Influence of Cutting Orientation and Aging Time on Juiciness of Different Beef Cuts

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I. INTRODUCTION

The succulence of meat is a crucial sensory aspect that directly impacts consumers' perception of quality. According to Smith et al. (2008), the direction of the cut significantly influences the juiciness of the meat. Cutting with the grain allows the fibers to shorten less during chewing, resulting in a softer and juicier texture. On the other hand, cutting against the grain may break the fibers, releasing more juices and enhancing the perception of juiciness. Meat aging also influences its juiciness. Smith et al. (2018) observed that aging for a period of 14 days resulted in a significant increase in meat succulence, attributed to the breakdown of muscle fibers and juice retention during the process.

Therefore, selecting appropriate orientation for cutting the meat and conducting effective aging are crucial to ensuring a satisfactory sensory experience. This study aimed to investigate the influence of cutting orientation on the succulence of different beef cuts (Longissimus thoracis and Biceps Femoris) during various aging periods.

II. MATERIALS AND METHODS

Three pieces of Longissimus thoracis and three pieces of Biceps Femoris were collected from the slaughterhouse of the Faculty of Animal Science and Food Engineering / University of Sao Paulo – FZEA/USP, located in Pirassununga, Sao Paulo. The samples were halved and subdivided according to maturation times, separating them for subsequent analyses. One half was intended for cuts parallel to the orientation of muscle fibers, while the other half was reserved for perpendicular cuts, against the fiber orientation. All pieces were labeled, vacuum-packed, and stored at 4°C until the predetermined maturation times (days 0, 7, and 14), and then frozen at -18°C.

The assessment of juiciness of the different cuts was performed through the analysis of weight loss during cooking. The pieces were cut into steaks with a thickness of 1 inch, resulting in a total of five steaks per piece, both for parallel and perpendicular treatments. Subsequently, the steaks were arranged in identified trays and individually weighed. The steaks were baked in an electric oven at 180°C until the geometric center reached a temperature of 70°C and then cooled at room temperature until 23°C. Subsequently, all exuded liquid from the trays was removed, and the samples were weighed again to evaluate the total weight loss during cooking. For the statistical analysis, a factorial experiment was conducted, in which the factors evaluated were: cut type (Longissimus thoracis and Biceps femoris), cutting orientation (parallel and perpendicular to the fibers), and maturation time (0, 7, 14 days). Tukey's mean test was applied with significance level ($p<0.05$).

III. RESULTS AND DISCUSSION

We observed that both the Longissimus thoracis and the Biceps Femoris showed a significant increase in the amount of exudate loss over maturation time. This is evidenced by higher weight loss during cooking on days 7 and 14 compared to day 0, in both cutting orientations (Table 1). Having day 0 as the day with the lowest amount of exuded liquid, as the fibers are still intact within the muscle, able to retain a greater amount of water. The lower water retention capacity of the meat implies losses of nutritional value due to the exudate released; when this capacity is reduced, significant nutrient losses occur due to the released exudate. This results in drier and less tender meat.

Table 1 - Cooking Loss Results by Fixing the Maturation Day

Day	Longissimus thoracis Parallel	Longissimus thoracis Perpendicular	Biceps femoris Parallel	Biceps femoris Perpendicular
0	62.41 b	19.32 b	29.96 b	25.16 c
7	97.23 a	83.65 a	130.00 a	187.33 a
14	94.00 a	72.59 a	134.93 a	110.28 b

Different letters in each column differ from each other by Tukey's test ($p<0.05$).

When comparing different cuts from the same muscle (Table 2), it is noticeable that cuts made perpendicular to the muscle fibers exhibited greater liquid retention during cooking compared to parallel cuts. This is consistent with the findings from Cross et al. (1978), which also emphasized the influence of cutting orientation on meat succulence, indicating that cuts made perpendicular to the muscle fibers result in a greater release of fluids during chewing, contributing to an immediate perception of succulence.

Table 2 - Cooking Loss Result by setting the cut orientation.

Cut	Longissimus thoracis Day 0	Longissimus thoracis Day 7	Longissimus thoracis Day 14	Biceps femoris Day 0	Biceps femoris Day 7	Biceps femoris Day 14
Parallel	62.41 a	97.23 a	94.00 a	29.96 a	130.00 b	134.93 a
Perpendicular	19.32 b	83.65 a	72.59 a	25.16 a	187.33 a	110.28 a

Different letters in each column differ from each other by Tukey's test ($p<0.05$).

On the other hand, parallel cuts tend to retain less liquid, resulting in a less pronounced succulence sensation. Bouton (1971) observed that cuts made perpendicular to the muscle fibers tend to retain more liquid throughout the cooking process, resulting in a prolonged sensation of succulence, while parallel cuts may exhibit a more pronounced initial succulence due to rapid fluid release. These findings underscore the importance not only of cutting orientation but also of fluid release dynamics in the overall meat succulence experience, suggesting that cutting orientation within the same piece of meat can directly influence the consumer's sensory experience, with cuts perpendicular to the muscle fibers potentially providing a juicier meat.

IV. CONCLUSION

The findings suggest that longer maturation periods result in greater weight loss, leading to reduced liquid retention and resulting in less succulent meat. Additionally, the orientation of the cut also plays a crucial role, with perpendicular cuts demonstrating superior succulence compared to parallel cuts. These results underscore the importance of carefully considering both maturation time and cutting orientation in meat preparation to achieve the desired sensory experience.

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VI. REFERENCES

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