

Effect of temperature and cooking time on the toughness of previously tumbled beef cuts

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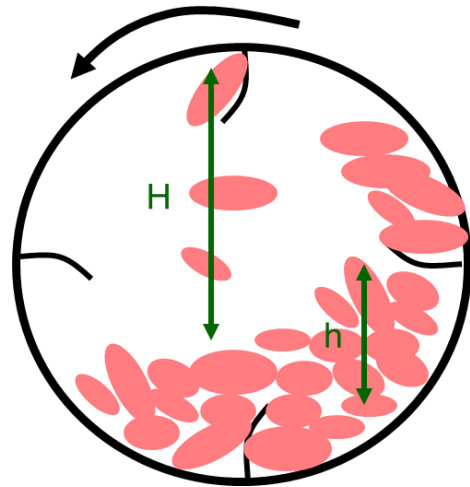
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➤ Introduction

Background



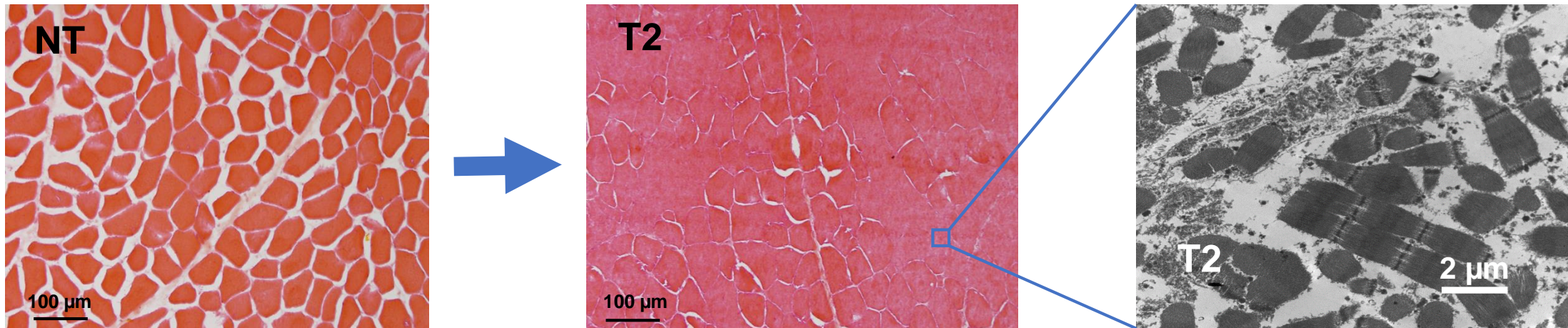
- Key step in the manufacture of cured and/or cooked meat products (Daudin et al. 2016)
- Meat structure damaging, brine sorption and protein extraction (Xaragayo et al. 1998).
- Better final products, more juicy and tender (Lachowicz et al. 2003; Hullberg and Lundstrom, 2004).

➤ Introduction

Background



N’Gatta et al. 2021 in Virtual Oral Session, Meat processing



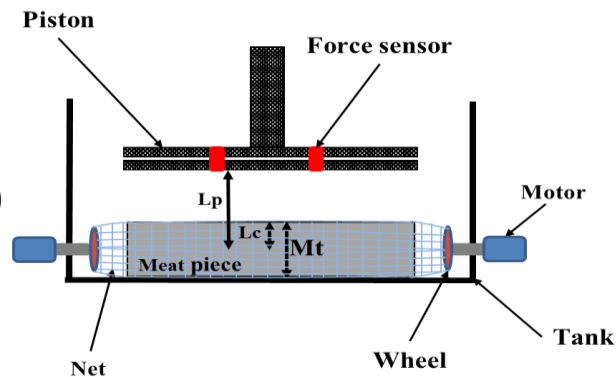
- Evaluation of the effect of temperature and cooking time on the toughness of tumbled beef meat pieces

➤ Materials and methods

Mechanical treatments

18 *ST* muscles, 9 charolais cows (52 months),
matured under-vacuum for 21 days / 4°C

Cylindrical meat pieces (18cm L ;
6.5cm Ø)



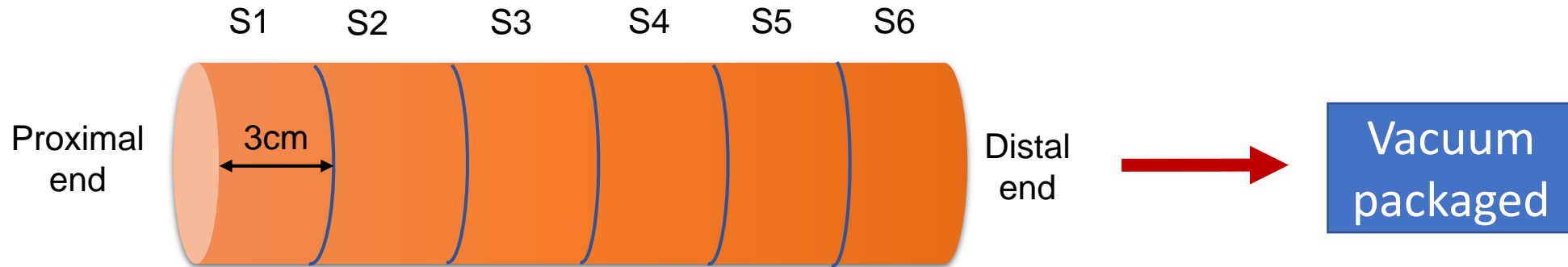
Daudin et al. (2016)

NT: Not tumbled (control)
T: Tumbled (12h, 9500 compression cycles)



➤ Materials and methods

Sampling, textural characterization



S1, S3, S5 => 1 hour

S2, S4, S6 => 4 hours



Cooking in water bath
50°C, 60°C and 80°C



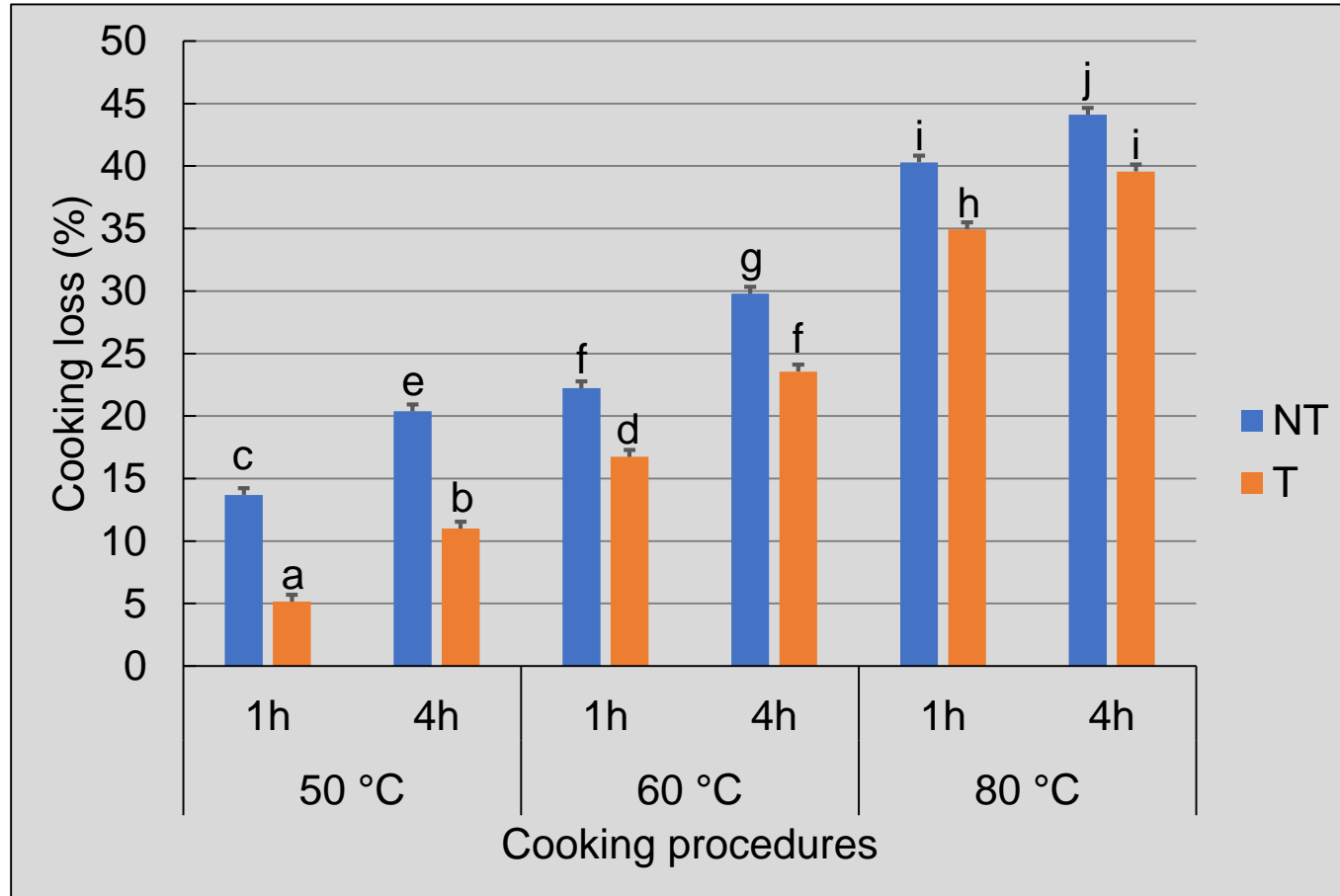
1 meat piece = 1 (NT or T) x 1 T°C (50°C, 60°C or 80°C) x 2 Cooking time (1h and 4h)

1. Cooking losses (%) = $\frac{P_0 - P_f}{P_0} \times 100$,
P₀ & P_f = weight before & after cooking

2. Shear forces (F_{max}), Shear cell (Salé, 1971), Instron 5543, 10 blocks of 1x1x3cm³/slice, Crosshead speed : 50 mm/min.

➤ Results

Effect of cooking procedures on cooking losses



***** P < 0.001**
NS = Not significant

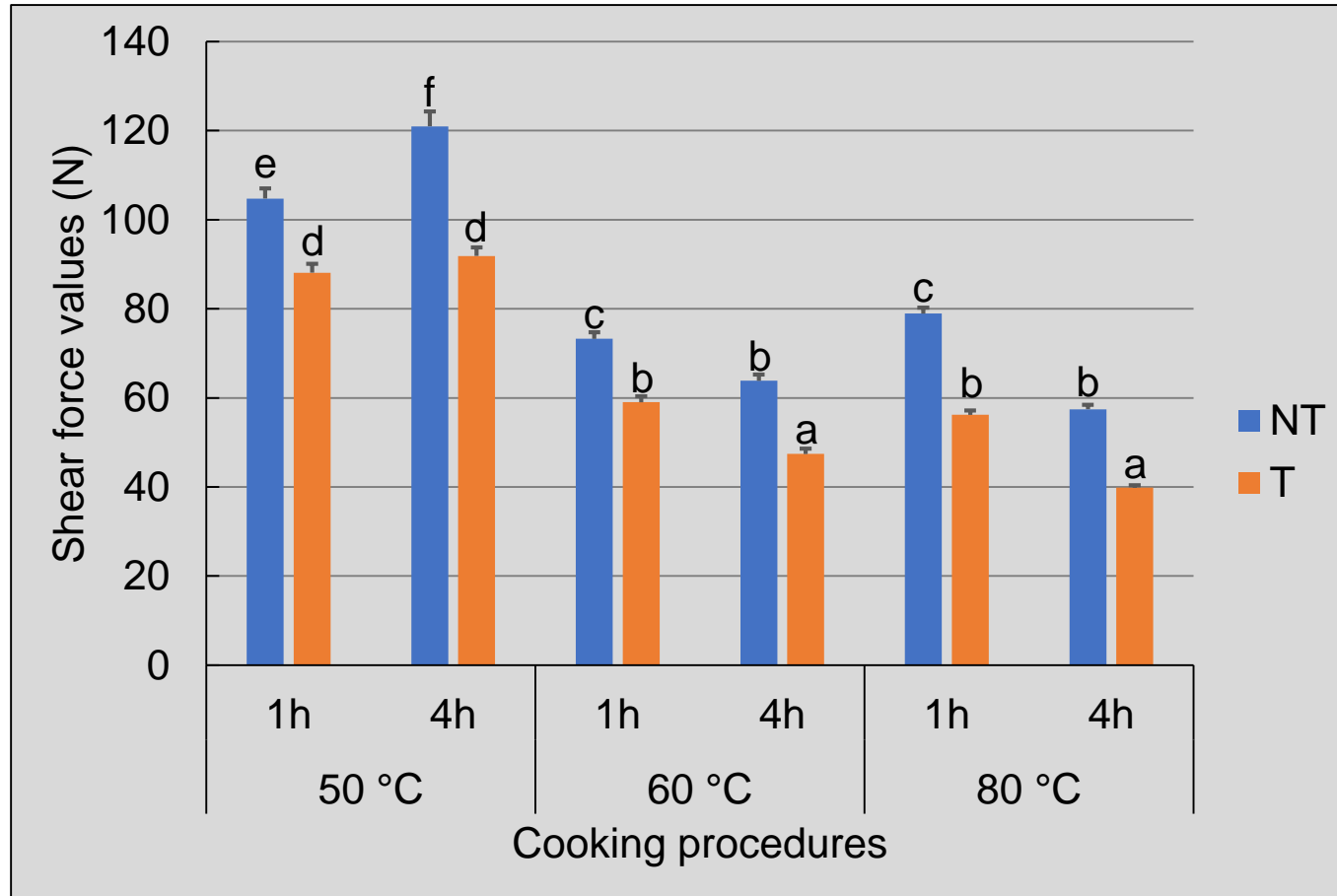
Treatment	***
Temperature	***
Time	***
Treat*T°C	***
Treat*Time	NS
T°C*Time	***



Different letters (a–j) indicate significant difference ($P < 0.05$) according to the Tukey test

➤ Results

Effect of cooking procedures on shear forces



*** P < 0.001 ; ** P < 0.01
NS = Not significant

Treatment	***
Temperature	***
Time	***
Treat*T°C	**
Treat*Time	NS
T°C*Time	***



Different letters (a–f) indicate significant difference (P < 0.05) according to the Tukey test

➤ Discussion

- Cooking losses and tenderization level of tumbled meat pieces are influenced by cooking temperature.

- Increasing in cooking losses at higher cooking temperatures (Dominguez-Hernandez et al. 2018).

- Decreasing in tumbled cooked beef roasts shear force and hardness (Pietrasik and Shand, 2004).

- Combined effect of extending tumbling time and cooking temperature to tenderize beef cuts.

➤ Conclusions

- The toughness of tumbled beef cuts is influenced by cooking temperature.
- Cooking temperature close to 60 °C provides lower cooking loss and better tenderness.

➤ Further research

- Investigation on the sensory aspects and consumer acceptance of mechanically tenderized meats by using the tumbling simulator.



THANK YOU FOR YOUR ATTENTION