Importance of the sensory and consumer methods for food businesses

Tünde Kuti, Campden BRI Hungary
Objectives

1. Highlight the role and best practice of Sensory Analysis
2. Overview of most frequently used sensory methods
3. Give a hint about novel approaches in consumer and sensory science
Sensory Evaluation - Definition

‘sensory discipline used to evoke, measure, analyse and interpret reactions to stimuli perceived through the senses’. *

The sensory properties of food/drink products are a major factor in ensuring product success

* ASTM 253-04a, Standard Terminology relating to Sensory Evaluation of Materials and Products, 2000
Why do consumers continue to purchase products?

- Quality
- Consistency
- Value for money
- Satisfaction

Underpinning satisfaction is sensory delivery
Introduction

• Tasting sessions are carried out in almost every food company e.g.:
  – Quality control
  – Product development
  – Research

• Informal tasting environment may provide ad hoc opinions, observation and comments.
  – But lack of structure and right methodology makes it quite wrong environment for collecting reliable information.

• Can it support major decisions????

It has numerous applications, provides input into a lot area!

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Achieving scientific control – Apply GLP

- Define test objective
- Define test type
- Select right assessors
- Ensure right test area (light & air quality, noise, space)
- Handle and prepare the sample in appropriate way
- Pay attention to test set-up, written test method and procedure
- Store your and archive documents safe and in logical order.

This will help you to eliminate biases

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Why use People?

- No instrument available to measure sensory quality
- Relatively easy to train
- Rapid response, easy to interpret
- Provides quantitative and qualitative info
Why Screen Assessors?

- People are all different
  - physiologically and psychologically
- To identify impairments \((ISO\ 8586:2012)\)
  - training cannot correct deficiencies
- To determine sensitivities \((ISO\ 3972:2011)\)
  - especially with regard to taint identification
- To evaluate ability \((ISO\ 8586:2012)\)
  - to verbalise perceptions and to communicate them
TEST YOURSELF!
**PROP test**

Based on Propylthiouracyl (PROP) the people can be categorized as:

- Non-tasters
- Medium tasters
- Super-tasters

„Supertasters“:

- Has more papillae
- In Europe the 25% of the people are PROP Taster
- Women & Children are more sensitive
Methods for sensory analysis
Most frequently used sensory test procedures

Analytical test

Descriptive test
“What is the nature of the differences?”
“How big are the differences?”

Simple descriptive
Profiling
Time intensity

Difference test
“Does sensory difference exist between samples?”
“Are there perceivable differences?”

Triangle test
Paired comparison
Duo-trio test

Hedonic test

Preference test
Acceptability test

NEW TREND Transfer of sensory methods to the consumer

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Applications of Difference Tests

- Assessing the effect of changes in raw material, process and or packaging on finished product quality
- Investigating the presence of off-flavours and taints
- Determining changes in product quality over shelf life
- Verifying changes to formulations during product development
Applications of Descriptive Profiling

• The effect of a manufacturing process change (e.g. ingredients, temperature) on the sensory characteristics of the product

• Defining the sensory properties of a target product for new product development

• Describing product attributes prior to consumer testing

• Defining the characteristics (specification) of a control or standard, for QA/QC and R&D applications
Example for Descriptive Profiling

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISCUIT DHA</td>
<td>4.57</td>
<td>A</td>
</tr>
<tr>
<td>BISCUIT DHA+AC</td>
<td>3.93</td>
<td>BC</td>
</tr>
<tr>
<td>BISCUIT AC</td>
<td>3.79</td>
<td>BC</td>
</tr>
<tr>
<td>BISCUIT DHA+BG</td>
<td>3.29</td>
<td>C</td>
</tr>
<tr>
<td>BISCUIT BG</td>
<td>2</td>
<td>D</td>
</tr>
</tbody>
</table>

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The Role of Sensory in Quality Control

- How does the product meet the company specifications with respect to sensory quality?

- How does the sensory quality fit in with the total quality of the product?

- What variation in quality is to be expected?

Requirements of any system that is going to be applied to a production environment:

Rapid, Uniform, Simple, Reliable, Valid
Key Stages

- Define a **realistic target product** - Consumer or in-house focused
  - Key sensory characteristic

- Establish a viable **acceptance range**
  - Limits of consumer tolerance

- Select and **train assessors**

- **Standardize and document procedures**, action plan in place
### Example for Quality Control

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Depth of Colour</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloss</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Presence of Cracking</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Presence of air bubbles</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Odour</th>
<th>Intensity of chocolate aroma</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intensity of nut filling aroma</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Off odour</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

### Quality Index Method

Sensory Evaluation of Fish Freshness, Emilia Martinsdóttir, Kolbrún Sveinsdóttir, Matis, Iceland

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**Quality ratings methods with targets**
New approaches
Transfer of sensory methods to the consumer

• Product characteristics from the consumers’ perspective
  – Penalty analysis
  – Napping – rapid method
  – Temporal methods

• Measuring product shelf-life with consumers
  – Survival analysis

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Penalty Analysis – Attribute diagnostics

- In consumer surveys **diagnostic attributes** frequently applied
- Penalty analysis is a way to analyse the JAR data in order to quantify and hierarchize the impact of sensory characteristics on the overall liking of the product...

<table>
<thead>
<tr>
<th>Hedonic Liking Scale</th>
<th><strong>Just About Right Scale</strong> „DIAGNOSTIC ATTRIBUTES”</th>
<th><strong>Collapsed Scale Definition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Like extremely</td>
<td>5 Much too much/too strong</td>
<td>Too much/too strong</td>
</tr>
<tr>
<td>8 Like very much</td>
<td>4 A little too much/too strong</td>
<td>Just about right</td>
</tr>
<tr>
<td>7 Like moderately</td>
<td>3 Just about right</td>
<td>Not quite enough</td>
</tr>
<tr>
<td>6 Like slightly</td>
<td>2 Not quite enough</td>
<td>Not enough</td>
</tr>
<tr>
<td>5 Neither like or dislike</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Dislike slightly</td>
<td>1 Not enough</td>
<td></td>
</tr>
<tr>
<td>3 Dislike moderately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Dislike very much</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Dislike extremely</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example of Penalty analysis

### Table 1: Percentage of Penalties for Various Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>%</th>
<th>Mean drops</th>
<th>Total penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too hard</td>
<td>74.2</td>
<td>1.1</td>
<td>81.2</td>
</tr>
<tr>
<td>Too weak filling fl.</td>
<td>36.7</td>
<td>2.1</td>
<td>77.2</td>
</tr>
<tr>
<td>Too week filling ar.</td>
<td>44.2</td>
<td>1.5</td>
<td>65.9</td>
</tr>
<tr>
<td>Too weak sweet fl.</td>
<td>24.2</td>
<td>1.99</td>
<td>48.2</td>
</tr>
<tr>
<td>Not greasy enough</td>
<td>22.5</td>
<td>1.8</td>
<td>41.4</td>
</tr>
<tr>
<td>Too weak choc ar.</td>
<td>31.7</td>
<td>1.2</td>
<td>39.3</td>
</tr>
<tr>
<td>Too weak sweet ar.</td>
<td>27.5</td>
<td>0.8</td>
<td>20.8</td>
</tr>
</tbody>
</table>

### Table 2: Percentage of Penalties for Various Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>%</th>
<th>Mean drops</th>
<th>Total penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too week filling ar.</td>
<td>36.7</td>
<td>1.2</td>
<td>42.9</td>
</tr>
<tr>
<td>Too hard</td>
<td>28.3</td>
<td>0.7</td>
<td>19.0</td>
</tr>
<tr>
<td>Too greasy</td>
<td>22.5</td>
<td>0.9</td>
<td>20.9</td>
</tr>
</tbody>
</table>
Rapids methods - napping

Projective napping with consumers for quick identification overall differences and similarities between a set of product samples.

Ref: Sarah Gough, June 2011, Sensory Dimensions
Temporal – methods - Temporal dominance of sensation (TDS)

Complex profile? Changing with time?

This wine is first sweet, than sour and finally dominated by a strong astringency and some bitterness

Ref.: Pascal Schlich (INRA), Centre des Sciences du Goût et de l’Alimentation
schlich@dijon.inra.fr
Survival analysis – measurement of shelf life with consumers

• How much can my product change before consumers reject it???

• Shelf-life estimation of 1 or several formulations of a product using consumers

• Modelling/predicting the % of rejection by consumers, from production to end of life

• Applicable when quality changes rather than microbiological safety are the deciding factors
Examples of survival analysis

• Advantages
  – Taps into direct consumer experience, with simple questions

• Applications
  – To confirm current shelf-life
  – When relying on consumers is preferred or when trained panel is not available
  – Can distinguish between various formulations

Ref: Marleen Chambault, Campden BRI (Chipping Campden, UK)
Take home messages - Minimise biases and calibrate your instrument!

- For assessing the sensory quality of the products the reliable and objective sensory analysis is essential.

- Invest into the training of your assessors because they are our measuring instruments! – The invested money, time and energy will pay back!
Take home messages – Get to know your consumers and their needs!

- The new consumer evaluation techniques contribute to the better understanding of consumers’ needs
- Make use of the opportunities of new sensory and consumer research techniques!
- For the successful implementation of consumer tests it is essential to follow standardized & controlled protocol.
Conclusion

• For each testing situation is very important:
  – To identify right objective
  – To choose the right method.

• Keep the all variables under control
  – To ensure that differences detected during sensory test, coming from the product.

Or your results will not be meaningful!
Thank you for your attention!

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References and further readings

  – Guidelines for Sensory Analysis in Food Product Development

• **D. Kilcast (2010)**
  – Sensory analysis for food and beverage quality control

• **M. Meilgaard, G. V. Civille, B. T. Carr (1999)**
  – Sensory Evaluation Techniques, 3rd edition

• **EA-4/09**
  – Accreditation for Sensory Testing Laboratories

• **Paula Varela, Gastón Ares (2014)**
  – Novel Techniques in Sensory Characterization and Consumer Profiling