EFFECTS OF IMMUNOCASTRATION AND RACTOPAMINE ON PORK SAUSAGE

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Abstract – The pork meat industry is continually developing new strategies to enlarge animal production. Two of those technologies, immunocastration an alternative method of physical castration, and ractopamine, a feed additive, are already well understood for carcass traits. The aim of this experiment was to evaluate the acceptability and physico-chemical effects of those technologies over pork ham sausages. Thirty animals were processed in 10kg of cooked sausages for each of the six treatments (three genders: gilts (G), physically castrated male pigs (PC) and immunocastrated male pigs (IC); and two ractopamine levels: 7.5ppm (+RAC) and 0 ppm (-RAC) during 21 days prior slaughter. The hind legs from the immunocastrated animals had a lower pH (5.72, P<0.0001) and the sausages from those showed the highest cooking yield (P=0.0036). The use of ractopamine in the physically castrated animals increased protein content from 18.25% to 19,85% (P<0.0001) in the hind legs and boosted moisture of sausages from gilts (53,28% to 56,68%; P<0.0001). On the other hand, immunocastration showed the lowest values for taste (P=0.0032) and purchase intention (P=0.0035). The present results show that both technologies can be applied in sausage production, but attention should be paid regarding product taste.

Key-words – sensory, pork ham, physico-chemical

I INTRODUCTION

The pork supply chain is constantly seeking new approaches to both animal and industrial production to increase yield of the carcasses. One of these is the immunocastration which can be seen as a possible response to the call for improvements in farm animal's welfare, and also improves carcasses' weight and quality once there is the presence of androgenic hormones during animal development [1,2]. This technology is based on the development of autoimmune response against Gonadotrophin-releasing factor (GnRF) to control the boar taint issued from the accumulation of androstenone and skatol [1,2].

In nutritional level, the ractopamine (β-adrenergic agonist), used as feed additive, may improve feed conversion of pigs directing the energy balance for muscle development in place of the deposition of fatty tissue. It promotes an increase in lean meat by increasing the action of lipases and calpastatine [3,4].

Both technologies are already in use in some countries (ractopamine is used in North America, Australia and Brazil; however immunocastration is used only the last two) where their animal performances are already well known and discussed, but a more focused approach to know their outcome regarding industrial processing is still pending. Thus the objective of this study is to understand the effects of proposed technologies through physicochemical and sensory analyses.

II MATERIALS AND METHODS

A completely randomized 3 X 2 factorial design was used which included (genders: gilts (G), physically castrated male pigs (PC), and immunocastrated male pigs (IC) X ractopamine levels: 7.5 ppm (+RAC) and 0.0 ppm (-RAC) during 21 days prior slaughter, summing six treatments each one represented by five hams from different animals. Each treatment was represented by a 10kg batter processed into sausages using 29mm diameter casings, weighting 90g, summing around 100 sample

units. All recipes had: 25.0% pork fat, 18.0% water, 1.80% maltodextrin, 1.60% NaCl, 0.40% sodium phosphate, 0.30% antioxidant, 0.20% sodium nitrite/nitrate salt, 0.40% spices and 52.30% ground pork ham. The sausages were cooked through all the regular steps using industrial oven until the inside temperature of the product reached 72-75 °C.

The analyses were accomplished using methods based on: Horwitz (2005) for protein, lipid and moisture content; AMSA (1995) for cooking yield and Stone & Sidel (1993) for consumer acceptance test. Three samples of ground ham were taken and six sausages from each treatment to evaluate the pH, protein, lipid and moisture content.

The sausages strings were weighted before heat processing and after chilling at 2 °C for 24h. The cooking yield was determined from weights and was expressed as a percentage of the initial weight.

In the Consumer Acceptance Test the judges were demographically asked about their age, type of sausage most consumed, its frequency and purchasing decisions. As for the sensory traits, a 9-point hedonic scales was used for the evaluation of the attributes of appearance, odor, flavor, texture and overall liking, where 9 = "like extremely" and 1 = "dislike extremely". Each judge fulfilled his test in an individual booth using a computer.

The effect of gender and ractopamine, and their interactions were determined by 2-way ANOVA and differences between treatments were analyzed by Tukey's HSD test at 95% confidence interval ($p \leq 0.05$).

III RESULTS AND DISCUSSION

Table 1 Effects of ractopamine and genders over cooking yield, physico-chemical parameters and sensory traits of ham and sausage

	GILTS		PC		IC		P-value		
	+RAC	-RAC	+RAC	-RAC	+RAC	-RAC	Genders	Rac	G x R
Cooking yield	91,0^{c}	92,7^{abc}	92,3^{abc}	91,5^{bc}	93,1^{ab}	93,8^{a}	0.0036	NS	0.0485
Ham									
pH	6,03^{a}	5,90^{b}	6,02^{a}	6,00^{a}	5,88^{b}	5,72^{c}	<0.0001	<0.0001	0.0083
protein%	19,48^{ab}	19,39^{ab}	19,85^{a}	18,25^{b}	19,37^{ab}	18,94^{ab}	NS	<0.0001	0.0006
lipid%	6,81^{b}	9,51^{ab}	9,99^{ab}	9,87^{ab}	11,67^{a}	8,29^{ab}	<0.0001	0.0244	<0.0001
moisture%	72,61^{a}	69,03^{a}	71,15^{a}	70,09^{a}	68,26^{a}	70,99^{a}	NS	NS	0.0052
Sausage									
pH	6,25^{a}	6,18^{ab}	6,25^{a}	6,20^{ab}	6,23^{a}	6,13^{b}	<0.0001	0.0346	NS
protein%	12,99^{a}	12,40^{a}	12,57^{a}	12,51^{a}	12,84^{a}	12,32^{a}	NS	0.006	NS
lipid%	25,55^{c}	29,50^{a}	28,28^{ac}	28,44^{abc}	25,96^{bc}	28,68^{ab}	0.0006	<0.0001	<0.0001
moisture%	56,68^{a}	53,28^{c}	54,26^{abc}	53,94^{bc}	56,15^{abc}	54,56^{abc}	<0.0001	<0.0001	<0.0001
Appearance	6,63^{a}	6,71^{a}	6,96^{a}	6,69^{a}	6,49^{a}	6,16^{a}	NS	NS	NS
Odor	6,82^{a}	7,00^{a}	7,12^{a}	6,80^{a}	7,02^{a}	6,57^{a}	NS	NS	NS
Flavor	6,78^{bc}	7,00^{ab}	7,49^{a}	7,27^{ab}	6,98^{abc}	6,29^{c}	0.0032	NS	NS
Texture	7,02^{a}	6,71^{ab}	7,27^{a}	7,02^{a}	6,94^{ab}	6,33^{b}	NS	0.0295	NS
Overall Impression	6,82^{a}	7,12^{a}	7,24^{a}	6,98^{a}	7,00^{a}	6,51^{a}	NS	NS	NS
Purchase Intention	3,65^{ab}	3,76^{a}	4,06^{a}	3,88^{a}	3,65^{ab}	3,22^{b}	0.0035	NS	NS

^{a,b,c} different letters mean statistically different means ($P<0.05$). NS means not significant.

Among the 49 consulted judges, it was observed that most of them (46.9%) were between 21-30 years old, with the frequency of consumption being mostly once every two weeks (40.8%), in which hotdog sausages were the mainly consumed (87.8%) and the product brand (63.3%) was the main selection factor when buying.

In the sensory evaluation it was observed that PC pork received the highest score for taste ($P=0.0032$) and purchase intention ($P=0.0035$)

(placed between “maybe/maybe not buy" and "probably purchase"), while IC pork obtained a lower score (Table 1). As for appearance, odor and overall impression, no difference was detected ($P > 0.05$) between different sexes or the use of ractopamine (Table 1).

The hind legs from IC animals obtained the lowest values for pH statistically differentiating them from the other treatments ($P<0.0001$). The use of ractopamine (+RAC) increased significantly pH of G and IC ($P<0.0001$) and protein content of PC ($P<0.0001$) (Table 1).

The cooking yield, showed that IC+RAC had the highest value and differed significantly from G+RAC ($P=0.0036$) from other treatments. The effect of ractopamine over sausage parameters showed an increase on pH of IC ($P=0.0346$), moisture content of G ($P<0.0001$); and reduction of lipid content of G ($P<0.0001$); it was observed a suspect numeric increase of texture but it was not significant (Table 1).

In the IC animals the reduction of androgenic hormones decreases the male instinct resulting in less aggressive behavior which decreases muscle activity and increases its glycogen muscle deposition, which will end in a greater fall in muscle pH [5].

The ractopamine increases the expression of calpastatine suggesting higher protein content which boosts the moisture retention besides nitrogen concentration of compounds that alkalinize the medium [3,4]. The texture of the product was increased probably due to better protein gel formation which favored the higher yield and better texture (important in this type of product).

This study is part of a research line to evaluate the effects of use of those two technologies over carcass traits, cuts yield, muscle centesimal composition, sensorial traits and different products like Italian coppa and salami, enhanced loin and smoked bacon.

IV CONCLUSION

Both immunocastration and ractopamine were interesting alternatives to routine methods because it did not affect important characteristics of the final product as appearance, overall impression, brightness and redness but increased the protein content and its production yield. Furthers studies must be carried out to understand the immunocastration effects over taste and develop the better strategy to outline this issue.

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