EFFECT OF LOIN PH AND TEMPERATURE DECLINE ON MEAT QUALITY TRAITS IN FOUR COMMERCIAL PLANTS

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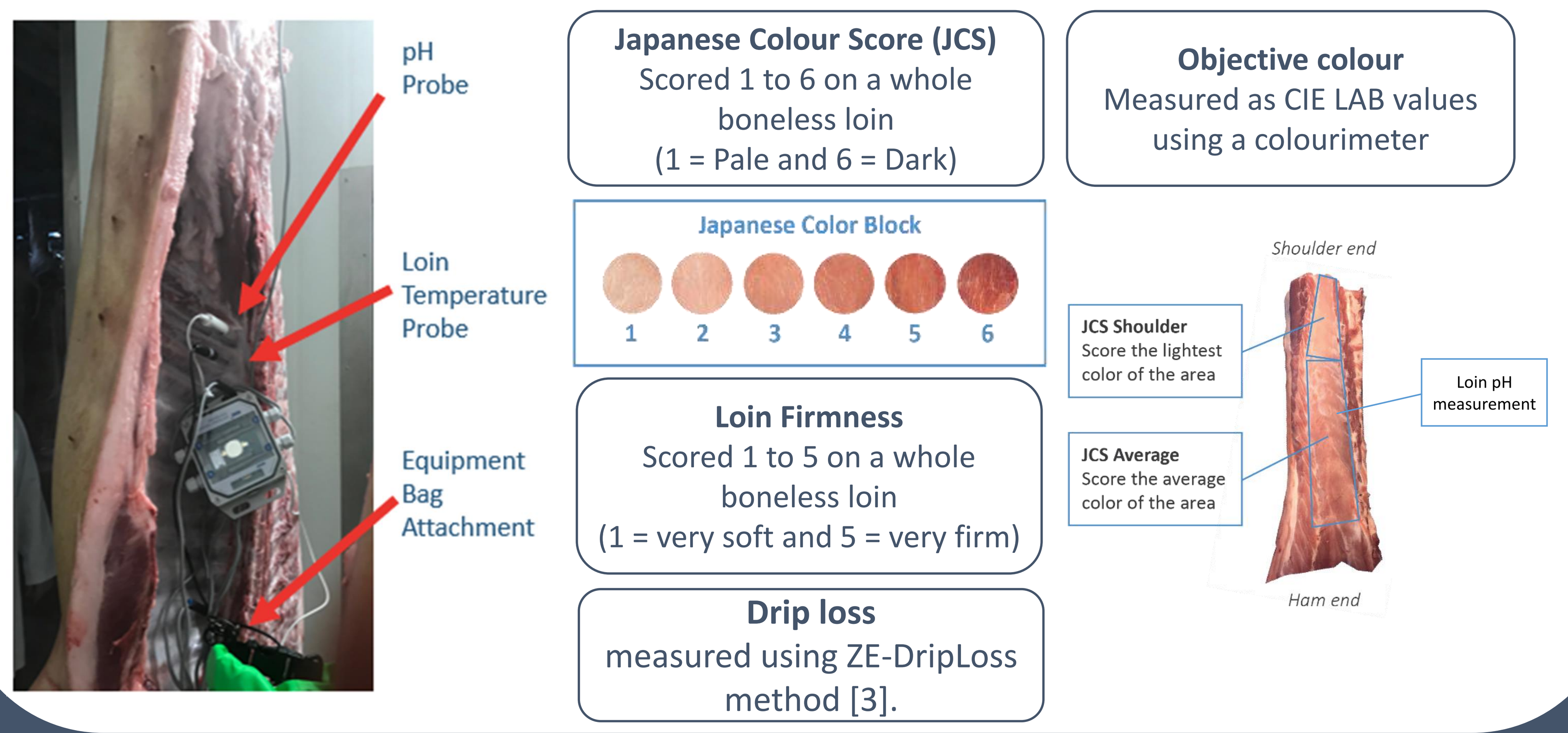
INTRODUCTION

Temperature and pH are two major factors affecting development of meat quality. *Post-mortem* glycolysis determines the ultimate pH in meat, which correlates with water holding capacity, colour and sensory traits [1]. Controlling the rate of temperature decline is considered critical in slowing down *post-mortem* glycolysis and improving pork quality [2]. The objective of this project was to further evaluate the effect of temperature and pH decline on the development of pork quality in different commercial chilling systems.

MATERIAL AND METHODS

- Data were collected from four different commercial US pork slaughter plants with CO_2 stunning and group animal movement (Plant 1: n = 47; Plant 2: n = 76; Plant 3: n = 51; Plant 4: n = 36).
- pH electrodes were inserted in the loin at the last rib, while temperature probes were placed in close proximity to pH electrodes.
- Probes were randomly placed in carcasses on the slaughter floor prior to chilling with measurements logged every minute for approximately 20 h.
- Meat quality, including ultimate pH, subjective Japanese Colour Score (JCS) and firmness, objective colour measurements and 24-hour drip loss, was assessed at approximately 24 hours *post-mortem* on boneless loins from the same carcasses.

Fig.1. Probe placement and meat quality evaluation



RESULTS

- Loin temperature decline rates varied among plants as Plant 4 chilled the slowest, followed by Plant 2, while Plants 1 and 3 chilled fastest.
- The rate and extent of pH decline also varied among plants with loins from Plant 4 having the lowest pH values and fastest rate of decline, followed by Plant 2, Plant 1, and Plant 3 (highest pH values and slowest decline rate), respectively.
- Boneless loins from Plant 3 had the highest ultimate pH values compared with loins from the rest of the plants ($P < 0.05$).
- L* value was the highest in loins from Plant 4 and lowest from Plant 3 ($P < 0.05$).
- The average and shoulder JCS were lowest in Plant 4 ($P < 0.05$), indicating the palest subjective colour.
- Loins from Plant 4 had the highest firmness score, while loins from Plant 2 had the lowest firmness score ($P < 0.05$).
- 24-h drip loss percentage was greatest in loins from Plant 4 and least in Plant 1 ($P < 0.05$).

CONCLUSIONS

In modern commercial pig slaughtering facilities, different chilling rates can lead to variation in pH decline rates that affect pork quality. Overall, faster temperature decline resulted in slower pH decline rate, which led to darker colour, higher pH, and better water holding capacity. These data indicate potential relationships between *post-mortem* temperature and pH decline rates and their influence on the development of pork quality.

RESULTS

Fig.2. Rate of Loin Temperature Decline in Four Commercial Slaughter Plants

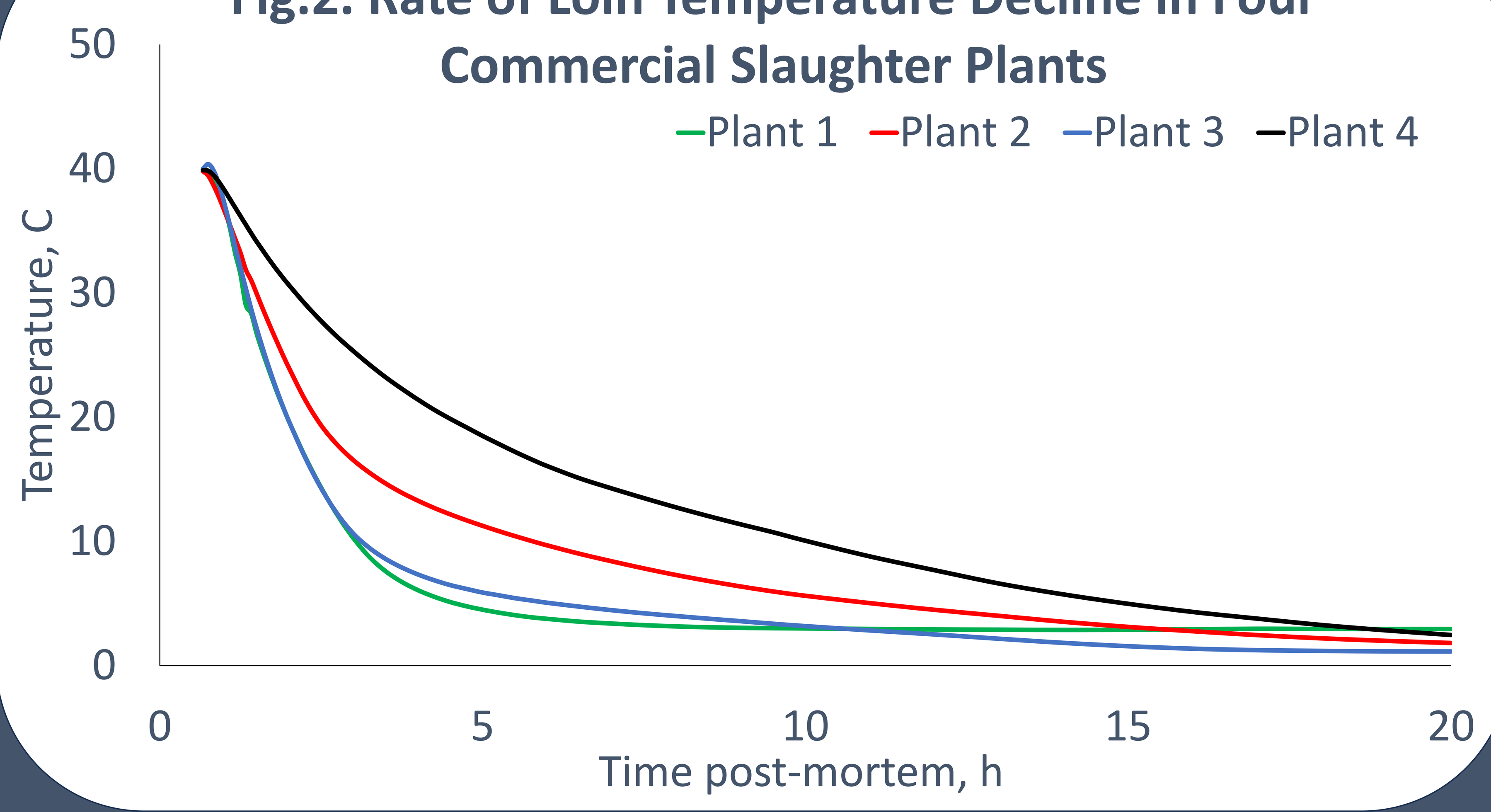


Fig.3. Rate of Loin pH Decline in Four Commercial Slaughter Plants

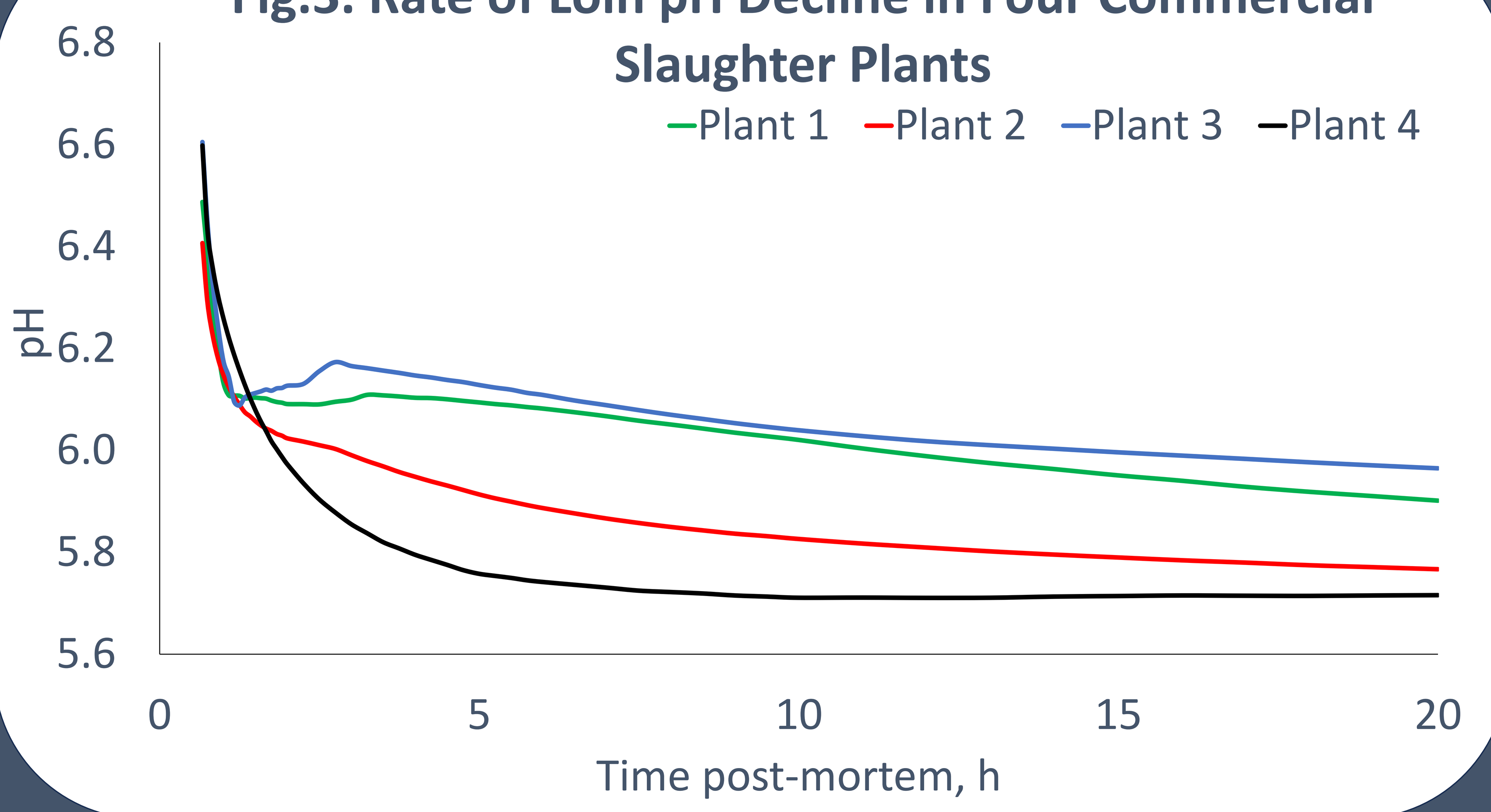


Table 1. Effect of Commercial Pig Slaughter Plants on Pork Quality

	Loin Quality				Pooled
Plant	Plant 1	Plant 2	Plant 3	Plant 4	SEM
n	47	76	51	36	-
pH 40 min	6.49^{b}	6.41^{c}	6.60^{a}	6.60^{a}	0.03
pHu - Bone-in loin (BI)	5.90^{b}	5.77^{c}	5.96^{a}	5.72^{d}	0.02
pHu - Boneless Loin (BNLS)	5.61^{b}	5.58^{b}	5.72^{a}	5.59^{b}	0.02
BI vs. BNLS pHu Differential	0.30^{a}	0.18^{c}	0.24^{b}	0.12^{d}	0.02
L*	42.0^{c}	43.4^{b}	40.5^{d}	45.0^{a}	0.42
a*	7.45^{a}	7.01^{b}	7.11^{ab}	7.19^{ab}	0.15
b*	2.02^{a}	2.02^{a}	1.05^{b}	2.17^{a}	0.13
JCS Average	3.57^{a}	3.41^{ab}	3.56^{ab}	3.40^{b}	0.06
JCS Shoulder	3.12^{a}	3.05^{a}	3.25^{a}	2.81^{b}	0.08
Firmness	2.60^{ab}	2.47^{b}	2.62^{ab}	2.81^{a}	0.10
24-h Drip Loss, %	1.85^{b}	2.02^{ab}	2.12^{ab}	2.59^{a}	0.23

^{abcd} Means within a row lacking common superscripts were significantly different ($P < 0.05$).

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