THE EFFECT OF FREEZING AND DURATION OF FREEZING ON THE QUALITY OF PORK LOIN.

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1. INTRODUCTION

- Frozen meat has a stigma because freezing is perceived to reduce meat quality.
- Freezing affects the functional properties of muscle proteins.
- This could in turn affect colour, water holding capacity and tenderness.
- Frozen storage can affect the oxidative stability of pork.
- This in turn can affect taste and consumer acceptability of fresh meat.

2. OBJECTIVE

- To evaluate the effect of freezing time on various quality parameters of pork loins.

3. METHODS

- Fresh deboned pork loins (n=36) were purchased and frozen at 18 (n=6), 12 (n=6), nine (n=6), six (n=6) and three (n=6) months before evaluation.
- Frozen loins were compared with fresh loins purchased on the day of testing.
- The following parameters were analysed:
  - Sensory analyses
  - Warner Bratzler shear force (WBSF)
  - Thawing loss

4. RESULTS

- Moisture characteristics (Table 1):
  - Thawing loss of loins frozen for 18 months was lower than those of the other frozen loins.
  - Loins frozen for 18 months recorded higher cooking losses than all other treatments, except the 12-month group.
  - Cooking loss also tended to increase from 6 months to 18 months of freezing.
  - This could be due to damage of the ultrastructure of the muscle due to freezing.
- Sensory evaluation (Figure 1 and 2):
  - Scores for roasted pork meat and fat aroma did not differ between fresh loins and those frozen for 3 to 9 months but deteriorated after 9 months.
  - Fat aromas described as “fishy” and “rancid” followed exactly the opposite trend as roasted pork fat and meat aromas.
  - Duration of freezing had the same effect on pork flavour as on typical pork aroma.
  - Possible reasons for flavour and aroma defects:
    - Unfrozen water fraction in frozen meat at temperatures around -20 °C leads to primary lipid oxidation and then secondary oxidation during thawing.
    - Release of pro-oxidants, especially the haem iron, due to cell membrane damage accelerates fat oxidation and formation of off-flavours.
  - Loins frozen for nine months or longer were significantly tougher than fresh samples, while duration of freezing also showed a slight downward trend.
  - Fresh loins were scored higher for juiciness than loins frozen for 12 or 18 months.
- Sensory evaluation (Figure 1 and 2):
  - WBSF complimented the sensory tenderness scores.
  - Most studies reported an increase in meat tenderness (lower shear values) as a result of freezing and freezing duration – mainly as a result of structural damage.

Figure 1: Effect of freezing and duration of freezing (3 – 18 months) on selected pork loin fat aroma overtones

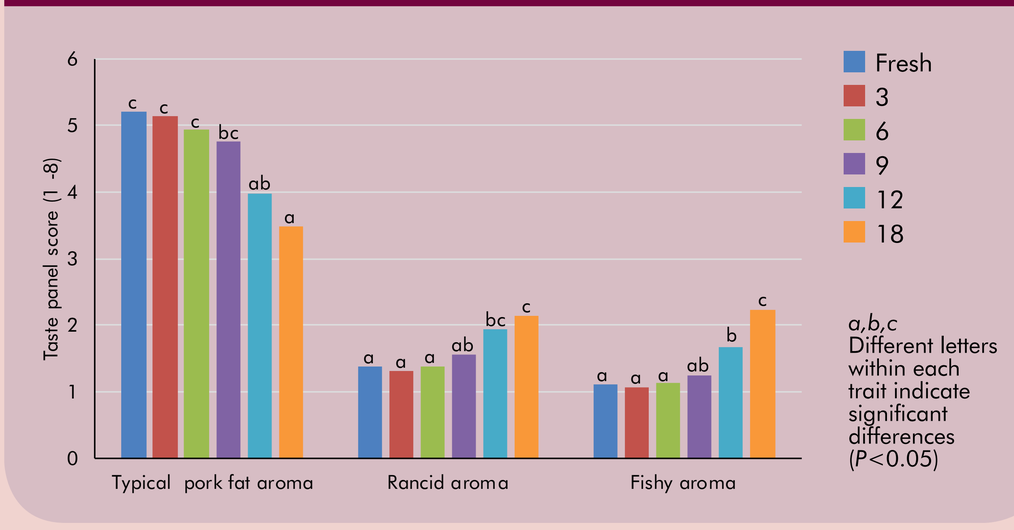

Figure 2: Effect of freezing and duration of freezing (3 – 18 months) on pork loin meat tenderness, juiciness and selected aroma and flavour overtones

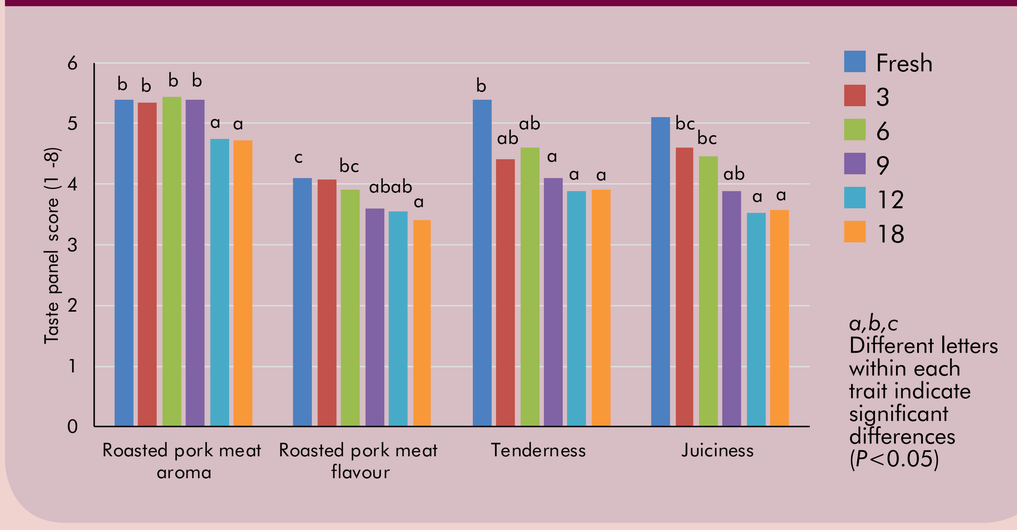

Table 1: Mean values and statistics indicating the effect of freezing and duration of freezing on moisture properties and WBSF of pork loins

	Freeze time						*P*	SEM
	Fresh	3	6	9	12	18		
WBSF (kg)	4.0^{a}	4.7^{ab}	4.7^{ab}	4.5^{ab}	6.2^{c}	5.3^{bc}	0.494	0.052
Thawing loss (%)	0.0^{a}	3.4^{c}	3.1^{c}	3.2^{c}	3.1^{c}	2.1^{b}	<0.001	0.313
Total cooking loss (%)	25.1^{a}	25.4^{a}	25.4^{a}	27.0^{a}	29.0^{ab}	32.0^{b}	0.012	1.451

a,b,c Values in the same row with different letter differ significantly (P<0.05)

5. CONCLUSION

- Freezing pork loins for longer than nine months increases the risk of poor eating quality in terms of flavour, aroma, tenderness and juiciness.
- This is in contrast to the recommendations of 12 months as stated by previous studies.