Subgroup 3

Genes and quality

PIG GENETICS AND ITS RELATIONSHIP WITH MEAT QUANTITY AND QUALITY

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Background

Brazilian pig meat chain production has increased its competitiveness with the introduction of new genetic companies, which has started their business in Brazil since 1995. This fact combined with the increasing participation in international pig market has driving the Brazilian pig producers to invest more in leaner animal. The challenge to reach this new pig model is to have a good balance between quantity and quality, aiming to ensure the economic feasibility of meat industry.

Objective

The aim of this work was to investigate two genetics lines from SEGHERS considering meat quantity and quality aspects.

Methods

Animals. Ninety six animals, 48 from genetic line **A** and 48 from genetic line **B**, were used in this study. Within these two genotypes, the animals were distributed in a balance way in four groups of 12 according to their weight and sex.

Meat quantity. Carcass characteristics evaluated included chilled carcass weight (kg), loin muscle area (cm^2), fat depth at 10^{th} rib (cm), lean yield (expressed as percentage of boned cuts – shoulder, ham and loin - in relation to the weight of cold carcass), fat and muscle thickness at 15^{th} rib given by the Hennessey Grading System (mm).

Meat Quality. The left side of the carcass was used to perform meat quality. The pH values were measured on post-rigor (pH_{24h}) *Semimenbranosus* **(SM).** Surface L*, a*and b* colour values were determined on the post-rigor *Longissimus dorsi* **(LD)** using Minolta CR-2000 color meter. Drip loss (HONIKEL, 1987) and water holding capacity (GRAHAM, 1988) were carried out on the post-rigor *Longissimus dorsi* **(LD)** and *Semimenbranosus* **(SM)** respectively.

Results and Discussion

The statistical results of carcass characteristics and meat quality are given in Table 1. It has been shown that cold carcass from male, independent from genotype, was significantly heavier than female. As can be observed, when the carcass weight increased within the sex classes, the lean thickness muscle increased ($p>0.05$), the fat thickness increased ($p<0.05$) for female from genotype **B** as well as for male from genotype **A** ($p>0.05$), loin muscle area increased ($p>0.05$) except for female from genotype **B** whereas fat depth decreased ($p>0.05$) except for female from genotype **B** while the lean meat content decreased for genotype **B**, significantly for female. These results corroborated with ARMERO *et al*., (1999). No significant differences were found between genetic types in carcass lean meat content, which was around 50.11% when the lean meat from belly and ribs were taken account, reaching similar value reported by ARMERO *et al*., (1999), which was 50%, although OLIVER *et al.,* (1993) reported that breeds with good conformation such as Pietran and BL had significantly higher lean content than LR, LW and DU. As far as the lean meat content is concern the heavy female from genotype **A** and light female from genotype **B** reached higher values 53.32% and 55.60%, respectively, considering meat from belly and ribs.

Meat quality has shown significant differences between the genetic types for pH_{24h}. It can be noted that animals from genotype **B** presented lower pH in **SM** (5.57; 5.56; 5.66; 5.52) and **SC** (5.96; 5.89; 5.93; 5.78) muscles than genotype **A** (**SM,** 5.76; 5.72; 6.04; 5.94 and **SC,** 5.96; 5.94; 6.09; 6.04 muscles). van LAACK, R, KAUFFMAN, R & GREASER M. (2001) reported that production of pig with ultimate pH above 5.7 would result in constant quality meat with high water holding capacity and reddish pink color. Based on this consideration genotype **B** can be classified between red, soft and exsudative (**RSE**) and pale, soft exsudative (**PSE**) which is undesirable because the poor quality of the myofibril proteins. Meat color (L*, a* and b*) showed statistics differences for L* reaching values as high as 55.45 for light male from genotype **B**, which is considered above the range for normal meat (**L*** = 52.2 a 54.8) proposed by van der WAL et al., (1988). Drip loss was higher ($p<0.05$) for genotype **B** showing values next to 10%, which is considered near the range of **PSE** meat (**DL**>10%, WARRISS & BROWN, 1996). No significant differences between genetics types were found in water holding capacity, although it can be observed that genotype **B** presented values slightly lower than genotype **A**.

Conclusions

The present study emphasizes the importance and interactions of different genetic lines, carcass weight and sex on quantity and quality of pig meat.

In Brazil 75 to 85% of pig meat is used as raw material for further processed products and there are specific markets for whole carcass as well. The first market requires heavier carcass (95 to 105kg) while the latter search for lighter (70 to 80kg) but with good conformation.

Based on the results of this investigation it can be concluded that genetic line **B**, which has Pietran, did not present higher lean meat as it was expected although good conformation was there. However it is necessary to point out the high investment required to improve a genetic line and in this connection the overall difference on lean meat content between genetics lines **A** and **B** is 1.21% and that becomes significant when meat quantity is considered. Further experiments using more animals to confirm the variations in some quantity traits evaluated are in progress.

The effect of Hal^n gene in heterozygous scheme present in genetic line **B**, was evident in carrier muscles. Quality traits such as ultimate pH and drip loss were influenced resulting poor meat quality. This was not evident in others studies (KRZECIO (2001), which showed that allele expression is stronger in pure maternal breed than in group originated for crossing of maternal breeds sow with synthetic line boars (exceptional for lactate level, loin muscle area and water holding capacity).

Pertinent literature

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Table 1. Statistical results of carcass characteristics and meat quality for different genetic types, sex and weight of the pigs.

Characteristics	A				B			
	Male		Female		Male		Female	
	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light
Chilled carcass (kg)	94.52^{a}	81.20^{cde}	84.57^{bc}	76.63^{de}	96.98^{a}	$82,52^{cd}$	$90,33^{ab}$	$74,42^{e}$
Lean meat (%)	45.54^{bc}	45.49^{bc}	48.82^{ab}	44.55^{c}	46.70^{bc}	$47,02^{bc}$	$44,41^{c}$	$51,10^{a}$
LMA (cm^2)[1]	50.88^{ab}	43.35^{b}	49.58^{ab}	42.18^{b}	58.20^{a}	$50,50^{ab}$	$49,37^{ab}$	$52,13^{ab}$
FD (cm)[2]	1.79^{ab}	2.05^{a}	1.35^{ab}	1.94^{ab}	1.36^{ab}	$2,15^{a}$	$1,62^{ab}$	$1,02^{b}$
FT (mm)[3]	18.93^{ab}	17.60^{ab}	14.67^{b}	16.70^{ab}	18.24^{ab}	$22,87^{a}$	$21,27^{a}$	$13,00^{b}$
MT (mm)[3]	69.73^{a}	61.67^{a}	65.78^{a}	60.67^{a}	72.08^{a}	$62,83^{a}$	$67,27^{a}$	$62,07^{a}$
pH_{24h} SM[4]	5.76^{bc}	5.72^{be}	6.04^{a}	5.94^{ac}	5.57^{de}	5.56^{de}	5.66^{bde}	5.52^{de}
WHC[5]	0.36^{a}	0.38^{a}	0.37^{a}	0.43^{a}	0.36^{a}	0.36^{a}	0.36^{a}	0.32^{a}
DL[6]	5.80^{c}	5.98^{c}	7.77^{abc}	6.38^{bc}	10.77^{a}	9.16^{ab}	9.67^{ab}	8.35^{abc}
L*[7]	49.78^{ab}	50.26^{ab}	51.48^{ab}	48.51^{b}	51.58^{ab}	55.45^{a}	48.53^{b}	50.91^{ab}
a*[7]	5.61^{a}	5.35^{a}	4.89^{a}	5.54^{a}	6.31^{a}	5.45^{a}	$6,.78^{a}$	6.33^{a}
b*[7]	5.29^{a}	5.10^{a}	5.60^{a}	4.74^{a}	5.31^{a}	6.04^{a}	$4,.80^{a}$	5.25^{a}

[1] Loin Muscle Area, at 10^{th} rib.
[2] Fat Depth, at 10^{th} rib.
[3] Fat and Muscle Thickness – optic probe at 15^{a} rib and inserted at 6 cm from splitted carcass.
[4] *Semimenbranosus.*
[5] Water Holding Capacity.
[6] Drip Loss.
[7] Illuminant source D 65.
^{abcde} – Means within a row without a common superscript letter differ ($p < 0.05$)