THE EFFECT OF FREEZING AND THAWING ON MEAT QUALITY OF BEEF LOINS

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INTRODUCTION

- Meat which is frozen and thawed will undergo physical and chemical changes.
- The rate at which meat is frozen could affect quality.
- Properly frozen retail cuts may allow retailers to extend shelf life and take advantage of wholesale price fluctuations.
- In South Africa consumers tend to buy meat in bulk to freeze at home but do not trust frozen meat on the shelf.

OBJECTIVE

- To compare method of freezing on meat quality of beef steaks.

METHODS

- Twenty one loins (M. longissimus lumborum) aged for 14 days, processed into 25 mm steaks, vacuum-packed.
- Three treatment groups:
  - Fresh – Control.
  - Slow frozen – domestic freezer for 24h reaching -20°C core temperature (Fig. 1) – Consumer.
  - Quick frozen – blast freezer for 3h reaching -35°C core temperature (Fig. 2) – Commercial.
- Parameters studied:
  - Colour properties (L*, chroma, hue, oxymyoglobin, deoxymyoglobin and metmyoglobin).
  - Water holding capacity (WHC; pressed out water), drip/thawing loss.
  - Warner Bratzler Shear Force (WBSF).
  - Sensory attributes (flavour, aroma, juiciness, overall tenderness).
- Samples for every parameter were randomly taken from each loin so that each parameter had a sample number of n=21.

RESULTS

- Drip/thawing loss and water holding capacity:
  - Both freezing groups recorded twice as much thawing loss compared to the drip loss of fresh samples (Fig. 3).
  - No significant difference between two freezing methods.
  - No significant difference for WHC between any of the groups.
- Colour:
  - Frozen and thawed samples reflected less light (lower L*) than fresh samples (Fig. 4).
  - Lower chroma and higher hue angle values for frozen samples were accompanied by higher levels of metmyoglobin (MetMb) and lower levels of oxymyoglobin (OxyMb) compared to fresh samples (Fig. 4 and 5).
  - No differences in colour attributes recorded between two freezing methods.
- Tenderness:
  - Lower WBSF recorded for both freezing methods (P<0.001) compared to fresh samples (Fig. 3).
  - Sensory tenderness did not support differences in WBSF among treatments.
- Other sensory attributes:
  - No differences for aroma, flavour, juiciness and residue recorded among treatments.

CONCLUSION

- Freezing vs. Fresh: Meat with poorer visual quality and excessive drip but possibly more tender meat.
- No effect on quality due to differences in freezing rate.
- Eating quality of properly frozen meat, domestic or industrial, should not differ from fresh meat.
- On retail level, consumer resistance will have to be overcome to sell frozen meat successfully.

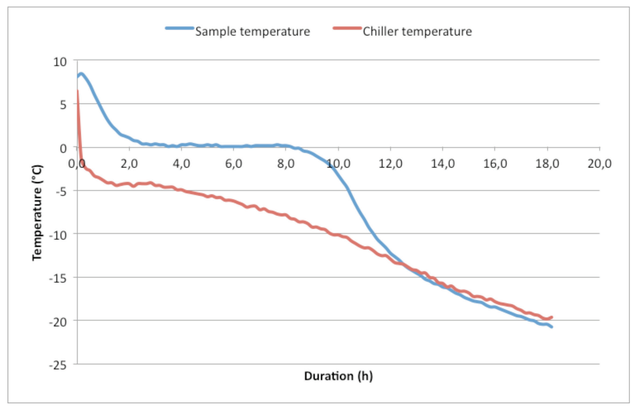

Figure 1: Temperature profile of slow frozen sample (domestic freezer)

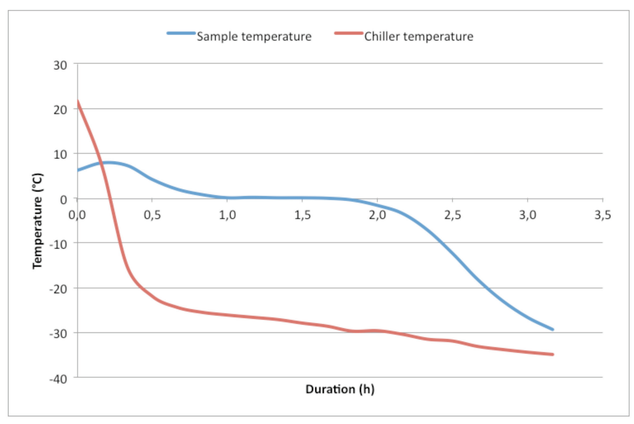

Figure 2: Temperature profile of quick frozen sample (blast freezer)

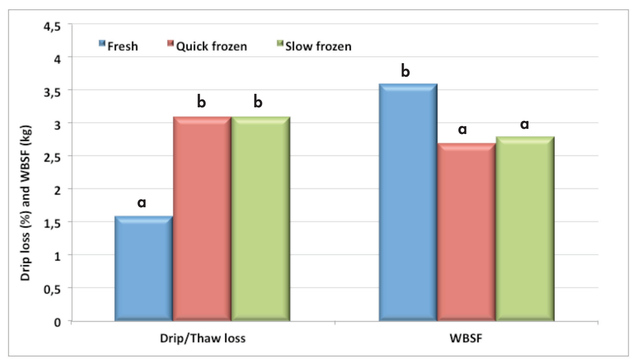

Figure 3: Means for drip/thaw loss and WBSF for fresh, quick frozen and slow frozen beef loins

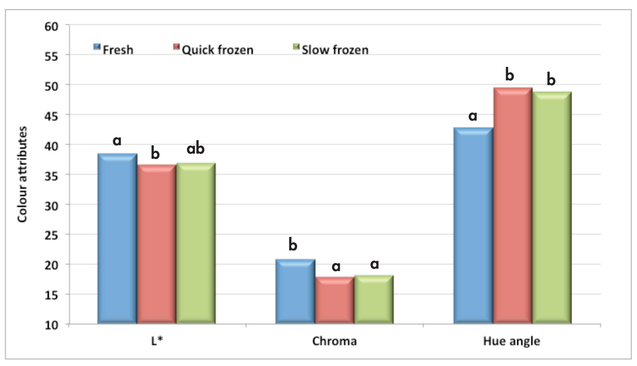

Figure 4: Means for L*, chroma and hue angle for fresh, quick frozen and slow frozen beef loins

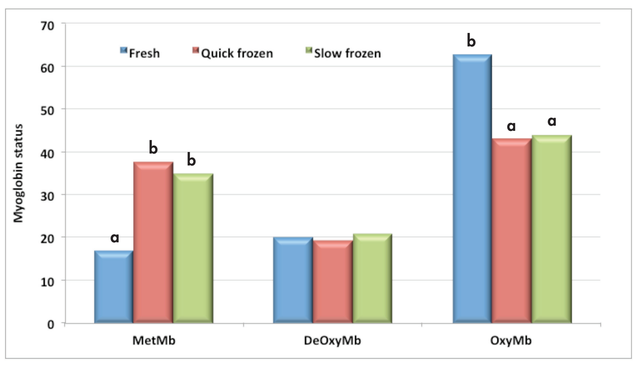

Figure 5: Means for metmyoglobin, deoxymyogobin and oxymyoglobin status for fresh, quick frozen and slow frozen beef loins