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EFFECT OF PRE-SLAUGHTER WEIGHT ON CARCASS QUALITY IN PIGS OF IRISH ORIGIN

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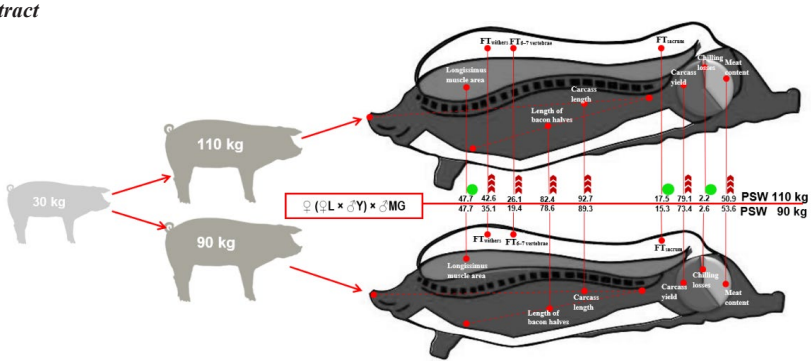
Abstract

To determine the effect of pre-slaughter weight on carcass performance of pigs of Irish origin, two groups of 14 pigs were formed with live weights of 90 and 110 kg per group, including 7 barrows and 7 gilts. After slaughter and carcass fabrication, carcass indicators were measured and the relationship to pre-slaughter weight was examined. For 110 kg pigs, a 1 kg inrease in pre-slaughter weight increased carcass chilling losses by 0.1% (r = 0.41; p<0.001), decreased carcass yield by 0.81 kg (r = -0.5; p<0.001), increased carcass length by 0.48 cm (r = -0.64; p<0.001), increased fat thickness over withers by 0.76 mm (r = 0.38; p<0.001), increased fat thickness over 6th-7th thoracic vertebrae by 0.76 mm (r = 0.37; p<0.001). For 90 kg pigs, an 1 kg increase in pre-slaughter weight increased fat thickness over 6th-7th thoracic vertebrae by 0.45 mm (r = 0.45; p<0.001), increased fat thickness in sacrum by 0.89 mm (r = 0.16; p<0.001), and decreased meat content by 0.89% (r = -0.28; p<0.001). An increase in pre-slaughter weight did not lead to a decrease in the carcass quality class.

Graphic abstract



Key words: *bacon halves, carcass yield, carcass length, fat thickness, meat content.*

INTRODUCTION

Breeding for meat production has been a major goal in pig farming for decades (Tribout et al., 2010). The composition and quality of the carcass is contingent on the pre-slaughter weight, which is due to the intensity of growth and influence of consumer or market demand. Balancing the performance of pigs and consumer demand in the pork market increases the profitability of pig farms (Yang et al., 2012). Indicators of slaughter quality of pigs in different ways affect the further evaluation of meat cuts, which are evaluated differently by consumers in different regions. In addition, slaughter quality indicators are closely interrelated, including carcass yield, lean meat content, and fat thickness, which are the focus for both pork producers and consumers (Lebret et al., 2014). It has long been known that when a pig's body reaches a state of puberty, exchangeable energy, nutrients and minerals of

fodder cease to be expended on the formation and enlargement of skeletal muscles and bones. The energy is then converted into fat, which is first deposited under the skin, then deposited between the muscles, and then between the bundles of muscle fibers (De Smet et al., 2004). Based on this pattern, genetic companies and pork producers have focused their research on breeding heavier pigs to provide lean pork while maintaining acceptable levels of fat (Price et al., 2019). Pre-slaughter or market weights vary around the world with pigs slaughtered at live weight 115 kg in South Korea, 160 kg in Italy, 100-140 kg in the United States and 110-120 kg in most European and Asian countries (USDA, 2022). Thus, the pig industry is now focused on increasing the pre-slaughter weight, which is likely to continue in the search for the optimal ratio between weight and carcass quality in the near future (Hwang et al., 2020; Kim et al., 2005; Wu et al., 2017).

The influence of the slaughter weight of pigs on the quality of their carcasses, both before and now, is devoted to a lot of research. Thus, the evaluation of pork eating quality attributes found the highest consumer taste and juiciness ratings for pork from pigs with greater loin fat thickness. And for the general acceptability of pork the minimum fat thickness of 21–30 mm is required (Hoa et al., 2021). There is a linear positive relationship fat thicknesses in different parts of the carcass with pre-slaughter weight (Choi et al., 2019; Virgili et al. 2003). These past studies found that fat thickness increased by 0.18 mm per 1 kg increase in the pre-slaughter weight of pigs from 85 to 150 kg. This change in fat thickness was due to growth in pre-slaughter weight by 4.67%, and other changes in fat thickness depended on other factors (Park et al., 2013). Growth intensity was negatively correlated to fat thickness over withers was significant and negative up to 20 weeks, and after 20 weeks of fattening it changed to positive and lost statistical significance before slaughter (Park et al., 2018). The researchers also reported that 37.81% of the variability in fat thickness over 6^{th}–7^{th} thoracic vertebrae was due to the influence of the pre-slaughter weight factor (Harsh et al., 2017).

Indicators of meat content and its dependence on pre-slaughter weight are important for the whole process of pork production. Researchers have found conflicting data that increasing pre-slaughter weight can lead to both an increase in meat content and a decrease in meat content, depending on the breed of pig (Birta et al., 2020). Increasing the meat content of pig carcasses through targeted feeding is widely used in the practice of pig farming (Hambrecht, 2004). Positive linear relationships have been found in lean meat content with slight increases in pre-slaughter weight in the range from 85 to 120 kg, and at heavier pre-slaughter weights up to 135 kg. Korean researchers also reported that the meat content in the carcass increased by 0.37% for every 10 kg increase in pre-slaughter weight from 88.6 to 122.5 kg (Jeong et al., 2010). Similar findings (Park, 2011) can be observed in other publications, which say that the pre-slaughter weight can be increased from 110 to 125 and 135 kg, respectively, as the meat content does not decrease with increasing pre-slaughter weight. With such an increase in pre-slaughter weight, it is also predicted that the fat thickness will be approximately 24 mm over 6^{th}-7^{th} ribs without compromising the quality and content of meat. Similar reports indicate that despite an increase in pre-slaughter weight from 110 to 130 kg (Kim et al., 2005) and from 125.6 to 152.5 kg (Maiorano et al., 2007) and on a corresponding increase in fat content and fat thickness, lean meat content also increased. It was reported that the content of meat is contingent not only on the ratio of fat and lean tissues, but also depends on the carcass yield. The meat content increases by 0.84 kg, with the increase in carcass yield by 1.0% (Mikhailov, 2011).

However, there are many studies that point to the inexpediency of raising pigs to heavy weights, as this leads to an increase in fat content, and reduced content and quality for pork (Peinado et al., 2011). As the pre-slaughter weight increased from 126 to 168 kg, the carcass yield and fat thickness increased linearly while percentage lean meat decreased (Malgwi et al., 2022). Although feeding to heavier pre-slaughter weights increased the absolute amount of meat on carcass, pork quality deteriorated (Bertol et al., 2015). Other studies (Barducci et al., 2020) havefound weak relationships between pre-slaughter weight and longissimus muscle depth or lean meat yield and a weak relationship between fat thickness and

Longissimus muscle area such that the amount of lean meat does not decrease with heavier pre-slaughter weights. This showed that with increasing weight, pigs lost little of their lean meat. Our hypothesis is to avenge the increase in pre-slaughter weight from 90 kg to 110 kg in pigs of the Irish breeding, finishing in the minds of the industrial pig farm, not to reduce the class of their carcasses. Thus, the aim of this study was to determine the effects of pre-slaughter weight on carcass quality and the nature of the relationship amongst carcass quality attributes in pig carcasses from commercial genotypes of Irish origin.

MATERIALS AND METHODS

The pigs for this study were sourced from 400 commercial hybrids of Irish origin from the genetic firm Hermitage. These pigs were produced from Irish Landrace and Yorkshire F_1 sows, that were bred to semen from the Max Gro synthetic terminal line boars. Pigs were raised and fattened in equal numbers of barrows and gilts in Globinsky Pig Complex (Poltava region, Ukraine).

At an average live weight of 100 kg, all experimental pigs were individually weighed and divided into two groups with an average weight of 90 and 110 kg. From each weight group, 14 pigs were selected for slaughter 7 gilts and 7 barrows for the 90 kg pre-slaughter weight group and 7 gilts and 7 barrows for the 110 kg pre-slaughter weight group. Pre-slaughter pigs from both groups were marked on the waist on each side with numbers using a tattoo hammer to identify carcasses.

All pigs were produced and fed under identical conditions. During the study, pigs were finished in 40 m^2 area pens with 50 pigs in each pen. The material of the buildings and floors, their planning and technological equipment for feeding, watering and maintenance zoohygienic conditions for keeping pigs were identical. Pigs of both sexes were kept together in a pen.

Complete feeding rations (Table 1) with a distribution frequency of 10 times a day were used for feeding. Compound feeds were manufactured and balanced with nutrients and energy in Weda feed production equipment (Dammann & Westerkamp GmbH, Austria) at Globinsky Pig Complex (Poltava region, Ukraine).

Table 1. The structure of the feed ration

Ingredient	Value
Maize grain kibbled (IFN 4-02-866), %	19.0
Wheat grain (IFN 4-05-211), %	35.9
Soybean seeds meal solvent extracted (IFN 5-04-604), %	13.3
Sunflower seeds meal mechanical extracted (IFN 5-27-477), %	8.8
Sorghum grain (IFN 4-04-383), %	12.0
Wheat bran (IFN 4-05-190), %	1.0
Cereals, screenings (IFN 4-02-156), %	10.0

The nutritional value of the diet was sufficient and included the necessary vitamins and micro- and macro-elements necessary for normal fattening pigs (Table 2). Pigs were fed with this diet from their live weight of 60 to 110 kg. The ratio of dry food to water was 1: 3.

Table 2. Nutritional value of feed for pigs fattening

Indicator	Value
Protein content, %	18.0
Lysine content, %	1.0
Oil content, %	2.8
Fiber content, %	4.3
Calcium content, %	0.63
Assimilable phosphorus content, %	0.29
Total phosphorus content, %	0.57
Vitamin A content, IU/kg	10000
Vitamin D content, IU/kg	2000
Vitamin E content, IU/kg	100
Biotin content, μg/kg	100
Assimilable energy, MJ/kg	13.65

All experimental pigs were sent for slaughter to the slaughterhouse of Globinsky Meat Processing Plant (Poltava region, Ukraine). The pigs were held for 24 hours without access to feed and then stunned in the gas chamber Schaller Butina DK 4300 (Butina ApS, Denmark) with death by carbon dioxide asphyxiation. The carcasses were then processed according to generally accepted methods (ISO 3100-1). The following carcass parameters were measured on the hot carcass: carcass length, length of bacon halves, fat thickness at three carcass points (over the withers, over the sacrum, at the level of 6^{th}–7^{th} thoracic vertebrae). After pre-keeping the carcasses at a temperature of 14ºC for 1 hour 45 minutes, the carcasses were chilled at a temperature of 4ºC for 24 hours. Twenty-four hours after slaughter, the carcasses were

fabricated in the meat processing department of Globinsky Meat Processing Plant to determine their characteristics according to existing methods (ISO 3100-1): *Longissimus* muscle area, carcass yield, meat content, cooling losses after 24 hours, weight of chilled carcass.

Warm carcass weight was measured as unchilled carcass weight after slaughter and removal of the head, skin, intestinal tract and internal organs.

Carcass yield was calculated as the percentage of carcass weight, head, legs and visceral fat to the live weight of the pig before slaughter.

Weight of chilled carcass was measured as carcass weight without head, tail, internal fat, genitalia, internal organs and their contents after 24 hours of cooling.

Cooling losses were calculated as the difference between warm carcass weight and chilled carcass weight.

Fat thickness was measured with a millimeter ruler at warm half-carcass in a hanging vertical position including the thickness of the skin.

Carcass length was measured in centimeters with a ruler in a hanging vertical position, along the middle of the cut from the anterior edge of the pubic bone to the front surface of the first cervical vertebra.

The length of the bacon half was measured with a centimeter ruler, in the hanging vertical position of the carcass, along the middle of the cut from the anterior edge of the pubic bone to the middle of the first rib.

The Longissimus muscle area was measured on a transverse section between the last thoracic (or 12^{th}) and first lumbar vertebrae (or 13^{th}). The contour of the cut of the longest muscle of the back was transferred to a transparent film and scanned from the film to an electronic medium using a scanner. Next, we used ImageJ 1.53e software capabilities. The downloaded cut image was calibrated for size using a photo millimeter scale ruler and converted to 8-bit expansion. Next, using the shape selection function and the area analysis function, we measured the area of the cut image. Cut image area measured using this software corresponds to the Longissimus muscle area.

Meat content was calculated as the ratio of the total mass of striated red muscle to the mass of the carcass without the head and forelimbs.

The class of the carcasses was determined by a staff certified classifier in the slaughterhouse after 15 minutes they were fabricated by using the method of calculating the meat content. Each carcass was assigned the appropriate class and marking according to SEUROP (Commission Regulation (EU) 2008). Classes of pig carcasses depended on the content of meat content: S - 60% or more, E - 55% or more, U - 50% or more, but less than 55%, R - 45% or more, but less than 50%, O - 40% or more, but less than 45%, P - less than 40%.

Statistical analysis included: calculation of mean value, standard deviation, errors of standard value, correlation coefficients, coefficient of determination (square of correlation coefficient) and method of constructing a two-dimensional linear mathematical model. The significance of the discrepancy ($p<0.001$) between the slaughter qualities indicators ($n = 28$) was analyzed using Student's t-test. The assessment of the strength of the correlation relationship was determined by the value of its coefficient (r): $0.1<r<0.3$ - weak correlation, $0.3<r<0.5$ - moderate correlation, $0.5<r<0.7$ - noticeable correlation, $0.7<r<0.9$ - high correlation, $0.9<r<1$ - very high correlation. To obtain graphs and perform statistical calculations were used Microsoft Office Excel 2010.

The protocol of the experiment was agreed and approved by the Bioethical Commissions of Animal Care and Use during scientific (experimental) research of Sumy National Agrarian University (ethical approval number BT-22-0122-03). Experimental pigs were used strictly accordingly to Guide for the Care and Use of Laboratory Animals, with Law of Ukraine On protection of animals against inhumane treatment and in accordance with the requirements of Council Directive 86/609/EEC.

RESULTS AND DISCUSSIONS

Increasing pre-slaughter weight from 90 to 110 kg increased ($p<0.001$) warm carcass weight by 21.1 kg or 32.25%, carcass yield by 5.7%, weight of chilled carcass by 20.9 kg or 34.83%, fat thickness over 6^{th}-7^{th} thoracic vertebrae by 6.7 mm or 34.54%, carcass length by 3.4 cm or 3.81%, length of the bacon half 3.8 cm or 4.83% (Table 3).

Table 3. Slaughter rates of pigs with different pre-slaughter weight (n = 28)

Indicators	I Group (90 kg)	II Group (110 kg)	p-value
Warm carcass weight, kg	61.6±0.34[a]	82.7±0.24[b]	<0.001
Carcass yield, %	73.4±0.83[a]	79.1±0.80[b]	<0.001
Weight of chilled carcass, kg	60.0±0.32[a]	80.9±0.64[b]	<0.001
Chilling losses after 24 h, kg	1.6±0.15[a]	1.8±0.43a	0.3257
Chilling losses after 24 h, %	2.6±0.22[a]	2.2±0.47[a]	0.2041
Fat thickness:			
over 6^{th}-7^{th} thoracic vertebrae, mm	19.4±0.80[a]	26.1±0.61[b]	<0.001
over sacrum, mm	15.3±1.24[a]	17.5±0.6[a]	0.0747
over withers, mm	35.1±0.83[a]	42.6±1.08[b]	<0.001
Carcass length, cm	89.3±0.57[a]	92.7±0.41[b]	<0.001
Length of bacon halves, cm	78.6±0.34[a]	82.4±0.47[b]	<0.001
Longissimus muscle area, cm^2	47.7±1.07[a]	47.7±1.07[a]	0.4895
Meat content, %	53.6±0.47[a]	50.9±0.44[b]	<0.001
Carcass class (average)	U	U	

Note: [ab]Means in the same row without common letter are different at p<0.05.

Pigs with a pre-slaughter weight of 90 kg had a higher meat content by 2.7% (p<0.001) than a 110 kg pig. There was no significant difference between the carcasses, the thickness of the fat in the sacrum, and the *Longissimus* muscle area between the carcasses of the two groups of pigs. There was no significant difference between cooling losses after 24 hours, fat thickness over sacrum, and *Longissimus* muscle area in the carcasses of the two groups of pigs.

The correlation between pre-slaughter weight in 90 kg pigs with fat thickness over 6^{th}-7^{th} thoracic vertebrae was direct, moderate and reliable (r = 0.45; p<0.001), with fat thickness over sacrum was direct, weak and also reliable (r = 0.16; p<0.001), with meat content was inverse, weak and probable (r = -0.28; p<0.001). Evaluation of the correlation between slaughter indicators and pre-slaughter weight showed the presence of both direct and inverse interdependence between them (Table 4).

In particular, the correlation between the indicators of cooling losses after 24 hours (r = -0.07; p<0.001), the carcass length (r = -0.18; p<0.001) and the *Longissimus* muscle area (r = -0.24; p<0.001) in pigs with pre-slaughter weight 90 kg had a weak and inverse. Correlation between the carcass yield (r = 0.12; p<0.001), the length of the bacon half (r = -0.06; p<0.001), the fat thickness at the withers (r = 0.16; p<0.001) and pre-slaughter weight in light weight pigs was direct but weak.

Table 4. Correlation between pre-slaughter weight and slaughter indicators (n = 28)

Indicator	Group I (90 kg)		Group II (110 kg)	
	r	p-value	r	p-value
Cooling losses after 24 hours	-0.07	<0.001	0.41	<0.001
Carcass yield	0.12	<0.001	-0.55	<0.001
Carcass length	-0.18	<0.001	0.64	<0.001
Length of bacon halves	0.06	<0.001	0.29	<0.001
Fat thickness over withers	0.16	<0.001	0.38	<0.001
Fat thickness over 6^{th}-7^{th} thoracic vertebrae	0.45	<0.001	0.37	<0.001
Fat thickness over sacrum	0.16	<0.001	0.13	<0.001
Longissimus muscle area	-0.24	<0.001	-0.01	<0.001
Meat content	-0.28	<0.001	0.03	<0.001

The correlation relationship of pre-slaughter weight in 110 kg pigs with the indicator of cooling losses after 24 hours was direct and moderate (r = 0.41; p<0.001), with the indicator of carcass yield was inverse and noticeable (r = -0.55; p<0.001), with the carcass length was straight and moderate (r = 0.64; p<0.001), with the length of the bacon half was straight and weak (r = 0.29; p<0.001), with the fat thickness over withers was straight and moderate (r = 0.38; p<0.001), with the fat thickness over 6^{th}-7^{th} thoracic vertebrae was straight and moderate (r = 0.37; p<0.001).

The correlation between the pre-slaughter weight in heavy weight pigs (110 kg) and the fat thickness over sacrum, the *Longissimus* muscle area and meat yield was statistically insignificant.

It was found that with increasing pre-slaughter weight in 110 kg pigs per 1 kg cooling losses after 24 hours increased by 0.1% (Figure 1 a, b). Moreover, changes in the rate of cooling losses after 24 hours were formed by the impact of pre-slaughter weight by 1.73% and by unaccounted factors by 98.27%. When changing the pre-slaughter weight of 90 kg of pigs, there was no significant increase or decrease in cooling losses after 24 hours.

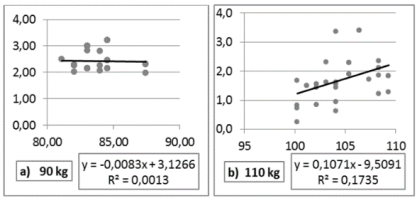


Figure 1. Linear approximation of the dependence of cooling losses after 24 hours on pre-slaughter weight

Fluctuations in pre-slaughter weight in 90 kg pigs did not significantly affect changes in carcass yield (Figure 2 a). With an increase in pre-slaughter weight in 110 kg pigs per 1 kg, carcass yield decreased by 0.81 kg. The detected change in carcass yield was due to the influence of pre-slaughter weight by 3.01% (Figure 2 b).

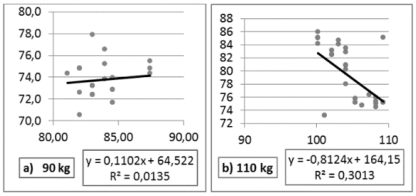


Figure 2. Linear approximation of the dependence of the carcass yield on pre-slaughter weight

No reliable relationship between carcass length and pre-slaughter weight in 90 kg pigs was found (Figure 3 a). The increase in pre-slaughter weight in 110 kg pigs per 1 kg caused an increase in the carcass length by 0.48 cm. Moreover, this dependence of the carcass length was formed under the influence of the pre-slaughter weight by 4.09% (Figure 3 b).

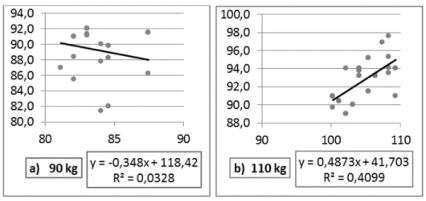


Figure 3. Linear approximation of the dependence of the carcass length on the pre-slaughter weight

Any changes in the pre-slaughter weight in 90 kg pigs did not lead to probable changes in the length of the bacon half (Figure 4 a). Changes in the pre-slaughter weight per 1 kg in the group of 110 kg pigs significantly changed the length of the bacon half of their carcass by 0.24 cm with a force of 0.81% (Figure 4 b).

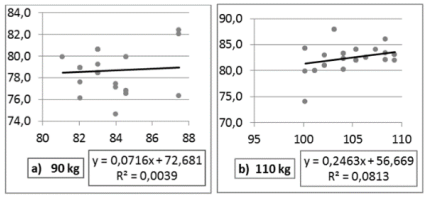


Figure 4. Linear approximation of the dependence of the length of the bacon half on the pre-slaughter weight

Fluctuations in the fat thickness over withers in 90 kg pigs did not depend on the effect of pre-slaughter weight (Figure 5 a). With the increase in pre-slaughter weight in 110 kg pigs per 1 kg, the fat thickness over withers increased by 0.76 mm under the influence main factor by 1.44% (Figure 5 b).

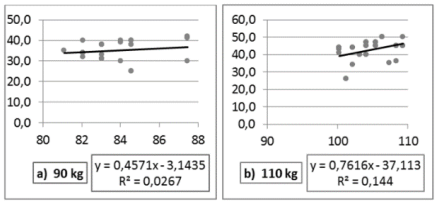


Figure 5. Linear approximation of the dependence of the fat thickness over withers on the pre-slaughter weight

The fat thickness over 6^{th}-7^{th} thoracic vertebrae increased in 90 kg pigs by 1.20 mm, and in 110 kg pigs by 0.42 mm in parallel with the increase in pre-slaughter weight by 1 kg (Figure 6 a, b). Moreover, the main factor in the group of light weight pigs caused a change in the dependent

indicator by 2.0% and in the group of heavy weight pigs by 1.4%.

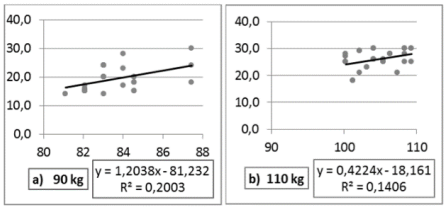


Figure 6. Linear approximation of the dependence of the fat thickness over 6th-7th thoracic vertebrae vertebrae on the pre-slaughter weight

Changes in the pre-slaughter weight in 90 kg pigs led to changes in the fat thickness over sacrum by 0.89 mm with a force of 0.79%. No correlation was found between the fluctuations in the fat thickness over sacrum and the pre-slaughter weight in 110 kg pigs (Figure 7 a, b).

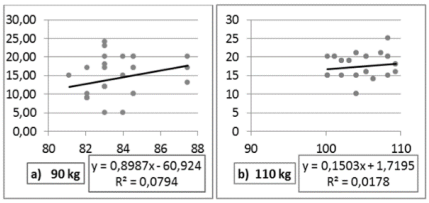


Figure 7. Linear approximation of the dependence of the fat thickness over sacrum on the pre-slaughter weight

The nature of the dependence of meat content and pre-slaughter weight in 90 kg pigs was determined by the influence of the factor trait with a force of 0.76%. This led to a decrease in meat content by 0.89% with growth in pre-slaughter weight by 1 kg. In 110 kg pigs, the meat content did not depend on changes in the pre-slaughter weight (Figure 8 a, b).

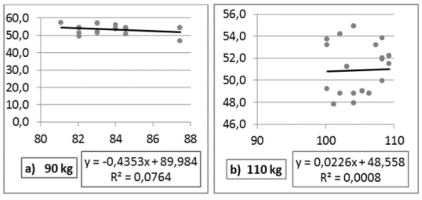


Figure 8. Linear approximation of the dependence of meat content on pre-slaughter weight

The Longissimus muscle area only tended to decrease by 0.87 cm^2 with an growth in pre-slaughter weight by 1 kg in 90 kg pigs and by a decrease of 0.01 cm^2 in 110 kg pigs (Figure 9 a, b).

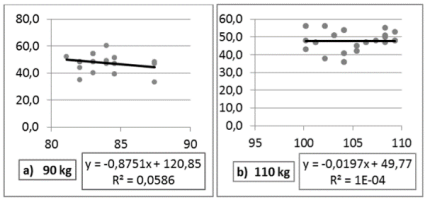


Figure 9. Linear approximation of the dependence of the *Longissimus* muscle area on the pre-slaughter weight

The results of our studies only partially coincided with the report (Makaukii, 2000), which indicated that increasing the pre-slaughter weight of pigs from 60 to 90 kg significantly increased the *Longissimus* muscle area, fat thickness, carcass length and carcass yield. Contrary to the report (Makaukii, 2000), in our study with increasing pre-slaughter weight to 90 kg, the *Longissimus* muscle area and the carcass length tended to decrease, and the carcass yield tended to increase. We found that when the pre-slaughter weight increased by 1 kg, only the fat thickness significantly increased at only two points of the carcass: over 6th–7th thoracic vertebrae by 0.45 mm and over sacrum by 0.89 mm, what is similar to the results where fat thickness increased by 0.18 mm per 1 kg increase in pre-slaughter weight of pigs from 85 to 150 kg (Park et al., 2013).

Also, our findings partially coincided with the published data (Price et al., 2019), which reported that with increasing pre-slaughter weight increased: the *Longissimus* muscle area ($r = 0.24$; $p<0.001$), fat thickness ($r = 0.13$; $p<0.001$). We found similar results with respect to the increase in fat thickness with increasing pre-slaughter weight in both 90 kg pigs and 110 kg analogues. But in light weight pigs the increase in fat thickness over 6th-7th thoracic vertebrae was in combination with growth fat thickness over sacrum, and in heavy weight pigs the growth of fat thickness over 6th-7th thoracic vertebrae was in combination with growth of fat thickness over withers. This result is confirmed by data, which indicate a statistically appreciable effect of pre-slaughter weight on the fat thickness over 6th-7th thoracic vertebrae with a force of 22.09% (Andrieieva, 2020) and 37.81% (Harsh et al., 2017). But in our results the factor of pre-slaughter weight on the fat

thickness over 6^{th}-7^{th} thoracic vertebrae affected much weaker: in 90 kg pigs at 2.00% and in 110 kg pigs at 1.40%. We concluded that fat thickness increased with increasing pre-slaughter weight in pigs, which coincides with reports that fat thickness was greater ($p<0.05$) in heavy pigs with pre-slaughter weight 135 kg (31.2 mm) and 125 kg (29.3 mm), compared with light 115 kg analogues (25.0 mm) (Oh et al., 2022). We obtained a direct linear relationship between pre-slaughter weight and fat thickness similar to other published results (Choi et al., 2019; Malgwi et al., 2022; Virgili et al., 2003).

The *Longissimus* muscle area did not show a statistically significant increase with increasing pre-slaughter weight in pigs of both weights. This also contradicts the results of publications that found a mean positive correlation ($r = 0.57$; $p<0.001$) between pre-slaughter weight and the *Longissimus* muscle area (Sládek et al., 2003) and contradicts publications where a negative weak correlation was found ($r = -0.14$; $p<0.001$) between these indicators (Barducci et al., 2020). In addition, we did not find a statistically perceptible effect of pre-slaughter weight on the *Longissimus* muscle area, contrary to the results of scientific research, which found a significant effect of pre-slaughter weight with a strength of influence 20.10% on the *Longissimus* muscle area (Andrieieva, 2020).

Our conclusions coincided with the results, which showed a low negative correlation ($r = -0.20$; $p<0.001$) between pre-slaughter weight and meat content (Sládek et al., 2003). In our experiment, the correlation between pre-slaughter weight and meat content in carcasses of 90 kg pigs was also low and negative, similar to the findings of (Barducci et al., 2020), which also indicate a negative correlation ($r = -0.23$; $p<0.001$) between these carcass slaughter indicators and a decrease in meat content with increasing pre-slaughter weight (Peinado et al. 2011). At the same time, the correlation between pre-slaughter weight and meat content was not statistically significant in carcasses of 110 kg pigs, similar to other findings (Bertol et al., 2015), which states that the meat content remains unchanged with increasing pre-slaughter weight of pigs. Thus, our results, which describe the relationship between meat content and pre-slaughter weight, agree with the data (Malgwi et al., 2022), but contradict the conclusions (Jeong et al., 2010), which show a linear increase in meat content with pre-slaughter weight increases as in carcasses 85-120 kg, and in carcasses 120–135 kg and more than 152.5 kg (Kim et al., 2005; Maiorano et al., 2007; Park, 2018). According to previous reports, the carcasses of the Irish Landrace pigs with a pre-slaughter weight 120 kg statistically perceptible outperformed the carcass meat content by 3.72% of analogues with a pre-slaughter weight 110 kg (Mykhalko et al., 2022). However, in the current experiment, on the contrary, the meat content in carcasses of light weight pigs (90 kg) was higher than in carcasses of heavy weight pigs (110 kg) by 2.7% ($p<0.001$).

Our data did not coincide with the previously published reports (Povod et al., 2020), the results of which show that in the conditions of industrial pork production it is advisable to slaughter animals with increased pre-slaughter weight more than 115 kg. It will increase carcass yield by 1.8% in gilts and by 1.6% in barrows. In our experiment, the increase in pre-slaughter weight of light pigs (90 kg) did not show a significant increase in carcass yield, and in heavy pigs (110 kg) carcass yield was significantly reduced by 0.81 kg with a decrease in pre-slaughter weight by 1 kg.

According to reports, the evaporation of moisture from the surface of pig carcasses is the cause of weight loss during the cooling period (Zhang et al., 2017). However, it was found that the pre-slaughter weight does not significantly affect the cooling losses after 24 hours in 90 kg of pigs, which coincided with widespread similar claims (Bankovskaya et al., 2016; Mykhalko et al., 2020; Povod, 2018), but contradicts the results (Patinho et al., 2013), which indicate cooling losses after 24 hours from 1.0 to 1.5% in light pigs (90 kg). However, a direct correlation was found cooling losses after 24 hours and pre-slaughter weight in 110 kg pigs, which was in direct contrast to the other findings (Daszkiewicz et al., 2011), which found that the rate of cooling losses after 24 hours was negatively correlated with pre-slaughter weight of fattening pigs.

The difference between the lengths of the bacon halves in the pig's carcasses of both groups was established. It was higher in heavy pigs (110 kg)

by 3.8 cm or 4.83% ($p<0.001$). The effect of pre-slaughter weight on the length of the bacon half was confirmed by a direct and weak correlation ($r = 0.29$; $p<0.001$) in 110 kg pigs, which coincides with (Shpetny, 2018) reports, which showed a parallel increase in the length of the bacon half and pre-slaughter weight of pigs. But this contradicts the conclusions that show the absence of such effect in the carcasses of pigs 100, 110 and 120 kg (Nechmilov, 2019). However, in 90 kg pigs in our experiment, no significant effect of pre-slaughter weight on this slaughter indicator was found. This coincides with the results of experiments on the lack of correlation between the length of the bacon half and the pre-slaughter weight and coincides with the reports where is a significant impact on it pig breed (Kozir et al., 2020; Shevchuk, 2019) or diet (Fasuyi et al., 2012).

CONCLUSIONS

Increasing the pre-slaughter weight of pigs from 90 to 110 kg resulted in a decrease in meat content by no more than 5%, thus its quality class remained unchanged. An increase in the pre-slaughter weight had an effect on the increase in the carcass yield, the fat thickness and the increase in the size of the carcass and its parts, which will positively affect the volume of pork production without reducing the quality of the carcass.

We consider it necessary to continue the study of the impact on carcass quality of a further increase in the pre-slaughter weight of pigs up to 120 kg, taking into account the influence of the sex of the animals.

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