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SENSORY CHARACTERISTICS OF COOKED PORK LOIN FROM IMMUNOCASTRATED AND SURGICALLY CASTRATED MALE PIGS FED WITH PEA OR SOYABEAN

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I. INTRODUCTION

Consumers' purchasing intentions are determined by various quality aspects, such as animal welfare [1], health aspects (no antibiotics residues) and environmental issues [2] among others. Boar taint is the off-odour or off-flavour of cooked pork, mainly due to androstenone and skatole, especially detectable upon cooking. Surgical castration is the most common method of control boar taint in heavy pigs; however, immunocastration has been used as a more welfare-friendly alternative method. Martinez-Macipe et al. [3] found that meat from immunocastrated males (IM) had higher rancidity (odour and flavour) scores than surgically castrated males (CM). Soybean meal is the primary protein source used in pig feed; however, the livestock industry depends on imported soybeans. As consequence, efforts are being made to encourage the use of locally grown protein crops for animal feed. In Europe countries, field pea is considered potential alternative to imported legume. Nevertheless, the effect of substituting imported protein with different local protein on the sensory attributes of meat is poorly understood. Therefore, the aim of this study was to evaluate the effect replacing soybean on the sensory characteristics of cooked loin from CM and IM.

II. MATERIALS AND METHODS

The experimental design consisted of a factorial design with two castration types (CM and IM) and two feeding strategies (soya and pea) during the entire fattening period. Immunocastrated male received two application of the vaccine Improvac® (Zoetis, Belgium). Pea was gradually included at 25% (40–80 kg), 30% (80–110 kg), and finally 40% (110–140 kg), with partial to entire replacement of soybean meal in feed. Diets were isoenergetic and isoproteic between treatments. A total of one hundred and twenty pigs (crossbreds of Duroc dam line x Berkshire sire line) were slaughtered at 140 kg body weight. Twenty-four loins (~500 g each, 10 cm of caudal *Longissimus lumborum*) were randomly selected across the four treatments (6 replicates per treatment). Samples were vacuum-packaged in plastic bags and frozen at a temperature of -21ºC until their evaluation. Sensory evaluation was conducted in a specific room of the Agriculture School of Polytechnic Institute of Bragança by a trained taste panel of eight members previously recruited. The room light was white and each booth the red light was used to mask the samples' colour. The day before the tasting session samples were thawed at 4ºC. Samples were wrapped individually in cooking bags and roasted in an oven until the internal muscle temperature reached between 70 and 80°C (NP-ISO-8586-1, 2001). Immediately after cooking the loin was divided in 2 × 2 cm cubed samples and wrapped in aluminum foil, marked with random three-digit codes and placed in a preheated oven of 60-70°C and evaluated within 10 min. The sensory descriptors were muscle colour (Figure 1), fat colour, odour intensity, flavour persistency, flavour intensity, chewiness, juiciness, hardness and skatole and androstenone odour. A structured scoring scale was used in which 1 indicated the absence and 9 the high intensity of the attribute. The process involved five sessions, each lasting 1-2 hours, during which the panellists assessed samples of the four treatments in triplicate, presented in a random order. The data were analyzed with the JMP Pro 16 version, statistical software (SAS Institute, Cary, NC, USA), a standard model including fixed effects of feeding strategy, castration type and single interactions. The interaction between feeding strategy and castration type is not reported in the text as they were non-significant ($p > 0.05$) in any variable. Values are presented as least square means and standard error of the mean. The level of significance was set at 0.05.



Figure 1. Pictures grading of muscle colour (1 to 9, light to dark)

III. RESULTS AND DISCUSSION

The effect of feeding strategy and castration type on cooked loin is presented in Table 1. The fat colour was more yellowish in pigs fed a pea-based diet than in those fed soya. This is probably due to the influence of the pea

carotenoid lutein, a lipophilic molecule that accentuates yellowish colour [4]. No unpleasant odours were detected depending on the type of feeding. Regarding the type of castration, IM meat was juicier and easier to chew than MC meat due to the higher PUFA content, according to previous work [5], and IM meat also resulted in a lighter muscle colour. Although other studies [6], with lower intramuscular fat content (IMF, 1.45%), reported opposite results in terms of juiciness, in the present trial, the higher IMF (4.9%) may have attenuated the effect of castration type. Unpleasant odours of urine (androstenone) and faeces (skatole) were higher in IM than CM. Finally, the flavour intensity and persistence and hardness were not influenced by feeding strategy or type of castration.

Table 1 – Sensory attributes of cooked loins evaluated by trained panel (ranked from 1 to 9, from least to most)

	Feeding strategy (F)		Castration type (S)		SE	P-value	
Sensory traits	Soya	Pea	IM	CM		F	S
Muscle colour (lean) (light to dark)	2.53	2.52	2.42	2.64	0.08	0.92	0.04
Fat colour (white to yellow)	2.66	3.04	2.81	2.89	0.12	0.02	0.66
Hardness (tender to tough)	3.95	3.61	3.61	3.95	0.14	0.1	0.1
Juiciness (dry to juicy)	3.70	4.01	4.07	3.64	0.13	0.09	0.02
Chewiness (easy to difficult)	3.96	3.65	3.57	4.03	0.14	0.10	0.02
Odour intensity (low to high)	5.46	5.40	5.53	5.32	0.12	0.70	0.21
Flavour intensity (overall assessment) (low to high)	5.47	5.25	5.41	5.31	0.11	0.18	0.56
Flavour persistence (low to high)	5.32	5.19	5.28	5.23	0.13	0.45	0.77
Boar taint (off-odour)							
Do you detect androstenone, urine odour? (low to high)	1.54	1.55	1.75	1.34	0.11	0.95	0.01
Do you detect skatole, faeces odour, stable odour? (low to high)	1.58	1.39	1.77	1.20	0.12	0.23	<0.001

SE = standard error. IM: immunocastrated male pigs; CM: surgical castrated male pigs.

IV. CONCLUSION

The inclusion of pea in fattening diets had a negligible effect on the sensory traits of pork. Immunocastration, however, may improve juiciness and chewiness in high marbled pork. While its impact on boar taint and muscle colour requires further investigation to prevent rejection, it remains uncertain whether untrained consumers would be able to detect these differences.

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