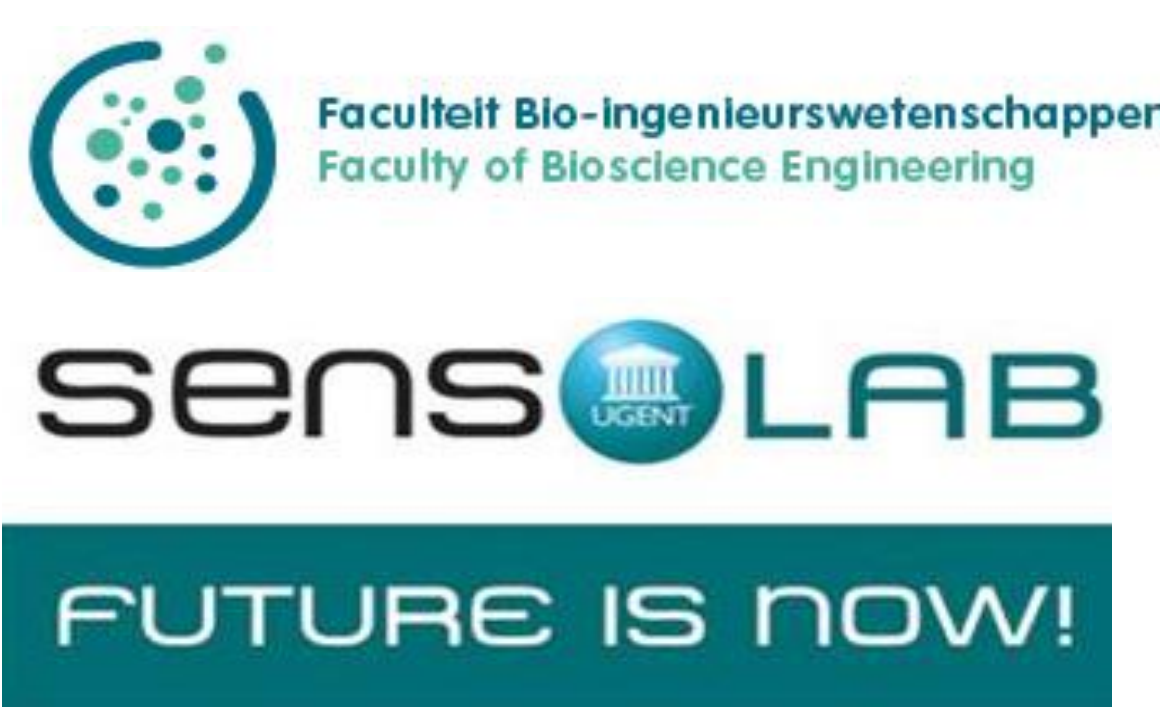


Linking instrumental, sensory and emotional evaluation of flavoured chocolates.



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Objectives

Research on emotions associated with food products is gaining popularity in food sensory and consumer research since emotions can influence consumers’ consumption behaviour and offer competitive advantages for food companies. Moreover, more companies and research is performed with consumers instead of trained panelists for the sensory evaluation of food products. But, little is known if instrumental measurements could provide additional information for emotional measurements and similar results with consumer evaluation

Therefore, the aim of this study was to examine if

This aim of this study was to examine if instrumental evaluations of flavoured chocolates could be linked to emotional and sensory profiling by consumers.

Materials & methods

PRODUCTS:

- 3 Flavoured chocolates:
 - Mint
 - Strawberry
 - Orange



- Reference:
 - Dark chocolate (similar cocoa%)



INSTRUMENTAL EVALUATION

- GC-MS
 - headspace solidphase micro-extraction

- DCS
 - Melting point
 - TA Instruments, heat-flux DSC, refrigerated Cooling System
 - 10 times measured for repeatability

- Penetration test
 - Lloyd Instruments TA500 Texture Analyzer
 - 3 times measured for repeatability

CONSUMER TEST

- Sensory evaluation
 - 1 Reference and 1 flavoured chocolate
 - Overall liking
 - Emotional conceptualizations and sensory attributes
 - Rate-all-that-apply
- Socio-demographic
 - age, gender

- Location: consumer goods trade fair

STATISTICAL ANALYSIS: IBM® SPSS 22

RESPONDENTS

- Mint: 51 respondents (30% ♂, 70% ♀)
- Strawberry: 41 respondents (42% ♂, 58% ♀)
- Orange: 60 respondents (45% ♂, 55% ♀)

Results

INSTRUMENTAL EVALUATION

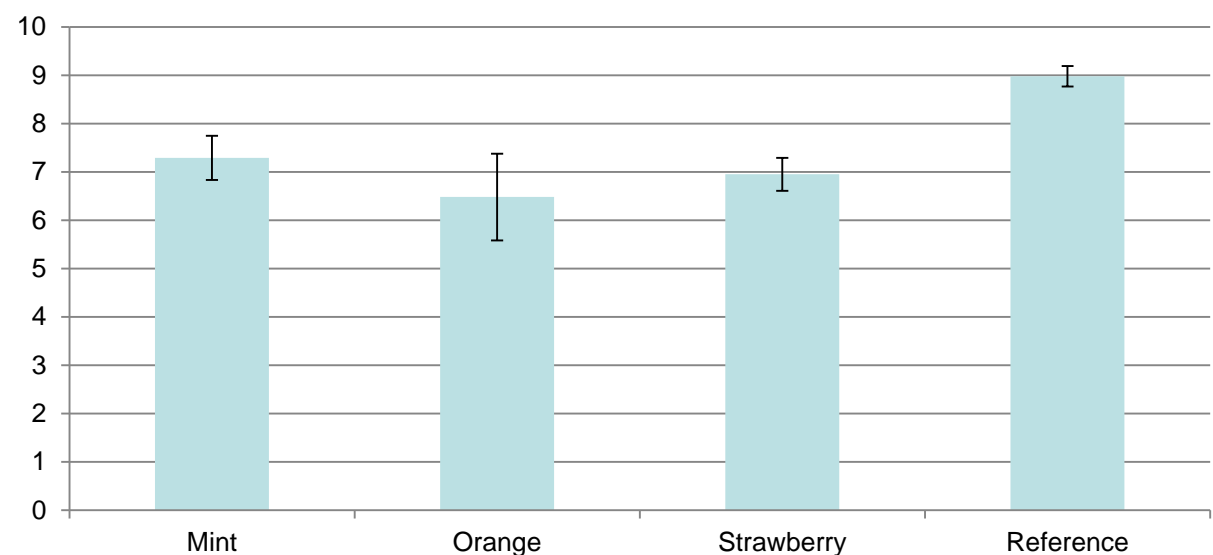
GC-MS

Concentration (g/L)	DC	OC	MC	SC	Flavour
Undecane	0,338 ± 0,001	0,338 ± 0,001	0,338 ± 0,001	0,338 ± 0,001	/
2,3-butandiol	0,736 ± 0,2	0,976 ± 0,228	1,472 ± 0,573	1,147 ± 0,222	Sweet, flowery
Benzyl alcohol	0,341 ± 0,098	0,320 ± 0,148	0,468 ± 0,267	0,758 ± 0,117	
Benzaldehyde	0,326 ± 0,080	0,308 ± 0,111	0,322 ± 0,111	0,465 ± 0,057	Nutty bitter
2,3,5-trimethylpyrazine	0,214 ± 0,048		0,113 ± 0,040	0,177 ± 0,027	Chocolate, cocoa
tetramethylpyrazine	0,810 ± 0,181	0,330 ± 0,126	1,318 ± 0,600	1,003 ± 0,131	
2-acetylpyrrole	0,096 ± 0,031	0,692 ± 0,322	0,421 ± 0,266	0,503 ± 0,085	Hazelnut
Limonene	0,458 ± 0,193	35,779 ± 6,449	0,903 ± 0,286	0,247 ± 0,049	Orange
Menthol			19,568 ± 7,451		
l-menthone			15,121 ± 5,279		Mitty
Hydroxydimethyl furanone				1,058 ± 0,375	
cis-3-hexenylacetate				2,668 ± 0,373	flowery, strawberry

Melting point

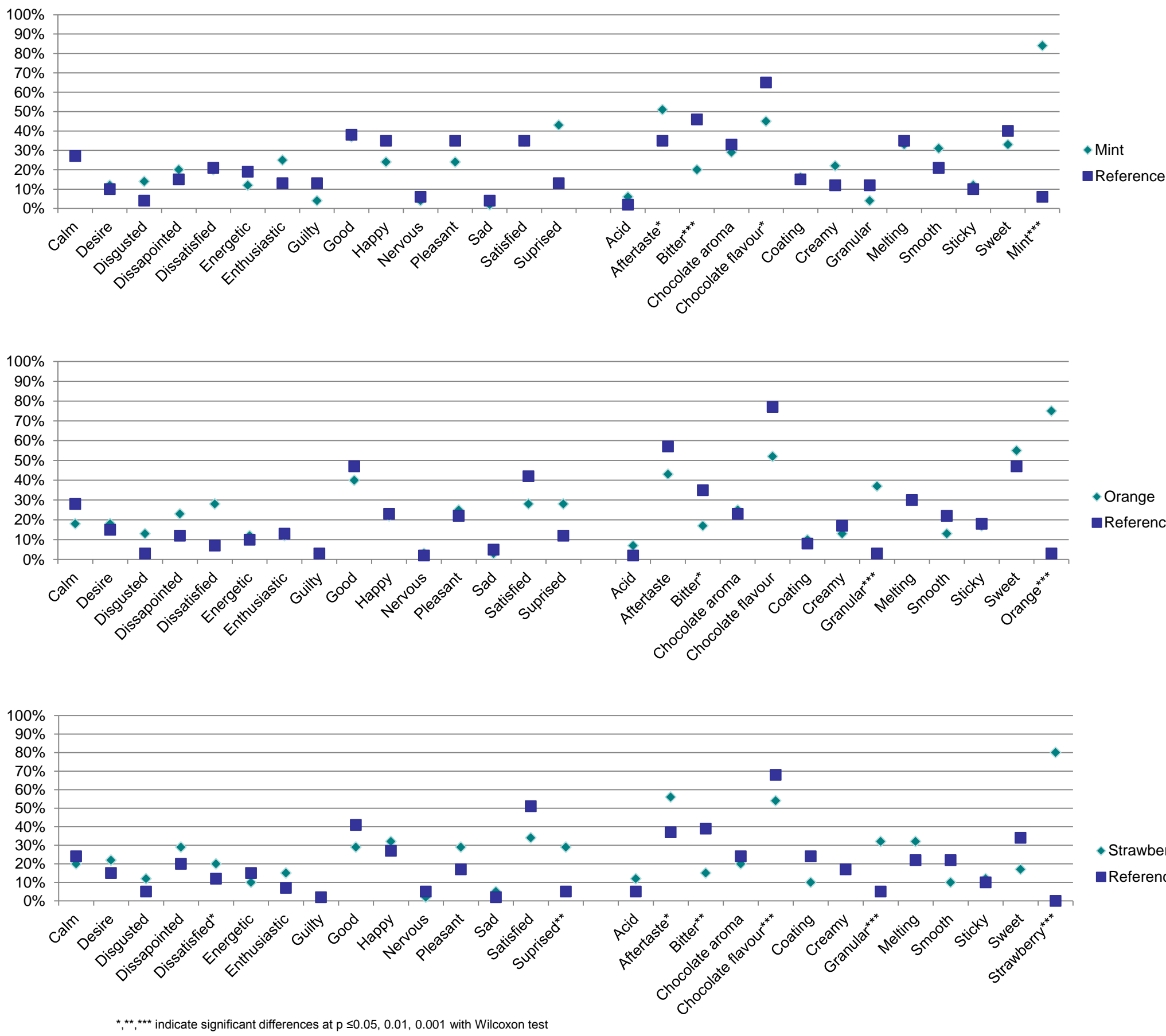
Chocolate	Melting point (°C)	Means	Standard deviation	Enthalpy (W/g)	Enthalpy J	Means	Standard deviation
Dark chocolate							
Sample 1	35,26	34,86	0,3736	-0,154	-0,1502	-0,1464	0,0038
Sample 2	34,52			-0,1454	-0,1426		
Sample 3	34,8			-0,1465	-0,1463		
Orange-chocolate							
sample 1	33,94	33,48	0,5519	-0,2726	-0,2571	-0,2318	0,0568
sample 2	33,64			-0,1713	-0,1667		
sample 3	32,87			-0,2762	-0,2714		
Mint-chocolate							
sample 1	33,56	33,14	0,3853	-0,1808	-0,1747	-0,1697	0,0057
sample 2	33,07			-0,1745	-0,1709		
sample 3	32,8			-0,1701	-0,1635		
Strawberry-chocolate							
sample 1	32,59	32,97	0,6962	-0,0587	-0,0574	-0,0520	0,0330
sample 2	32,54			-0,08504	-0,0820		
sample 3	33,77			-0,0173	-0,0166		

Penetration test

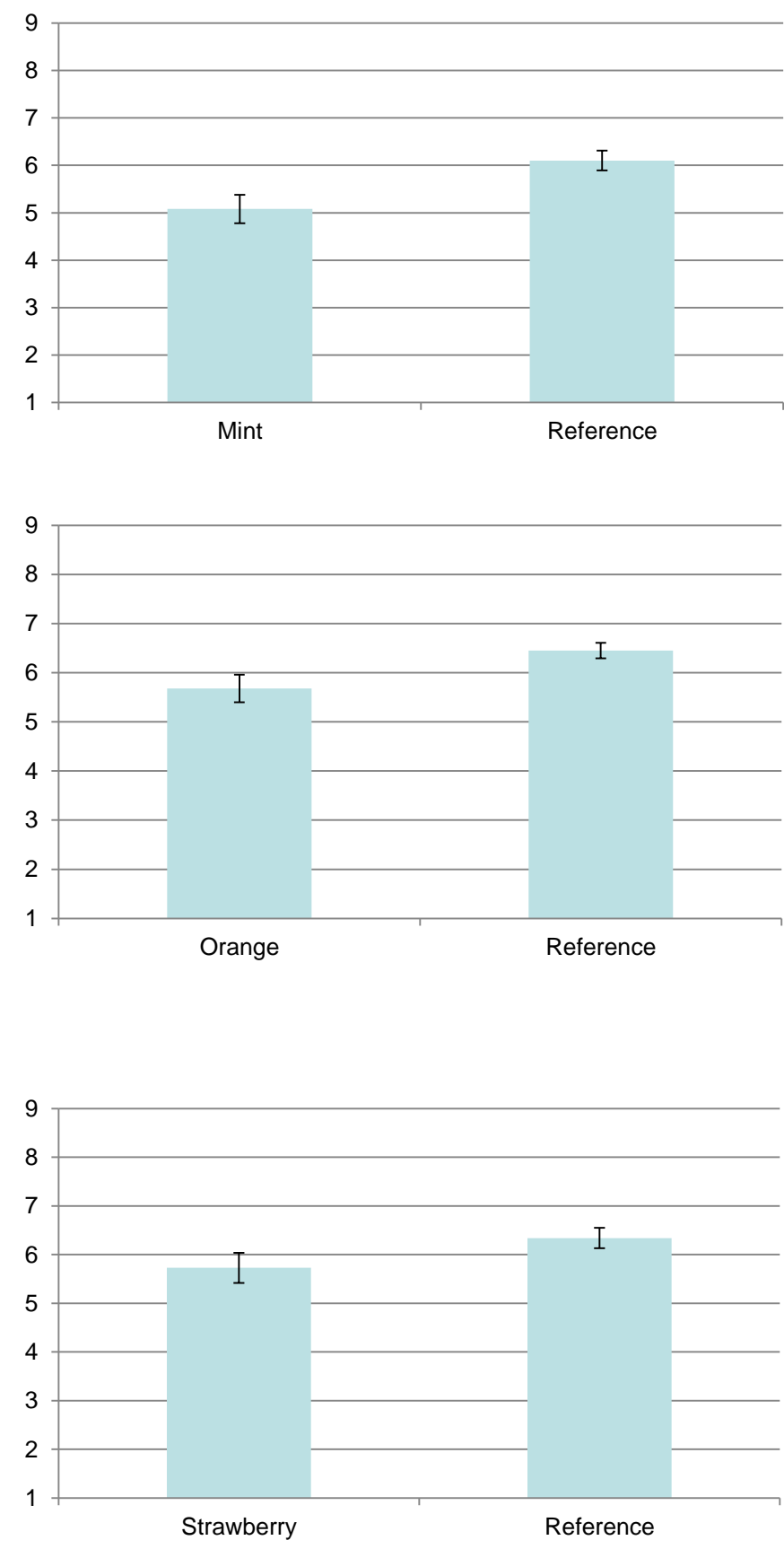


CONSUMER EVALUATION

Sensory and emotional profiles



Acceptance



Conclusions

- ✓ Sensory evaluation by consumers shows similar results with instrumental measurements
- ✓ Consumers still preferred regular chocolate, however consumer clustering revealed certain target groups keen of a specific flavoured chocolate
- ✓ Almost no differences were found between the emotional profiles when comparing a flavoured chocolate with reference chocolate

Practical applications:

This study shows that the overall acceptability and emotional profiles differs between flavoured chocolates. It explores how sensory characteristics, overall acceptability and emotional conceptualisations are interrelated which can offer interesting insights for both scientific research as food companies. Future research could include larger consumer groups, additional instrumental measurements and other food products.