



Marbling and ageing – Part 2. Consumer perception of sensory quality

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ABSTRACT

Studies have shown that ageing of pork has a positive effect on its eating quality, but often these studies are limited to a trained sensory panel. The objective of this work was to investigate the influence of ageing on the sensory properties of grilled pork as perceived by the consumer. Sixty pork loins aged 2, 6, 8, 10 or 12 days were evaluated by 98 consumers. Only tenderness was sufficiently influenced by the ageing period to be perceived by the consumer, being more tender at 6 to 12 days than 2 days ($P < 0.001$). Sex, however, influenced tenderness ($P < 0.001$), juiciness ($P < 0.001$) and taste liking ($P < 0.015$), being stronger in pork from female pigs than castrates. No evidence was found to suggest that current ageing practices are not optimal for both the trait originally intended, tenderness, and for perceived taste.

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1. Introduction

An extensive review of potential sources of amelioration of the sensory properties of fresh pork concluded that those with the most promise were pH, intramuscular fat (IMF) content and ageing period (Ngapo & Gariépy, 2008). A study of the influence of marbling and ageing on the sensory properties was therefore undertaken as a means to improving the perceived sensory quality of today's pork in response to consumer perceptions of deteriorated taste (Ngapo, Riendeau, Laberge, & Fortin, 2012). In this study, pork loins were divided into three marbling classes (≤ 2.00 , 2.25 – 2.75 , ≥ 3.00 ; based on a modification of the NPPC scale; NPPC, 1999) and accorded an ageing period of 2, 4, 6, 8, 10 or 12 days post-mortem (p.m.) at 3.7 °C. Extremes in marbling score and ageing period were not sought, but rather conditions of actual or potential industry practice were used.

While it is generally accepted that meat lipids provide flavour and aroma volatiles that impact on meat flavour, the role of IMF (for which marbling is a visual estimation) in the sensory quality of pork is far from understood. In the current study, weak correlations ($r \leq 0.36$, $P < 0.05$) of IMF content with trained panel evaluations of juiciness, meat flavour and salt taste, and marbling with sweet taste were observed (Ngapo et al., 2012). However, the marbling class alone did not influence the sensory scores. Ageing also had little effect on the sensory scores of the meat characteristics and the basic tastes, but in grilled pork impacted on presence notes of other selected traits. Compared to 2 and 4 days, more caramel flavour notes were observed at 6 and 10 days and pig flavour notes at 8 and 12 days. In addition to these trends of increased

caramel and pig flavour notes with increased ageing period, the overall number of notes also increased, paralleled by an increasing number of panellists detecting the presence of the different notes. These traits included cardboard odour and vegetable oil, nut and metal flavours as well as the caramel and pig flavours mentioned above.

Ageing is often overlooked in the pork industry, with periods being determined primarily for tenderness at the expense of other sensory properties. A number of investigations using trained sensory panels have shown that ageing of pork for 6 to 10 days has a positive effect on its eating quality compared to only 1 or 2 days (Agerhem & Tornberg, 1993; Bejerholm, 1991; Bryhni et al., 2003; Buchter & Zeuthen, 1971; Channon, Baud, Kerr, & Walker, 2003; Channon, Kerr, & Walker, 2004; Juarez et al., 2011; Kepčija, 1972; Li et al., 2009; Nishimura, Rhue, Okitani, & Kato, 1988; Wood et al., 1996, 1999). While ageing results in tenderisation through the gradual breakdown of the myofibrillar protein structure, it is also suggested that the process changes flavour through the generation of peptides and amino acids. Pork flavour has been described as changing from uncharacteristic and undeveloped to pleasant and full after 7 days of ageing (Kepčija, 1972). Could it be that an increasing ensemble of sensory notes, which individually are not necessarily significant, is responsible for taking this sensory perception from undeveloped to full? And is this combination of subtle differences sufficiently strong to be perceived by the consumer?

Few consumer studies are reported on aged pork. Bryhni et al. (2003) observed that a taste panel was able to discriminate a pork flavour increase, and abnormal or acidic flavour reduction during conditioning for 6 to 10 days compared to 1 day p.m., but no differences were detected by consumers. However, Agerhem and Tornberg (1993) found that consumers preferred both grilled *longissimus dorsi* and roasted *biceps femoris* after 6 than 2 days ageing. And Channon et al. (2003, 2004) observed that consumers scored grilled pork *longissimus thoracis*

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Table 1
Questionnaire composition, responses and sensory scores where significant in response distribution for the given sensory criterion.

Question	Response options	Consumers		Significance ¹ and means where significant				Overall acceptability
		Number	%	Tenderness	Juiciness	Taste		
						Strength	Liking	
What is your age (years)?	16–24	17	17	ns	***	***	*	ns
	25–34	17	17		6.6 ^{ab}	6.1 ^a	6.7 ^a	
	35–44	20	20		6.9 ^a	6.1 ^a	6.5 ^{ab}	
	45–54	20	20		5.7 ^c	5.4 ^b	6.1 ^b	
	55–64	24	24		6.3 ^b	5.6 ^b	6.2 ^b	
Gender?	Female	49	50	*	ns	**	*	ns
	Male	49	50			5.5 ^a	6.2 ^a	
Marital status?	Single	21	21	ns	ns	ns	ns	ns
	Married	77	79			5.9 ^b	6.4 ^b	
How many people live in your household?	1	5	5	ns	ns	**	*	ns
	2	40	41			4.7 ^a	5.1 ^a	
	3	11	11			5.6 ^{ab}	6.2 ^{ab}	
	4	26	27			5.9 ^b	6.4 ^{ab}	
	5+	16	16			5.8 ^b	6.4 ^{ab}	
They are? ²	Spouse	76	78			5.8 ^b	6.7 ^b	
	Children	46	47					
	Parents	13	13					
	Grandparents	1	1					
	Others	11	11					
What is your annual household income (Canadian dollars)?	<\$20,000	3	3	ns	***	***	ns	ns
	\$20,000–\$29,999	11	11			5.7 ^a	6.8 ^a	
	\$30,000–\$39,999	14	14			6.9 ^b	6.0 ^{ab}	
	\$40,000–\$49,999	18	18			5.9 ^{ab}	5.1 ^b	
	\$50,000–\$59,999	9	9			6.8 ^{ab}	5.7 ^b	
	≥\$60,000	42	43			6.2 ^{ab}	5.8 ^b	
How old were you when you finished your studies?	Up to 16 years	7	7	ns	ns	ns	ns	ns
	17–18 years	25	26					
	19–22 years	36	37					
	23 years or older	23	23					
	Not yet finished	6	6					
Do you have a dental prosthesis?	Yes	17	17	ns	ns	*	ns	ns
	No	81	83			5.3 ^a	5.8 ^b	
Do you smoke?	Yes	11	11	ns	ns	*	**	*
	No	87	89			6.1 ^a	6.9 ^a	7.0 ^a
Are you the member of your household who shops for meat?	Yes	82	84	*	ns	ns	***	***
	No	16	16			5.6 ^b	6.2 ^b	6.5 ^b
Where do you normally purchase your meat? ²	Butcher	53	54				6.8 ^a	7.1 ^a
	Supermarket	89	91			6.3 ^b	6.2 ^b	6.4 ^b
	Farmer	9	9					
Do you cook the main meals in your household?	Everyday	44	45	*	**	*	***	***
	Several times/week	45	46			6.2 ^a	5.5	5.9 ^a
	Once/week	6	6			6.4 ^{ab}	5.9	6.5 ^{ab}
	<Once/week	3	3			7.1 ^b	6.8 ^a	7.1 ^b
	Grill	76	78			6.3 ^a	5.3 ^b	5.2
If you do the cooking, how do you normally cook pork? ²	Fry	65	66			5.2	6.6 ^{ab}	7.1 ^b
	Roast	70	71					
	Stew	42	43					
	Boil	5	5					
	ns							
How long do you normally spend preparing a meal?	<30 min	26	27	ns	***	***	ns	ns
	30 min–1 h	66	67			5.8 ^a	5.5 ^a	
	>1 h	6	6			6.5 ^b	5.7 ^a	
Do you eat alone?	Everyday	3	3	ns	ns	ns	ns	ns
	Several times/week	24	24					
	Once/week	7	7					
	<Once/week	5	5					
	Almost never	58	59					
How often do you eat meat?	Every meal, everyday	17	17	*	*	ns	ns	ns
	Once/day, everyday	42	43			5.9	6.3	
	Several times/week	38	39			6.2	6.6	
	≤Once/week	1	1			6.6	6.6	
	ns					6.6	5.7	

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