Selection of Duroc pigs for a traditional and distinguished pork production model (Rodapork)

Summary

The vast majority of production of pork with white coat genotypes (including Duroc) except for the case of "Italian pork" produced as the basis for Parma or San Daniele ham, is currently based on optimising the profit-cost ratio, within which the market price manages this production as a "commodity".

However, new market niches are constantly appearing, which demand a differentiated product and highlight aspects directly related to the quality of the product, and its gastronomic quality and ethical quality in particular":

- Gastronomic quality: its possible use as part of a list of ingredients in a distinguished high added-value cuisine.
- Ethical quality: the incorporation of sustainability criteria (environmental, economic and social) as well as differentiated animal welfare criteria in the production model of a specific animal protein.

One of the main objectives in this project is therefore to obtain a uniform product from a genetic programme that incorporates various combinations of genetic lines, and an in-depth study of the heterosis achieved and the complementarity between the combined lines and the Duroc base.

Objectives

This project designed, developed and validated a production model involving an appropriate genetic selection of Duroc pigs in order to obtain an optimal animal that can provide a distinguished meat, with a series of specific characteristics that meet the current requirements of an emerging market that is very concerned about its food, and based on a range of ethical considerations that affect the production process, without neglecting the urgent need to optimise the animal science parameters that lead to more efficient and competitive production in terms of production costs.

The main objective of this project was to return to a production model capable of producing a high-end differentiated product which provides a unique raw ingredient that can occupy a high value-added market niche, with the twofold benefit of being a raw material that meets the requirements of the traditional delicatessen, and which can provide new "cuts" of meat for the gourmet market and/or restaurants.

Description of the actions carried out in the project

- Characterisation of the genotypes in the RODAPORK project based on parental purity

- Planning and carrying out of crosses

- Genetic/nutritional monitoring of the various combinations studied (monitoring and crosses with Duroc).

- Slaughter and carving

- Quality analysis of meat and fat. Sensory analysis of cooked meat

- Final assessment of products

Final results and practical recommendations

Infiltrated Intramuscular Fat (IIF): a higher level of IIF content for each maternal line was observed in animals from the Duroc cross with a higher IIF content. The maternal line with the highest fat content was the Landrace. There were no significant differences between Large White and F1.

Shelf life, lipid peroxidation (TBARs): the shelf life was classified according to the lipid oxidation of each Duroc cross according to its IIF content. Higher levels of lipid peroxidation were observed in animals from the Duroc cross with higher IIF content for each maternal line.

The most lipid-impaired maternal line was F1, followed by Landrace.

Sensory analysis of raw meat: the crosses with the highest percentage of IIF (crosses > 4.5% and 3-4.5%) obtained more colour values, lower levels of colour intensity, and both parameters deteriorated at an earlier stage. These levels lead to greater consumer acceptance than animals with lower IIF content. No differences were observed between the various crosses on day 0 of the analysis for the inherent odour parameter (meat odour), but less deterioration was observed in animals with lower IIF content. However, the parameters of other odours and colours that appear during the life of the meat were observed to be higher and appeared earlier in crosses with a higher IIF percentage, which leads to increased rejection due to deterioration.

If the different parameters are compared by groups of maternal line, the results show that the pure lines obtained more colour in the meat and it was preserved better over time than the F1, and the Landrace line was the best preserved colour. The same findings apply to colour intensity. Higher values and less deterioration were observed for inherent odour in F1 than in the pure lines, and the worst rated in this respect was Large White. Other odours and colours appeared earlier and with higher values in pure lines than in F1.

Sensory analysis of cooked meat: no differences in the meat's inherent odour and colour were observed between crosses. However, the "other odours" parameter obtained higher values in fatter animals. The colour intensity was higher with a lower IIF percentage. Taste and other flavours are more noticeable in fatter animals. The toughest meats were those from animals with a lower IIF content, while the juiciest meats were from those with the highest IIF content. The meats with the least IIF content had the highest levels of chewability and fibrousness.

A comparison of the various parameters by groups of maternal line concluded that better values for odours and colour of meat were observed in F1, and for "other odours", better values were observed in the pure lines than in F1. The breed with the most colour intensity was the LD, and the F1 had an intermediate value. There were no differences between the flavour of meat and "other flavours" between the maternal lines. The F1 meats were tougher and juicier than pure line meats, and Landrace line meat was the least tough and juicy. Chewability was higher in F1 and higher in LW. Landrace was the most fibrous.

These results are consistent with those obtained in the sensory analysis of raw meat.

Conclusions

1- Genetic selection to obtain the desired product

1.1 Each genetic cross expressed a growth curve with specific parameters, which enabled the creation of growth models for each genotype in order to design tailor-made precision feeding programmes.

1.2 The carving of gourmet pieces was described for each cross. This information will be necessary in the future to develop marketing strategies for different market niches.

1.3 It was observed that the higher the fat content of the Duroc boar used, the higher the fat content of the end product obtained in all of the crosses studied.

1.4 Some maternal lines were also found to have a greater genetic predisposition to fat content, such as the Landrace line, and greater sensitivity to lipid deterioration than others notwithstanding their fat content, such as F1.

1.5 The crosses with the best parameters for sensory acceptability by the consumer were those that had used the Duroc boar with the highest fat infiltration crossed with the F1 maternal line. Their organoleptic characteristics (colour, smell and colour intensity over time) were best preserved in raw meat, and they had the best colour intensity and texture in cooked meat. With these results, this product can be established as a "gourmet selection" product.

2- Feeding of the animals studied

2.1 Multi-feed programme.

2.2 Formulation based on the specific nutritional needs of each cross.

2.3 Feeding programme aimed at improving the quality and shelf life of meat to increase the economic return and added value of the product.

- % crude protein
- Fatty acids composition
- Antioxidants

3- Classification of products according to their characteristics, genetic crossing, feeding, age and weight at slaughter:

- Conventional
- Quality
- High-end or *gourmet selection*

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Subject area(s) of application

☒ Livestock farming and animal welfare

☒ Genetic resources

☒ Food quality/processing and nutrition

Geographical area(s) of application

PROVINCE(S): Barcelona

REGION(S): Osona

Dissemination of the project: publications, seminars, multimedia, etc. (State links)

Presentation by Gepork at the seminar organised by the RRN:
http://www.redruralnacional.es/documents/10182/713897/Sala1.PPT2-GEPORK.pdf/86d98835-25ea-45d1-83a6-d4e33a93cb40

Project website

https://www.innovacc.cat/2021/08/10/seleccio-de-duroc-per-a-un-model-productiu-de-carn-de-porc-tradicional-i-diferenciada-rodapork-3/

More information on the project

PROJECT DATES	TOTAL BUDGET
Starting date: July 2019	Total budget: €193,267.71
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