



Impact of Ultrasound Treatment on Quality and Microstructure of Semitendinosus Muscle from Old Philippine Carabaos (*Bubalus bubalis*)

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INTRODUCTION & AIM

Background

Global meat consumption continues to rise, with livestock production and importation increasing to meet demand—even as the popularity of alternative protein-rich foods grows. To augment the local meat supply, efforts are being exerted to use underutilized meats such as carabeef, meat derived from carabaos (*Bubalus bubalis*). However, carabeef remains unpopular due to its tough texture, as most sources are old carabaos retired from years of farm work. Emerging technologies like ultrasound treatment, previously shown to improve the quality of beef, pork, and poultry, may enhance the market potential of carabeef since tenderness strongly influences consumer acceptance.

Justification

Ultrasound (UL) treatment for carabeef tenderization has not yet been explored. Investigating its effects on meat quality could help address toughness, promote greater utilization of local meat, and reduce dependence on imported products.

Significance

The study benefits the following:

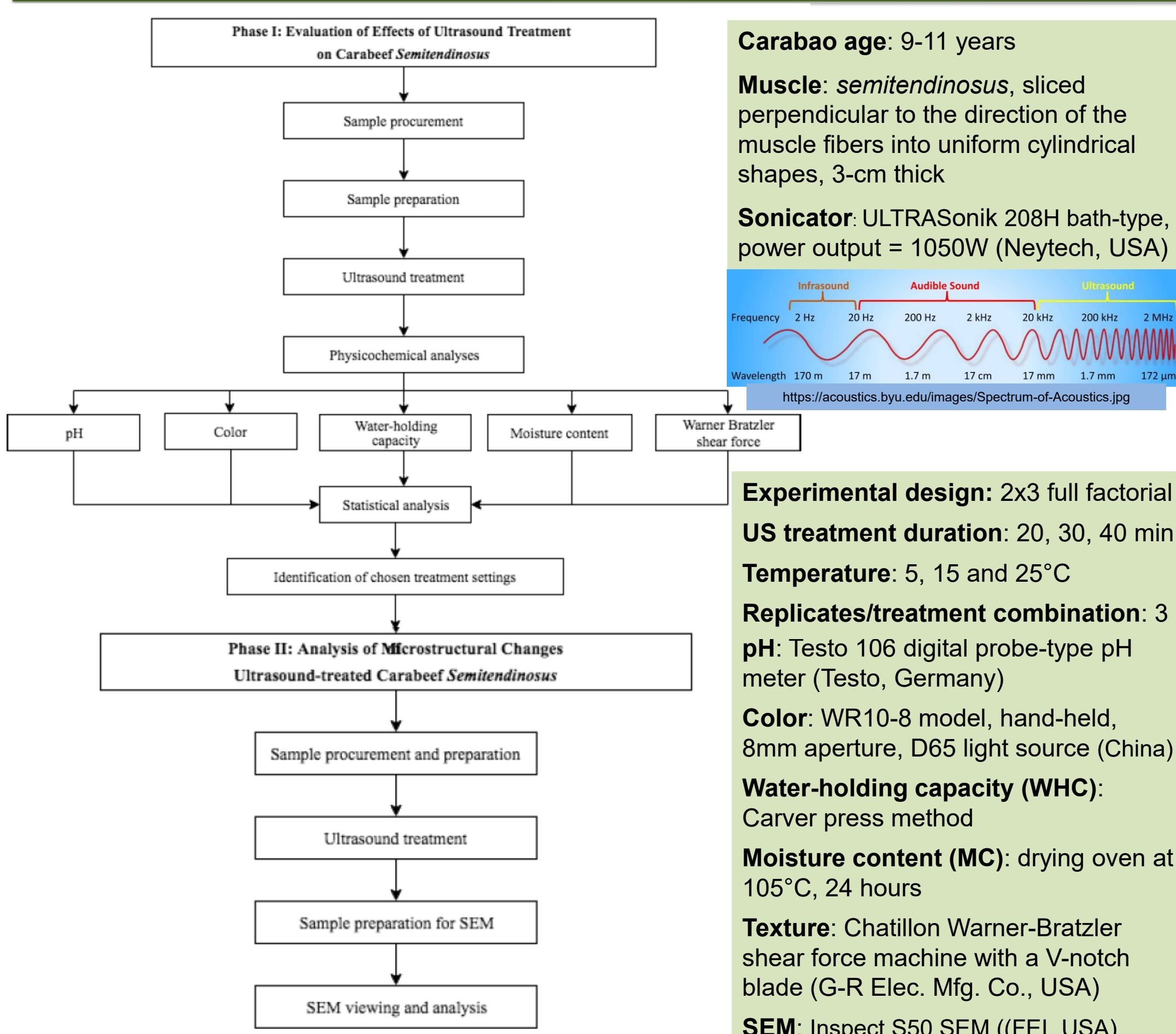
1. carabeef producers and processors, by improving meat tenderness and profitability;
2. consumers and the food industry, by providing a nutritious, affordable, and locally sourced meat option; and
3. researchers and equipment developers, by generating data for future applications of ultrasound technology in meat processing.

Aim

To determine the effects of ultrasound treatment on the quality and microstructure of carabeef *semitendinosus* by:

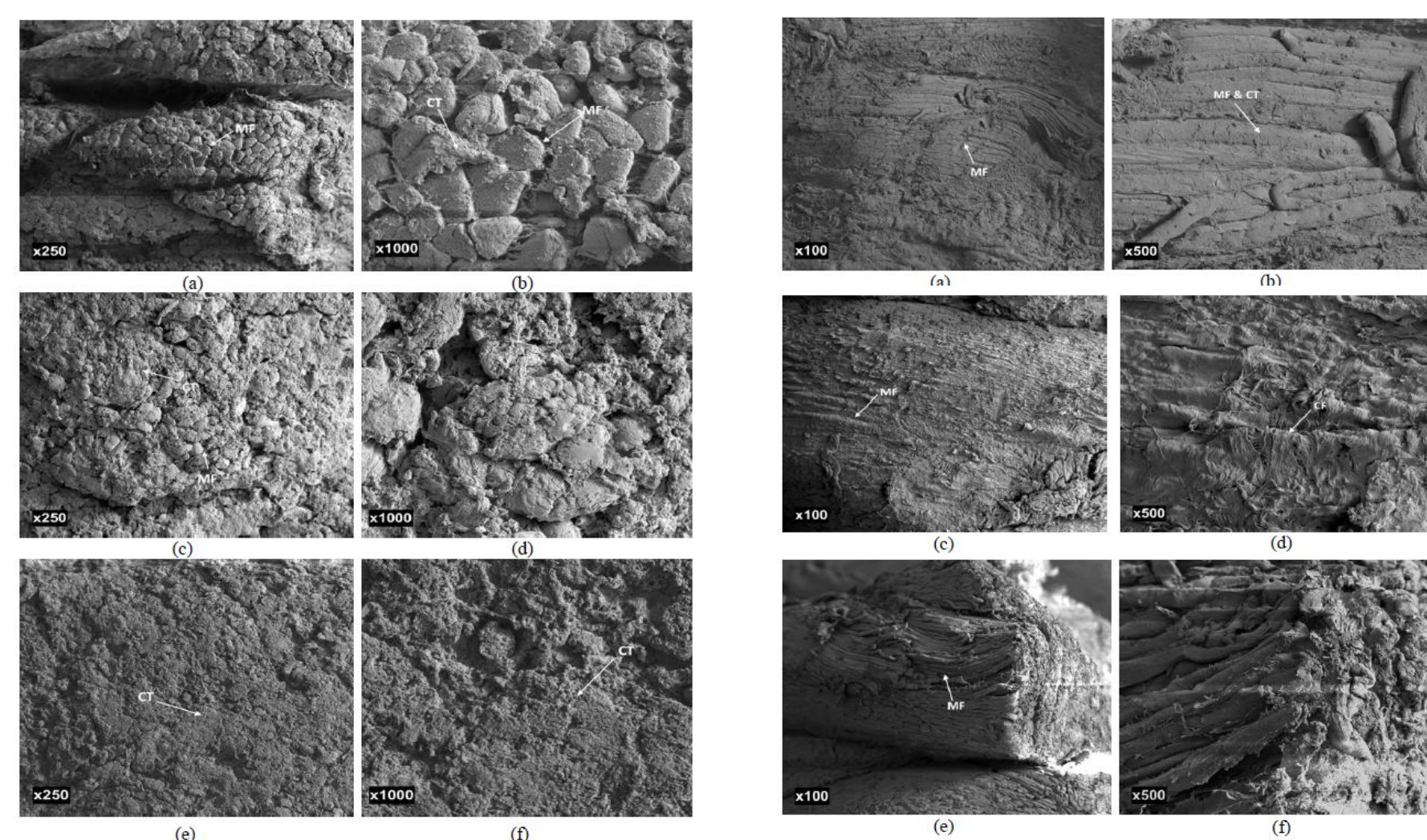
1. evaluating its impact on pH, moisture, water-holding capacity, color, and shear force; and
2. examining structural changes using scanning electron microscopy (SEM).

METHOD



RESULTS & DISCUSSION

- Significant effects were detected in selected treatment combinations.
- Warner-Bratzler shear press results showed general improvement in tenderness across treatment durations.
- Color analysis revealed increased lightness (L*) and yellowness (b*) ($p < 0.05$), with no change in redness (a*).
- Treatment duration had no significant effects on pH, MC, or WHC ($p > 0.05$).
- SEM revealed US-induced damage to connective tissue layers, including disrupted structure, cavities, and loss of integrity—observations that are associated with enhanced meat tenderness.
- US treatment caused damage to meat microstructure mainly through the weakening of collagen network and destruction of muscle cell integrity.
- Connective tissues loosened, protein aggregation became more prominent on the surface, fiber diameter shrunk, collagen network disintegrated, and cavities increased.



A

B

Cross-sectional (A) and longitudinal (B) SEM images of carabeef *semitendinosus* samples subjected to different lengths of exposure to US treatment: a,b - control; c,d - 40 min; e,f - 80 min. CT - connective tissue; MF - muscle fibers

CONCLUSION

This study demonstrates the potential of ultrasound technology to improve carabeef texture with minimal impact on other quality parameters.

FUTURE WORK

Results support further optimization studies addressing industrial applications, process conditions, and animal traits.

REFERENCES

