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NATURAL ANTIMICROBIALS, E-POLY-L-LYSINE AND NISIN Z, DID NOT AFFECT THE SENSORY PROFILE OF REDUCED-SODIUM CALABRESA SAUSAGE

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I. INTRODUCTION

Calabresa sausage, a popular pork-based sausage in Brazil, is susceptible to spoilage due to its high nutritional value, pH > 6.0, and high-water activity, leading to bacterial growth. Lactic acid bacteria (LAB), such as *Lactobacillus, Carnobacterium*, and *Leuconostoc*, dominate in vacuum-packed cooked sausages [2], with spoilage accelerating at room temperature. Although salt aids in preservation, growing demand for reduced sodium and natural ingredients highlights alternatives like nisin (NI) and Ɛ-poly-L-lysine (Ɛ-PL) [1, 3]. These antimicrobials are effective against spoilage microbes; however, they must not compromise the sensory quality of the product [4]. This study evaluates the sensory impact of NI and Ɛ-PL in reduced-sodium *Calabresa* sausage stored at room temperature.

II. MATERIALS AND METHODS

Reduced-sodium *Calabresa* sausage was produced in a medium-scale commercial meat processing facility. The sausage batter was composed of pork shoulder trim (68.45%), pork back fat (15.0%), mechanically deboned poultry meat (10.0%), water (2.0%), texturized soybean protein (2.0%), garlic (0.25%), Calabrese pepper (0.15%), sodium tripolyphosphate (0.25%), and an antioxidant mix (0.25%). Salt content was reduced by 30% and added at 1.4%, with curing salt (0.25%) included. Three formulations were tested: T1 (control, without antimicrobials), T2 (95 mg/kg Ɛ-polylysine + 0.5 mg/kg Nisin Z), and T3 (142.5 mg/kg Ɛ-polylysine + 0.25 mg/kg Nisin Z). After processing and vacuum packaging, sausages were stored at room temperature for 28 days. Sensory analysis was approved by the Ethics Research Committee (CEP/PUCPR, protocol 2.401.970) and involved 105 consumers (50 men, 55 women, aged 18–55 years) using a nine-point hedonic scale to evaluate odor, color, taste, tenderness, and overall liking. The Acceptability Index (AI) was calculated to assess consumer acceptance and ensure that antimicrobial addition did not alter sensory quality. Sensory analysis was conducted in one session and data were analyzed using a random block design, considering a mixed linear model including the fixed effect of treatment and random block effect (panelist). Means were compared by Tukey's test ($P < 0.05$), and analysis was performed using Statgraphics® Centurion XVI version 16.1.11 (Statpoint Technologies, Warrenton, VA, USA).

III. RESULTS AND DISCUSSION

Sensory analysis revealed no significant differences in odor, color, tenderness, taste, or overall liking among the treatments (Table 1). The acceptability index for all formulations was above 80% for odor, texture, flavor, and overall liking, suggesting a positive consumer response. Only the color acceptability index was slightly lower than 80% (77.6%, 75.6% and 78.0% for T1-control, T2 and T3, respectively), remaining above 70% across treatments. An acceptability index ≤ 70% indicates the commercial viability of the product. Both treatments containing Ɛ-PL and NI (T2 and T3) were well accepted by consumers, suggesting their market potential [5]. These findings indicate that the antimicrobial treatments, particularly those with Ɛ-PL and NI, did not negatively impact the sensory properties of the sausages, and all formulations had the potential for commercial viability.

Table 1 - Sensory analysis of *Calabresa* sausage added with nisin and Ɛ-polylysine (mean ± standard error)

Characteristics	T1	T2	T3
Odor	7.38± 0.13[a]	7.25± 0.14[a]	7.42± 0.14[a]
Color	6.99± 0.14[a]	6.80± 0.15[a]	7.01± 0.12[a]
Tenderness	7.58± 0.11[a]	7.30± 0.14[a]	7.47± 0.14[a]
Taste	7.90± 0.10[a]	7.76± 0.13[a]	7.69± 0.13[a]
Overall rating	7.65± 0.09[a]	7.62± 0.10[a]	7.52± 0.11[a]

T1 = control, without antimicrobials, T2 = 95 mg Ɛ-PL/ kg + 0.50 mg NI/ kg, T3 = 142.5 mg Ɛ-PL/ kg + 0.25 mg NI/ kg. Different lowercase letters show significant differences ($P < 0.05$) in the same row.

IV. CONCLUSION

The incorporation of Ɛ-PL and Nisin Z in reduced-sodium *Calabresa* sausages did not negatively affect consumer perception of odor, taste, texture, or overall liking. The consistent acceptability index and absence of sensory differences support the commercial viability of Ɛ-PL and NI as natural preservatives solutions to maintain the product shelf-life stored at room temperature.

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