Sensory and physicochemical quality of ‘frescal’ sausage from young bulls’ meat fed with levels of licuri cake

Ana Alice Lima de Gouvêa, Ronaldo Lopes Oliveira, Dallyson Yehudi Coura de Assis, Máikal Souza Borja, Rebeca Dantas Xavier Ribeiro, André Gustavo Leão, Paulo Andrade Oliveira and Leilson Rocha Bezerra

ABSTRACT
The study evaluated the quality of ‘frescal’ sausage obtained from bulls fed diets containing various amounts of licuri cake. Thirty-two young Nellore bulls averaging 24 months in age and with an initial body weight of 368 ± 32 kg were housed in individual pens and distributed in a randomised experimental design with four treatments: 0, 7, 14 or 21% licuri cake inclusion in dry matter content of the diet. The inclusion of licuri cake in the diets of the bulls did not affect the chemical composition (p > .05). However, there was a linear increase (p = .033) in the cooking weight loss of the sausage. There were no effect of licuri cake inclusion in young bulls diet on pH (p = .097), lightness L* (p = .602) and yellowness b* (p = .692) of the ‘frescal’ sausage manufactured; however, there was a quadratic effect on the redness a* (p = .035) and chrome C* (p = .033). The panellists preferred the appearance of the sausage without licuri cake inclusion. There was no difference between 0% and 14% levels (DM basis) of licuri cake inclusion (p > .05) on aroma, tenderness, juiciness or overall acceptance in ‘frescal’ sausage. However, all characteristics were best evaluated in diets without including licuri (0%). It is not recommended licuri cake inclusion as an alternative feed source in the diets of young Nellore bulls because of decrease in redness and saturation (chrome) colour indexes and increase in cooking loss resulting in the reduction of appearance, juiciness and overall acceptance for consumption of ‘frescal’ sausage despite without affecting its chemical composition.

Introduction
Sausage type ‘frescal’ is a meat derivative that has high acceptability in the market and its production can be presented as an option for increasing the profits of companies that process meat (Jin et al. 2015). There are several factors that influence the quality of sausages, which can be assessed objectively and subjectively depending on the analysis used, as the sensorial, technological, health and nutritional characteristics of meat, in addition to the ethical, environmental and nutritional aspects of how the animals were produced (Rodrigues Filho et al. 2014). Meat quality can be altered with the animal nutrition and feed ingredients comprise a major cost in meat production. Thus, alternative feeds as cakes and oil vegetables (Adeyemi et al. 2016; Cerutti et al. 2016) can be an option on the ruminant diets to reducing costs, but these feeds must be evaluated on how it can affect the quality of the final product (Gonzaga Neto et al. 2015; Oliveira et al. 2015; Silva et al. 2015).

The licuri cake is a low-cost alternative feed produced by the extraction of the oil from a palm tree fruit (Syagrus coronata (Martius) Beccari). The extracted oil is used for human consumption. The residue of the extraction is the cake. It is used as a fibrous feed, which has chemical composition, approximately 24% of crude protein, 10% of ether extract, 52% neutral detergent fibre, 32% acid detergent fibre and 11% acid detergent lignin in dry matter. The cake can be used as a supplement in ruminant diets (Lima et al. 2015; Costa et al. 2016). One of the unique characteristics of licuri cake is the nice flavour (Gouvêa et al. 2016). These specific traits of the feed can alter organoleptic properties of meat by different mechanisms. The glycogen levels in bovine muscle can be reduced which has a direct impact on the process of
transformation of muscle into meat (Andersen et al. 2005). Thus, changes promoted by the feed affect the physicochemical and sensory attributes of the meat and consequently the embedded products manufactured (Gouveia et al. 2016).

The use of licuri cake in the diets of cattle raised for meat may result in physicochemical and sensory changes in the meat of these animals and consequently in products, such as ‘frescal’ sausage. This study aimed to evaluate the quality of ‘frescal’ sausage made from young Nellore bulls fed diets containing licuri cake at varying levels, specifically its effect on the physical, chemical and sensory attributes of the ‘frescal’ sausage.

Materials and methods

Ethics considerations

This study was conducted in strict accordance with the recommendations provided in the Guide for the National Council for Animal Experiments Control. The protocol was approved by the Committee on the Ethics of Animal Experimentation, Brazil (Permit Number: 13–2012).

Location, animals and diets

The experiment was conducted in the Experimental Farm of Federal University of Bahia, located in São Gonçalo dos Campos, Bahia, Brazil. Thirty-two young Nellore bulls averaging 24 months in age and with an initial body weight of 368 ± 32 kg were kept and fed individually in stalls with 30 m². The feeding experiment lasted 84 days and was preceded by an adaptation period of 15 days wherein the animals were treated for internal and external parasites (Ranger LA, Ivermectin® 3.5% w/v, 1 mL for 50 kg of body weight, Salvador, Brazil). The animals were weighed at the beginning and end of the feeding experiment. The weighing was made after a 12-h fasting period throughout the feeding trial.

The diets were composed by 60% of a concentrated feed, constituted by corn bran, soybean meal, mineral salt and licuri cake at amounts of 0, 7, 14 and 21% of diets’ total dry matter (DM) (Table 1). The forage constituted 40% of the diet, and a Cynodon spp. hay chopped to approximately 5 cm length was offered. The diets were formulated according to the guidelines from the National Research Council (NRC 1996) for 1.2 kg daily gains.

Analysis of diets

Samples of feeds (in triplicate) were predried at 55 °C for 72 h, ground with a Willey mill (Tecnal, Piracicaba, São Paulo, Brazil) with a 1-mm sieve, stored in air tight plastic containers (ASS, Ribeirão Preto, São Paulo, Brazil) and sealed properly until the laboratory analysis. The chemical composition was determined according to AOAC (1990) methods 967 (Dry Matter), 942 (ash), 981 (Crude Protein) and 920 (Ether Extract). To determine the neutral detergent fibre (NDF) and acid detergent fibre (ADF) contents, the methodology of Van Soest et al. (1991) was used with the modifications proposed by the Ankom device manual (Ankom Technology Corporation, Macedon, NY). Acid detergent lignin (ADL) was determined according to method 973.18 of AOAC (2002). The non-fibrous carbohydrates (NFC) were obtained according to Mertens (1997), and the neutral detergent insoluble protein (NDIP) and acid detergent insoluble protein (ADIP) were determined following the methodology of Licitra et al. (1996). The total digestible nutrients (TDN) were calculated according to the formula estimates of digestibility for each analytical fraction of NRC (2007).

Slaughtering and ‘frescal’ sausage processing

At the end of the experimental period, all the thirty-two animals, with an average weight of 480.7 ± 22.3 kg, were transported to a commercial slaughterhouse and then fasted for 16 h. After fasting, the animals were stunned, using a stunning air gun, slaughtered, bled, skinned and eviscerated, and the carcases were split longitudinally and identified. The carcases were then conducted to a cold chamber and kept under refrigeration for 24h at 4 °C. All these procedures were made according to the guidelines of Brazilian Department of Agriculture and Livestock (n°03 rules/00 Brazil) for the Federal Inspection Service (SIF).

After the 24h in a cold chamber, carcases were cut into specific larger cuts. The Semimembranosus and adductor femoris muscles were manually cut, from the hindquarters, using knives. Cuts were weighted (average weight of 3 kg), identified, packed with vacuum plastic bag and then stored for 3 days in a freezer (Consul, 519 L2 CHB53CB, São Paulo, Brazil) at −20 °C, until the processing of ‘frescal’ sausage.

‘Frescal’ sausage was processed after removing of connective tissue, fat, aponeuroses and nerves of each muscle. The muscles were then ground to obtain a homogeneous mass (790 g/kg) and mixed with subcutaneous pork fat (150 g/kg) ground into 8 mm (Skymsen, PSEE model – 22, Brusque, Brazil). The mixes were placed individually in identified plastic trays and other ingredients were added to each mass. Adding ingredients were salt (2 g/kg), ground pepper and garlic pulp (5 g/kg), dehydrated onion (20 g/kg) and sugar.
(3 g/kg). These ingredients were dissolved in 40 g cold water and incorporated into the mass. The masses were then manually mixed again for 20 min and allowed to rest for 12 h in a refrigerator at 4 °C.

The stuffing of the ‘frescal’ sausages (Skymsen, PSEE model – funnel 22, Brusque, Brazil) was done after resting period. The dark surrounding areas and air bubbles were avoided. Air bubbles in the mass can cause unwanted oxidation. Salted natural casings of medium calibre (28–32 mm) obtained from young bulls were used. Prior to embedding, the casings were desalted with potable water and soaked in 10% acetic acid solution (vinegar) for approximately one hour.

While the ‘frescal’ sausage casings were being stuffed, dough twists were made in, approximately, every 10 cm; these were tied with cotton yarn (string) using appropriate pressure to prevent cuts in the casing and leakage of the sausage mass. Subsequently, the sausages were placed in labelled plastic bags and chilled in a refrigerator (Consul, 300 L CRB36AB, São Paulo, Brazil) at 4 °C until further analysis.

Physicochemical composition of ‘frescal’ sausage

The chemical composition of ‘frescal’ sausage was evaluated according to AOAC (1990), following the methods: moisture: method 950.46; crude protein: method 928.080; ash: method 920.153; ether extract: method 960.39. The crude protein was calculated by multiplying the total nitrogen by 6.25. The pH measurements were made in each sausage, in triplicate, using digital potentiometer with a skewer type extremity (Mettler-Toledo International Inc., Columbus, OH).

The evaluation of ‘frescal’ sausage colour was carried out on the back section using a transverse cut and exposed to atmospheric air for 30 min. Posteriorly, the coordinates L*, a* and b* were measured at three different points of the muscle and subsequently averaged in triplicate for each coordinate per animal (Miltenburg et al. 1992). These measurements were performed using a Minolta CR-10 colorimeter (Konica® Minolta, Osaka, Japan) that was previously calibrated using a blank tile with the CIELAB system, Illuminant D65 and 10° as the standard observation points, which considers L*, the index related to lightness (L* = 0 black, 100 white); a* (redness), the index that ranges from green (−) to red (+); and b* (yellowness), the index that ranges from blue (−) to yellow (+). Intensity or saturation of the colour (Chroma, C*) was calculated \((a^{*2} + b^{*2})^{1/2}\) according to Boccard et al. (1981).

Cooking loss (CL) of ‘frescal’ sausage was determined using six slices (1 cm thick and 5 cm long). The samples were weighed on a semi-analytical scale (Mettler M P1210), packed in aluminium and roasted on a preheated paper plate at 175 °C (Tramontina, 25683100, São Paulo, Brazil). The samples maintained at this temperature until the internal temperature reached 72 ± 2 °C (the temperature was monitored with the aid of a digital thermometer). The samples were then cooled to room temperature and reweighed. The difference between the initial and final weight of the samples determined the CL, according to the American Meat Science Association (AMSA 1978).

Sensory characteristics

‘Frescal’ sausages, after being made, were stored at 4 °C for 24h, and then a sensory analysis was performed using an untrained sensory panel, with 70 panellists (Lyon et al. 1992). Trays with coded sample dishes containing frescal sausage, from each treatment, were presented to the panellists in the sensory panel room of the Animal Science and Nutrition Dept., Federal University of Bahia, Salvador, Brazil. All of the panellists were accustomed to eating ‘frescal’ sausage at least once per week. The evaluated samples were baked in a preheated electric oven at 170 °C until the temperature of the geometric centre of the samples reached 71 °C (Tramontina, 25683100, São Paulo, Brazil). The samples were then cut into approximately 2.0 cm cubes and transferred to preheated and encoded beakers that were covered with aluminium foil to ensure minimum loss of heat and volatile aromatics. The beakers were kept in a water bath at 75 °C to maintain the temperature of the samples within the range of 65–70 °C.

Two samples per treatment were provided for every panellist in plastic and lidded containers that were coded with three aleatory digits. The samples were served in disposable dishes and water and cream cracker-type biscuits were served in order to be used between the tastings to remove the aftertaste. The tests were performed between 900 and 1100 hours in individual cabins, and the sensory attributes were recorded using a nine-point scale. The tasters evaluated the following attributes: appearance, aroma, flavour, tenderness, juiciness, overall acceptability and preference. The possible scores, ranging from 1 to 9, were as follows: 1 – disliked very much; 2 – disliked; 3 – moderately disliked; 4 – slightly disliked; 5 – indifferent; 6 – liked slightly; 7 – liked moderately; 8 – liked; and 9 – liked very much.
Experimental design and statistical analysis

The experiment utilised a randomised completely design with four treatments and eight repetitions. The physicochemical data were analysed for regression according to the linear model, $Y_i = \mu + \beta_1 D_i + E_i$, and quadratic model, $Y_i = \mu + \beta_1 D_i + \beta_2 D_i^2 + E_i$, where $Y_i$ = dependent variable; $\mu$ = population mean; $\beta_1$ = the effect of the regression parameter for linear component; $\beta_2 D_i$ = the effect of the regression parameter for quadratic component; $i = 0, 7, 14$ and $21$%; and $E_i$ = random error. Was used the general linear model (PROC REG) procedure available in the statistics programme Statistical Analysis System -SAS 6.2® (2014). The significance level was set to $p < .05$.

For the sensory analyses, products were evaluated using a nine-point hedonic scale. These data have a multinomial distribution belonging to the class of models based on exponentials, thus permitting the use of generalized linear models (GLM). With this method, unlike mathematical transformation methods for normalisation of the data, the nature of data distribution is incorporated and the transformation takes place only in the systematic component of the model, thereby increasing the power of the test. The link function used was the cumulative logit, the canonical (natural) function for models with multinomial distribution. Using the SAS 6.2 version GENMOD procedure, an analysis of deviance (ANODEV), a generalisation of the ANOVA for GLM, was performed. When significant, the difference between treatments was investigated using the contrasts test available in PROC GENMOD.

Results

Physicochemical composition of the ‘frescal’ sausage

The inclusion of licuri cake in the diets of the bulls did not affect the chemical composition, as the moisture ($p = .142$), ash ($p = .981$), protein content ($p = .425$) and ether extract ($p = .945$) contents of the ‘frescal’ sausage (Table 2). The different levels of licuri cake feeding level on the index L* ($p = .425$) and b* ($p = .981$) contents of the ‘frescal’ sausage (Table 3). The mean values of the L* and b* in the treatments were 46.36 and 13.28, respectively.

However, the licuri cake in the diet quadratically affected the index colour a* ($p = .035$), with a minimum value calculated of 9.22 in ‘frescal’ sausage prepared with the meat from bulls fed with 12% of licuri cake in diet. There was a quadratic effect on the index

### Table 1. Ingredients and chemical composition of the experimental diets.

| Ingredients | 0% | 7% | 14% | 21% |
|-------------|----|----|-----|-----|
| Tifton 85 hay, % DM | 40.0 | 40.0 | 40.0 | 40.0 |
| Ground corn, %DM | 49.8 | 44.8 | 40.8 | 36.8 |
| Soybean meal, % DM | 8.00 | 6.00 | 3.00 | 0.00 |
| Licuri cake, % DM | 0.00 | 7.00 | 14.0 | 21.0 |
| Urea + ammonium sulphate, % DM | 1.20 | 1.20 | 1.20 | 1.20 |
| Mixture mineral, % DM | 1.00 | 1.00 | 1.00 | 1.00 |

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Table 2. Physicochemical composition (mean ± standard deviation) of ‘frescal’ sausage obtained from meat young bulls fed licuri cake.

| Attributes          | Licuri cake level | p-Valuea |
|---------------------|-------------------|----------|
|                     | 0%                | 7%       | 14%      | 21%      | Mean     | Linear | Quadratic |
| Moisture, %         | 61.07 ± 1.15      | 63.08 ± 0.65 | 64.03 ± 0.93 | 63.00 ± 1.18 | 62.8     | .142   | .140      |
| Ash, %              | 3.85 ± 0.03       | 3.84 ± 0.05 | 3.93 ± 0.02 | 3.82 ± 0.07 | 3.54     | .981   | .317      |
| Protein, %          | 17.94 ± 0.16      | 18.25 ± 0.23 | 18.45 ± 0.16 | 18.11 ± 0.22 | 17.2     | .425   | .103      |
| Lipids, %           | 27.53 ± 0.52      | 26.14 ± 0.51 | 27.09 ± 0.76 | 27.24 ± 0.47 | 2.50     | .945   | .182      |
| pH                  | 5.77 ± 0.10       | 5.63 ± 0.07 | 5.67 ± 0.07 | 5.54 ± 0.10 | 5.65     | .097   | .959      |
| Cooking loss, %     | 14.09 ± 1.54      | 17.80 ± 2.43 | 15.19 ± 1.23 | 21.46 ± 2.33 | 17.1     | .033   | .516      |

*p-Value (linear or quadratic) indicates the probability of obtaining the observed difference between supplement levels within each feeding strategy if the null hypothesis is true.

Table 3. Colour indices (mean ± standard deviation) of ‘frescal’ sausage obtained from meat young bulls fed licuri cake.

| Index colour | Licuri cake level | p-Valuea |
|--------------|-------------------|----------|
|              | 0%                | 7%       | 14%      | 21%      | Mean     | Linear | Quadratic |
| L°/C3        | 45.41 ± 1.37      | 46.57 ± 0.73 | 47.37 ± 1.23 | 46.11 ± 1.44 | 46.4     | .602   | .331      |
| a°/C3        | 12.60 ± 1.47      | 9.13 ± 0.17 | 9.96 ± 0.91 | 10.88 ± 0.94 | 10.6     | .339   | .035*     |
| b°/C3        | 12.89 ± 0.58      | 13.67 ± 0.13 | 13.38 ± 0.26 | 13.20 ± 0.24 | 13.3     | .692   | .177      |
| C°/C3        | 25.5 ± 1.08       | 22.8 ± 0.06 | 23.3 ± 0.54 | 24.1 ± 0.57 | 23.9     | .236   | .033*     |

*p-Value (linear or quadratic) indicates the probability of obtaining the observed difference between supplement levels within each feeding strategy if the null hypothesis is true.

Table 4. Sensory evaluation (mean ± standard deviation) of ‘frescal’ sausage obtained from meat young bulls fed licuri cake.

| Variables        | Licuri cake level |
|------------------|-------------------|
|                  | 0%                | 7%     | 14%     | 21%     |
| Appearance       | 6.69a ± 1.44      | 5.90ab ± 1.62 | 5.19b ± 1.92 | 5.75bc ± 1.76 |
| Aroma            | 6.80a ± 1.30      | 6.07b ± 1.17 | 6.52a ± 1.38 | 6.37bc ± 1.49 |
| Flavour          | 7.12a ± 1.39      | 6.37ab ± 1.45 | 6.59bc ± 1.63 | 6.77cd ± 1.54 |
| Tenderness       | 7.01a ± 1.37      | 6.40b ± 1.45 | 6.89a ± 1.32 | 6.84bc ± 1.25 |
| Juiciness        | 6.77a ± 1.54      | 6.00b ± 1.57 | 6.42ab ± 1.42 | 6.32b ± 1.34 |
| Overall acceptance | 7.03a ± 1.44 | 6.04b ± 1.61 | 6.63ab ± 1.54 | 6.40bc ± 1.56 |

*Scores attributed by a tasting panel: 9: maximum score; 1: minimum score. Different letters on the same line indicate significant differences according to the contrast test 5% significance.

Sensory characteristics of the ‘frescal’ sausage

The panellists preferred the appearance of the sausage made from the bulls’ meat without licuri cake inclusion (Table 4). There was no difference between 0% and 14% levels (DM basis) of licuri cake inclusion (p > .05) on aroma, tenderness, juiciness or overall acceptance in ‘frescal’ sausage. However, all characteristics were best evaluated in diets without including licuri (0%). The licuri cake inclusion levels each a score for the ‘frescal’ sausage sensory characteristics on the hedonic scale between 5 and 7 (indifferent to liked moderately).

Discussion

Physicochemical composition of the ‘frescal’ sausage

Licuri cake is an important by-product of the biodiesel industry obtained during the processing of the licuri palm nut for oil extraction by pressing that contains approximately 82.0 mg/g of unsaturated fatty acids, 6.5 mg/g of monosaturated fatty acids and 11.5 mg/g of polyunsaturated fatty acids (Queiroga et al. 2010). Despite the great content of ether extract (EE) and the moderate content of crude protein (CP) in licuri cake, its inclusion did not promote difference on lipid or protein concentration of ‘frescal’ sausages, which may be explained by the similar dietary energy content (Carvalho et al. 2014). Lipid and protein content of
‘frescal’ sausage observed in this study is in accordance with the Technical Regulations (USDA 1990) of the product identity, where the minimum lipid and protein content were 250 g/kg and 120 g/kg, respectively.

In addition, the age and the genetic group of the young bulls used in this experiment were similar, which also explains the same carcase composition, since animals with similar carcase weight and fat quantities have nearly all body regions with similar proportions (Jiao et al. 2015). The intramuscular lipid deposition is important to improve meat aromatic characteristics and tenderness, which are appreciated by consumers (Oliveira et al. 2008), and lipid ‘frescal’ sausage content has inverse relation with the water proportion (Wood et al. 2008). Thus, as the lipid content was not affected by the licuri cake inclusion, the water content, probably, remained the same for all treatments (Oliveira et al. 2008; Gouvêa et al. 2016).

The carcases of these animals made use of the anaerobic route in a similar way, which indicated the similarity in pH mean in the ‘frescal’ sausages, and there were therefore no differences between the pH mean and the inclusion of the licuri cake (Malti and Amarouch 2008). The postmortem pH drop curve shows that the 24 h after slaughtering the pH mean reached values between 5.77 and 5.54 which is characteristic of the normal development postmortem and a meat quality (Malti and Amarouch 2008). This is good because when the pH, after 24 h postmortem, is greater than 6.0, the meat can be dark, firm and have a dry cut surface, characteristics known as DFD (dark, firm and dry) (Carvalho et al. 2014). In this study, all mean pH was below 5.8 (Mendenhall 1989; Purchas 1990; Swatland 2004). An adequate decrease in pH is directly related to the colour, tenderness and capacity of the muscle to retain water (Savadkoohi et al. 2014).

Licuri cake addition promoted an increase in cooking losses (CL). The inclusion of licuri cake on diets can explain these results, since, according to Lawrie (1981), CL corresponds to loss of water and some fat. The inclusion of licuri cake in the diet may change the fatty acids of the meat, because the oil from the licuri palm is known for its medium-chain fatty acids (6–12 carbons) (Lima et al. 2015; Oliveira et al. 2015). Thus, although there has been no influence on the fat content, the quality of fat incorporated in the ‘frescal’ sausages can influence the quantity of fat diluted during the cooking process. Probably, a quantity of the medium fatty acids was released, because it has a lower fusion point, and then fat losses during the cooking process may have been favoured (Carvalho et al. 2014). Cooking loss is an important variable to predict the juiciness and tenderness of the meat and its derivatives, because the dryness of meat affects the sensory characteristics (Guerrero et al. 2013). This lower CL to ‘frescal’ sausage prepared with meat from bulls fed the control diet did not include licuri cake characterises a product with a juiciness and tenderness, desired by consumers and confirmed by sensory analysis (Gouvêa et al. 2016).

Colour parameters are among the most important characteristics of meat as the primary attributes considered at the time of purchase. The decreased slaughtering weight with greater licuri cake concentrations (240 g/kg total DM) decreased muscle mass, and thus with less blood flow and decreased concentrations of sarcoplasmic proteins and other pigments, may have been reduced redness and chrome colour indexes (MacDougall and Taylor 1975). Additionally, with the reduced carcase weight gain, the muscle fibre composition may have been modified because of the delayed development, and although an identical amount of myoglobin was deposited, that result was less pigmented meat (Oellingerth and Slinde 1985; Faustman and Cassens 1990). Sausage colour is a very important aspect of the presentation of the product to the consumer and is crucial in consumer acceptance for the product (Savadkoohi et al. 2014).

**Sensory characteristics of the ‘frescal’ sausage**

Comparing the four treatments, it was observed that the inclusion of licuri cake in diets resulted in lower scores for juiciness and overall acceptance. The increase in the colour indices redness ($a^*$) and saturation ($C^*$) associated with increase in cooking loss can negatively influence the product’s appearance and reduce consumer acceptance (Scheeder et al. 2001). However, inclusion of 14% licuri cake in the diet yielded a product that was similar to the 0% level in the following variables: aroma, tenderness, juiciness and overall acceptability in ‘frescal’ sausage prepared with meat from bulls. Thus, all licuri cake inclusion levels resulted in scores on the hedonic scale of approximately 6 (liked slightly) for the sensory characteristics of the sausage. The taste characteristics, tenderness and overall acceptance of ‘frescal’ sausage made from the meat of bulls whose diet did not include licuri cake obtained a score of 7 (moderately liked) with greater acceptability. The same effect occurred for overall acceptance in which ‘frescal’ sausage made from bulls whose diet did not include licuri cake received a score of 7.
Conclusions
It is not recommended licuri cake inclusion as an alternative feed source in the diets of young Nellore bulls because of decrease in redness and saturation (chrome) colour indexes and increase in cooking loss resulting in the reduction of appearance, juiciness and overall acceptance for consumption of ‘frescal’ sausage despite without affecting its chemical composition.

Disclosure statement
No potential conflict of interest was reported by the authors.

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