

DOES TRIMMING EXTERNAL FAT BEFORE COOKING AFFECT PALATABILITY AND CALORIE CONTENT OF BEEF RIBEYE STEAKS?

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I. INTRODUCTION

Health experts have recently encouraged consumers to remove excess fat from meat prior to cooking [1]. This practice, however, might be detrimental to meat eating quality. The objective of this study was to determine the effect of removing the external fat before cooking on the palatability and calorie content of beef ribeye steaks.

II. MATERIALS AND METHODS

Twenty *longissimus thoracis* muscles with Canada AAA (n=10) and AA (n=10) quality grades (equivalent to USDA Choice and Select, respectively) were obtained from a federally inspected commercial slaughter plant, vacuum packaged and transported under refrigerated conditions to the Lacombe Research and Development Centre (Agriculture and Agri-Food Canada). The muscles were aged for an average of 28 d and, subsequently, removed from the vacuum packaging and fabricated into four 2.54-cm steaks. Half of the steaks were trimmed to 0.635 cm of external fat (cap on). The remaining steaks were completely trimmed of external and seam (kernel) fats (cap off), and the *longissimus* and *spinalis dorsi* muscles were combined with butcher's twine. Steaks were cooked on an electric grill to an endpoint temperature of 74°C in the center of the steak and cooking time and losses were measured. Subsequently, descriptive sensory analyses were performed by a 10-member trained meat evaluation panel and calorie analyses were conducted. The effect of cooking with and without external fat on meat palatability and calorie content was evaluated using a one-way analysis of variance (ANOVA) in the MIXED procedure of SAS.

III. RESULTS AND DISCUSSION

The AA steaks with cap on cooked faster ($P<0.001$) and had less cooking losses ($P<0.01$) than steaks cooked with cap off (Table 1). Compared to muscles of AA steaks cooked with cap off, the AA steaks cooked with cap on had *longissimus* with higher initial and sustained juiciness ($P<0.01$, Table 1) and a tendency towards a smaller proportion of panelists detecting livery off-flavour ($P=0.058$) and mealy texture ($P=0.071$), and *spinalis* with a tendency towards a lower frequency of panelists detecting unidentified off-flavours ($P=0.096$) and spongy texture ($P=0.096$) (Table 2). Likewise, the AAA steaks with cap on cooked faster ($P<0.01$) and tended to have less cooking losses ($P=0.093$) than steaks cooked with cap off (Table 1). When cooking the AAA steaks with cap on, the *longissimus* had a lower frequency of panelists detecting 'other' off-flavours (i.e., burnt, rancid, barnyard, stale; $P<0.05$) and mushy texture ($P<0.05$) (Table 2) and tended to have lower off-flavour intensities ($P=0.083$, Table 1), whereas the *spinalis* had higher beef flavour intensity and desirability ($P<0.05$, Table 1) and a smaller proportion of panelists tending to detect 'other' off-flavours (i.e., burnt, fatty, oily, rancid; $P=0.052$, Table 2), compared to steaks cooked with cap off. The more pronounced flavour effects in the *spinalis* compared to the *longissimus* of AAA steaks cooked with cap on could be due to the *spinalis* potentially having higher endpoint temperatures than the *longissimus* muscles, which probably caused more Maillard reactions and more efficient fat melting. Regardless of the quality grade and muscle type, cooking steaks with cap on did not increase the calorie content compared to the steaks cooked with cap off ($P>0.10$, Table 1).

Table 1. Effect of cooking steaks with cap on (external fat included) and cap off (external and seam fats removed) on meat quality, descriptive sensory attributes¹ and calorie content of *longissimus thoracis* and *spinalis dorsi*.

	AA				AAA			
	Cap on	Cap off	SEM	P-value	Cap on	Cap off	SEM	P-value
Steak cooking loss (mg/g)	240	281	8.87	0.005	266	287	12.0	0.093
Steak cooking time (s/g)	3.37	5.13	0.27	<0.001	3.58	5.28	0.40	0.005
<i>Longissimus thoracis</i>								
<i>Descriptive sensory attributes</i>								
Initial tenderness	6.14	6.06	0.15	0.612	6.27	6.52	0.19	0.114
Initial juiciness	6.01	5.49	0.22	0.001	5.51	5.69	0.20	0.370
Beef flavour intensity	6.65	6.58	0.11	0.575	6.68	6.62	0.12	0.533
Beef flavour desirability	6.66	6.51	0.11	0.205	6.68	6.58	0.12	0.394
Off-flavour intensity	7.60	7.62	0.18	0.903	8.16	7.76	0.20	0.083
Amount of perceived connective tissue	7.41	7.45	0.10	0.607	7.56	7.62	0.10	0.512
Overall tenderness	6.83	6.84	0.10	0.911	6.91	7.02	0.13	0.256
Sustainable juiciness	6.16	5.89	0.09	0.004	5.93	6.00	0.13	0.607
Calorie content (Cal, WMB)	2.50	2.45	0.05	0.514	2.49	2.50	0.05	0.823
<i>Spinalis dorsi</i>								
<i>Descriptive sensory attributes</i>								
Initial tenderness	7.78	7.91	0.13	0.317	7.66	7.89	0.15	0.124
Initial juiciness	7.45	7.23	0.15	0.307	7.21	7.34	0.15	0.267
Beef flavour intensity	7.40	7.44	0.13	0.826	7.64	7.29	0.12	0.044
Flavour desirability	7.44	7.32	0.14	0.528	7.63	7.26	0.13	0.021
Off-flavour intensity	8.05	7.84	0.20	0.271	8.32	8.17	0.13	0.301
Amount of perceived connective tissue	8.17	8.21	0.11	0.679	7.97	8.16	0.14	0.274
Overall tenderness	8.12	8.05	0.09	0.569	7.94	8.10	0.12	0.278
Sustainable juiciness	7.25	7.14	0.12	0.424	7.17	7.19	0.12	0.886
Calorie content (Cal, WMB)	2.79	2.83	0.05	0.557	2.90	2.90	0.07	0.992

WMB, wet matter basis; SEM, standard error of least squares means; ¹Nine-point descriptive scales: 9 = extremely tender, juicy, intense beef flavour, desirable flavour, bland off-flavour, and no perceptible connective tissue; 1 = extremely tough, dry, bland beef flavour, undesirable flavour, intense off-flavour, and abundant perceptible connective tissue.

Table 2. Effect of cooking steaks with cap on (external fat included) and cap off (external and seam fats removed) on the frequency (percentage of respondents) for meat off-flavour and texture descriptors of *longissimus thoracis* and *spinalis dorsi*.

	AA						AAA					
	<i>Longissimus thoracis</i>			<i>Spinalis dorsi</i>			<i>Longissimus thoracis</i>			<i>Spinalis dorsi</i>		
	Cap on	Cap off	P-value	Cap on	Cap off	P-value	Cap on	Cap off	P-value	Cap on	Cap off	P-value
<i>Off-flavour descriptors</i>												
Metallic	0.00	0.27	-	0.27	0.00	-	1.08	0.54	0.414	1.09	1.37	0.739
Off-sour	7.30	6.49	0.674	1.08	0.81	0.705	5.38	5.38	1.000	0.00	0.55	-
Livery	3.78	7.03	0.058	2.15	1.61	0.593	3.49	4.84	0.369	1.37	0.82	0.480
Grainy	0.27	0.00	-	0.00	0.00	-	0.54	0.27	0.564	0.00	0.00	-
Bloody/serumy	7.84	6.22	0.405	7.53	6.45	0.579	3.23	4.30	0.450	6.01	6.28	0.881
Other	2.16	1.08	0.248	4.84	4.57	0.866	0.54	4.32	0.020	1.64	5.46	0.052
Unidentified	2.70	1.62	0.317	0.54	1.88	0.096	0.54	0.81	0.655	0.55	0.82	0.655
None	26.2	27.0	0.831	33.3	35.0	0.707	33.6	30.1	0.398	38.8	34.7	0.360
<i>Texture descriptors</i>												
Typical	29.1	27.3	0.630	28.3	27.5	0.836	28.6	27.3	0.729	33.3	29.5	0.514
Mushy	5.88	4.81	0.527	16.6	15.8	0.785	2.15	8.06	0.012	15.3	13.1	0.579
Mealy	3.48	6.42	0.070	0.00	0.27	-	4.28	4.81	0.732	0.00	1.09	-
Spongy	4.81	3.21	0.273	1.06	3.72	0.096	4.01	2.67	0.317	0.55	1.64	0.317
Rubbery	4.01	3.48	0.706	1.07	1.07	1.000	2.94	2.41	0.655	0.55	1.09	0.564
Crumbly	2.67	4.81	0.131	2.14	2.41	0.808	4.81	6.68	0.286	1.64	2.19	0.705

IV. CONCLUSION

Overall, cooking ribeye steaks with external fat had positive effects on juiciness, flavour and texture without increasing the calorie content compared to steaks cooked without external fat. Educating consumers on the benefits of maintaining the external fat while cooking will improve the eating experience of Canadian beef.

ACKNOWLEDGEMENTS

Canada Beef provided funding and this research was conducted as part of the Canada Beef Meat Quality Strategy.

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