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### **Fattening and slaughter value of crossbred pigs depending on their age**

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Wartość tuczna i rzeźna mieszańców świń w zależności od wieku

**Summary.** The objective of this paper was to determine the fattening and slaughter values in three age groups of crossbred pigs fattened to similar body mass of 103 kg. The experiment was performed on 131 crossbred baconers of polish landrace, duroc, hampshire and pietrain breeds with the division into 3 age groups. The crossbreds of group III (fattening period lasted on average 199 days) exhibited the lowest fattening value, and those of group I (157 days of fattening) exhibited the highest fattening values – the animals recorded the highest increase of body mass and the lowest consumption of nutrients per (1) kg of body mass gain).

**Key words:** pigs, fattening and slaughter value

#### INTRODUCTION

Efforts to maximize meat content in carcasses, regardless of its quality, may lead to the occurrence of various meat quality deviations [Krzywicki 1972, Grześkowiak 1995, Koćwin-Podsiadła *et al.* 1997, 1998]. That is why, at present, the breeding programs take into account the relationships between fattening and slaughter traits and meat quality.

However, despite a significant improvement in the meatiness of Polish fatteners, the production level achieved is not as yet competitive to animals from Western Europe. Achieving comparable level requires, on the one hand – an increase in fatter population through an effective use of sows (the number of fatteners bred from one sow in Poland does not exceed 13, whereas the respective EU average is 17), on the other hand – an increase in the value of fattening and slaughter characteristics of bred stocks. Achieving good production results depends on a combination of factors, affecting primarily: the genotype of animals, suitable environmental conditions (feeding and maintaining) as well as the production profitability [Różycki 1995, 1999, Jasek 1997, Poznański 1997, Wyniki... 1998, Michalska *et al.* 2004].

For the production of fatteners to be profitable must meet favorable market conditions (policy of the state, system of payment and incentives for pigs with high meatiness offered by slaughter houses). Also, the fattening process must be effective, which is closely connected with the mass of slaughtered animals. With age and growing body mass, fatteners tend to accumulate less protein and more fat. The fat share grows and, thus, the percentage of meat in carcass becomes lower, so its quality gets worse. The greater the final mass of a fattener, the smaller the share of the cost of source material – piglets – in the fattening process. Therefore, the final mass, when the animal is slaughtered, shall be the resultant of the cost of feed and that of the piglet. The correct final mass should be determined by the recipient, meat industry, while offering suitable prices depending on final mass as well as quality of the carcasses [Rekiel 1997].

The objective of this paper was to determine the fattening and slaughter values in three age groups of crossbred pigs fattened to similar body mass of 103 kg.

#### MATERIAL AND METHODS

The experiment was performed on 131 crossbred baconers of polish landrace, duroc, hampshire and pietrain breeds with the division into 3 age groups:

- group I – 150 to 169 days,
- group II – 170 to 189 days,
- group III – 190 to 210 days.

The fattening was run in uniform conditions of environment and feeding in the Swine Fattening House in Hruszowice.

Piglets were separated from sows when 6 weeks old and fattened based on full-portion nutritive fodder supplied ad libitum in dry condition from automatic devices. Then, the animals were subjected to weighing and the average daily weight gains, as well as the consumption of total protein and metabolic energy per kg of weight gain, were calculated throughout their life.

Then the fatteners were transported to the slaughter house in Jarosław and slaughtered, after weighing them, in accordance with the methods obligatory in the meat industry. The obtained porkhalves were weighed to determine the mass of „warm” carcass and to calculate the „warm” slaughter yield from it. They were also subjected to evaluation of their slaughter value, after taking the following linear measurements [Znanięcki 1983]: carcass length to atlas, central length of carcass, ham length, ham circumference, bacon thickness, thickness of dorsal fat in 5 places (above the shoulder blade; at the back, behind the last thoracic vertebra; above the front edge of the buttock muscle section – low back I, above the middle edge of the buttock muscle section – low back II, above the rear edge of the buttock muscle section – low back III).

Then, the leaf fat was removed from carcasses and weighed to the nearest 0.1 kg, and the porkhalves were moved to the cool storage at 0–4°C for a period of 24 hours. On the second day of testing, the right-hand porkhalves were subjected to partition to main parts, which were weighed to the nearest 0.1 kg. The sirloins were cut behind the last thoracic vertebra, the contour of the longest dorsal (*longissimus dorsi*) muscle section was defined and cross-section area of the longest dorsal muscle was determined on it by planimetric method. Besides, the width and height of „sirloin eye” were measured.

All obtained numerical data were segregated and subjected to statistical and mathematical processing. Tables specify arithmetic means ( $\bar{x}$ ) of each of the studied characteristics as well as the value of standard deviation (S). Analysis of variance (ANOVA) was used in calculations which were then checked with Tukey's confidence intervals, at two significance levels  $\alpha \leq 0.01$  and  $\alpha \leq 0.05$ . The zero hypothesis in ANOVA was verified, using the test constructed by Fisher Snedecor (test F).

Calculations were performed on the basis of the Statistica ver. 5.1 software program.

## RESULTS AND DISCUSSION

It is commonly known that an extension of fattening period causes a higher consumption of total protein and metabolic energy per kg of body weight gain, and that the average daily weight gains will also be smaller. As expected (refer to Table 1), the average consumption of total protein and metabolic energy per kg of body weight gain in group I (545 g and 38 MJ) will be smaller by approx. 22% compared to group II (671 g and 48 MJ) and 40% lower, compared to group III (750 g, 55 MJ). On the other hand, the average daily weight gains in group I will be higher by an average of 15% compared to group II (551 g) and 22% higher compared to group III (504 g). The differences between, average values of these traits were statistically significant for all age groups. Michalska *et al.* [2004] obtained a little greater average daily weight (696 g and 729 g) in 2 groups of gilts slaughter in 185 the day of the life.

Table 1. Results of fattening of hybrids originating from different age groups  
Tabela 1. Wyniki tuczu mieszańców pochodzących z różnych grup wiekowych

| Specification<br>Wyszczególnienie   | Statistical<br>measures<br>Miary<br>statystyczne | Age group<br>Grupa wiekowa   |                              |                              |
|---|--|------------------------------|------------------------------|------------------------------|
|   |  | I                            | II                           | III                          |
| Number of investigated pigs<br>Liczba badanych świń   |  | 34                           | 57                           | 40                           |
| Age, days<br>Wiek, dni  | $\bar{x}$<br>S                                   | 157.41 <sup>A</sup><br>5.70  | 179.42 <sup>B</sup><br>5.69  | 199.35 <sup>C</sup><br>9.34  |
| Average daily gains in fattening period, g<br>Średnie dobowe w okresie tuczu                    | $\bar{x}$<br>S                                   | 649.93 <sup>A</sup><br>42.90 | 551.11 <sup>B</sup><br>57.51 | 504.85 <sup>C</sup><br>48.47 |
| Protein total intake per 1 kg of gain, g<br>Zużycie białka ogólnego na 1 kg przyrostu           | $\bar{x}$<br>S                                   | 545.23 <sup>A</sup><br>37.33 | 671.17 <sup>B</sup><br>74.95 | 750.11 <sup>C</sup><br>82.48 |
| Energy metabolic intake per 1 kg of gain, MJ<br>Zużycie energii metabolicznej na 1 kg przyrostu | $\bar{x}$<br>S                                   | 38.81 <sup>A</sup><br>2.72   | 48.69 <sup>B</sup><br>5.54   | 55.09 <sup>C</sup><br>6.21   |

<sup>ABC</sup> – means in the same row with different letters are significantly different at high essential level;  $\alpha \leq 0.01$

<sup>ABC</sup> – średnie w tym samym rzędzie z różnymi literami są istotnie różne przy wysoce istotnym poziomie;  $\alpha \leq 0.01$

Table 2 summarizes the results that describe the slaughter value of crossbreds. Fatteners of group I showed the highest values of warm carcass mass and the middle carcass length: 82.36 kg and 82.47 cm, respectively, and those of group II – had the lowest respective values: 78.91 kg; and 80.65 cm. The differences between these groups were statistically significant. Animals of the group III had the thickest back fat, measured

Table 2. Slaughter value porkers of individual age groups  
Tabela 2. Wartość rzeźna tuczników z poszczególnych grup wiekowych

| Specification<br>Wyszczególnienie  | Statistical<br>measures<br>Miary<br>statystyczne | Age group<br>Grupa wiekowa |                             |                            |
|--|--|----------------------------|-----------------------------|----------------------------|
|  |  | I                          | II                          | III                        |
| Mass of „warm” carcass, kg<br>Masa tuszy „cieplej”   | $\bar{x}$<br>S                                   | 82.36 <sup>a</sup><br>6.29 | 78.91 <sup>b</sup><br>8.22  | 79.79<br>7.95              |
| Warm dressing percentage, %<br>Wydajność rzeźna „ciepla”   | $\bar{x}$<br>S                                   | 79.50 <sup>a</sup><br>1.64 | 78.72<br>3.40               | 78.23 <sup>c</sup><br>3.28 |
| Length of carcass, cm<br>Długość tuszy do atlasu   | $\bar{x}$<br>S                                   | 99.37<br>3.19              | 97.32<br>5.67               | 97.60<br>4.44              |
| Middle length of carcass, cm<br>Długość środkowa tuszy   | $\bar{x}$<br>S                                   | 82.47 <sup>a</sup><br>3.98 | 80.65 <sup>b</sup><br>4.08  | 81.23<br>3.56              |
| Width of carcass, cm<br>Szerokość tuszy  | $\bar{x}$<br>S                                   | 36.60<br>1.42              | 36.53<br>1.88               | 36.99<br>1.88              |
| Thickness of backfat above shoulder, cm<br>Grubość słoniny nad łopatką   | $\bar{x}$<br>S                                   | 4.72<br>0.63               | 4.71<br>0.90                | 4.81<br>0.73               |
| Thickness of backfat above cross section area of loin, cm<br>Grubość słoniny nad „okiem” poślednicy                              | $\bar{x}$<br>S                                   | 2.51<br>0.67               | 2.46<br>0.73                | 2.48<br>0.71               |
| Thickness of backfat above first vertebra<br>of small of back, cm<br>Grubość słoniny nad pierwszym kręgiem kręgosłupa            | $\bar{x}$<br>S                                   | 3.16<br>0.84               | 3.13<br>0.84                | 3.23<br>0.70               |
| Thickness of backfat above second vertebra<br>of small of back, cm<br>Grubość słoniny nad drugim kręgiem kręgosłupa              | $\bar{x}$<br>S                                   | 1.93 <sup>ab</sup><br>0.59 | 1.93 <sup>Bba</sup><br>0.78 | 2.37 <sup>CC</sup><br>0.86 |
| Thickness of backfat above third vertebra<br>of small of back, cm<br>Grubość słoniny nad trzecim kręgiem kręgosłupa              | $\bar{x}$<br>S                                   | 2.76<br>0.57               | 2.49<br>0.85                | 2.65<br>0.90               |
| Average thickness of backfat of five foregoing<br>measurements, cm<br>Przeciętna grubość słoniny z pięciu powyższych<br>pomiarów | $\bar{x}$<br>S                                   | 3.02<br>0.51               | 2.97<br>0.73                | 3.11<br>0.57               |
| Thickness of bacon, cm<br>Grubość boczku   | $\bar{x}$<br>S                                   | 5.06<br>0.44               | 5.18<br>0.58                | 5.25<br>0.77               |
| Length of leg, cm<br>Długość szynki z golonką  | $\bar{x}$<br>S                                   | 37.71<br>1.40              | 37.03<br>2.40               | 37.18<br>2.71              |
| Girth of round, cm<br>Obwód szynki z golonką   | $\bar{x}$<br>S                                   | 60.03 <sup>a</sup><br>5.82 | 61.58<br>7.37               | 63.38 <sup>c</sup><br>5.97 |
| Width of cross-section area of loin, cm<br>Szerokość „oka” poślednicy  | $\bar{x}$<br>S                                   | 10.31<br>0.86              | 10.32<br>0.75               | 10.24<br>2.02              |
| Height of cross-section area of loin, cm<br>Wysokość „oka” poślednicy  | $\bar{x}$<br>S                                   | 6.44<br>0.61               | 6.43<br>0.66                | 6.63<br>0.61               |
| Cross-section area of loin, cm <sup>2</sup><br>Powierzchnia „oka” poślednicy   | $\bar{x}$<br>S                                   | 49.61 <sup>a</sup><br>8.40 | 51.44<br>7.00               | 54.36 <sup>c</sup><br>8.56 |

ABC – means in the same row with the different letters are significantly different at high essential level;  $\alpha \leq 0.01$ ,

abc – means in the same row with the different letters are significantly different at essential level;  $\alpha \leq 0.05$

ABC – średnie w tym samym rzędzie z różnymi literami są istotne przy wysokim istotnym poziomie  $\alpha \leq 0.01$ ,

abc – średnie w tym samym rzędzie z różnymi literami są istotne przy wysokim istotnym poziomie  $\alpha \leq 0.05$

above the middle edge of the buttock muscle section (2.37 cm), whereas the remaining groups had the same average values of this characteristic of 1.93 cm. In turn, cross-breeds of group III exhibited the highest average values of such characteristics as ham circumference and the warm slaughter yield (63.38 cm, 79.50%, respectively), while those of group I had the lowest respective values (60.03 cm, 78.23%). Interestingly, such trait as the surface of the „sirloin eye”, which reached the highest values in group III (54.36 cm<sup>2</sup>), decreased in groups II (51.44 cm<sup>2</sup>) and I (49.61 cm<sup>2</sup>). Statistically significant differences were determined in groups I and III for all the above mentioned slaughter value characteristics. Łyczyński *et al.* [2004] obtained the thinner pork fat (about 36 mm) in light carcasses (to 80 kg), while the thickness of the pork fat in heavy carcasses (from 80.1 to 100 kg) amount to about 42 mm.

Table 3. Mass of the most valuable pork parts in carcass obtained from fatteners of respective age groups  
Tabela 3. Masa wyrębów uzyskanych z tusz tuczników z poszczególnych grup wiekowych

| Specification<br>Wyszczególnienie         | Statistical measures<br>Miary statystyczne | Age group<br>Grupa wiekowa  |                            |                            |
|---|--|-----------------------------|----------------------------|----------------------------|
|   |  | I                           | II                         | III                        |
| Round with shank, kg<br>Szynka z golonką  | $\bar{x}$<br>S                             | 11.14<br>1.05               | 10.77 <sup>b</sup><br>1.16 | 11.35 <sup>b</sup><br>0.93 |
| Fore leg, kg<br>Noga przednia             | $\bar{x}$<br>S                             | 0.38<br>0.04                | 0.38<br>0.05               | 0.38<br>0.05               |
| Back leg, kg<br>Noga tylna                | $\bar{x}$<br>S                             | 0.66 <sup>a</sup><br>0.05   | 0.63 <sup>b</sup><br>0.07  | 0.64<br>0.08               |
| Backfat, kg<br>Słonina                    | $\bar{x}$<br>S                             | 3.37 <sup>A</sup><br>0.63   | 2.76 <sup>B</sup><br>0.81  | 2.83 <sup>C</sup><br>0.61  |
| Head, kg<br>Głowa                         | $\bar{x}$<br>S                             | 1.81 <sup>Aab</sup><br>0.17 | 1.89 <sup>ba</sup><br>0.27 | 2.03 <sup>Cc</sup><br>0.22 |
| Fore shank, kg<br>Przednia golonka        | $\bar{x}$<br>S                             | 0.80 <sup>a</sup><br>0.08   | 0.83<br>0.10               | 0.86 <sup>c</sup><br>0.09  |
| Shoulder, kg<br>Łopatka                   | $\bar{x}$<br>S                             | 5.75<br>0.55                | 5.60 <sup>b</sup><br>0.62  | 5.95 <sup>c</sup><br>0.49  |
| Loin with bone, kg<br>Schab z kością      | $\bar{x}$<br>S                             | 4.79<br>0.65                | 4.65<br>0.69               | 4.80<br>0.63               |
| Grain, kg<br>Pachwina                     | $\bar{x}$<br>S                             | 1.06<br>0.18                | 1.02<br>0.25               | 0.97<br>0.23               |
| Dewlap, kg<br>Podgardle                   | $\bar{x}$<br>S                             | 1.55 <sup>ac</sup><br>0.23  | 1.43 <sup>b</sup><br>0.29  | 1.59 <sup>ca</sup><br>0.30 |
| Bacon with ribs, kg<br>Boczek z żeberkami | $\bar{x}$<br>S                             | 5.41<br>0.48                | 5.40<br>0.90               | 5.48<br>0.70               |
| Neck, kg<br>Karkówka                      | $\bar{x}$<br>S                             | 2.54 <sup>a</sup><br>0.32   | 2.59<br>0.36               | 2.72 <sup>c</sup><br>0.23  |
| Tallow, kg<br>Sadło                       | $\bar{x}$<br>S                             | 1.52<br>0.38                | 1.63<br>0.56               | 1.56<br>0.39               |
| Porkhip, kg<br>Biodrówka                  | $\bar{x}$<br>S                             | 0.42 <sup>Aa</sup><br>0.14  | 0.34 <sup>Bb</sup><br>0.08 | 0.34 <sup>c</sup><br>0.12  |
| Back shank, kg<br>Golonka tylna           | $\bar{x}$<br>S                             | 1.07 <sup>a</sup><br>0.13   | 1.09<br>0.17               | 1.16 <sup>c</sup><br>0.15  |

Symbols like in Tab. 2 – Symbole jak w tab. 2.

The results specified in Table 3 are the evidence that most statistically significant differences occurred between group I and III for such features as: head mass, mass of porkneck, mass of back fat, mass of front and rear, porkhip. Animals of group III exhibited higher values of these characteristics. The exceptions are only the mass of back fat and that of porkhip, where the situation was reverse. Statistically significant differences between groups I and II occurred for such characteristics as: mass of dewlap, mass of back fat, mass of hind leg and mass of porkhip. In group I the values of these traits were higher than in group II. In turn, between groups II and III statistically significant differences occurred only for: head mass, mass of dewlap, mass of shoulder and mass of ham with porkshank. Group III had higher values of the above mentioned characteristics.

#### CONCLUSIONS

On the basis of the analyses of results of research it is possible to draw the following conclusions:

1. The crossbreds of group III (fattening period lasted on average 199 days) exhibited the lowest fattening value, and those of group I (157 days of fattening) exhibited the highest fattening values – the animals recorded the highest accruals of body mass and the lowest consumption of nutrients per (1) kg of body mass gain).
2. Fatteners of group III had the highest and the most favorable average values of such characteristics as: ham circumference, „sirloin eye” surface and mass of the most valuable parts in carcass (porkneck, porkshoulder and ham with porkshank).
3. Crossbreds belonging to group II exhibited the lowest values of such characteristics as the mass of back fat and the average thickness of back fat from 5 measurements.

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**Streszczenie.** Celem niniejszej pracy było określenie wartości tucznej i rzeźnej 3 grup wiekowych mieszańców świń tuczonych do jednakowej masy ciała, wynoszącej około 103 kg. Doświadczenie przeprowadzono na 131 tucznikach mieszańcach ras: pbz, duroc, hampshire i pietrain z podziałem na trzy grupy wiekowe. Najniższą wartością tuczną charakteryzowały się mieszańce z grupy III (tucz trwał średnio 199 dni), a najwyższą z grupy I (przy 157 dniach tuczu zwierzęta uzyskały najwyższe przyrosty masy ciała i najniższe zużycie składników pokarmowych na przyrost 1 kg masy ciała).

**Słowa kluczowe:** świnię, wartość tuczna i rzeźna