

EINFLUSS DES GESCHLECHTES AUF DIE EIGENSCHAFTEN
DER MUSKELN DER SCHWEINE
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Z U S A M E N F A S S U N G

In der Literatur gibt es genügend Daten über den Einfluss des Geschlechtes auf das Wachsen der Schweine, auf die Verwertung des Futters und auf die Entwicklung eines spezifischen Geschlechtsgeruches. Es ist uns aber nicht bekannt dass eine Untersuchung des Einflusses auf die Eigenschaften der Muskeln durchgeführt wurde. Aus diesem Grund hat man entschlossen durch diese Untersuchungen festzustellen, wie sich das Geschlecht auf einige Eigenschaften der Muskeln bei Schweinen auswirkt. Die Untersuchungen wurden an Proben von 23 Zuchtebern, 20 Kastraten und 16 Sauen-Mischlingen, Gr.Yorkshire-Schwed.landrace durchgeführt. Alle diese Schweine hat man unter gleichen Bedingungen gehalten und gefüttert auf einer Versuchsanstalt eines Gutes. Diese wurden beim Gewicht von cca. 100 kg. auf übliche Weise abgeschlachtet. Zur Untersuchung nahm man m.long.dorsi. entfernt vom eingekühlten Körper 48 Stunden post mortem.

Beim entfernten Muskel wurden pH, der UP-Inhalt, die Farbe durch Göfo-Apparatur und sensorisch, wie auch der Bindegewebsgehalt und der Durchmesser der Muskeflächen bestimmt. Bei Fragen von cca. 150 g. hat man den Verlust beim kochen (1 Stunde 90°C) bestimmt, und nachdem wurde die Zartheit (Festigkeit) durch den Warner-Bratzler-Apparat (W B shear press) und sensorisch die Zartheit und die Saftigkeit bestimmt.

Als man die Varianten analysierte stellte man fest dass nur der Diameter der Flachsen m.long.dorsi. der Sauen signifikant grösser ist ($P < 0,01$) als die Flachsen der Muskeln bei Zuchtebern und Kastraten und dass die sensorisch bestimmte Farbe der Muskeln signifikant bei Sauen dunkler ist ($P < 0,05$) im Bezug auf die Muskefarbe der Zuchtebern und Kastraten.

Durch Berechnungen der Korrelation zwischen einigen Eigenschaften stellte man eine enge Verbundenheit der Farbe, sensorisch und durch den Göfo-Fotometer bestimmt, bei Sauen und Zuchtebern fest ($r = 0,85$ und $r = 0,64$) sowie auch eine bedeutende Abhängigkeit zwischen den sensorischen Schätzungen der Farbe und UP der Muskeln bei Kastraten ($r = 0,57$). Es kommt auch eine bedeutende lineare Abhängigkeit zwischen der sensorisch festgestellten Zartheit und der Zartheit gemessen durch den Warner-Bratzler-Apparat bei gekochten Muskeln der Zuchtebern und Kastraten zum Ausdruck ($r = -0,50$) und ($r = -0,62$).

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L'INFLUENCE DU SEXE SUR LES QUALITÉS DES MUSCLES DE PORCS

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Dans la littérature il y a assez de données concernant l'influence du sexe sur la croissance des porcs, l'utilisation des aliments et le développement de l'odeur sexuelle spécifique. Cependant, il ne nous est pas connu que l'influence du sexe sur les qualités des muscles était aussi examinée.

C'est pour cette raison qu'on a décidé de constater par ces examens comment le sexe agit sur quelques qualités des muscles de porcs. Les examens ont été réalisés aux échantillons de 23 verrat, 20 castrés et 16 truies, hybrides de grand yorkshire x landrace ondois. Tous ces porcs étaient tenus et alimentés dans un domaine d'expérience sous les mêmes conditions. Ils étaient abattus au poids de 100 kg environ de la façon usuelle. Pour l'examen on a utilisé m.long. dorsi étant séparé de la carcasse réfrigérée 48 heures post mortem.

On déterminait au muscle séparé par le photomètre Göfo et par voie sensorielle pH, la teneur de UP, la couleur ainsi que la teneur du tissu conjonctif et le diamètre des tissus musculaires. On déterminait aux échantillons (1h/90°C) ayant le poids de 150 kg environ la perte de poids à la cuite, puis la tendreté par l'appareil de Warner-Bratzler (WB shear press), et la tendreté ainsi que la succulence par voie sensorielle.

Par l'analyse des variances on a déterminé que seulement le diamètre des tissus m.long. dorsi de truies était considérablement supérieur ($P < 0,01$) aux tissus musculaires de verrats et de castrés et que la couleur des muscles de truies déterminée par voie sensorielle ($P < 0,05$) était considérablement plus foncée par rapport aux muscles de verrats et de castrés.

En calculant la corrélation entre quelques qualités on a déterminé par voie sensorielle et par le photomètre Göfo un rapport étroit de la couleur déterminée de m.long. dorsi de truies et de verrats ($r = 0,85$ et $r = 0,64$) ainsi qu'une dépendance linéaire considérable entre l'évaluation sensorielle de la couleur et l'UP des muscles de castrés ($r = 0,57$). On a constaté aussi une dépendance linéaire considérable entre la tendreté déterminée par voie sensorielle et la tendreté des muscles cuits de verrats et de castrés mesurée par l'appareil de Warner-Bratzler ($r = 0,50$ et $r = 0,62$).

THE INFLUENCE OF SEX ON THE CHARACTERISTICS
OF MUSCLES IN PIGS

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S U M M A R Y

There are many data about the influence of sex on the growth of pigs, as well as on the conversion of food and on the development of specific odour. However, it is not known to us whether the investigations of the influence of sex on the characteristics of muscles have ever been done.

For that reason we decided to establish what is the influence of sex on some characteristics of muscles in pigs. The research work was carried out with the samples taken from 23 boars, 20 barrows and 16 gilts, cross-breeds of Large White and Sweden Landrace. All these pigs were kept and fed on the same experimental estate under the same conditions. They were slaughtered when they were about 100 kgs. of weight in an usual way. After this investigation m.long. dorsi, parted from the cooled carcass 48 hours post mortem, was used.

pH, the content of TP, colour by Göfo photometer and sensory evaluation, as well as the content of connective tissue and the diameter of muscle fibres were determined. For the determination of the loss of weight during cooking (1 h/90°C) were taken the samples of about 150 g. of weight; firmness of muscle was determined by Warner-Bratzler shear device, and tenderness and juiciness were determined by sensory evaluation.

Analyzing variances, we established that only fibre diameters of m.long.dorsi in gilts are significantly larger than those in boars and barrows, and that sensory evaluated colour of muscles was significantly darker in gilts ($P < 0,05$) in comparison with the colour of muscles in boars and barrows.

Calculating correlations between some of the characteristics, we established that the values for colour of m.long. dorsi in gilts and boars determined by sensory evaluation and by Göfo photometer ($r = 0,85$ and $r = 0,64$) were very close to each other, as well as that there exists certain linear dependence ($r = -0,50$ and $r = -0,62$) when it was determined by sensory evaluation and by Warner-Bratzler shear device.

ВЛИЯНИЕ ПОЛА НА СВОЙСТВА МЫШЦ СВИНЕЙ

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РЕЗЮМЕ

В литературе имеется достаточно данных о влиянии пола на рост свиней, на использование кормов и развитие специфического полового запаха. Между тем, нам неизвестно испытывалось ли влияние пола на свойства мышц.

На основании этого было решено провести такие испытания для выяснения влияния пола на некоторые особенности мышц свиней. Испытания были проведены с 23 кабанами, 20 кастрами и 16 свинометками, полученным скрещиванием большого йоркшира x шведским ландрасом. Все эти свиньи содержались и откармливались на одном опытном хозяйстве при одинаковых условиях. Убой проводился обычным способом при живом весе около 100 кг. Для испытаний были использованы m. long. dorsi, отделенный с охлажденной туши 48 часов после убоя.

На отделенной мышце определялись: pH, содержание TP (всего пигментов), цвет - фотометром Göfo и органолептически, как и содержание соединительной ткани и диаметр волокнистых мышц. На сваренных образцах, весом в 150 г., определялась потеря веса при варке (1h/90°C), затем определялась нежность (жесткость) аппаратом Warner-Bratzler-a (W B shear press), а органолептически - нежность и сочность.

Берационо статистическим анализом было утверждено, что только диаметр волокон m.long. dorsi свинометки значитель но больше ($P < 0,01$), чем волокна мышц кабана и кастра и что органолептически оцененный цвет ($P < 0,05$) мышцы сигнификантно темнее у свинометок по отношению к цвету мышц кабанов и кастра.

Определением корреляционной зависимости между некоторыми свойствами была утверждена тесная взаимосвязь при оценке цвета органолептически и фотометром Göfo m. long. dorsi у свинометок и кабанов ($r = 0,85$ и $r = 0,64$), также как и значительная линейная зависимость между органолептической оценкой цвета и ВП мыши кастров ($r = 0,57$). Также была выражена значительная линейная зависимость между утвержденной органолептической нежностью и нежностью варенных мышц кабанов и кастра ($r = -0,50$ и $r = -0,62$), измеренных аппаратом Warner Bratzler-a.

THE INFLUENCE OF SEX ON THE CHARACTERISTICS
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INTRODUCTION

There are a lot of data in literature about the influence of sex in pigs on the growth of animals, on the conversion of food and on the development of specific odour of meat, specially of fat tissue in boars, as well as on the utilization of meat of male animals. These data could be found in the paper by Desmoulin (1). Besides this paper, we think that it is necessary to mention also that one by Matassino and bordi (2), on the influence of sex on the utilization of meat.

However, we do not know whether the influence of sex in pigs on the characteristics of muscles was investigated. For that reason we decided to investigate comparatively some qualities of muscles in boars, gilts and barrows.

Investigation

Materiјal. The influence of sex on the characteristics of muscles in pigs was investigated in the cross-breeds of Large White and Sweden Landrace. The animals were kept under the same conditions and fed with the same food in the fattening period from 20 to 50 kgs, and from 60 to 100 kgs of weight. They were slaughtered when they were 6 or 6,5 months old, and when their weight was about 100 kgs. The animals were slaughtered in an usual way in a slaughterhouse of the experimental agricultural estate "Kamendin", where they were also bred.

M.long.dorsi was cut from the halves, which were kept in a cold store, 48 hours post mortem and used for the laboratory investigations. 16 gilts, 23 boars and 20 barrows were used for these investigations. Male suckling pigs were castrated when they were 21 days old.

Methods

1. pH of muscles was measured in water extract (1:10) by pH-meter PYE UNICAM (Model 291).
2. The quantity of total pigments (TP) was determined by the Möhler's modification of Hornsey's method (3).
3. Colour was determined on a fresh cutting of muscle by Göfo photometer.

4. Colour of fresh muscles was determined by sensory evaluation according to the scale scored from 1 (very pale) to 9 (very dark); optimal score 5.

5. The quantity of connective tissue was determined by the method after Stegemann (4).

6. The diameter of fibres was determined in a homogenate obtained by chopping up 10 g. of ground muscle in 100 ml. of 0,9% solution of NaCl by means of Ultra Turax, at 5000 r/min., during 2-3 sec.

7. Loss of weight during cooking was determined on the basis of the weight of samples before and after cooking (1 hour at 90°C). The sample of about 150 g. was cooked.

8. The firmness of muscles was determined on "core" samples, each one cut twice by Warner-Bratzler shear device

9. Sensory evaluation of tenderness and juiciness was scored from 1 (extremely tough, i.e. extremely juicy) to 9 (extremely tender, i.e. extremely juicy). Meat of optimal tenderness and juiciness was scored with 8.

Results and discussion

The results obtained by these investigations are given in table 1. From these data it is obvious that the pH value of muscles in boars is the highest, in barrows lower and in gilts the lowest. The same differences could be found in the content of connective tissue.

The results of investigation of some characteristics of raw and cooked m.long.dorsi in pigs

Characteristics	Source and number of samples					
	0 = 23		0 = 20		0 = 16	
	\bar{x}	σ	\bar{x}	σ	\bar{x}	σ
1. pH	5,76	0,28	5,72	0,24	5,56	1,27
2. Quantity TP	37,90	6,04	33,97	6,45	36,04	8,04
3. Colour by Göfo	51,93	9,34	52,25	7,39	57,10	10,08
4. Sensory eval.col.	3,39	1,02	3,20	0,94	4,25	1,60
5. Connect.tissue	0,43	0,11	0,37	0,12	0,37	0,27
6. Diameter of fibres	88,64	6,11	85,17	3,10	93,22	7,13
7. Cooking loss %	35,03	2,13	33,46	2,52	34,37	2,13
8. Firmness (lb)	10,87	2,33	9,65	2,24	11,17	2,68
9. Tenderness	7,35	0,75	7,75	0,48	7,12	1,11
10. Juiciness	5,72	0,74	5,72	0,82	5,31	1,11

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Colour of muscles determined by Göfo photometer was the darkest in the samples taken from gilts, and lighter in those taken from barrows and boars. The similar differences were established when colour was determined by sensory evaluation. It was also proved that muscle fibres of m.long.dorsi in gilts are thicker than the ones in barrows and boars.

However, by means of statistical analysis we established that the only significant differences were found in the thickness of muscle fibres, i.e. that muscle fibres in female animals have significantly larger diameter ($P < 0,01$) than muscle fibres in male animals and barrows. In the same way colour of muscles in female animals determined by sensory evaluation was significantly darker ($P < 0,05$).

Therefore, it is obvious that sex of the examined gilts, boars and barrows had not any influence on pH, the quantity of TP, colour when it was determined by Göfo photometer, and on the content of connective tissue in m.long.dorsi. We also did not find that the sex of the examined pigs had any influence on the loss of weight of muscle during cooking, on the tenderness when it was determined by Warner-Bratzler's shear device, as well as on the firmness and juiciness determined by sensory evaluation.

Correlations of some of the characteristics of m.long.dorsi in boars, barrows and gilts

Source and number of samples	Characteristics			
	Warner-Bratzler shear values:	Colour		
	fibres	firmness by Göfo	TP	
0	diameter	sens evaluation		
n=23	0,0770	- 0,5033 ^{xx}	0,6429 ^{xx}	0,089
0				
n=20	0,1918	- 0,6258 ^{xx}	0,2660	0,5718 ^{xx}
0				
n=16	0,2355	- 0,3334	0,8492 ^{xx}	0,0811

From the results given in the Table 2. it is clear that there is a very close correlation between the colour of muscles in female ($r=0,8492$) and male animals ($r=0,6429$) determined by sensory evaluation and by Göfo photometer, but it is not expressed in barrows. On the contrary, in muscles of barrows a significant linear dependence between the sensory evaluated colour and TP was expressed ($r=0,5718$).

Summarizing the results obtained by these investigations it can be concluded that the sex of pigs, cross-breeds of Large White and Sweden Landrace, i.e. castration of male animals carried out when they were 21 days old, does not influence significantly pH, quantity of TP, colour determined by Göfo photometer, content of connective tissue, loss of weight during cooking, firmness, as well as tenderness and juiciness of m.long.dorsi.

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