

The effects of Ractopamine hydrochloride and immunocastration on Italian salami quality

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Abstract- Sixty pork carcasses out of one hundred and eighty PIC crossbred pigs (G337 sire and CB22 dams) which were penned into 6 groups corresponding to 6 treatments of control and ractopamine (RAC, 7.5 mg/Kg during 21 days), and sex (female, FE, physically castrated male, PC, and immunocastrated, IC) aiming to clarify the combined effects of these two technologies on Italian salami quality were carried out. The salami was produced with this meat and pH, aw and weight loss was evaluated. The microbial counts were carried out at the end of the process: analyses of lactic acid bacteria, molds, coliforms, *Escherichia coli*, *Salmonella spp.* and *Staphylococcus aureus*. At selected times during processing aw, pH, colour and weight loss were recorded. The salami lost weight during processing and, as a consequence, the aw gradually decreased to 0.87-0.89 ($p>0.05$ at 28 day) and all salami dried evenly. The pH values of all salami equally declined during processing around 4.9-5.0 ($p<0.05$) at the end of processing, when Italian salami obtained from immunocastration with or no RA diet and castration no RA ($p>0.05$) showed high value (5.0). Products obtained from females with or no RA ($p>0.05$) showed low value (4.9). The treatments showed yield around 64-65%. The microbiological quality of all formulations of salami evaluated was considered adequate. The results of this study indicate that the pork meat from these different technologies can be used for the manufacture of Italian salami without being modified traditional manufacturing processes.

Keywords: Italian salami, immunocastration, ractopamine hydrochloride.

I INTRODUCTION

During sexual development and when mature, boars accumulate substances, predominantly androstenone and skatole, in their fatty tissue that are regarded as the main contributors to boar taint in pork [1]. Physical castration of male piglets is common practice, in order to prevent the occurrence of boar taint in pork, however, it is a painful and animal-unfriendly practice [2]. Other method of inhibiting sexual development and boar taint is the immunocastration, immunization against gonadotropin releasing hormone, GnRH [3,4].

Ractopamine hydrochloride is a phenthanolamine with beta-adrenergic agonist properties and has been reported to increase leanness and reduce the amount of fat in pork carcasses as well as exhibit positive effects on growth performance traits in pigs [5,6,7].

Pork is the most important source of raw material for most fermented sausage processors. The quality of fermented sausages depends on raw material characteristics and on technological parameters and is determined by the formation of end products, originating from the breakdown of proteins, lipids and carbohydrates [8]. However the industry requires further studies to clarify the interaction of these two technologies on processed pork meat quality traits. Hence, the objective of this experiment was to evaluate the influences of immunocastration and addition of ractopamine in pig diets on the quality of Italian salami.

II MATERIAL AND METHODS

A. Animals

A total of 60 AGROCERES PIC crossbred pigs (AGPIC 337 sires x CB 22 dams) from a commercial farm were grouped in females (FE), physically castrated (PC) and immunocastrated boars (IC), fed or not with ractopamine hydrochloride (7.5 mg/kg, Ractosuin, Ourofino Agrobusiness) for the final 21 d before slaughter. The boars designated to immunocastration received two doses of vaccine 8 and 4 weeks before slaughter, as recommended (Improvac, Pfizer Animal Health).

B. Slaughter

The animals were raised in the same commercial farm. At the end of finishing period pigs at an average weight of 115kg were transported to a commercial slaughter (Mondelli, Bauru, SP, Brasil) where they were electrically stunned and humanely slaughtered in accordance with the Sanitary and Industrial Inspection Regulation for Brazilian Animal Origin Products [9].

C. Italian salami manufacture

Salamis were manufactured at a meat processor's (Frigor Hans, Jundiaí, SP, Brasil) using a standard recipe consisting of pork (chilled) and pork backfat (frozen) from the six treatments (F, FR, C, CR, I, IR), with a total of six batches. Other ingredients were added as follows: NaCl, NaNO₂, NaNO₃, dextrin and ground black pepper. Ingredients were mixed in; appropriate starter cultures were added during mixing and stuffed into 50 mm diameter casings. The sausages were placed in a fermentation chamber. The following conditions of relative humidity (RH) and temperature were applied: day 0 until day 5, 75–92% RH and 18–28°C; day 5 until day 22, 73–74% RH and 17°C.

D. Physicochemical analysis

At selected times during processing, two sausages from each batch were taken for analysis. Water activity was measured with an Aqualab Instrument (Decagon Devices Inc., EUA) at 25°C. The surface colour of sausage slices (CIE L*, a* and b* values) was measured using a portable spectrophotometer (Minolta Spectrophotometer CM-508D, Japan). Measurement of pH was performed with a HI99163

pH-meter (Hanna Instruments, Romania) directly in the sample. Weight loss was measured to determine the yield.

E. Microbial analysis

Sausages samples of each treatment were collected aseptically and evaluated following the method described by Downes and Ito [10].

F. Statistical analysis

Results were evaluated by analysis of variance (ANOVA) and comparison of means by Tukey test to compare means with the 95% confidence interval, using SAS.

III RESULTS AND DISCUSSION

The initial pH (day 0) ranged between 5.89 and 6.08 (Fig. 1), with no significant differences ($P>0.05$) between treatments. At the eighth day, there was a drop of pH due to acidification caused by the starter culture [11,12]. Then it can be seen a slight increase, according to [13,14] as the pH usually increases at the end of the ripening due to the utilization of lactate and acetate together with the production of ammonia from amino acid breakdown. The final pH values differed significantly ($P<0.05$), being higher for treatments I and IR, however, these values were considered normal [11,14].

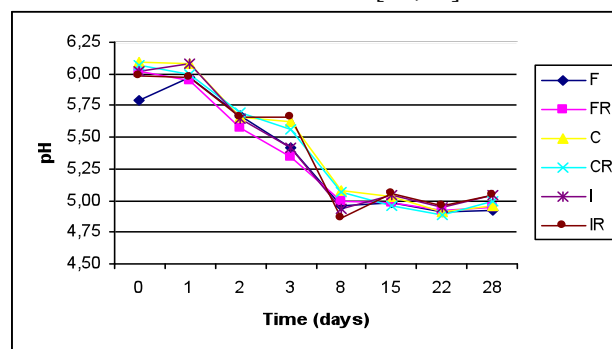


Figure 1. Changes in pH during the ripening of dry fermented sausages.

The final aw values showed a similar pattern in all treatments, ranged between 0.874 and 0.888 (Figure 2) showing no difference among the treatments ($P>0.05$).

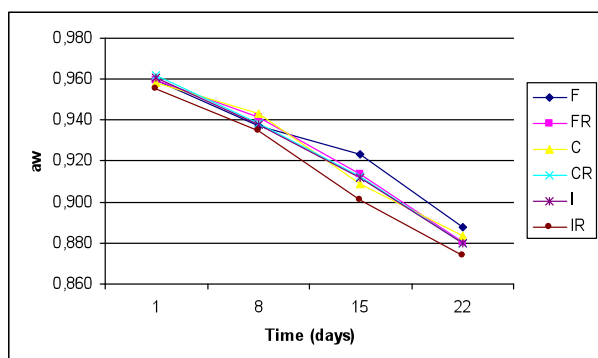


Figure 2. Changes in aw during the ripening of dry fermented sausages.

Statistical analysis indicated that there was no effect ($P>0.05$) of sex and ractopamine on the colour changes. It was observed that the time of ripening which has an influence on the colour of the sausages. The treatments showed similar yield around 64-65%. The microbiological quality of all formulations of salami evaluated was considered adequate.

V CONCLUSION

The present results suggest that immunocastration and ractopamine feeding can be successfully applied for Italian salami, with no modification of the traditional manufacturing processes or changing its quality characteristics.

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