



Correlation between carcass sides meatness and ultrasound measures on live pigs

Đ. Senčić, T. Šperanda, M. Šperanda, Z. Antunović

Department of Animal Science, Faculty of Agriculture in Osijek, Osijek, HR-31000 Trg Sv. Trojstva 3., Croatia

ABSTRACT

Correlation (r) between carcass sides meatness, determined by the Regulations («two points» method) and by dissection, and bacon thickness and musculus longissimus dorsi (MLD) measured at various places (between 10th and 11th rib, behind the last rib, in the middle of the loins and at the sacrum) by an ultrasound device on live pigs ($n=60$) at their body weight of approximately 100 kg was investigated. Bacon thickness on the small of the back ($r=-0.85$ and $r=-0.75$) was determined to be the best indicator the sides meatness and potential selection criteria.

(Keywords: carcass sides, ultrasound measures, meatness, correlation)

INTRODUCTION

Pigs of high meatness are required by developed world markets. Meatness of the pigs in the Republic of Croatia, especially on family farms, is low and coupled with higher food consumption for the gain unit of their body weight. Due to higher fattening costs and lower slaughter quality, low meatness pigs are not market competitive, whereas pig production is not profitable. The carcass sides meatness can be faster improved by selection since it is characterized by high heritage compared to fattening and reproductive pig traits. While selecting pigs for higher meatness, optimal meatness indicators (selection criteria) significantly related to it, should be chosen. This paper aims to determine optimum selection criteria in pig meatness improvement by means of ultrasound measurements on live pigs.

MATERIALS AND METHODS

The investigation was conducted with 60 Swedish Landrace pigs weighed 98.17 ± 5.66 kg. Sex ratio was equal. The pigs were kept in the same conditions at optimal air temperature and moisture. They were fed with a mixture including 16.14% crude protein and 12.5 MJ metabolic energy/kg ad libitum from 30 to 100 kg of body weight.

Bacon and MLD thickness was measured on live pigs weighed about 100 kg on the places as follows: between 10th and 11th rib, behind the last rib in the middle of the loins and in the sacrum. The measuring was conducted 6 cm from medial line by means of ultrasound device Shimatzu (Tokio, Japan) prior to slaughtering.

The carcass sides meatness was determined in the slaughter house by using the Regulations (N.N. No. 119, 1999) and by dissection after *Weniger et al.* (1963).

Arithmetic means (\bar{x}) and variability measures (s and v) of the investigated pig meatness indicators as well as their mutual relation (r) were computed by using statistical program *Stat Soft, Inc.* (2001). The correlation intensity (r) between meatness indicators was evaluated by Roemer-Orphal scale.

RESULTS AND DISCUSSION

Indicators of slaughter quality in Swedish Landrace pigs can be seen in *Table 1*.

Table 1

Indicators of slaughter quality in Swedish Landrace pigs

Indicators	\bar{x}	s	v
Final body weight, kg	98.17	5.66	5.77
Bacon thickness, mm:			
- between 10 th and 11 th rib (1)	7.39	2.23	30.18
- behind the last rib (2)	6.26	2.12	33.79
- in the middle of the loins (3)	8.17	2.79	34.14
- sacrum (4)	8.57	2.48	28.99
MLD thickness, cm:			
- between 10 th and 11 th rib (5)	50.13	3.98	7.94
- behind the last rib (6)	49.74	3.73	7.50
- in the middle of the loins (7)	54.22	4.32	7.96
- at the beginning of the sacrum (8)	58.91	4.61	7.83
Carcass sides meatness, %:			
- by the Regulations (9)	53.47	3.24	6.06
- by dissection (10)	54.85	3.15	5.74

The thickest bacon of the live pigs weighed about 98 kg was in the middle of the sacrum, whereas thinnest one behind the last rib. Musculus longissimus dorsi (MLD) was the thickest in the beginning of the sacrum and the thinnest behind the last rib. Meatness of the carcass sides, determined by the Regulations (53.47%) and by dissection (54.85%) was approximate to the meatness determined earlier by *Senčić et al.* (1999) for young boars (56.92%) and gilts (54.53%) of Swedish Landrace. However, this meatness was lower compared to the meatness (61.20% and 58.30%) determined by *Stern et al.* (1990). On the other hand, the meatness differences were not conditioned only by a genotype but differences in fattening conditions.

Correlation between some ultrasound measures i.e. slaughter quality indicators on live pigs and carcass sides determined by the Regulations on the slaughter lines and by dissection can be seen in *Table 2*.

The bacon thicknesses on some places in live pigs were mutually in slight to strong positive correlation. Correlations between bacon and musculus longissimus dorsi (MLD) thickness varied depending on measuring places. Bacon thickness between 10th and 11th rib was in slight and positive correlation with MLD thickness on the same place; in medium and positive correlation with MLD thickness behind the last rib and in slight or medium and negative correlation with MLD thickness in the middle of loins and at the beginning of the sacrum. Correlation between bacon and MLD thickness was mostly slight and positive.

The pig sides meatness, determined by the Regulations and dissection, decreased on that places where bacon thickness increased. Bacon thickness in the middle of the sacrum ($r=-0.85$ and $r=-0.75$) was in the strongest correlation with the carcass sides meatness. Thus, it is the best indicator of the carcass sides meatness.

Table 2

Correlation among indicators of slaughter quality in Swedish Landrace pigs

Indicators ¹	2	3	4	5	6	7	8	9	10
Bacon thickness (1)	0.27*	0.26	0.71**	0.20	0.53**	-0.38**	-0.53**	-0.51**	-0.48**
Bacon thickness (2)	-	0.50**	0.52**	0.10	0.38**	0.22	0.17	-0.56**	-0.50**
Bacon thickness (3)	-	-	0.58**	0.08	0.14	0.21	0.17	-0.59**	-0.52**
Bacon thickness (4)	-	-	-	0.06	0.29*	0.04	0.09	-0.85**	-0.75**
MLD thickness (5)	-	-	-	-	0.49**	0.05	-0.24	0.18	0.10
MLD thickness (6)	-	-	-	-	-	-0.22	0.05	0.10	0.07
MLD thickness (7)	-	-	-	-	-	-	0.49**	0.02	0.05
MLD thickness (8)	-	-	-	-	-	-	-	0.05	0.02
Carcass sides meatness (9)	-	-	-	-	-	-	-	-	0.86**
Carcass sides meatness (10)	-	-	-	-	-	-	-	-	-

¹Measure places: 1 and 5 – between 10th and 11th rib, 2 and 6 – behind the last rib, 3 and 7 – in the middle of the loins, 4 and 8 – at the sacrum, 9 - carcass sides meatness determined by the Regulations, 10 – carcass sides meatness by dissection; * $P < 0.05$, ** $P < 0.01$

Hulsegge and Sterenburg (1992) determined that the best anticipation of the sides meatness was provided by bacon thickness measuring between 3rd and 4th rib from behind and 60 mm from the medial line (point HGP). This measuring point was also used by other authors (Mc Laren *et al.*, 1989; Orcutt *et al.*, 1990; Zhang *et al.*, 1993; Uremović *et al.*, 1995; Senčić *et al.*, 1999). Evans and Kempster (1979) determined that bacon thickness on the last rib and 65 mm from dorsal line (P2) enabled anticipation of meatness percent in the carcass sides. Uremović *et al.* (1995) studied correlation between ultrasound measurements on live Swedish Landrace pigs weighed 30 to 100 kg and sides meatness. They determined that correlation between back bacon thickness in HGP point ranged from -0.42 to -0.79, whereas on P2 point from -0.27 to -0.63 in both sexes.

Thickness of the musculus longissimus dorsi (MLD) on some measuring places were in a very slight and insignificant correlation with the carcass sides meatness.

CONCLUSIONS

Based on the correlation investigation between back bacon and musculus longissimus dorsi (MLD) thickness on various places (between 10th and 11th rib, behind the last rib, in the middle of the loins and at the sacrum) in live pigs and their sides meatness according to the Regulations on the slaughter line and by dissection, it was determined that bacon thickness on the sacrum ($r = -0.85$ and $r = -0.75$) is the best indicator of the carcass sides meatness as well as a potential selection criteria.

REFERENCES

- Evans, D.G., Kempster, A.J. (1979). A comparison of different predictors for use in population studies and experiments. *Animal Production*, 28. 97-108.
- Hulsegge, B., Sterenburg, G.P. (1992). Estimation of EC-lean meat percentage in pig carcass and major cuts based on multiple measurements of fat thickness with the Renco LM, IVO-DLO, Zeist, The Netherlands Reeport B, 373. 1-13.

- Mc Laren, D.G., Mc Keith, F.M., Novakofski, J. (1989). Prediction of carcass characteristics at market weight from serial real-time ultrasound measures of backfat and eye area in growing pig. *J. Anim. Sci.*, 67. 1657-1667.
- Orcutt, M.W., Forrest, J.C., Judge, M.D., Schinckel, A.P., Kuei, C.H. (1990). Practical means for estimating pork carcass compositions. *J. Anim. Sci.*, 68. 3987-3997.
- Senčić, Đ., Šperanda, T., Antunović, Z., Šperanda, M., Antunović, B. (1999). Fenotipske značajke švedskog landrasa prema spolu u tovu za bekon. (Phenotypic characteristics of Swedish Landrace pigs in bacon-fattening according to sex). *Stočarstvo*, 6. 403-409.
- Stat Soft. Inc. (2001). STATISTICA (data analysis software system), version 6, www.statsoft.com.
- Stern, S., Rydhmer, L., Johansson, K., Andersson, K. (1993). Selection for lean tissue growth rate in Swedish Yorkshire pigs on low or high protein diets. In: *Proc. 4th World Congr. of Genetics Applied to Livestock Production*, Edinburgh, July 23-27. 1990.
- Uremović, M., Uremović, Z., Šperanda, T., Šperanda, M. (1995). Correlations between ultrasonic measurements on live pig and carcass meatiness. *Zb. Biotehniške Fak. Univ. v Ljubljani, Kmetijstvo (Zootehnika)*, Slovenia, 22. 149-154.
- Weniger, H.I., Steinhilber, D., Pahl, G. (1963). *Topography of Carcasses*. BLV Verlagsgesellschaft, München.
- Zhang, W., Huiskes, J.H., Ramaekers, J.L. (1993). Serial ultrasonic measurements of backfat thickness in growing-finishing pigs. I. Location determination of serial ultrasonic measurements. II. Relationship with carcass traits. *Pig News and information*, 4. 173-180.
- Pravilnik o utvrđivanju kategorija i klasa svinjskih trupova i polovica. N.N. 119, Zagreb, 1999.

Corresponding author:

Đuro Senčić

Faculty of Agriculture in Osijek
HR-31000 Osijek, Trg Sv. Trojstva 3., Croatia
Tel.: 385 32 224 223; Fax: 385 31 207 017
e-mail: dsencic@suncokret.pfos.hr