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Development and characterization of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid including inulin as fat replacer

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Abstract

The aim of this study was to focus on developing formulations of fermented salami-type inlaid using channel catfish (*Ictalurus punctatus*) fillets as the main raw material and inulin as a fat replacer. Chemical, physical, microbiological, and sensory analyses were conducted to characterize the products. pH variation during maturation ranged from 5.53 to 4.76, with subsequent stabilization. Treatments showed a significant reduction in water activity from 0.90 to values below the required maximum for Italian-type salami. Shear force increased throughout maturation, with the 0.5% inulin treatment exhibiting lower values. Proximate composition analysis revealed high protein content (49.70–53.22%) and reduced lipid levels (5.32–5.75%). Sensory evaluation indicated overall acceptance above 70%, with purchase intention highest for sausages without inulin. This study underscores the potential of utilizing catfish fillets and inulin as fat substitutes in value-added meat products, offering improved nutritional profiles while maintaining sensory attributes.

Keywords: fish valorization; fermented sausage; food products.

Practical Application: The combined utilization of fish and inulin in fermented sausages provides low-fat and nutritious food products with desired sensory attributes.

1 INTRODUCTION

One of the significant global challenges is to provide a growing population with nutritious food. Fish, rich in amino acids, unsaturated fatty acids, vitamins, and trace metals, and easily digestible due to its minimal connective tissue, is considered a key source of animal food and a contender for meeting this challenge (Cavenaghi-Altemio et al., 2023).

Catfish (order Siluriformes) represent a diverse group of ray-finned fish found worldwide. They are well-suited for aquaculture and industrialization due to their adaptability to intensive rearing conditions, high domestication potential, nocturnal foraging habits, ability to thrive in turbid waters, resistance to infectious diseases, efficient feed conversion, and the absence of intra-muscular bones, facilitating fillet processing (Casallas et al., 2012; Gisbert et al., 2022).

Farmed catfish are mainly processed into whole fish, dressed fish, fillets, fillet strips, nuggets, and steaks, which are usually sold as either iced, frozen, battered, breaded, or fresh (Haque and Silva, 2023). In the United States, the channel catfish (*Ictalurus punctatus*), from the family Ictaluridae, is the major aquaculture species and is mainly processed into fillets for marketing due to high processing yield (Jin et al., 2016). However, additional processed catfish products such as sausages could be introduced to the market, providing a value-addition option (Kin et al., 2013).

Catfish sausages including fermented sausages are made by blending catfish meat with other supplementary ingredients and are processed through heat treatment (Aditya et al., 2020). Fermented sausages undergo a rapid pH decrease during fermentation, resulting in desirable color, taste, and flavor (Yost, 2014). Furthermore, fermentation also ensures the microbiological safety and digestibility of the food (Kwon et al., 2014).

The development of catfish sausages has been conducted using pork fat as an ingredient. However, due to the risk factors involved such as obesity and cardiovascular diseases, it is important to develop low-fat or reduced-fat food products, which is challenging because reducing fat often results in palatability changes of the meat products (Fonseca et al., 2013). In this sense, the development of new food products becomes increasingly complex, striving to fulfill consumer demands for health, attractiveness, and functional attributes. In the case of functional foods, they do not only contribute to nutrition but also contain biologically active substances with clinical or health benefits (Baker et al., 2022). These foods can be categorized based on the food itself or the bioactive components it contains, such as probiotics, fibers, phytochemicals, vitamins, minerals, herbs, omega-3 fatty acids, peptides, and proteins (Galanakis, 2021). Inulin is a soluble dietary fiber with a low caloric value extracted commercially from chicory root. It stands out among the functional compounds in food products due to its prebiotic

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characteristics related to its indigestibility and selective stimulation of the growth and activity of beneficial intestinal bacteria (Qin et al., 2023). Inulin can be used as a substitute for fat and sugar. As a fat replacer, inulin stabilizes water in a creamy structure, maintaining the same perception of fat taste (Li et al., 2022).

Thus, the aim of this work was to develop formulations of fermented salami-type inlaid using channel catfish (*Ictalurus punctatus*) fillets as the main raw material and inulin as a fat replacer and characterize them through chemical, physical, microbiological, and sensory analyses.

2 MATERIALS AND METHODS

2.1 Raw materials

Channel catfish (*Ictalurus punctatus*) fillets were donated by Pantanal Pescados Ltda (Itaporã, MS, Brazil). Spices and additives were purchased from Conatril Ltda (Rio Claro, SP, Brazil). The starter culture was purchased from Chr. Hansen Ind. Com. Ltda (Valinhos, SP, Brazil). The inulin was donated by Clariant S.A. (São Paulo, SP, Brazil). The casings were purchased from Viscofan do Brasil Soc. Com. Ind. Ltda. (Cruz das Almas, SP, Brazil).

2.2 Sausage processing

Sausages were prepared in three different treatments containing (in %) 95.10 (T1), 94.90 (T2), or 94.70 (T3) of catfish fillet and 0.10 (T1), 0.30 (T2), or 0.50 (T3) of inulin. The remaining 4.8% of the formulations were composed (in %) of refined sodium chloride, 1.6; sugar, 0.50; ascorbic acid, 0.50; garlic, 0.4; liquid smoke aroma, 0.30; sodium polyphosphate, 0.25; carrageenan, 0.45; white pepper, 0.20; coriander, 0.14; cumin, 0.14; nutmeg, 0.14; starter culture, 0.43; and sodium nitrite, 0.014. After weighing, the ingredients of the formulations were mixed in a cutter (Filizola, model Sire, São Paulo, Brazil) for 10 min at 4°C, and the temperature was gradually raised to a maximum of 16°C to stabilize the emulsion until complete homogenization. The fillets were previously milled in a grinder with a 10-mm disc (Weg, Jaraguá do Sul, Brazil) at 1.5°C. Subsequently, the masses were stuffed into reconstituted collagen casings with a 60 mm diameter and 250 mm length (Viskase, Atibaia, SP, Brazil), previously hydrated in a 15% saline solution for 15 min, using a manual inlaid equipment (Picelli, Rio Claro, SP, Brazil). The sausages were then placed in a climate chamber (Ethik Technology, model 420CLDTS, Vargem Grande Paulista, SP, Brazil) at an initial temperature of 23°C and a relative humidity of 85%. During 21 days of fermentation, the temperature and the relative humidity of the chamber were reduced gradually to 17°C and 75%, respectively. The dry-fermented sausages were identified as T1, T2, and T3, according to the treatment, vacuum packed, and utilized for further analysis.

2.2 Determinations during the maturation process

Monitoring the maturation process (fermentation and drying) was carried out by determining the pH value, water activity, instrumental color, and shear force from samples taken on days 0, 4, 7, 14, and 21.

2.2.1 Water activity and pH

The water activity of the sausages was determined in triplicate in a hygrometer (Addium Inc., Aqualab model CX-2, São José dos Campos, SP, Brazil) at 25°C with 1 g of sample. The pH of the sausages was measured in triplicate using a digital pH meter (Digimed, model DM2, São Paulo, SP, Brazil) by mixing 25 g of the sample with 10 mL of distilled water, according to the method described elsewhere (Spitzer & Werner, 2002).

2.2.2 Instrumental color

The color [CIE L*(lightness), a* (redness), b* (yellowness)] of the sausages was evaluated in five replicates for each treatment using a colorimeter (Konica Minolta Co., Chroma Meter CR 410, Ramsey, USA), with measurements standardized with respect to the white calibration plate. Color differences (Δ) were calculated to have a numerical comparison between the sample and the standard. The total color variation (ΔE) was expressed according to Equation 1:

$$\Delta E^* = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2} \quad (1)$$

where:

ΔL*: variation between lighter and darker (- = darker, + = lighter);

Δa*: variation between green and red (- = greener, + = redder);

Δb*: variation between blue and yellow (- = bluer, + = yellower) (Cavenaghi-Altemio et al., 2021).

2.2.3 Shear force

Texture analysis of the sausages was carried out using a texture analyzer Model TAXTplus (Stable Micro Systems, Surrey, UK), calibrated with a standard weight of 5 kg. Samples measuring 15 × 15 × 15 mm were kept at 2°C, equilibrated at room temperature (28–30°C) before analysis, and then placed into the texture analyzer to conduct the cutting/shearing test (speed of 1.0 mm/s, distance of 30 mm) using a Warner–Bratzler (Knife-Guillotine) shear blade (1 mm thick) to determine the shear force (N). A minimum of 10 replicates were analyzed for each treatment (Kang & Chen, 2015).

2.3 Proximate composition

The moisture, crude protein, and crude ash contents of the sausages were determined in triplicate according to the methods described by AOAC (2012). Moisture was determined by the oven drying method at 105°C until constant weight (method 950.46B), protein by the Kjeldahl method (method 928.08) using the conversion factor of 6.25, and ash by using the muffle oven technique (method 920.153). The lipid content was obtained in triplicate by the extraction method with a cold organic solvent (Bligh & Dyer, 1959). The difference estimated the carbohydrate content.

2.4 Microbiological analysis

To assess the microbiological analysis of the sausages, duplicate 25 g samples were aseptically transferred into a stomacher bag containing 100 mL of sterile distilled water containing 0.1% peptone (1% for *Salmonella* sp. determination). Samples were homogenized for 1 min. Notably, 10-fold serial dilutions were prepared using sterile 0.1 peptone solution (9 mL) and spread plated (0.1 mL) in duplicate onto broths and/or agars for detection of typical colonies, biochemical confirmation, and identification, and plate counting for thermo-tolerant coliforms at 45°C, coagulase-positive *Staphylococcus* and *Salmonella* sp., to ensure the food safety of the judges during the sensory analysis, according to the methodology described elsewhere (USDA, 1998).

2.5 Sensory analysis

Sensory analyses of the sausages were conducted by 50 non-trained panelists. A nine-point hedonic scale (9 = like extremely; 1 = dislike extremely) was used for the evaluation of attributes such as color, odor, taste, and texture. The treatments involved heating in microwave ovens for 5 s, then cut transversely to 3 mm thick, and served in disposable containers, coded with three-digit random numbers. Purchase intention was evaluated using a 5-point scale, where 5 = certainly would purchase, 4 = probably would purchase, 3 = maybe would purchase / maybe would not purchase, 2 = probably would not purchase, and 1 = certainly would not purchase, which was expressed as the percentage of the total score. The acceptability index (AI) was calculated according to Equation 2. The sample was considered acceptable if the AI was greater than 70% (Cavenaghi-Altemio et al., 2018):

$$AI = \frac{\text{average of the attributed grades}}{\text{maximum attributed grade}} x100 \quad (2)$$

2.6 Statistical analysis

Statistical results were evaluated through analysis of variance (ANOVA) and Tukey's test for comparison of means, at a level of 5% significance, using the statistical software Statistica 7.0. The sensory attributes and the purchase intention results were analyzed in percentages.

3 RESULTS AND DISCUSSION

3.1. Determinations during the maturation process

3.1.1 pH

Figure 1 shows the pH variation during the maturation process. It observes a high pH decrease from 5.53 to 5.70 at time zero to 4.67 to 4.76 on the fourth day. During the fermentation, lactic acid bacteria (starter culture) metabolize the substrate, especially the carbohydrates added to the treatments, to produce lactic acid. This lactic acid accumulation lowers the pH of the meat (Bezerra & Fonseca, 2023). From day 4 to 7, the pH remained practically constant, but from day 7 to 21, there was a slight increase for all treatments, achieving values from 4.87 to 5.00. Treatments did not show a significant difference ($p > 0.05$) between them for each evaluated time.

The pH decreases achieved levels below the isoelectric point ($pH = 5.4$) of the myofibrillar proteins of catfish (DeWitt et al., 2007). When the pH drops below the isoelectric point of the meat proteins, they become positively charged due to the excess of protons (H^+) in the surrounding environment. This positive charge causes the meat proteins to repel each other, leading to protein denaturation and the formation of a gel-like structure, enhancing the water-holding capacity of the meat (Lucarini et al., 2020; Soghomonyan et al., 2011).

3.1.2 Water activity

Figure 2 shows that there is no significant difference ($p > 0.05$) between the treatments, except at time zero and on the fourth day. On the seventh day, the samples showed a significant difference ($p < 0.05$) between all treatments. On the 14th day, the samples containing 0.1% of inulin (T1) showed a significant difference ($p < 0.05$) in relation to T2 and T3. On the contrary, on the 21st day, the a_w of T2 showed a significant difference ($p < 0.05$) in relation to T1 and T3. The reduction in the a_w was

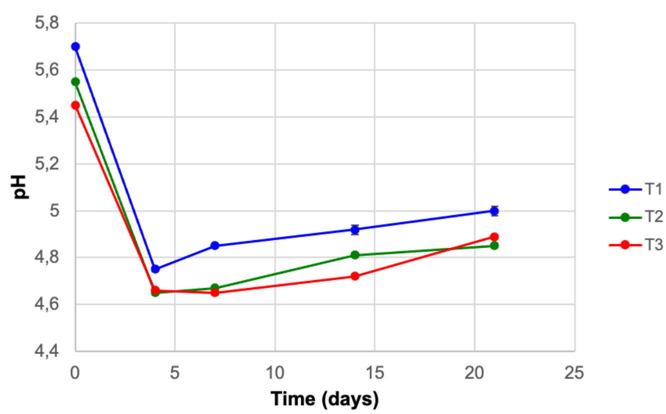

Figure 1. Variation of pH of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid during storage. Treatments T1, T2, and T3 contain 0.1, 0.3, and 0.5% inulin, respectively.

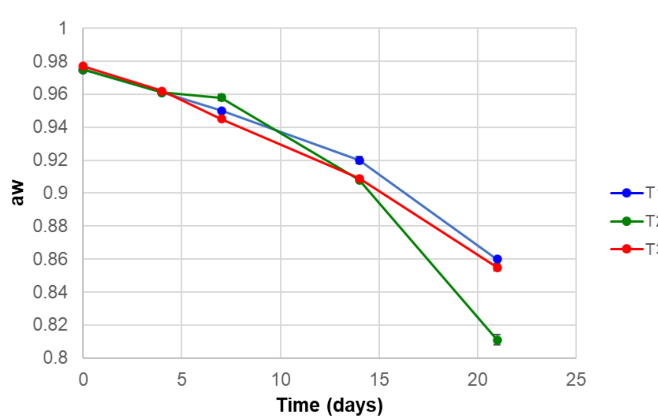

Figure 2. Variation of water activity (a_w) of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid during storage. Treatments (T1, T2, and T3) according to Figure 1.

gradual during the 21 days of maturation (fermentation and drying) of the inlaids. The Brazilian legislation establishes that the a_w must be at a maximum of 0.90 for Italian-type salami (Brazil, 2000). Thus, the values found for a_w are within the standards required by this legislation.

As the inlaid matures, moisture is gradually lost through processes such as evaporation and diffusion. This loss of moisture leads to a decrease in the amount of free water available in the product, thereby lowering the a_w (Cevoli et al., 2014). Additionally, the lactic acid bacteria can also contribute to the reduction in water activity through their metabolic activities, e.g., hydrolysis of proteins and lipids during growth and ripening, and because the lactic acid produced can bind with water molecules, reducing the amount of free water available in the inlaid matrix (Wang et al., 2021; Ziarno et al., 2023). Proteins and fats present in the salami-type inlaid may also undergo interactions during maturation, e.g., the binding of proteins with water molecules, which reduces the availability of free water and thus lowers a_w, and the formation of a stable fat network within the protein matrix. The presence of salt in the salami matrix contributed to the reduction in a_w during maturation (Puolanne & Halonen, 2010), which resulted in the preservation and stability of the product during storage (Chacón-Flores et al., 2023).

3.1.3 Shear force

Table 1 presents the shear force values obtained over the days during the maturation process. It is observed that the treatments showed an increase in shear force throughout the time. At time zero, there was a statistical difference for T3 in comparison to T1 and T2 that did not differ ($p > 0.05$) between them. At 4 and 14 days, all treatments did not show a significant difference ($p > 0.05$). However, at 7 and 21 days, all treatments differed ($p < 0.05$).

The replacement of fat by inulin has been related to the increase in the hardness of meat products (Cavenaghi-Altemio et al., 2021; García et al., 2006; Mensink et al., 2015; Selgas et al., 2005). In accordance, T3 (0.5% of inulin) presented the highest ($p < 0.05$) shear force at time zero (Table 1). However, on the 21st day, T3 showed lower shear force ($p < 0.05$) in relation to T1 and T2, i.e., it was softer, which is attributed to the inulin's gelling property after addition of water, resulting in a gel with a texture similar to that of the fat (García et al., 2006).

3.1.4 Instrumental color

Table 1 shows the variation in lightness (L*), redness (a*), and yellowness (b*) for the three treatments along the maturation time. For L*, the lowest value obtained was 46.67 and the highest was 47.14 for T1 and T2, respectively, at time zero. At 0, 4, 7, and 21 days, the treatments showed no significant difference ($p > 0.05$) between them. Except at 14 days, there was a difference between T1 to T2 and T3.

The a* at time zero ranged from 3.04 to 4.09 for T3 and T2, respectively. At 21 days, there was no significant difference ($p > 0.05$) between the treatments. In other times, there was a difference ($p < 0.05$) between them. The range of variation along the maturation time was between 2.98 and 9.37.

The b* at 0, 14, and 21 days showed no significant difference ($p > 0.05$) between the treatments. However, all treatments differed ($p < 0.05$) at 4 and 7 days of maturation. The variation between treatments over the days ranged from 12.41 to 18.85.

Table 1. Shear force and instrumental color of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid.

Treatment	Time (days)	SF (N)	L*	a*	b*
T1	0	$4.7^{abE} \pm 0.5$	$46.79^{aB} \pm 1.04$	$2.84^{aB} \pm 1.06$	$12.82^{aD} \pm 1.12$
	4	$20.8^{aD} \pm 0.8$	$51.25^{aA} \pm 1.34$	$3.22^{aB} \pm 0.69$	$13.61^{bCD} \pm 0.79$
	7	$38.7^{aC} \pm 1.4$	$49.23^{aAB} \pm 1.12$	$5.97^{aAB} \pm 0.86$	$19.38^{aA} \pm 0.75$
	14	$57.3^{aB} \pm 1.5$	$49.80^{bAB} \pm 0.93$	$6.02^{aAB} \pm 0.91$	$17.22^{aAB} \pm 0.81$
	21	$142.5^{bA} \pm 1.7$	$46.75^{aB} \pm 2.23$	$9.19^{aA} \pm 3.61$	$15.93^{aBC} \pm 1.61$
T2	0	$4.0^{bE} \pm 0.4$	$47.21^{aB} \pm 1.03$	$4.18^{aC} \pm 1.13$	$12.58^{aC} \pm 0.96$
	4	$20.1^{aD} \pm 1.6$	$50.60^{aA} \pm 0.94$	$3.83^{aC} \pm 0.78$	$14.78^{abBC} \pm 0.93$
	7	$29.3^{bC} \pm 1.5$	$48.71^{aAB} \pm 1.05$	$5.58^{aBC} \pm 0.72$	$15.24b^{B} \pm 0.70$
	14	$54.6^{aB} \pm 1.6$	$51.59^{abA} \pm 1.15$	$7.04^{aAB} \pm 0.73$	$17.77^{aA} \pm 0.62$
	21	$171.9^{aA} \pm 2.1$	$46.78^{aB} \pm 1.23$	$8.87^{aA} \pm 0.61$	$16.05^{aAB} \pm 1.01$
T3	0	$5.3^{aD} \pm 0.4$	$46.99^{aC} \pm 1.03$	$2.79^{aB} \pm 1.16^{C}$	$12.94^{aB} \pm 1.14$
	4	$21.3^{aC} \pm 1.7$	$51.05^{aAB} \pm 1.14$	$2.85^{aA} \pm 0.88^{C}$	$16.15^{aA} \pm 0.69$
	7	$24.0^{cC} \pm 1.3$	$50.11^{aB} \pm 0.95$	$6.95^{aA} \pm 0.85^{AB}$	$18.20^{aA} \pm 0.70$
	14	$55.3^{aB} \pm 1.2$	$53.20^{aA} \pm 1.03$	$5.38^{aA} \pm 0.94^{BC}$	$16.58^{aA} \pm 0.87$
	21	$94.5^{cA} \pm 2.4$	$44.12^{aC} \pm 1.23$	$9.41^{aA} \pm 1.10^{A}$	$16.21^{aA} \pm 0.91$

SF: Shear force; L*: lightness; a*: redness, b*: yellowness, ΔE*: color difference. Means with the same lowercase letter in the same column for each time do not differ statistically at 5% ($p > 0.05$) for the different treatments. Means with the same uppercase letter in the same column for each parameter do not differ statistically at 5% ($p > 0.05$) for the same time. Treatments T1, T2, and T3 contain 0.1, 0.3, and 0.5% inulin, respectively.

Pérez-Alvarez et al. (1999) studied the effect of color parameters during the preparation of Spanish-style salami. The authors observed an increase in the L* parameter after 36 h of fermentation and during the first 12 days of maturation, which was attributed to changes in pH value and lactic acid formation that caused exudation in the meat. During maturation, the moisture decreases. Thus, the lower the moisture content, the lower the amount of reflected light and the higher the L* value.

3.2 Proximate composition

Table 2 presents the proximate composition of the fermented inlaids after 21 days of maturation for T1, T2, and T3. The moisture content ranged from 33.28 to 36.88. T3 showed a significant difference of ($p < 0.05$) in relation to T1 and T2, which did not differ from each other ($p > 0.05$). Considering the maximum moisture of 35% recommended for Italian-type fermented sausages (Brazil, 2000), only T3 presented a value lower than that established by legislation.

Protein contents ranged from 49.70 to 53.22%, showing a significant difference ($p < 0.05$) between treatments. These values are much above the minimum of 25% recommended (Brazil, 2000).

Lipid contents ranged from 5.32 to 5.75%, without significant differences ($p > 0.05$) between treatments (Table 1). These low values for lipids are due to the use of catfish fillets as the main ingredient, which present reduced lipids in their composition, and to the use of inulin, which results in products with 50% fewer calories and reduced fat content. The obtained lipid contents complied with Brazilian legislation, which sets a maximum limit of 32% (Brazil, 2000).

Table 2. Proximate composition of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid.

Compound (%)	Treatment		
	T1	T2	T3
Moisture	$36.88^{a} \pm 0.70$	$36.28^{a} \pm 0.38$	$33.55^{b} \pm 0.33$
Protein	$49.70^{b} \pm 0.02$	$49.72^{a} \pm 0.03$	$53.22^{c} \pm 0.02$
Lipids	$5.52^{a} \pm 0.43$	$5.32^{a} \pm 0.17$	$5.75^{a} \pm 0.09$
Ash	$5.60^{a} \pm 2.10$	$6.67^{a} \pm 2.78$	$5.97^{a} \pm 2.37$
Carbohydrates	2.30	2.01	1.51

Means with the same lowercase letter in the same line do not differ statistically at 5% ($p > 0.05$). Treatments (T1, T2, and T3) according to Table 1.

The values found for the ash content ranged from 5.60 to 6.67, without significant differences ($p > 0.05$) between treatments (Table 1). The degree of drying and the amount of added salt can influence the different ash contents found in fermented sausages since ash is the inorganic residue resulting from the burning of organic matter. The legislation does not establish a maximum or minimum content of ash present in fermented sausages (Brazil, 2000).

The carbohydrate values for the treatments with 0.1, 0.3, and 0.5% of inulin were 2.30, 2.01, and 1.51, corresponding to T1, T2, and T3, respectively. The low values obtained indicate that inulin was probably consumed by the lactic bacteria, together with the sugars.

3.3 Microbiological determinations

Salmonella sp., coliform counts at 45°C, and coagulase-positive staphylococci were evaluated to identify raw materials' quality and hygienic-sanitary processing conditions, to guarantee food safety prior to the sensory analysis. The obtained results (Table 3) were within the limits established by the Brazilian National Health Surveillance Agency (ANVISA) for ripened meat products for *Salmonella* sp. (absence in 25 g), coliforms at 45°C (maximum of 10^3 CFU/g), and coagulase-positive *Staphylococcus* (maximum of 5×10^3 CFU/g) (Brazil, 2019). The results also followed the international standards, which determine that these products must be free of *Salmonella* sp. and the levels of coagulase-positive *Staphylococcus* below 1.0×10^2 CFU/g (ICMSF, 2011). Thus, the products were considered safe for sensory analysis.

3.4 Sensory analysis

The means and standard deviations for the sensory attributes of color, odor, taste, texture, and overall acceptance of the fermented salami-type inlaid by the acceptance test are presented in Table 4. None of the parameters showed a difference ($p > 0.05$) between T1, T2, and T3. The average scores of the sensory attributes varied from 6 (like slightly) to 8 (like very much) on the hedonic scale, in an average range of 6.47–7.59. All treatments presented acceptance indexes above 70% (Table 4), indicating that the products were considered sensorially accepted (Stone & Sidel, 2004). Similar results were already expected, as the fermented inlaids have basically the same formulation, except for the amount of inulin, which was not perceptible to the judges.

Figure 3 shows the purchase intention of fermented inlaids prepared according to T1, T2, or T3. T3 had the highest percentage of purchase intention of 40% for "certainly would

Table 3. Microbiological analyses of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid.

Microbiological analyses	Treatment		
	T1	T2	T3
Coliforms at 45°C (CFU/g est.)	$< 5.0 \times 10^2$	$< 5.0 \times 10^2$	$< 5.0 \times 10^2$
Coagulase-positive staphylococci	Negative	Negative	Negative
Salmonella sp. (in 25 g)	Absence	Absence	Absence

Treatments (T1, T2, and T3) according to Table 1. CFU: colony-forming units.

Table 4. Sensory analysis of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid.

Sensory attribute	Treatment		
	T1	T2	T3
Color	$7.42^a \pm 1.56$ (82.66)	$7.59^a \pm 1.70$ (81.72)	$7.46^a \pm 1.92$ (79.56)
Odor	$7.33^a \pm 1.56$ (82.49)	$7.37^a \pm 1.58$ (82.33)	$7.29^a \pm 1.67$ (81.35)
Taste	$6.47^a \pm 2.42$ (72.79)	$7.03^a \pm 1.81$ (79.51)	$7.46^a \pm 1.56$ (82.74)
Texture	$6.56^a \pm 1.74$ (79.07)	$7.37^a \pm 1.50$ (83.04)	$7.37^a \pm 1.47$ (83.41)
Overall acceptance	$6.94^a \pm 1.93$ (78.26)	$7.16^a \pm 1.77$ (80.14)	$7.55^a \pm 1.54$ (83.03)

Means with the same lowercase letter in the same line do not differ statistically at 5% ($p > 0.05$). Values in parentheses refer to acceptance index (%). Treatments (T1, T2, and T3) according to Table 1.

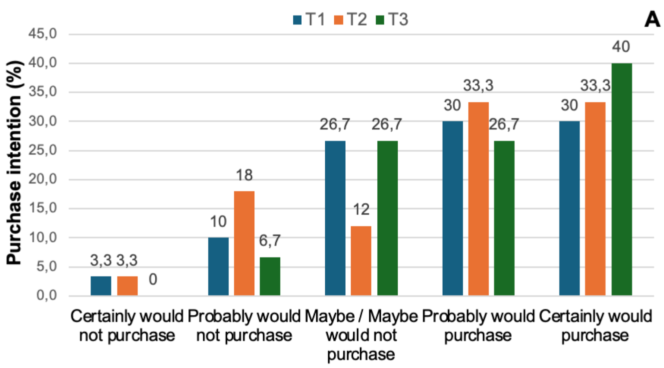

Figure 3. Purchase intention (%) of channel catfish (*Ictalurus punctatus*) fermented salami-type inlaid. Treatments (T1, T2, and T3) according to Figure 1.

purchase," followed by T2 with 33.33% and T1 with 30%. The sum of the frequencies of the intentions "certainly would purchase" and "possibly would purchase" was 60, 66.67, and 66.67% for treatments T1, T2, and T3, respectively, with a rejection rate ranging from 0 (T3) to 3.33% (T1 and T2).

4 CONCLUSION

The obtained proximal composition presented high protein (above 49.72%) and low lipid (below 5.75%) contents for all treatments. Moisture was slightly above the 35% stated by legislation for T1 and T2, which could be easily circumvented with minor changes in the maturation processing. The products met the microbiological standards established by Brazilian legislation. All treatments presented acceptance indexes above 70%, indicating that the products were considered sensorially accepted. The addition of inulin probably did not interfere with the sensory scores due to the close average range of scores, varying from 5.03 to 5.90 for all attributes and treatments. However, it influenced the metabolic activity of the starter cultures, by increasing moisture consumption and evaporation during the maturation process, which influenced shear force and color parameters.

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