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Influence of beef retail cuts on the quality, sensory, and color beef floss: a comparison between silverside and chuck

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Abstract. This study evaluates the influence of different beef retail cuts on the chemical composition, color attributes, and sensory acceptability of traditional beef floss. The differences in this research treatment were the location of retail cut P1 (silverside) and P2 (Chuck), each treatment replicated in five batches, each batch consisting of 3 replicates. The sensory attributes observed including color, texture, and overall acceptability, were significant, but not significant on aroma and aftertaste. The differences in retail cuts influence the chemical composition, especially in moisture, fat, and protein. There were also contributions on instrumental color measurements were higher lightness (L*), redness (a*), and yellowness (b*) values on P2 compared to P1, suggesting enhanced visual appeal. These findings suggest that chuck cut (P2) is more favorable for producing high-quality, visually appealing, and consumer-accepted beef floss.

1 Introduction

Beef Floss is one of the most popular traditional Indonesian meat products, characterised by its fine fibrous texture, savoury aroma, and long shelf life due to low moisture content. The processed meat product is commonly prepared through a combination of boiling (meatball), frying (nughet), and drying processes (beef jerky) [1], resulting in a distinctive caramelised flavour and crispy texture. Despite its popularity, the quality and sensory attributes of beef floss are highly dependent on the raw materials and formulation techniques used during production.

Previous studies have explored ways to improve the physical quality [2], the chemical composition, texture [3] and also impact the healthy aspect [4]. Almost all the treatments on the previous ones used fillers [1], or explored cooking methods [5] and other approaches.

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Substitute ingredients or adulteration products are a problem that is frequently found in processed meat products such as beef floss [6]. Therefore, the key to producing a high-quality product is choosing the right ingredients and the method used to produce food products.

The choice of meat cut plays a critical role in determining product quality and also can deliver into consumer perception. Each cut of beef differs in muscle fiber orientation, connective tissue content, fat distribution, and myoglobin level, all of which influence the physicochemical and sensory characteristics after processing [7]. For instance, the silverside cut (from the hindquarter) (Figure 1, 2) is known for its lean texture and mild flavor, while the chuck cut (Figure 1, 2) (from the shoulder) contains higher connective tissue and marbling, which can enhance flavor development during Maillard and lipid oxidation reactions. Beef quality is a multifactorial attribute influenced by intrinsic characteristics such as muscle type, connective tissue, and fat content, as well as extrinsic factors including handling, storage, and processing. Different commercial cuts (Figure 1) (e.g., silverside round, loin, chuck) vary in their muscle composition and functional properties also appearance (Figure 2), which in turn affect quality attributes such as flavour, tenderness, water-holding capacity, and colour.

These intrinsic variations suggest that beef floss produced from different cuts may exhibit distinct chemical, physical, and sensory profiles, even under identical processing conditions. Therefore, this study aims to evaluate the effect of meat cut differences (silverside vs. chuck) on the proximate composition, color properties, and sensory attributes of filler-free beef floss. By eliminating filler interference, the research seeks to reveal how natural variations in beef composition contribute to product quality differences. The findings are expected to provide a scientific foundation for optimising meat cut selection in beef floss production and guiding future innovations in filler-based formulations, ensuring both nutritional integrity and consumer-preferred sensory characteristics.

Silverside s located between the topside and the knuckle and stretches from the outside of the back leg. This part has a silver wall of connective tissue that has to be removed before cooking. Because the muscles in this part come from exercise-type muscles. It needs the gentle moist cooking method. One of them, the silverside, was being processed into beef floss.

2 Materials and methods

The ingredients of beef floss used are beef meat, namely silverside beef (called Gandik in Javanese) and Chuck (called Sampil in Javanese), and seasoning consisting of palm sugar, white sugar, salt, coriander, and garlic were purchased from the market. The equipment used is a slicer, knife, food processor, and tray. Beef floss in this research was divided into 2 different beef retail cuts. The processing flow for making beef floss was divided into three steps. First step was beef meat muscles that were trimmed of silverskin/vessels, and any surface dirt, as well as visible fat, and sliced into chunks. In the second step, meat slices were mixed thoroughly with spices before thermal processing. Thermal processing was done when the internal temperature was reached between 80 °C for 60 minutes, and allowed to cool to 180 °C at room temperature. The cooked meat was pounded with an improvised local device (mortar and pestle). The last steps, after pounding, the matrixes were separated manually. The separated matrix was allowed to cool at ambient temperature for 20 minutes and then fried until a golden-brown colour was obtained. The fried sample was then dried for the second time for 4-5 hours at 60°C to a moisture content of 5-10%. The product obtained was cooled and packaged in airtight containers (plastic) for subsequent analysis.

The proximate composition of the product was evaluated in five replicates to ensure analytical precision and statistical validity. The experimental design aimed to quantify how distinct processing approaches could alter moisture, mineral, fat, protein, and carbohydrate. Parameters that collectively define product quality and nutritional value.

The beef floss was evaluated using 5 hedonic scale there were 1 for strongly dislike, 2 for dislike, 3 for neutral, 4 for like and 5 for like very much. In this respect, the assessment was based on five criteria, namely colour, aroma, taste, texture and overall. To characterise the Sensory profile,thirty panellists were semi-trained to evaluate those samples based on colour, aroma, taste, texture and overall beef floss. All sensory analyses were performed under the same environmental conditions and conducted by the same panellists. Each panellist received at least three paper cups of beef floss in a 1 g sample.

3 Data analysis

The chemical quality data obtained were analysed using the independent sampel t-test analysis. Colour analysis was performed using colourimetry and interpreted in cie lab. In 3d diagram.

4. Result and discussion

4.1. Chemical quality of beef floss

The result of the chemical composition of beef floss made from different beef cuts (T1: *Silverside beef floss* and T2: *Chuck beef floss*) is presented in Table 1. The results showed that moisture, mineral, fat, protein, and carbohydrate contents varied depending on the type of meat used. This result found no significant difference between the different types of beef cuts (with p value > 0,05). Event beef floss made from different types of beef cuts, both of which have almost the same number and diameter of beta-red and alpha-red muscle fibres. And each muscle included in the red muscle was categorised and also classified as intermediate [8]. Even the tenderness decreased from the middle of the muscle to both ends, and also decreased from the anterior sides of the long head to the middle; it did not influence the chemical composition [9]. The detailed information on intramuscular tenderness and muscle fiber orientation could be used to increase the value added and different types of cooking methods [8].

The muscle fibre comparison from the silver side and chuck only demonstrated a willingness to pay for eating quality [10]. The higher protein content in T2 can be attributed to its intrinsic muscle structure and lower water-binding capacity after processing, which concentrates protein in the final product. Conversely, T1 exhibited slightly higher carbohydrate levels, which could be associated with increased absorption of sugar or seasoning during the frying and caramelization stages. Caramelisation is the common name for a group of reactions that occur when carbohydrates are exposed to high temperatures with no amino groups involved [11]. According to caramelisation concepts, there is a wide range of consecutive and parallel reactions that may occur during the heating of sugars, and the quantitative distribution of the intermediates and products depends largely on pH, water activity, redox potential, and food structure [12]. Differences in fat content and how the muscle fragments on shredding change surface area and oil penetration; greater surface exposure and lower water activity accelerate sugar caramelisation and Maillard reactions at the surface, producing more brown/volatile sugar-derived products and altering the residual measurable carbohydrate fraction [13]. Also non-significant difference in moisture suggests that both cuts reached similar water activity levels after drying, which is desirable for shelf-stable meat floss products. Overall, these findings indicate that chuck beef floss (T2) offers a superior nutritional profile with significantly higher protein content and lower fat, making it more suitable for consumers seeking a higher-protein, lower-fat product. Meanwhile, silverside beef floss (T1) remains advantageous in terms of sweetness and carbohydrate-derived flavor, potentially offering a softer texture and enhanced palatability for certain market preferences.

Table 1. Chemical Composition of beef floss in different commercial cuts.

c	Moist	Mineral	Fat	Protein	Carbohidrat
T1	4.65 ± 0.81	3,64 ± 0,2	14,22 ± 0,47	26,80 ± 0,45	50,63 ± 0,48
T2	5.10 ± 0.42	3.78 ± 0.4	14.78 ± 0.14	29.01 ± 0.78	47.1 ± 0.67
F	2.09	16.07	16.85	5.27	2.2
p	0.19	0.004	0.003	0.051	0.178
t	-11.2	-1.66	-2.54	-5.47	9.58

4.2. CIE lab color of beef floss

The mean CIELAB coordinates you reported (T1 mean: *L≈30.96, a*≈17.65, b≈31.11) T2 mean: *L≈32.89, a*≈17.67, b≈32.28) show that T2 is measurably lighter (higher L*) and slightly more yellow (higher b*) while a* (redness) is essentially equivalent between treatments. In practical terms, T2 will visually appear brighter/golden-brown whereas T1 will present a slightly darker brown tone. The gaps generated between the fibers due to the muscle and myofibril shrinkage caused by protein denaturation, reduction of the water holding capacity and disruption of the sarcolemma, are some key structural changes that increase the reflected light [11]. The redness of the meat is associated with the heme proteins, and the loss during heating of the characteristic redness of raw meat is related to the denaturation of myoglobin and hemoglobin that occurs at 65–80^0C [14]. Color metrics like L*, a*, b* are reliable predictors of perceived meat color and can be used to link instrumental color to sensory color impressions. The slightly different colours of various beef cuts were reflected in blooming times and reflectance measurements of myoglobin redox during the oxidation process [15].

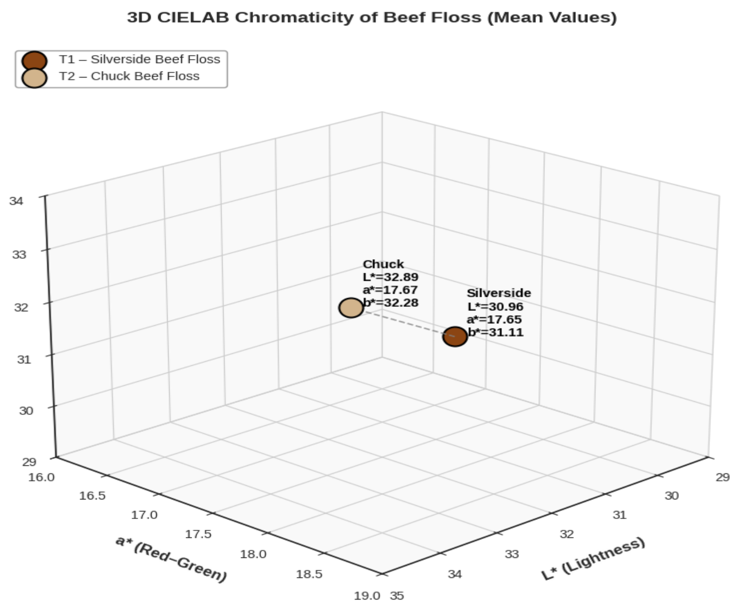

Figure 1. Graph interpretation CIE (Lab) of beef floss, different commercial cuts.

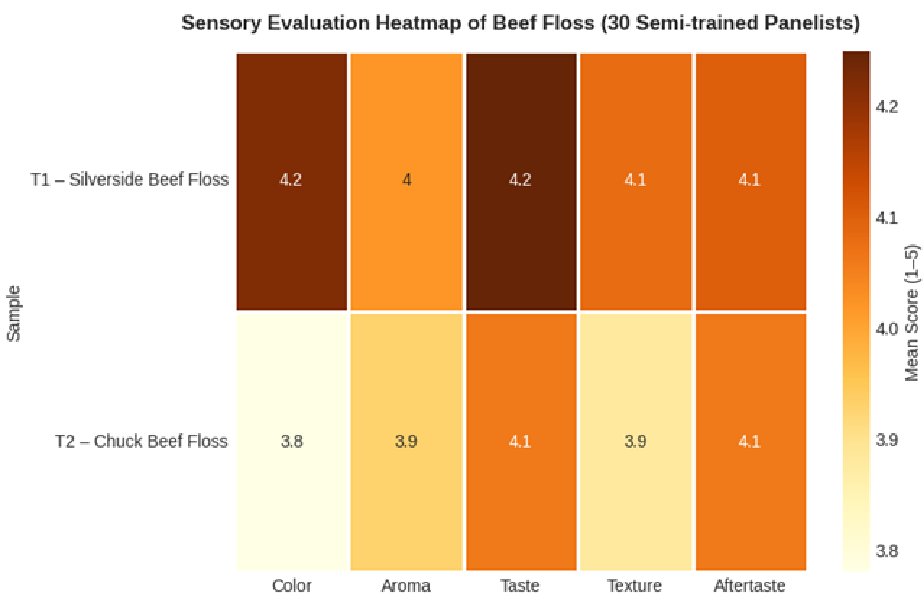

Figure 2. Heatmap Graph interpretation CIE (Lab) of beef floss, different commercial cuts.

4.3 Sensory quality on Heatmap of beef floss

The heatmap and radar chart (mean scores from 30 semi-trained panelists on a 5-point liking scale) show subtle but consistent trends: T1 scores higher in *Color, Taste,* and *Aftertaste* (e.g., Color ≈4.2 vs 3.8; Taste ≈4.2 vs 4.1. This pattern suggests panelists perceived T1 as having a more attractive brown appearance and a slightly stronger savory/aftertaste impact, whereas T2 provides a marginally lighter appearance and comparable aroma/tactile attributes.

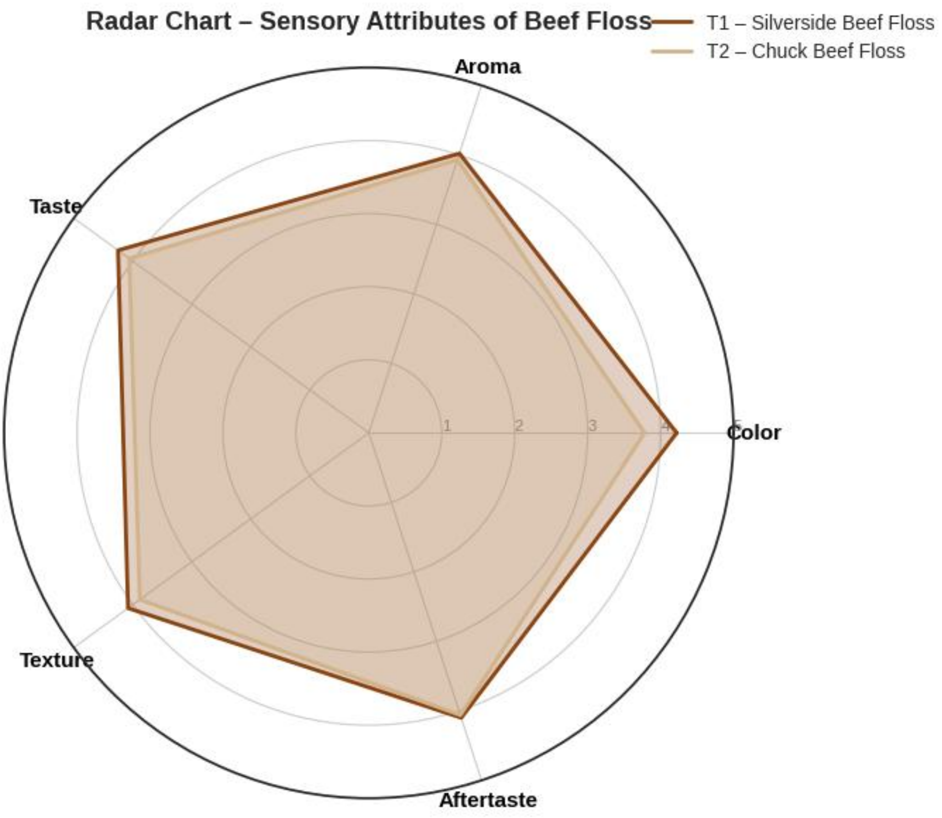

Figure 3. Radar chart Graph interpretation CIE (Lab) of beef floss, different commercial cuts

From a flavour chemistry standpoint, differences in lipid content, protein concentration, and thermal processing explain why one sample has a stronger roasted/meaty impression and the other a brighter golden tone; such chemical drivers are well-documented in meat flavour reviews. The radar's shape shows (Figure 3), T1's strengths cluster around colour and lingering savoury impact, indicating these are the driver attributes for consumer liking in this panel. Overall, the findings revealed consistent associations between specific colours and tastes.

5 Conclusion

Chemical Composition: Chuck meat (T2) had higher protein and lower fat contents than silverside meat (T1), while moisture remained similar. **Color Characteristics:** T2 appeared lighter and more yellow (higher L* and b* values), whereas T1 showed a darker brown tone, reflecting differences in fat content, pigment concentration, and Maillard browning intensity. **Sensory Evaluation:** Panelists preferred T1 for its stronger savory flavor, color, and aftertaste, while T2 offered better nutritional quality. Overall, both treatments produced acceptable beef floss with distinct compositional and sensory advantages

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References

1. W. Swastike, E. Suryanto, Rusman, C. Hanim, Jamhari, Y. Erwanto, Jumari, The quality properties, thiobarbituric acid (TBA) values and microstructure of chicken sausage with local red beetroot powder. Food Research. **5**, 113-119 (2021) https://doi.org/10.26656/fr.2017.5(S2).019
2. A.M.P. Nuhriawangsa, W. Swastike, B.S. Hertanto, A. Hanifa, L.R. Kartikasari, Physical quality of beef sausage using porang flour as a substitute for tapioca flour. **1200**, 012024 (2023) https://doi.org/10.1088/1755-1315/1200/1/012024
3. A. Putra, Huda, Nurul, Ahmad, Ruzita, Changes during the processing of duck meatballs using different fillers after the preheating and heating process. International Journal of Poultry Science. (2011) https://doi.org/10.3923/ijps.2011.62.70
4. W. Swastike, E. Suryanto, R. Rusman, R. O. Sujarwanta, Health benefits of consumption of chicken sausage enhanced with local beetroot powder. Food Research. (2024) https://doi.org/10.26656/fr.2017.8(S2).162.
5. W. Swastike, L. R. Kartikasari, A.M.P. Nuhriawangsa, F.H. Barido, B.S. Hertanto, The effectiveness of enhanced Moringa oleifera leaves extract powder (MOLEP) in beef patties as a fortification on a well-done cooking method. Iop Conference Series Earth and Environmental ScienceOpen source preview. **1292**, (2024) https://doi.org/10.1088/1755-1315/1292/1/012024
6. P. Aprilia, R. Ummami, C.M. Airin, F. Aziz, P. Astuti, Comparison of ELISA and PCR assays for detection of pork adulteration in Halal -labelled beef products. Journal of Food Quality and Hazards Control. **9**, 112 -117 (2022) https://doi.org/10.18502/jfqhc.9.2.10648
7. Astruc, Thierry, Connective tissue: structure, function, and influence on meat quality. (2014) https://doi.org/10.1016/B978-0-12-384731-7.00186-0.
8. K. S. Kirchofer, C.B. Calkins, B.L. Gwartney, Fiber-type composition of muscles of the beef chuck and round. Journal of animal science. **80**, 2872–2878 (2002) https://doi.org/10.2527/2002.80112872x
9. L. S. Senaratne, C. R. Calkins, A. S de Mello, Jr. S. Pokharel, J. B. Hinkle, "Mapping of intramuscular tenderness and muscle fiber orientation of muscles in the beef round." Journal of animal science. **88**, 3084-106 (2010) doi:10.2527/jas.2009-2683

10. M. K. Nyquist, T. G. O'Quinn, N. D. Lindsey, L. W. Lucherk, Loni W Lucherk , J C Brooks , M. F. Miller, J. F. Legako, "Palatability of beef chuck, loin, and round muscles from three USDA quality grades" Journal of Animal Science. **96**, 4276 (2018) https://doi.org/10.1093/jas/sky305
11. Mafalda A.C. Quintas, Teresa R.S. Brandão, Cristina L.M. Silva, Modelling colour changes during the caramelisation reaction. Journal of Food Engineering. **83**, 483-491. https://doi.org/10.1016/j.jfoodeng.2007.03.036
12. Kocadağlı, Tolgahan, Gökmen, Vural, Caramelization in Foods: A Food Quality and Safety Perspective. (2018) https://doi.org/10.1016/B978-0-08-100596-5.21630-2.
13. A. Listrat, B. Lebret, I. Louveau, T. Astruc, M. Bonnet, L. Lefaucheur, B. Picard, J. Bugeon, How muscle structure and composition influence meat and flesh quality." The Scientific World Journal. 3182746 (2016) https://doi.org/10.1155/2016/3182746
14. S.P. Suman, M.N. Nair, P. Joseph, M. C. Hunt, "Factors Influencing Internal Color of Cooked Meats." Meat *Science*. **120**, 133-144 (2016) https://doi.org/10.1016/j.meatsci.2016.04.006
15. H. Martens, E. Stabursvik, M. Martens, "Texture and colour changes in meat during cooking related to thermal denaturation of muscle proteins1." Journal of Texture Studies, **13**, 291-309 (1982) https://doi.org/10.1111/j.1745-4603.1982.tb00885.x