

Application of Temporal Dominance of Sensation in the Study of Sensory Shelf life of Sugar Reduced Products

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Background and aims

Dynamic sensory techniques provide sensory perception data during the eating process. Currently, the use of these techniques has increased. This project was divided in two case studies: one on long life sugar reduced soft drinks using the following sweeteners: sucralose, sucralose/acesulfame-K (Ace-K) and sucrose and another one on a shorter shelf life product: chocolate mousse. The main objectives of this study was to investigate the stability and the evolution of those sweeteners perception through storage and also the added value of using a dynamic sensory methodology: the Temporal Method of Sensations (TDS).

Study design and methodology

| Product | Time points (days) | Trained panel | Consumers | Instrumental |
|------------------|---------------------|---------------|---|---|
| Citrus drink | 0, 45, 90, 150, 195 | TDS | <ul style="list-style-type: none"> Overall liking Acceptability Sweetness perception | <ul style="list-style-type: none"> Colour measurement |
| Chocolate Mousse | 1, 2, 6, 8, 15/16 | TDS | <ul style="list-style-type: none"> Overall liking Acceptability | <ul style="list-style-type: none"> Texture measurement Microscopy |

Results – Citrus Drink

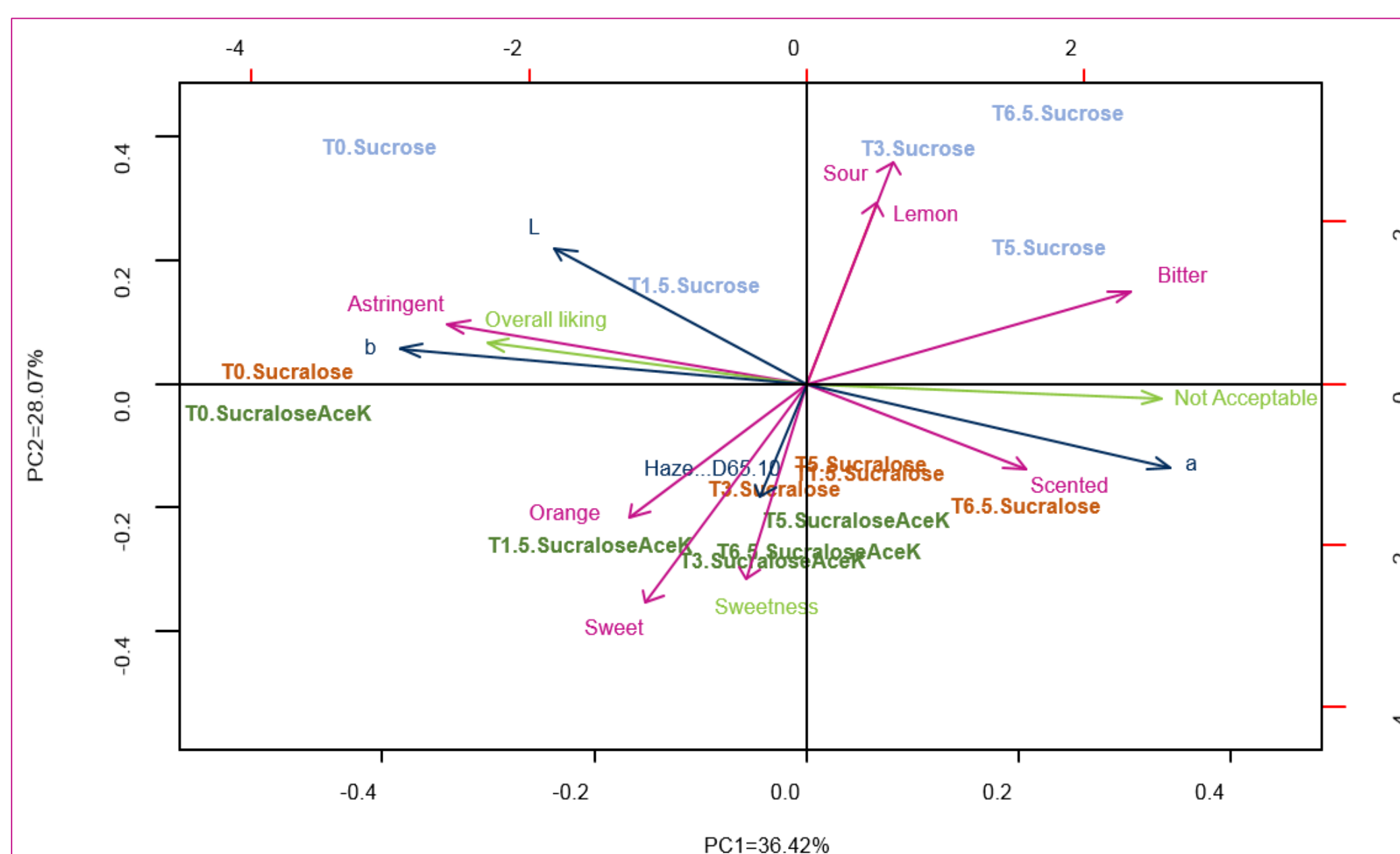


Figure 1: Principal Component Analysis biplot for TDS, Instrumental and Consumer acceptability data

- The fresh samples (T0) are positively correlated with a high overall liking and negatively correlated with the not acceptable variable. Those samples are also characterised by high L and b colour values.
- As the samples get older, the final perception is getting more sour, sweet and bitter for sucrose and scented for sucralose. Astringent is a finish characteristic of fresh samples.
- The sucrose sample is ageing showing the following characteristics: sour, lemon and bitter.
- The sucralose and sucralose/Ace-K seem to be closer to each other than to the sucrose sample. However, the sucralose/Ace-K seem positively correlated with the orange and sweet variables whilst the sucralose seems correlated with the scented variable (especially at T6.5).

Results – Chocolate Mousse

- Partial Least Square regression was used in order to correlate the TDS data with the consumer data. The data used was the area under the TDS curves split in 5 equal sections (t1 – t5). The area under the curve was computed for each attribute within each section.
- The first axis (PLS1=86.16%) highlight the fact that sucrose and the two erythritol formulations tend to be liked for their chocolate flavour and sweetness.
- The analysis didn't differentiate the time at which those attributes were perceived dominant. This is the case especially for sweetness whilst chocolate seems to have a slightly higher impact on liking at T2 and T4. Maltitol scored less on overall liking and this could be explained by a higher astringency (especially toward the end of the evaluation) in comparison to the other samples. The blank sample tended to be disliked because of its astringency, powdery and mouthcoating start (T1) and also its overall bitterness (T1, T2, T3, T4 and T5).

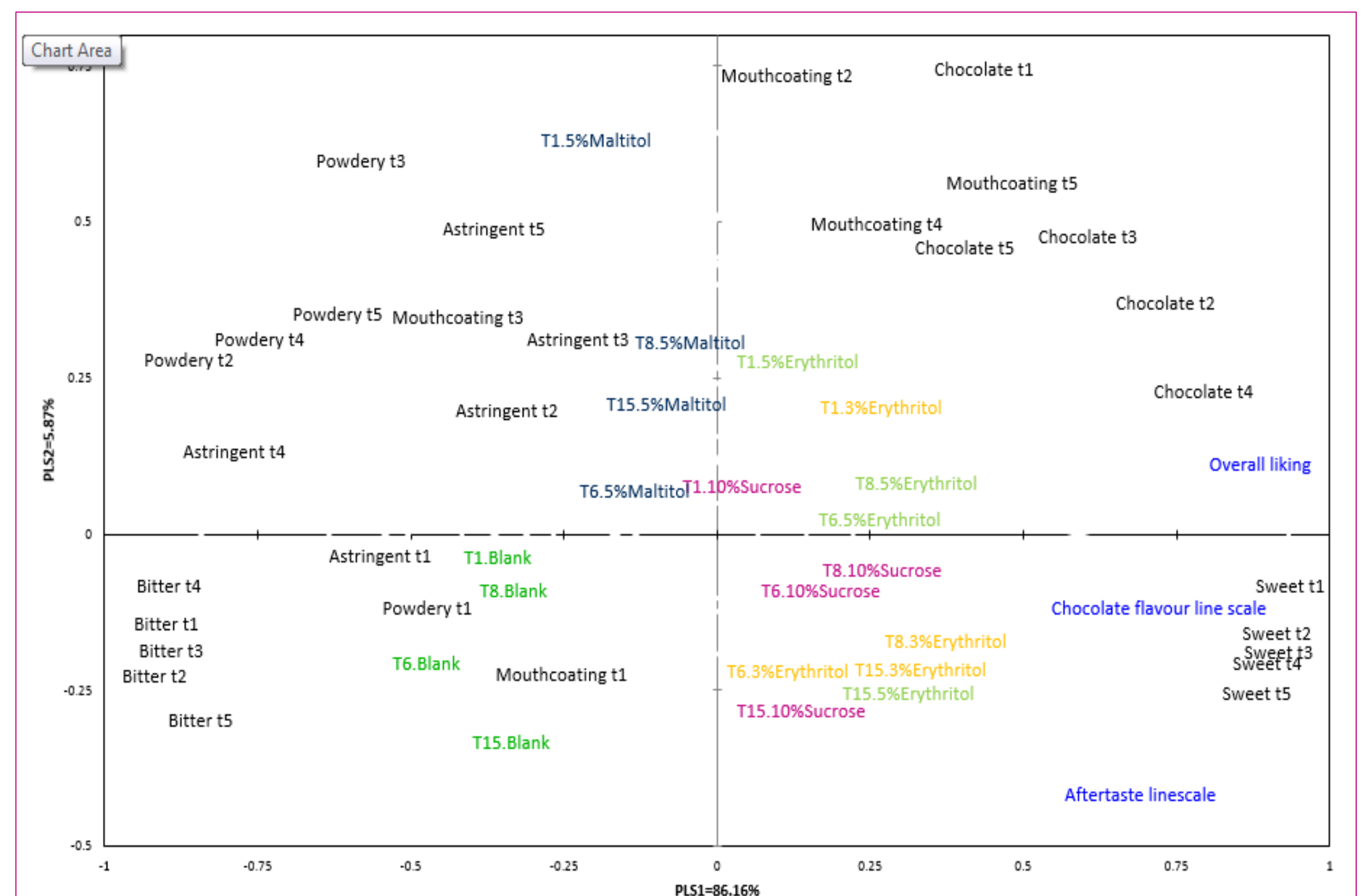


Figure 1: PLS regression on consumer measurements (Overall liking, Chocolate flavour intensity perception, aftertaste intensity perception) VS trained panel measurement (Area under TDS curves) – PLS1= 86.16% ; PLS2=5.87%

Conclusions

Although TDS is a relatively recent method, several developments regarding the method have been seen over the last 10 years. Those developments have been on the methodology itself (e.g. use of buttons instead of intensity scales) and on the way the data is analysed (e.g. classic dominance curves, PCA with area under the curves, sensory trajectories). By applying some of those improvements, this study was able to show that dynamic methods such as TDS give greater understanding of the perception of food samples during storage. The correlation of the TDS data with consumer's overall liking and acceptance helped explain the possible reasons for the rejection of the samples when it ages. PLS regressions identified potential driver of liking such as sweetness and bitterness