Characteristic of slaughter value and meat quality of 3 synthetic pigs lines P76, Redone and Galia

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Abstract

The aim of the study was to evaluation of meat quality from different lines of pigs differing in slaughter values and meat quality. The research was carried out on 60 hogs originated from the following pig line: P76, Redone and Galia (20 animals in each group), slaughtered at 105 kg live weight. The hot carcass weight and the percentage of meat was estimated. Samples were taken from the *Longissimus lumborum* muscle. The value of pH decline after 1, 3 and 24 h *post mortem*, natural drip loss, cooking yield and parameters of meat colour were measured. Fat level and glycolytic potential (GP) were also determined. Intramuscular fat level was determined chemically by Soxlet method and also as marbling on the basis of sensory evaluation or according to Japanese photographic standard. The results showed a significant differences between group in slaughter value of carcass and for pH_3, pH_{24}, GP, colour parameters and marbling. The P76 line showed higher meatiness and higher luminosity without detrimental effect. The Redone line was characterised by higher intramuscular fat level and marbling.

Introduction

For consumers, sensory quality such as texture and juiciness is of primary importance. Recent studies highlighted the link between these properties and the level of intramuscular fat (IMF) in meat and marbling. These two traits varied according to the breed and environmental conditions. Because level of intra muscular fat improve textural properties and flavour of meat as well as drip loss, feeding and genetic strategies have been developed. Recent studies on crossing pigs of Naïma sows with P76 boars shows a possible existence of intramuscular fat gene in these animals where high level and variability of intramuscular fat were observed (Jaworska et al. 2006, Przybylski et al. 2007). The Naïma line is obtained by crossbreeding of two lines - the Redone (from *Tiameslan)* and the Galia lines. *Tiameslan* line is created by Pen Ar Lan breeding company in collaboration with INRA by crossbreeding Chinese x European breeds (Zhang et al. 2000). The aim of the study was to evaluate the quality of meat in different lines of pigs (P76 boars line and two female line: Redone and Galia) with consideration of the level of marbling and intramuscular fat.

Materials and methods

The experiment was carried out on 60 hogs originated from three pigs line (P76, Redone and Galia – 20 animals - female in each group), slaughtered at about 105 kg live weight. The backfatt thickness and loin thickness were determined using CGM apparatus and on this basis the percentage of meat in carcass was calculated. Meat quality parameters were evaluated in samples of the *Longissimus* muscle taken behind the last rib. The pH value was measured at 1, 3 and 24 hours after slaughter. Meat colour was measured in CIE L*a*b* system at 48 h *post mortem*. Meat cooking yield was determined by subjecting 500 g meat samples and cooking until reaching the temperature of 72°C in the sample epicenter. The natural drip loss was determined according to Prange (1977) method. The fat in muscle was determined according to Polish Norm by Soxhlet's method. Glycogen, glucose and glucose-6-phosphate after glycogen hydrolysis with amyloglucosidase (Dalrymple and Hamm 1973) and lactate (Bergmeyer 1974) in the muscle were also determined. On the basis of them the glycolytic potential (GP) was calculated according to Monin and Sellier (1985). A sensory evaluation of marbling was determined on raw meat using sensory scaling method [scale 0-10 c.u. – conventional unit] and also using the Japanese photographic standard. The statistical analysis (analysis of variance) was performed using Statistica 6.0 software.

Results and discussion

In Table 1 the characteristics of three studied genetic lines is presented. The obtained results show a significant effect of genetic lines on lean meat and loin thickness carcass as well as ultimate pH and colour parameters. The influence of genetics lines on marbling and glycolytic potential was also observed.

Table 1. Characteristics of 3 evaluated genetic lines

Traits	Genetic line			SEM
	P76	Redone	Galia	
Hot carcass weight (kg)	86,13	85,12	87,52	0,99
Lean meat in carcass (%)	59,80^{a}	57,23^{b}	55,29^{c}	0,32
Loin thickness (mm)	65,30^{a}	57,55^{b}	52,38^{c}	0,86
Back fat thickness (mm)	12,70	13,48	14,35	0,31
pH_1	6,38	6,43	6,42	0,03
pH_3	6,31^{a}	6,12^{b}	6,18^{b}	0,02
pH_{24}	5,60^{a}	5,66^{a}	5,51^{b}	0,01
Glycolytic potential of LD muscle (µmol/g)	126,76^{a}	109,93^{b}	134,38^{a}	2,44
Intramuscular fat level (%)	1,67	2,27	1,89	0,16
Cooking yield (%)	72,23	72,77	71,75	0,41
Drip loss (%)	3,61	2,45	3,75	0,25
Colour L	55,67^{a}	53,95^{b}	54,04^{b}	0,26
a	15,99^{a}	15,58^{a}	17,19^{b}	0,13
b	9,33^{a}	5,49^{b}	5,97^{b}	0,23
Marbling of raw meat (0-10 c.u.)	2,70^{a}	4,28^{b}	3,83^{b}	0,15
Marbling evaluated according to Japanese standard (pt)	1,25^{a}	2,24^{b}	1,48^{a}	0,07

a, b, c – means signed by different letters are significantly different at P≤ 0,05

The line Redone expressed higher marbling than Galia and P76 lines. The level of IMF in Redone line was higher but not significantly because of high variability (Figure 1).

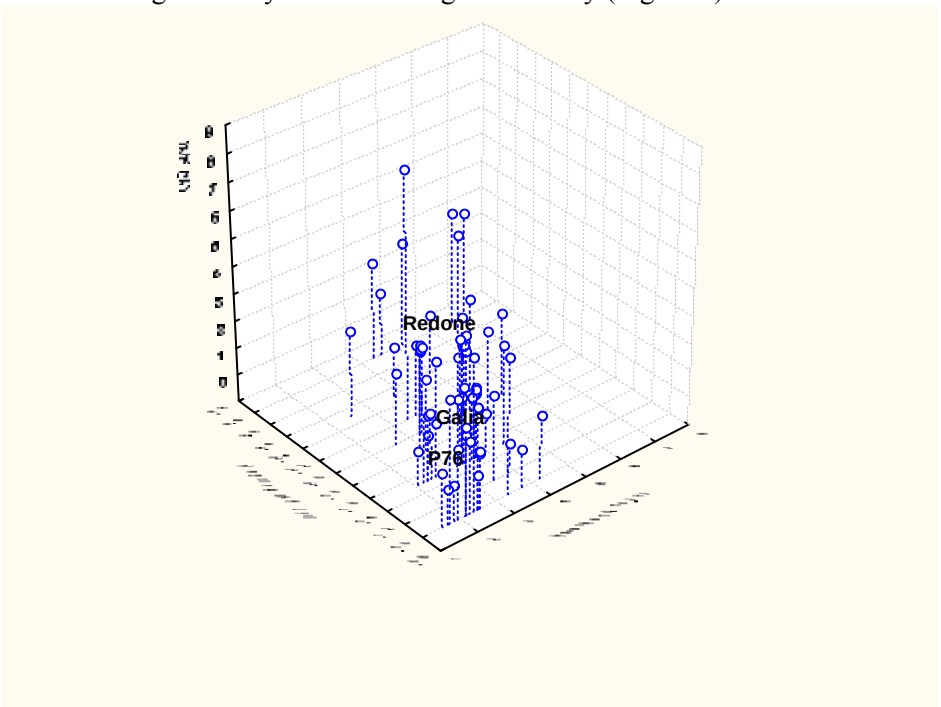

Figure 1. Distribution of intramuscular fat in studied group of pigs evaluated by Soxlet method and marbling (according to sensory method and Japanese standard).

However, statistically significant differences in marbling of meat were obtained. Sensory scaling method proved to be more precise scale than Japanese standard. Higher level of fat and ultimate pH was observed in Redone line and also lower drip loss. Similar results on intramuscular fat were obtained on crossing pigs from Naïma sows with P76 boars (Grześkowiak et al. 2006, Przybylski et al. 2007). The colour

of meat from Rodone line was darker (lower L*) and meat exhibited lower PG and higher pH_{24}. Darker meat are often found in muscle with limited glycolysis (Swatland 2004). Redness a* was similar to P76 line and yellowness b* similar to Galia line. Our results are consistent with study of Janss et al. (1997), who established hypothesis about existence of a main gene (in Meishan crossbreeding pigs) responsible for contents of intramuscular fat content. Gerbens et al. (1998, 1999) showed significant associations between genetic variation of the adipocyte (A-FABP) and heart (H-FABP) fatty acid-binding protein gene loci, and intramuscular fat content in purebreed Duroc pigs. Koćwin-Podsiadła et al. (2005) showed a relationship between polymorphism of H-FABP gene and IMF in LD muscle in pig population with 25% and 50% of Duroc breeds Árnyasi et al. (2006) showed an association between FABP3 gene with IMF in pigs. Nechtelberger et al. (2001) have not confirmed these results carried out the study in population of breeds large white, landrace and pietrain. The results of Li et al. (2006) indicated that the Meishan is characterised by only one allele for this gene. The results of Sanchez et al. (2003) shown also in *Tiameslan* line (created from Meishan breed) a major gene influenced meat quality. The mentioned above results indicate that there exist possibility of another gene.

Conclusions

The results showed significant differences between groups in slaughter value of carcass and in pH_3, pH_{24}, GP, colour parameters and marbling of raw meat. The P76 line was characterised by its meatiness and Redone line by higher marbling lower PG, higher ultimate pH and lower drip loss. These results indicate the possibility of another gene existing.

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