
3. Muscle fiber diam. ( )	52,48	5,34	55,90	5,98	NS
- m. long. dorsi					
- m. biceps fem.	53,26	9,97	56,81	10,82	NS
- m. rectus fem.	54,56	5,90	57,52	4,70	NS
4. Total primevt amount					
- m. long. dorsi	0,341	14,66	0,365	14,79	NS
- m. biceps fem.	0,611	12,43	0,762	6,41	NS
- m. rectus fem.	0,788	11,55	0,971	6,07	NS
5. Shrink on boiling (%)					
- m. long. dorsi	20,42	24,18	19,84	22,89	NS
- m. biceps fem.	18,71	22,26	17,31	21,90	NS
- m. rectus fem.	19,34	22,85	17,02	19,09	NS
6. Shrink on frying (%)					
- m. long. dorsi	29,58	17,99	27,21	15,72	NS
- m. biceps fem.	27,26	22,23	24,82	19,71	NS
- m. rectus fem.	28,46	10,24	25,85	11,00	NS

binding capacity was found with the older pigs when compared with the younger ones. It was also found that in the younger pig water binding capacity of m. long. dorsi was lower than

in the ham muscles, while in older pigs m. long. dorsi showed a rather better water binding capacity than the ham muscles.

Similar results are quoted by Witt et al. (1964), Ežkova (1967), Pivnjak (1969), and others. Also Rahelić et al. (1965) have found that there is a difference in the water binding capacity between m. long. dorsi and ham muscles. In other words, our results confirm many investigations that have proved that an intensive fattening, with high daily weight gains in younger age at slaughter result in lowering the water binding capacity in the pork muscles, which is very important from the processing point of view.

With regard to other quality characteristics rather small differences were found between younger and older pigs at the same slaughter weight, so that they were not significant. Meanwhile, we must note that these differences are very characteristic because they show certain tendencies that would presumably be more expressed if the difference in age had been greater than 53 days. We shall point to these indications: consistency of the meat in all the three investigated muscles was somewhat poorer in old pigs than in the younger ones; the muscle fibre diameter was also greater in older pigs than in the younger ones in all three muscles; the content of the total amount of pigments was smaller in all the three muscles of younger pigs; the shrink during cooking was greater in all three muscles of younger pigs. All these observations may find confirmation in many research works of various autors, but there are also results which are controversial to these observations.

In any case, we can state that the bringing of ever younger pigs to slaughter has surely an influence on the quality characteristics of pork, but this influence would not be so strong if other factors, which may contribute to the greater disqualification of the meat quality, were excluded.

In tab. 8 the pH fall is shown in the muscles of younger and older pigs of the same weight. We can see that on the average there are no significant differencies, but pH in the

m. long. dorsi in all intervals of observation of 45 to 360 minutes after slaughter was somewhat lower in the younger than in the older pigs. It seems therefore that pH in the first hours after slaughter falls more rapidly in younger pigs than in the older ones, in the older ones it attained somewhat lower values at 24 hours after slaughter. We can also observe that the ham muscles have somewhat higher pH at 24 hours after slaughter than the m. long. dorsi.

Tab. 8. The rate of pH fall in muscles of pigs with different age at the same slaughter weight

	Age group				Sign. of diff.
	Younger (n=14)		Older (n=14)		
	$\bar{x}$	Cv	$\bar{x}$	Cv	
1. pH in m. long dorsi					
- 45 min. after sl.	6,13	2,85	6,30	3,02	NS
- 60 " " "	6,07	3,19	6,22	3,70	NS
- 90 " " "	5,98	3,81	6,10	4,88	NS
- 180 " " "	5,79	3,43	5,91	4,31	NS
- 360 " " "	5,66	2,43	5,84	3,80	NS
2. pH after 24 h					
- m. long. dorsi	5,59	1,77	5,55	0,35	NS
- m. biceps femoris	5,74	1,46	5,68	1,69	NS
- m. rectus femoris	5,78	2,28	5,71	1,70	NS

Our results, with regard to the scope and the differences of pH are in essence in accordance with the data referred by Witt et al. (1964), Tepel et al. (1966), Ežkova(1967) and many other investigators.

2. The effect of different weights at slaughter on some quality characteristics of pork muscle tissues (tab. 9., 10)

With regard to the influence of the weight of pigs at slaughter on the most quality characteristics of muscle tissue, we have not found significant differencies. So, for instance, with regard to the water binding capacity, meat consistency, shrink during cooking and frying, there were no significant differencies when the same muscles are compared. In consequence, it seems that different slaughter weight of pigs has less influence on the qualitative than on the quantitative properties.

Tab. 9. Some characteristics of muscle tissue in pigs of different weight at slaughter

	Weight group			Signif. of differ.		
	L	M	H			
	$\bar{X}$	$\bar{X}$	$\bar{X}$	L:M	L:H	M:H
1.Water binding cap. (cm^2)						
-m.long. dorsi	14,61	15,79	14,87	NS	NS	NS
-M.biceps fem.	13,43	14,68	14,01	NS	NS	NS
-m.rectus fem.	15,81	16,67	15,26	NS	NS	NS
2.Consistency (cm^2)						
-m.long. dorsi	5,92	6,78	6,38	NS	NS	NS
-m.biceps fem.	6,95	7,00	7,81	NS	x	NS
-m.rectus fem.	6,30	6,96	7,24	NS	NS	NS
3.Shrink on boiling (%)						
-m.long. dosri	21,44	20,78	20,18	NS	NS	NS
-m.biceps fem.	20,33	17,93	19,31	NS	NS	NS
-m.rectus fem.	21,46	20,16	21,68	NS	NS	NS
4.Shrink on frying(%)						
-m.long. dorsi	24,60	23,45	22,86	NS	NS	NS
-m.biceps fem.	20,58	21,81	20,88	NS	NS	NS
-m.rectus fem.	20,27	20,84	23,20		NS	NS

On the other hand, this indicates that a greater difference in age, at the same weight, has a greater influence on the qualitative properties of muscle tissue than the different weight of pigs at relatively smaller differencies in age.

Tab. 10. The rate of pH fall in muscles of pigs with different weight at slaughter

	Weight group			Signif. of differ.		
	L	M	H			
	$\bar{X}$	$\bar{X}$	$\bar{X}$	L:M	L:H	M:H
1. pH in m.long. dorsi						
- 45 min after sl.	6,24	6,24	6,26	NS	NS	NS
- 60 " " "	6,10	6,11	6,15	NS	NS	NS
- 90 " " "	5,96	5,92	5,98	NS	NS	NS
- 180 " " "	5,81	5,78	5,84	NS	NS	NS
- 360 " " "	5,68	5,70	5,77	NS	NS	NS
2. pH after 24 h						
- m.long. dorsi	5,55	5,47	5,55	NS	NS	NS
- m.biceps fem.	5,63	5,63	5,60	NS	NS	NS
- m. rectus fem.	5,62	5,69	5,70	NS	NS	NS

When we consider the pH scope in the m. long dorsi of pigs of different slaughter weight, we can see that no significant differencies appear. Although it may be remarked that regulary a slightly higher pH was noticed in m. long. dorsi of the heavier pigs in the first 6 hours after slaughter and also a slightly higher pH in the ham muscles than in m. long. dorsi at 24 hours after slaughter.

CONCLUSION

On the basis of the presented results of our experiments the following conclusions may be drawn:

1. The carcass yield and some carcass characteristics were affected both by the age and the weight of the pigs at slaughter. The effect was more evident on the average backfat thickness and the loin fat area then on the carcass yield, eye muscle area and carcass length.

2. The carcass composition as well as the tissue ratio in the primal cuts has been more affected by the given difference in age of the pigs with the same weight than by the given difference in weight of pigs with smaller difference in age.

3. The intramuscular fat content was affected both by the age and the weight of pigs at slaughter, while the total protein content was more affected by the age than by the weight. A rather small influence of age and weight may be seen on the relative amount of connective tissue proteins and ash in the muscle tissue while the weight affected somewhat more the moisture content than the age.

4. Water binding capacity, more than other examined quality characteristics of the muscle tissue, was affected by the age of pigs at slaughter, although a certain influence of age may be seen also on the muscle fibre diameter, total pigments amount and on the shrinkage during cooking. The effect of different slaughter weights on the above mentioned quality characteristics has been considerably smaller.

5. The pH value of the m. long. dorsi seems to drop slightly faster in the first six hours after slaughter with the younger pigs of the same weight then compared with the older pigs. The same tendency may be seen when the lighter pigs are compared with the heavier pigs. However the ultimate pH value (24 h after slaughter) seems to be slightly greater both in the m. long. dorsi and the ham muscles, with the younger than with the older pigs of the same weight. But this indications need more proof.

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CARCASS COMPOSITION AND SOME QUALITY CHARACTERISTICS OF MUSCLE TISSUE AS AFFECTED BY THE AGE AND THE WEIGHT OF PIGS AT SLAUGHTER

by

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SUMMARY

In order to study the influence of age of the pigs when slaughtered at the same weight, two groups of 14 male pigs in each group (out of 4 liters) were used. One of the groups was fattened ad libitum and the other by restricted feeding so that a difference in age of 53 days was obtained when the both groups reached the slaughter weight of 100 kgs. To study the effect of different weight at slaughter, three groups of 12 male pigs in each group were fattened to three different weight. A difference of about 5 kgs in carcass weight averaged among the groups (76, 81, 86 kgs).

After slaughter the following quantitative and qualitative characteristics of the carcasses and the tissue were examined: Carcass yield and some carcass characteristics (tab. 1, 2); Carcass composition and the tissue ratio in the primal cuts (tab. 3, 4); Chemical composition of the muscle tissue (tab. 5, 6) and some quality characteristics of the muscle tissue (tab. 7, 8, 9, 10).

On the basis of the results obtained, the following conclusion have been drown: Both age and weight are, to a certain extent, of effect on the carcass composition and on some quality characteristics of the muscle tissue. But the main quantitative as well as the qualitative characteristics were more affected by a significant difference in age of pigs at the some slaughter weight than by a significant difference in weight at a smaller difference in age.

EINFLUSS DES ALTERS UND DES GEWICHTES DER SCHLACHTSCHWEINE AUF DIE SCHLACHKÖRPERZUSAMMENSETZUNG UND WICHTIGE QUALITATIVEN EIGENSCHAFTEN DES MUSKELGEWEBES

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ZUSAMMENFASSUNG

Um den Einfluss des Alters der Schlachtschweine bei selben Gewicht zu studieren hab man zwei Gruppen von 14 männliche Ferkel genommen (aus vier Wurfen). Eine der Gruppen wurde ad libitum gemässtet und die andere mit einer beschräubten Fütterung, so dass man einen Unterschied von 53 Tage erreichte, als beide Gruppen das Schlachtgewicht von 100 kgs halten Anderseits, um den Einfluss der verschiedenen Gewichte der Schlachtschweine zu prüfen, wurden drei Gruppen von je 12 männliche Ferkel ad libitum gemässtet bis man drei verschiedene Schlachtgewichte erreicht hat, miteinem Unterschied von zirka 5 kgs in Zweihälftengewicht zwischen den verschiedenen Gruppen.

Man untersuchte die folgenden quantitativen und qualitativen Eigenschaften des Schlachtkörpers und des Gewebeanteils nach dem Schlachten: Schlachtkörperausbeute und dessen einige Eigenschaften (tab. 1, 2); Schlachtkörperzusammensetzung und Gewebeanteil der einzelnen Teilstücke (tab. 3, 4), chemische Zusammensetzung der Muskulatur (tab. 5, 6) und einige Qualitätseigenschaften des Muskelgewebes (tab. 7, 8, 9, 10).

Gemäss der erhaltenen Ergebnisse, können folgende Schlussfolgerungen gezogen werden: Sowie das Alter als auch das Gewicht haben einigermassen Einfluss auf die Schlachtkörperzusammensetzung und auf einige Qualitätseigenschaften des Fleisches. Doch sind die quantitativen sowohl auch die qualitativen Eigenschaften mehr durch Alter beim selben Gewicht als durch verschiedene Schlachtgewichte beim ähnlichen Alter beeinflusst.

ВЛИЯНИЕ ВОЗРАСТА И ВЕСА СВИНЕЙ ПРИ УБОЕ НА СОСТАВ ТУЛОВИЩА И ВАЖНЕЙШИЕ КАЧЕСТВЕННЫЕ ХАРАКТЕРИСТИКИ МЫШЕЧНЫХ ТКАНЕЙ

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Р е з ю м е

Для утверждения влияния возраста свиней, при убое их в одинаковом весе /1оо кг/, исследования проводились с двумя группами, из 14 боровов /происхождением из 4 выводков/. Одну группу кормили "ad libitum", а вторую ограниченным образом, так что разница в возрасте составляла 53дня, когда эти группы достигли веса в 1оо кг.

Для исследования влияния различного веса свиней при убое, то 3 группы, по 12 боровов каждая, кормились по разному и получено три разных веса. При убое разница в весе туловищ из этих трех групп составляла, в среднем, 5 кг /76, 81, 86 кг./.

Проведены исследования следующих характеристик качества и количества туловищ; и тканей: радман и некоторые характеристики туловищ /таб.1 и 2/, состав туловищ и соотношение тканей в основных частях /таб.3 и 4/, химический состав мышечных тканей /таб.5 и 6/ и некоторых качественных характеристик мышечной ткани /таб.7,8, 9 и 1о/.

Из полученных результатов можно придти к следующим выводам: и возраст и вес, в определенной степени, влияют на состав туловищ и некоторые качественные характеристики мышечных тканей у свиней. Большее влияние на важнейшие качественные и количественные характеристики замечены при убое свиней разного возраста, а одинакового веса, чем при разном весе и незначительной разнице в возрасте.

INFLUENCE DE L'AGE ET DU POIDS DES PORCS ABATTUS SUR LA CONSTITUTION DE LA CARCASSE ET SUR LES CARACTERISTIQUES QUALITATIVES PLUS IMPORTANTES

par

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RÉSUMÉ

Pour déterminer l'influence de l'âge des porces en cas où ils sont abattus lorsqu'ils atteignant le même poids (100 kg), les examens sont faits sur les deux groupes comportant 14 animaux mâles chacun (les porcs provenaient de 4 gîtes). L'un groupe est nourri "ad libitum", et l'autre avec restriction, et lorsque les deux groupes d'animaux avaient atteint le poids de 100 kg., la diffèrence d'âge étaient 53 jours.

Pour examiner l'influence du poids diffèrent des porcs abattus, 3 groupes de 12 animaux mâles chacun sont nourris jusqu'a atteindre 3 diffèrents poids. A l'abattage, les diffèrences moyennes en ce qui concerne le poids des carcasses de ces trois groupes, étaient de 5 kg. (76, 81, 76 kg).

Les examens des caractéristiques quantitatives et qualitatives suivantes des carcasses et des tissues sont faits: rendement et certaines des caractéristiques de la carcasse (tab. 1 2t 2), constitution de la carcasse et le rapport des tissues dans les morceux principaux (tab. 3 et 4), structure chimique du tissu musculaire (tab. 5 et 6) et certaines caractéristiques qualitatives du tissu musculaire (tab. 7, 8, 9 et 10).

A la base des résultats obtenus, les conclusions suivantes peuvent en être tirées: l'âge ainsi que le poids interviennent dans une certaine mesure quant á la constitution de la carcasse et quant á les certaines caractéristiques qu-

litatives du tissu musculaire des porcs. Mais si les porcs sont abattus âgés différemment et syant le même poids, une influence plus grande sur les plus importantes caractéristiques qualitatives et quantitatives est remarquée que lorsque les porcs sont abattus ayant le poids différent et une toup petite différence d'âge.