



Variability in carcass composition of pigs during growth

D. Vincek¹, I. Đurkin², B. Lukić², G. Kralik², G. Kušec²

¹Administrative Department for Agriculture of Varazdin county, 42000 Varaždin, Franjevački trg 7., Croatia

²Faculty of Agriculture, J.J. Strossmayer University of Osijek, 31000 Osijek, Trg Svetog Trojstva 3., Croatia

ABSTRACT

The purpose of this study was to investigate variability in carcass composition of fattening pigs during growth. The research was conducted on 60 three way hybrid pigs between 49 and 215 days of age. For the purpose of growth measurement pigs were weighed at 7 days interval. After each 21 days, four pigs (2 barrows and 2 gilts) were selected for slaughter according to average live weight. Subsequent to slaughter, right side of pig carcasses was dissected according to Weniger (1963). Statistical analysis showed that average live weight increases with age in the sigmoid manner. The average daily gain during the trial was 550 g (562 g for barrows, and 537 g for gilts), while feed conversion was 3.5 kg. The highest share of muscle was achieved at 125 days of age for barrows and 146 days for gilts. The intramuscular fat content was higher in barrows than in gilts throughout the whole experiment time. Share of bone tissue in investigated pigs constantly decreases, but after 125 days of age it remains at the same level.

(Keywords: pigs, carcass composition, growth characteristics)

INTRODUCTION

Growth of certain body parts or tissues such as muscle, fat, skin or other has been of interest for animal scientists a long time. Although the fat tissue accumulates during the whole lifetime, intensive period begins in the second part of fattening. At this time accumulation of muscle tissue decreases. The moment of this event depends on genetic structure of the animal. The investigation of such matters resulted in useful knowledge which led to more effective selection on daily gain, increased muscle content and decreased fat content in pig carcasses (Wiseman *et al.*, 2007). Reeds *et al.* (1993) showed that during the last 50 years live weight of the pig at the same age increased for 20%, muscle content increased for 86%, while bone and fat content decreased for 11% and 29%, respectively. Having in mind that better efficiency in utilization of growth characteristics in pigs can be of benefit for the pig producers, the aim of this research was to investigate variability in carcass composition of pigs originating from Batalle breeding program during growth.

MATERIALS AND METHODS

The research was conducted on 60 (30 barrows and 30 gilts) three way hybrid pigs (Batalle breeding program) aged between 49 and 215 days. Four piglets (2 male and 2 female) per sow were included in the investigation. Pigs were housed in the same conditions and fed the same diet. The animals were fed *ad libitum* during the fattening period. Feeding scheme is shown in *Table 1*.

Table 1

Feeding scheme

Grower (<25 kg)	Finisher (>25 kg)
<i>ad libitum</i>	<i>ad libitum</i>
13.3 MJ ME	13.6 MJ ME
19.6% crude protein	17.4% crude protein

For the purpose of growth measurements pigs were weighted every 7th day during the experiment. Every 21th day four pigs were selected for the slaughter according to average live weight (LW). These animals were slaughtered at Vajda d.d. slaughterhouse and total dissection according to *Weniger* (1963) on the right side of the carcass was performed. For this part of experiment 15 barrows and 15 gilts were used. Statistical analysis was performed using SAS/STAT for Windows platform (SAS Inst. Inc., 2003, Version 9.1).

RESULTS AND DISCUSSION

Live weight

During the experiment, at the age of 82, 110 and 131 days, 3 gilts were excluded because of death or health issues. The average LW of animals at the beginning of study was approximately 22 kg, and 137 kg at the end. *Figure 1* and *Figure 2* show the increase of LW over time. It can be noticed that average LW of pigs during the growth resembles a sigmoid shape: low growth rate at the beginning of fattening is followed by an increase at the certain age (inflection point) and, at the end it decreases. During the research a homogeneous data structure at the beginning of experiment can be noticed, but later, with the increase in age and the decrease in number of investigated animals, variability markedly increased. *Solanes et al.* (2005) reported similar pattern in Batalle hybrids, although lower LW was achieved (average LW of 102.4 kg in 179.6 days). From *Figure 2* it can be seen that barrows obtained higher LW than barrows for the same period of time. *Reixach et al.* (2008) reported similar results regarding the change of LW in barrows. At the age of 200 days Landrace×Yorkshire hybrids had an average LW of 136.04 kg, Duroc pigs had 124.42 kg, Iberian×Duroc hybrids had 122.22 kg and double line Duroc pigs had 121.49 kg. Similarly, *Ball* (2000) reported that average age of 157.9 days is required to achieve 100 kg of LW in Duroc breed. *Šalehar et al.* (1995) investigated the differences in LW among several breeds. The authors reported that at the age of 90 days average LW of Duroc boars was 31 kg, which is considerably less than the results obtained in this study. However, in later stage (about 210 days) of their research Duroc boars obtained higher LW than the animals included in this research.

Daily gain

The average daily gain during the trial was 550.00 g (562.00 g for barrows, and 537.00 g for gilts), which was less than those reported by *Šalehar et al.* (1995); *Ellis et al.* (1996) and *Ball* (2000). *Figure 3* shows variability in daily gain of gilts and barrows. Average daily gain between weighing was 0.66 kg, with a minimum of -0.94 kg and maximum of 1.71 kg.

Figure 1

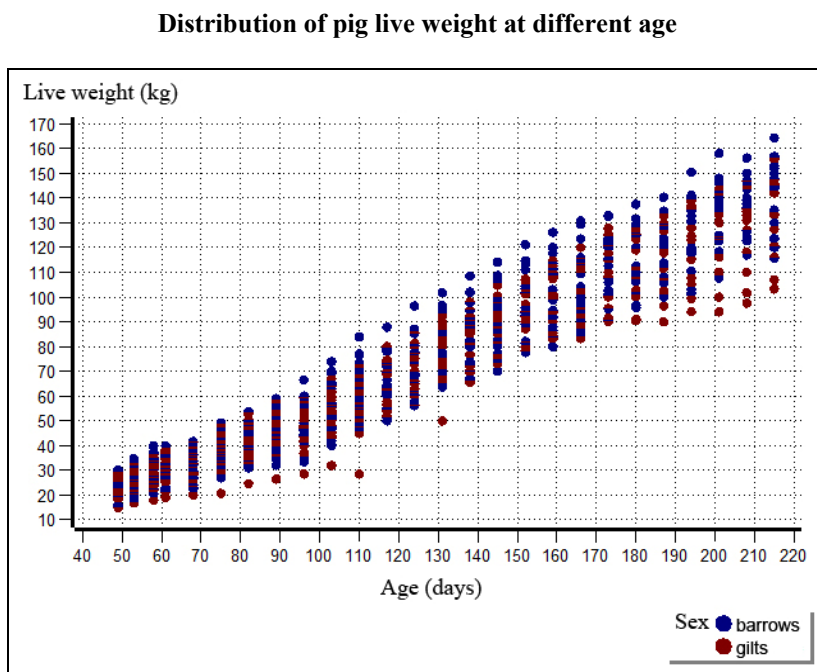


Figure 2

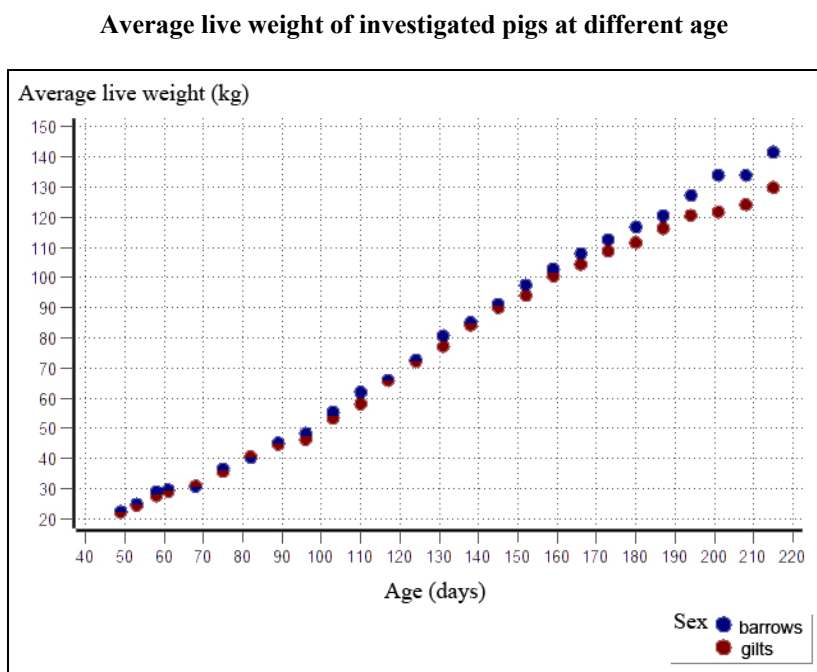
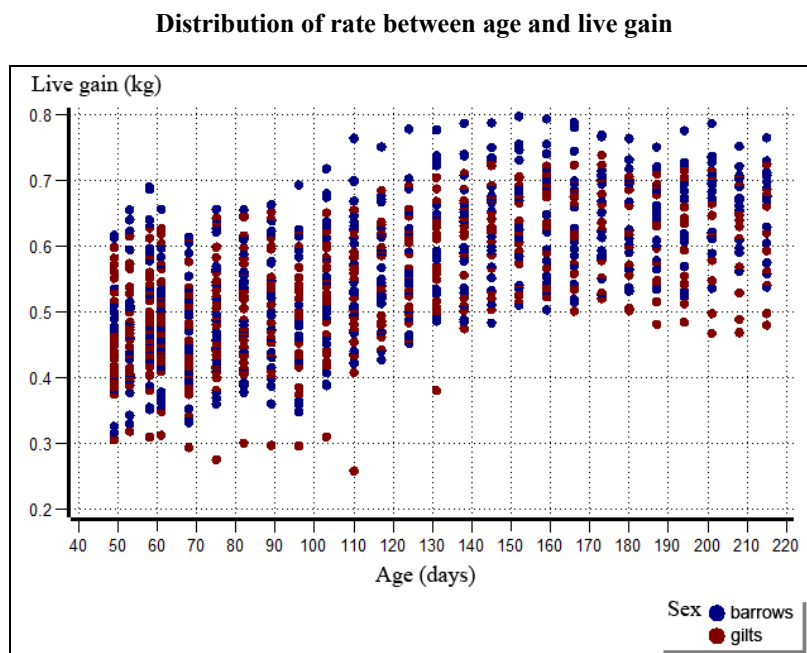


Figure 3



During the experiment a total of 16,635.00 kg of feed has been used for "ad libitum" feeding regime. Summing up the total final LW and putting it in relation with consumed feed, 3.5 kg of feed per kilogram of gain was estimated. Kanis *et al.* (1990) reported similar results for the feed conversion. The authors reported that Duroc pigs consumed 3.37 kg of feed per gained kilogram during the test between 60 and 100 kg of LW, in contrast to Pietrain pigs which consumed 3.18 kg. Between 100 and 140 kg this consumption was significantly higher (4.45 kg, 4.71 kg), but throughout the whole experiment (60–140 kg) 3.89 kg of feed was consumed, i.e. 4.00 kg in average. Affentranger *et al.* (1996) reported that feed conversion for Duroc pigs weighing from 25 to 103 kg was 2.75 and 2.59 kg for Pietrain, while Šalehar *et al.* (1995) reported conversion of 2.82 kg in Duroc boars.

Tissue growth

The results of dissection of pig carcasses at different age are shown in *Figure 4* and *Figure 5*. It can be noticed that gilts obtained higher percentage of meat, fat, IMF and bones in the carcass during the growth. This trend was retained until the age of 188 days, after which a decrease of all tissues was recorded. Unlike gilts, barrows continued linear growth of all tissues. The muscle tissue increased proportionally with increase of pigs LW. Bone growth patterns are similar to the results reported by Wagner *et al.* (1999). Bones grew significantly slower compared to the muscles.

Share of tissues alters with the age and the increase of pig carcass weight. In this study, the highest percentage of muscle tissue in the carcass of gilts was achieved at the age of 146 days (67.18%), while in the barrows; the highest percentage of muscle (60.22%) was recorded at 125 days of age. Also, from that moment the significant fat accumulation in the barrows bodies begun.

Figure 4

Share of meat, fat, intermuscular fat (IMF) and bones in the carcasses of barrows

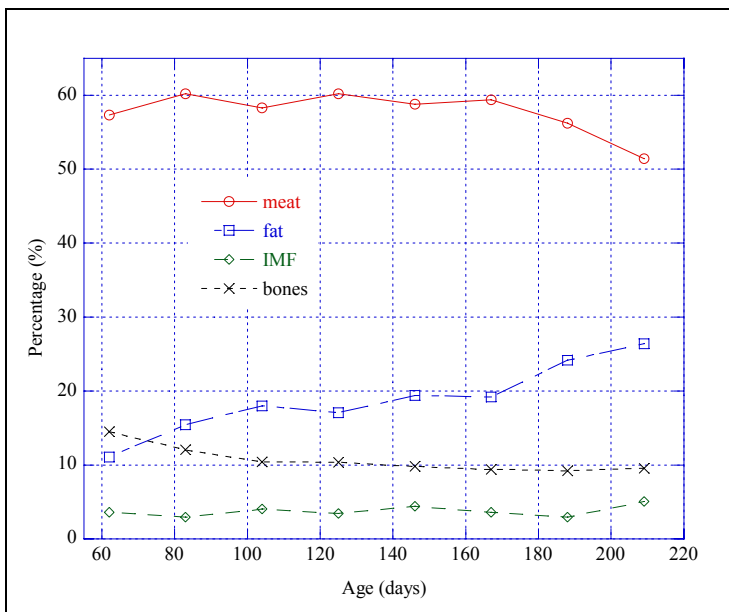
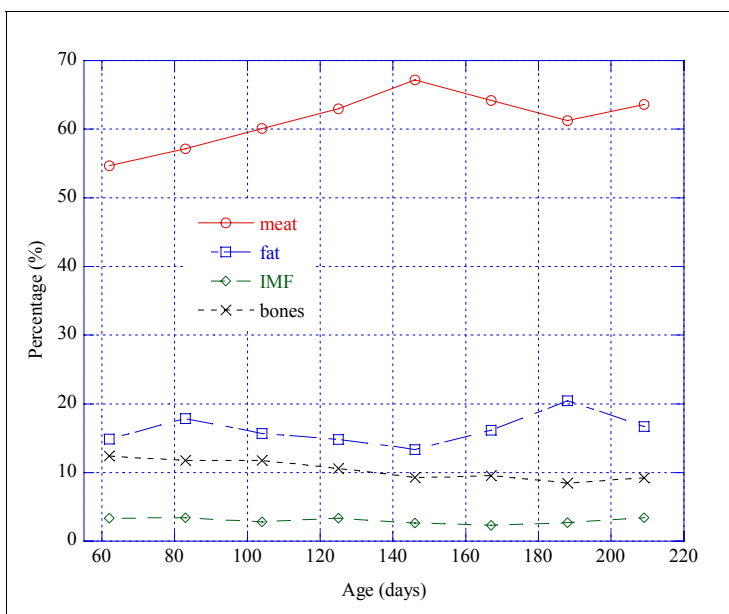


Figure 5

Share of meat, fat, intermuscular fat (IMF) and bones in the carcasses of gilts



On the basis of research on the similar samples of pigs at 100 kg of LW, Cilla et al. (2006) found the lean share from 53.1% to 57.6%. This is considerably lower than lean share established in this study. It was stated in many studies that Duroc pigs have a very favorable growth characteristics. Nevertheless, research of Edwards et al. (1992) and Affentrangera et al. (1996) showed that Duroc pigs achieved lower growth performance than in the present study. Possible explanation for these results could be existence of several different Duroc "types". Experts in Seleccion *Batalla* (2006) breeding company reported the content of 1.83% of intramuscular fat in their studies on gilts with 100 kg of LW, which is much higher than IMF content in gilts presented in this study (1.15%). Results of Reixacha et al. (2008) indicate the existence of genetic variation in fat and intramuscular fat content, which can depend on the age at which the sample was taken. Therefore, the authors propose to develop selection criteria based on the final live weight. According to Ball (2000), differences within and among the pig breeds enable the manufacturers a suitable response to market demands by specific production. For example, the author in his study confirmed higher marbling score in pig carcasses of Duroc breed compared to other breeds.

CONCLUSIONS

Average live weight of animals increases with age following the sigmoid pattern. The average daily gain during the research period in barrows was higher than in gilts. Feed conversion in the observed period was 3.5 kg. By applying the method of total dissection at regular intervals during the research it was found that the highest percentage of muscle tissue in the body of gilts was achieved at 146 days of age, in contrast to the barrows, where the highest incidence of muscle was determined at the age of 125 days. Thereafter, a significant accumulation of fat tissue in barrows was noticed during the dissection of selected carcasses. Throughout the entire period of study the percentage of intramuscular fat in the barrows was higher than in gilts. Share of bone tissue in barrows and gilts at 125 days of age decreases and then remains at the same level until the end of the study. As a practical consequence of this study it can be recommended to take into consideration the differences between genders in investigated growth characteristics when decisions on fattening period and slaughter weight/age are made.

ACKNOWLEDGEMENTS

The data presented in this paper are the result of an investigation financed by Croatian Ministry of Science, Education and Sports. Grant No. 079-0790566-0184.

REFERENCES

- Affentranger, P., Gerwig, C., Seewer, G.J.F., Schwörer, D., Künzi, N. (1996). Growth and carcass characteristics as well as meat and fat quality of three types of pigs under different feeding regimens. *Liv. Prod. Sci.*, 45. 187-196.
- Ball, R.O. (2000). Differences among Genotype and Gender for Growth, Carcass Composition and Meat Quality. *Pork Production*. 11. 227-235.
- Cilla I., Altarriba, J., Guerrero, L., Gispert, Marina, Martinez, L., Moreno, C., Beltran, J.A., Guardia Maria Dolores, Diestre, A., Arnau, J., Roncales, P. (2006). Effect of different Duroc line sire on carcass composition, meat quality and dry-cured ham acceptability. *Meat Science*. 72. 252-260.

- Edwards, S.A., Wood, J.D., Moncrieff, C.B., Porter, S.J. (1992). Comparison of the Duroc and Large White as terminal sire breeds and their effect on pigmeat quality. *Anim. Prod.*, 54. 289-297.
- Ellis, M., Webb, A.J., Avery, P.J., Brown, I. (1996). The influence of terminal sire genotype, sex, slaughter weight, feeding regime and slaughter-house on growth performance and carcass and meat quality in pigs and on the organoleptic properties of fresh pork. *Anim. Sci.*, 62. 521-530.
- Kanis, E., Nieuwhof, G.J., de Greef, K.H., van der Hel, W., Verstegen, M.W.A., Huisman, J., van der Wal, P. (1990). Effect of recombinant porcine somatotropin on growth and carcass quality in growing pigs: Interactions with genotype, gender and slaughter weight. *J. Anim. Sci.*, 68. 1193-1200.
- Reixach, J., Tor, M., Diaz, M., Estany, J. (2008). Between and within breed variation for lean growth and intramuscular fat content and fatty acid composition in pigs. 54th International Congress of Meat Science and Technology, ICoMST, Helsinki. 1-3. p.
- Reeds, P.J., Burrin, D.G., Davis, T.A., Fiorotto, M.A., Mersmann, M.J., Pond, W.G. (1993). Growth Regulation with Particular Reference to the Pig. In: G.R. Hollis (ed.): *Growth of the Pig*. CAB International, Wallingford (UK).
- Seleccion Batalle S.A. (2006). www.batalle.com, Batalle breeding program, work paper.
- Solanes, F., Reixach, X., Tor, J., Tibau, M., Estany, J. (2005). Genetic correlation of intramuscular fat content with performance traits and litter size in Duroc pigs. 56th Annual Meeting of European Association for Animal Production (EAAP). June 5-8, Uppsala, Sweden, 11. 307-308.
- Šalehar, A., Štuhec, I., Kovač M., Salobir, K., Salobir, J., Erjavec, E., Jerić, D. (1995). Prašičereja. ČZD, Kmečki glas, Ljubljana.
- Wagner, J.R., Schinckel, A.P., Chen, W., Forrest, J.C., Coe, B.L. (1999). Analysis of Body Composition Changes of Swine During Growth and Development. *J. Anim. Sci.*, 77. 1442-1466.
- Wiseman, T.G., Mahan, D.C., Loeller, S.J., Peters, J.C., Fastinger, N.D., Ching, S., Kim, Y.Y. (2007). Phenotypic measurements and various indices of lean and fat tissue development in barrows and gilts of two genetic lines from twenty to one hundred twenty five kilograms of body weight. *J. Anim. Sci.*, 85. 1816-1824.

Corresponding authors:

Dragutin Vincek

Administrative Department for Agriculture of Varazdin county

HR-42000 Varaždin, Franjevački trg 7., Croatia

Tel.: +385 42 39 05 79

e-mail: dragutin.vincek@varazdinska-zupanija.hr