

Quality assessment of sensory data (Flavoured waters)

Challenge

Assessing the quality of sensory data for a beverage manufacturer wanting to introduce a new type of flavoured water to the market.



In a descriptive sensory panel, the panelists act as instruments and objectively score pre-defined attributes for a number of products. It is crucial to train and calibrate the panel properly, in order to obtain reliable results. However, humans are by nature not instruments, and the sensory evaluations may be affected by variations in the panelists' psychological and physical conditions. It is therefore necessary to continuously monitor and evaluate the performance of a sensory panel.

The Quali-Sense software is tailor-made for monitoring panel performance and validating sensory profiling data. It contains a collection of statistical tests, covering the panelists' sensitivity, reproducibility, agreement, cross-over and rank correlation. Quali-Sense enables panel leaders to give constructive feedback to each panelist, and map the need for training. It also evaluates the relevance of the sensory attributes, and ensures that the final sensory profiles are reliable and can be used as basis for research and product development.

“Humans are by nature not instruments, and the sensory evaluations may be affected by variations in the panelists' psychological and physical conditions.”

Solution

Compare the test samples with trained sensory panels, discover the panelists' sensitivity, reproducibility or cross-over issues for each attribute, check the global panel agreement for decision-making and further data analysis.

Dr. Ingrid Måge
CAMO Software AS,
Oslo, Norway

Sensory evaluations of flavoured waters

A beverage manufacturer wants to introduce a new type of flavoured water to the market. In the first stage of product development, he wants to compare a set of 18 test samples using a trained sensory panel. The 11 panelists were trained and calibrated to score 23 different attributes (listed in the box to the right) on a 0-10 scale. Before analysing the data, the scores are evaluated using Quali-Sense.

Sensitivity and reproducibility

The first step is to single out attributes where the panelists are not able to sense differences or reproduce their scores. These attributes don't contain any information, and should be removed from the sensory profile. The results showed that the reproducibility was generally good, but four attributes had to be removed because of low sensitivity. The four discarded attributes are marked in yellow in the attributes list. Table 1 shows the sensitivity results for a selection of the attributes.

Sensory attributes for flavoured waters

- Odour tropical
- Odour synthetic
- Odour sulphurous
- Odour skin
- Odour ripe
- Odour lactonic
- Odour green
- Odour floral
- Odour candy
- Lactonic
- Green
- Floral
- Dry
- Candy
- Bitter
- Tropical
- Synthetic
- Sweet
- Sulphurous
- Sticky
- Sour
- Skin
- Ripe

Quality assessment of sensory data (Flavoured waters)

Agreement and use of scale

Next, the judges who don't agree with the panel consensus are identified. The reason for disagreement could be either deviating perception or wrong use of the scale. One of the panelists was found to have misunderstood the scale of attribute Odour ripe. The panelist has ranked the waters in completely opposite order to the rest of the panel, which clearly can be seen in the eggshell plot (Figure 1). This is called a cross-over effect.

Panelist	Odour green	Odour ripe	Odour skin	Odour ripe
11	0.53	0.10	0.51	0.12
12	0.62	0.00	0.26	0.01
16	0.50	0.08	0.80	0.05
23	0.50	0.00	0.56	0.00
25	0.51	0.01	0.52	0.00
26	0.01	0.15	0.75	0.00
28	0.07	0.00	0.56	0.05
30	0.50	0.71	1.00	0.07
32	0.09	0.00	0.40	0.81
33	0.43	0.00	0.53	0.00
34	0.73	0.02	0.66	0.10

Table 1: The table shows p-values from a statistical test of sensitivity, where high p-values correspond to low sensitivity. The results show that sensitivity towards odour ripe and ripe is excellent for almost all panelists, while few are able to detect differences in odour green and odour skin.

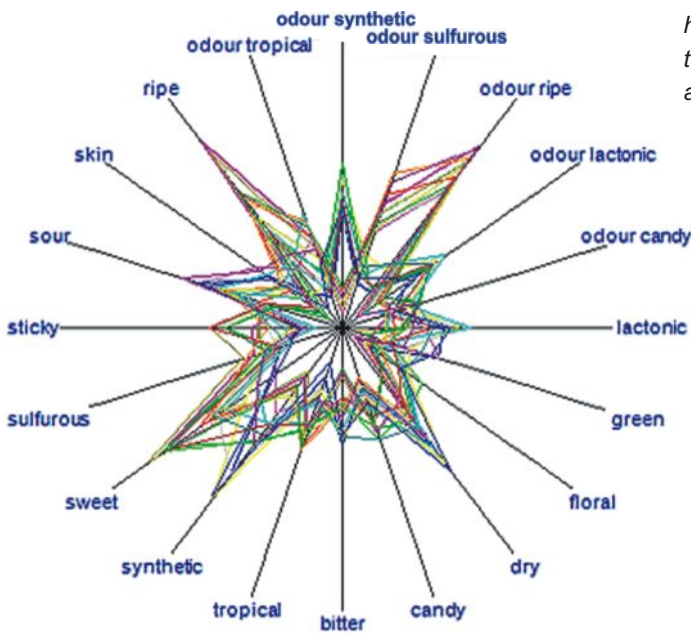


Figure 2: Average sensory profile for the 18 waters.

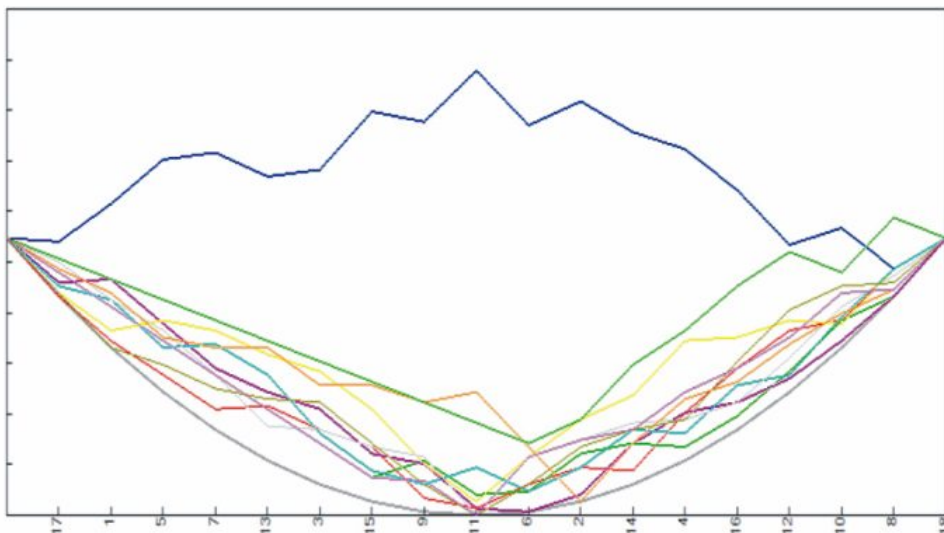


Figure 1: Eggshell plot for the attribute Odour ripe. The blue line is curved opposite of the eggshell, which means that the panelist has ranked the products in opposite order to the rest of the panel.

Conclusion

The Quali-Sense analysis verified that the panel performed well, with the exception of one severe cross-over error. Four attributes were also removed due to low sensitivity.

A sensory profile for each water sample was calculated as an average over all panelists (see Figure 2). The average profiles were exported to The Unscrambler® software for further multivariate analysis.

Application note overview

Software	Quali-Sense
Data type	Sensory profiling data
Industry	Food and Beverage
Added Value	The sensory panel scores were validated and can thereby confidently be used for decision-making and further data analysis.