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THE ULTRASOUND BATH DID NOT AFFECT THE TENDERNESS OF THE TOP ROUND OBTAINED FROM THE SHEEP CARCASS

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I. INTRODUCTION

Studies have reported potential applications of high-intensity ultrasound (HIU) in fresh meat, primarily in beef, while research on its effects in lamb remains limited. The outcomes of HIU treatment can vary, with some studies reporting beneficial effects such as improved tenderness and water retention, while others have observed adverse effects, including increased toughness and moisture loss [1]. Therefore, further research involving meat cuts from different species is warranted. The aim of this study was to evaluate the tenderness of lamb meat subjected to high-intensity ultrasound treatment.

II. MATERIALS AND METHODS

Top round cuts from six carcasses of 120-day-old lambs, finished in confinement and slaughtered at a body weight of 38 ± 2 kg were used. All lambs originated from the same farm, were sired by the same ram, and were subjected to identical nutritional management. After being removed from the carcass, the cut was cleaned to remove subcutaneous fat and connective tissue and was vacuum-packed and frozen (- 18°C) until analysis was carried out. Subsequently, the cuts were thawed for 12 hours at 4 °C, vacuum packed, and subjected to three times in the ultrasound bath: time zero (without ultrasound bath), 5, and 10 minutes. The ultrasound bath (USC-2800a, Unique) worked at a frequency of 40 kHz and a power of 100 W, representing high intensity ultrasound (10 –1000 W/ cm^2) and low frequency (20 –100 kHz). After ultrasound treatment, the cuts were aged for 0, 7, 14, 21, and 28 days at 4 °C. To measure the shear force (SF), samples were placed to cook on a grill until the internal temperature reached 70 °C. The cooked samples were cut into cylinders (three cylinders by sample) and subjected to shearing using the Texture Analyzer device, coupled to the Warner-Bratzler blade, with the values expressed in kgf. The design was completely randomized in a 3 x 5 factorial scheme, three ultrasound times (0, 5, 10 minutes) and five aging times (0, 7, 14, 21, 28 days). The means were compared using the Tukey test at 5% significance, and the Minitab 18.0® program was used for statistical analysis.

III. RESULTS AND DISCUSSION

There was no interaction (P≥0.05) between ultrasound bath and aging for SF, and the ultrasound bath did not affect the SF (P≥0.05) (Table 1), but the aging time did (Table 2). The SF of the round that was not subjected to aging was greater when compared to those that underwent aging for 7, 14, 21, and 28 days (Table 2). However, the values of SF are ideal for lamb meat.

Table 1- Shear force means (± standard deviation) of lamb meat subjected to three ultrasound bath times: 0, 5 or 10 minutes.

Ultrasound bath time (min.)	Shear force (kgf)
0	1.89 (± 0.500) ^{A}
5	1.80 (± 0.640) ^{A}
10	1.75 (± 0.435) ^{A}

Means followed by the same letters in the column do not differ by the Tukey test at 5% probability

Table 2 – Shear force means (± standard deviation) of lamb meat subjected to five aging times 0, 7, 14, 21 and 28 days.

Aging time (days)	Shear force (kgf)
0	2.69 (± 0.341) [B]
7	1.67 (± 0.249) [A]
14	1.62 (± 0.213) [A]
21	1.61 (± 0.218) [A]
28	1.50 (± 0.333) [A]

Means followed by the same letters in the column do not differ by the Tukey test at 5% probability

Gao et al. [2] reported that exposing goat meat to an ultrasound bath increased its tenderness, which was attributed to an observed increase in sarcomere length. However, the treated sample weighed only 0.05 g. According to the authors, the structural integrity of an entire muscle may limit the penetration of ultrasonic energy, thereby preventing sufficient energy from reaching deeper regions. As a result, only the surface of the sample was effectively tenderized. In our study, by contrast, the average sample weight was 50 g. Similarly, other authors have also reported no significant effect of ultrasound treatment on meat tenderness [3, 4]. However, the influence of aging on meat tenderness is already known and reported by other authors. Studies show that aging increases the rate of myofibrillar degradation in meat, resulting in increased tenderness [5].

IV. CONCLUSION

The ultrasound bath treatment did not affect the tenderness of the round obtained from the lamb carcass.

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