Sensory muscle profiling of beef muscles

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Abstract

The purpose of the study was to examine ways to add value to less appreciated cuts in the bovine carcass, by generating precise data on essential quality variables of selected muscles. Ten different muscles from Norwegian Red bull carcasses (n=10) were aged for 9 days at 4ºC and subjected to sensory assessment of tenderness, colour and taste. Large variabilities in sensory quality properties were recorded with regard to carcasses and individual muscles. Mostly low correlations were found between sensory quality data from different muscles. As related to the overall sensory quality the carcass forepart muscles tend to be underestimated in value as compared to backpart muscles.

Background

Recent and current research on beef muscle profiling holds considerable promise in enabling the development of novel processes and products in the beef industry (Von Seggern et al, 2005; Polkinghorne, 2006). By muscle profiling it is here meant precise characterisation of the muscles by physical and chemical analysis, with the intent to develop improved understanding and knowhow of properties of individual muscles in a carcass so as to better utilise them.

Material and methods

Ten Norwegian Red bull carcasses (250-439kg) were chilled for 48h at 4ºC post mortem and 10 muscles from each carcass were deboned and aged at 4ºC for 9 days (Table 1). Muscle slices of 4 cm thickness were heat treated in a water bath at 70.5 ºC for 50min and chilled in ice water. A trained taste panel of 11 persons performed Descriptive Sensory Analysis on 1x1x2cm fresh samples of 20 ºC (ISO-6564-1985-Methodology). The variables sensory tenderness, hardness, juiciness, colour intensity and acidity were assessed on 1-9 intensity scales

Table 1. Selected muscles in study

	Abbreviation	US trade	Norwegian names	Price ratio (Norwegian)
Forepart:				
Supraspinatus	SUP	Chuck tender	Bogstek	0.47
Infraspinatus	INF	Flat iron steak	Bogstek	0.47
Triceps brachi	TRB	Ranch cut steak	Bogstek	0.47
Backpart:				
Longissimus dorsi	LGD	Loin	Ytrefilet	**1.00**
Rectus femoris	REF	Sirloin tip steak	Rundbiff	0.48
Vascus lateralis	VAL	Sirloin tip steak	Rundbiff	0.48
Biceps femoris	BIF	West.griller steak	Bankekjøtt	0.47
Semitendinosus	SET		Lårtunge	0.48
Semimembranosus	SEM		Flatbiff	0.67
Adductor	ADD		Flatbiff	0.67

Results and discussion

Large variabilities in sensory quality properties with regard to both carcasses and individual muscles were recorded (Figure 1). This confirms recent results where substantial variations have been observed even within very consistent cattle lines (Polkinghorne, 2006). This is a problem in making robust prediction models for meat product quality for the carcass. Probably separate models must be made for each single muscle, where sampling procedures are”tailor-made” for each muscle. Table 2 shows that the univariate correlations between muscles in this study varied much. The correlations were in most cases not significant.

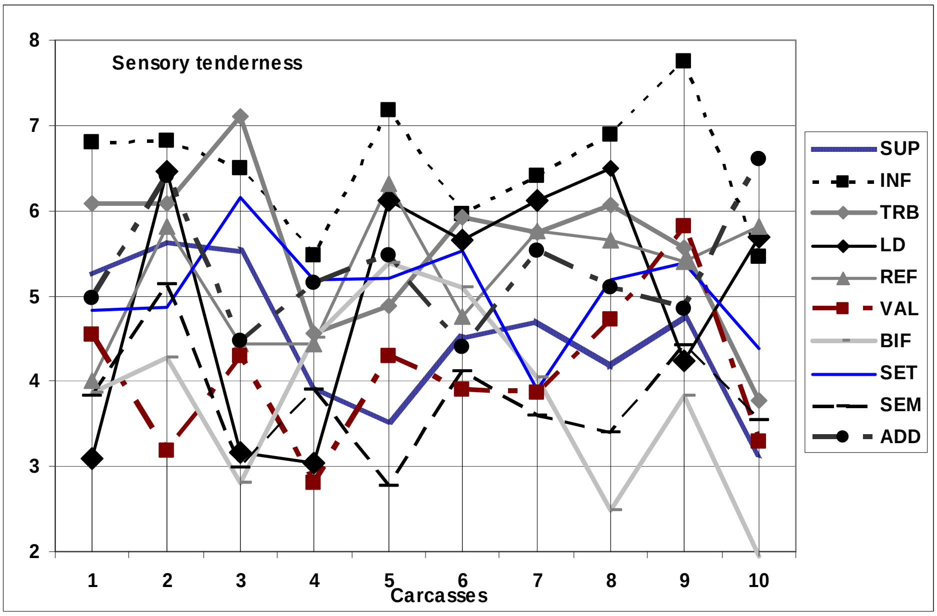

Figure 1. Sensory tenderness in selected muscles from 10 carcasses.

Table 2. Pearson correlations between sensory tenderness of 10 beef muscles. Univariate correlations between muscles in the study

	SUP	INF	TRB	LGD	REF	VAL	BIF	SET	SEM
INF	0,38								
TRB	0,86 0,001***	0,44							
LGD	-0,28	0,11	-0,15						
REF	-0,43	0,26	-0,37	0,85 0,002**					
VAL	0,20	0,82 0,004**	0,39	-0,09	0,02				
BIF	0,08	0,17	0,02	0,04	0,00	-0,09			
SET	0,27	0,21	0,47	-0,42	-0,41	0,31	0,08		
SEM	0,32	0,18	0,17	0,29	0,06	0,03	-0,07	-0,10	
ADD	-0,32	-0,21	-0,57	0,50	0,62	-0,51	-0,24	-0,68 0,032*	0,17

The results for each muscle for sensory tenderness, juiciness, colour intensity and acidic taste are given in Figures 2A-D. The average scores for the forepart muscles were significant higher ($p<0.001$) than for the backpart muscles for the first 3 parameters, while for acidic taste no difference was found. This is noteworthy as the latter muscles are generally assumed by the consumer to be of higher quality. There was a significant effect in tenderness between individual muscles in tenderness ($p<0.001$). The INF obtained the highest tenderness score, followed by an intermediate group of muscles of TRB, LGD, REF, SET and ADD (Figure 2A). The toughest group of muscles included VAL, BIF and SEM. However, this ranking need not be generally valid as many factors will influence the results. As for juiciness INF, TRB and BIF scored the highest, with SUP, LGD, VAL and SET in an intermediate group (Figure 2B). REF, SEM and ADD were the least juicy. Colour intensity was the highest in SUP, INF, TRB and BIF (Figure 2C), while REF and SET had the lowest scores. It is to be noted that INF was in the highest category as for all these three variables. TRB was the muscle with highest acidity taste, while SUP was the lowest (Figure 2D).

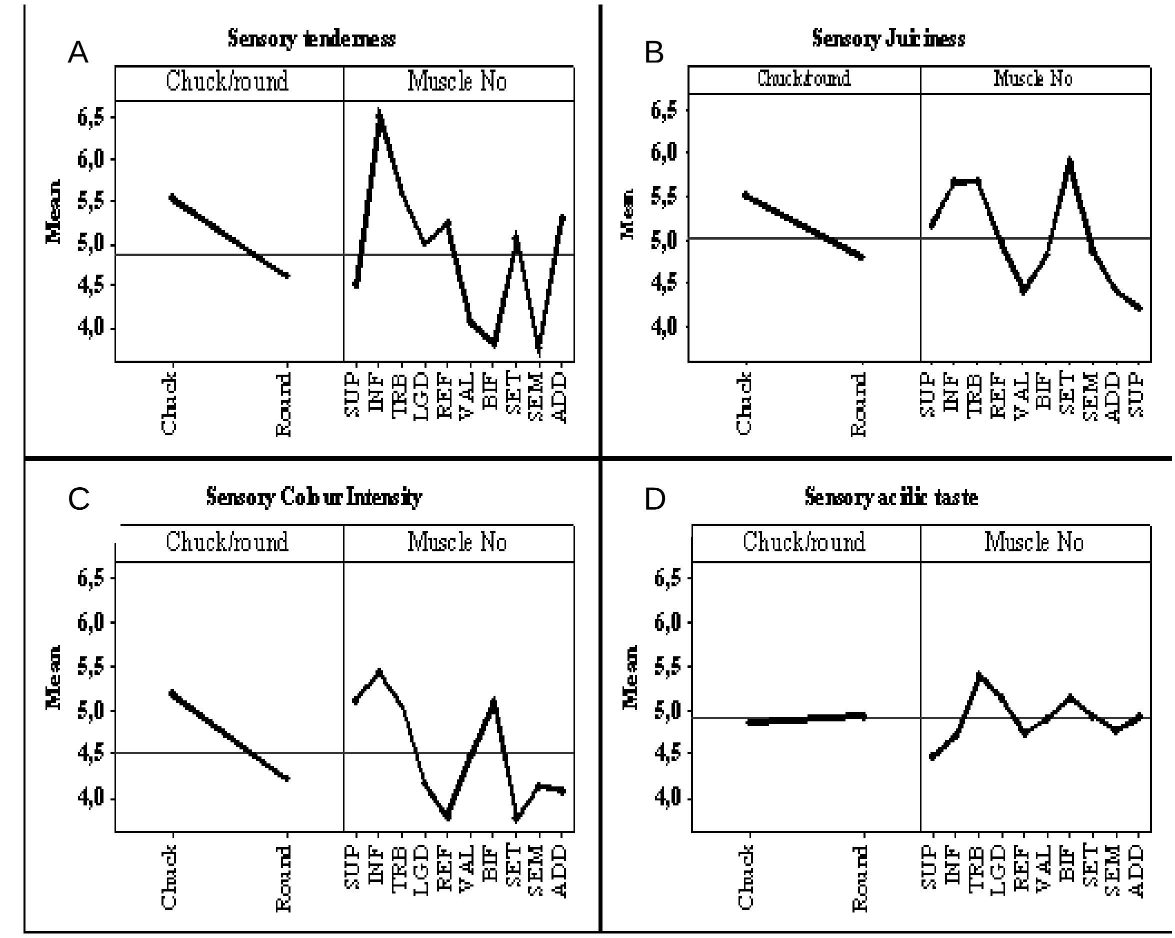

Figure 2 A-D. The results for each muscle for sensory tenderness, juiciness, colour intensity and acidic taste.

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