Combining Flavor Profiling and Temporal Dominance of Sensation to More Effectively Understand the Profile of Sweeteners

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Introduction

Understanding the sensory perception of high intensity sweeteners is important for the food and flavor industry. Mainly driven by the consumer trend to replace sugar sweetened products with lower caloric alternatives. Consumers want the sweetness profile and intensity of sugar in healthier products. However, many high intensity sweeteners (HIS) are accompanied by undesirable "off notes". This off-taste is described as a 'surprise' taste that comes in after the initial taste.

Quantitative Flavor Profiling (QFP) is used to measure intensity ratings of different attributes and Temporal Dominance of Sensation (TDS) is used to assess how the dominant attributes change over time .

Objective: To describe and compare the sensory perception, including temporality, of several high intensity sweeteners using two descriptive methods.

Materials & Methods

Trained panelists (n=11) were trained with references to better describe the high intensity sweeteners evaluated. All the sweeteners were made equi-sweet to an 8% sucrose standard.

Quantitative Flavor Profiling (QFP)

- Panelists evaluated 25 ml of each sample, presented monadically in a 3-digit randomly coded clear, plastic cup.
- 2 repetitions were collected using Compusense v 5.0 (Guelph, Canada). Attributes were rated immediately upon swallowing using a 100 point scale.
- 2 minutes was given between each evaluation.

Temporal Dominance of Sensation (TDS)

- Attributes were selected by consensus which has shown to give better results by research conducted by Gaelle Lecourt at Givaudan, Cincinnati, USA
- Panelists evaluated 20 ml of samples presented in a 3-digit randomly coded clear, plastic cup.
- Evaluated occurred over 6 sessions with an anchor samples in each sessions for alignment.
- Dominant attributes were evaluated immediately upon placing the solution in the mouth.
- After 6s, panelists were prompted to swallow and continued to evaluate dominant attributes until no sensation was perceived or the maximum evaluation of 120 s was reached.
- A randomized block design was used. 5 minutes break was given between evaluations. Data was collected using FIZZ v 2.21

Data Analysis

- Profiling data were analyzed using ANOVA ($p < 0.05$), and Tukey's post hoc test to determine significant differences.
- For TDS, dominant attributes were reported graphically with significance line calculated by FIZZ.

Results & Discussion:

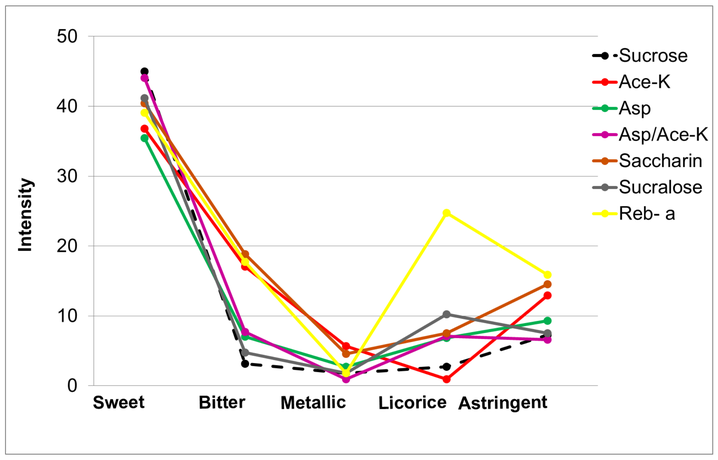

Fig 1: QFP Profile of High Intensity Sweeteners

Sucrose had a "clean" profile while the other sweeteners also imparted Bitter and Licorice notes

Differences were seen between Bitter, Licorice and Astringent levels (Fig 1). Saccharin and Ace-K were significantly higher for Bitterness and Astringency

Sucralose had the highest intensity of Licorice which was significantly higher than that in Ace-K.

Compared to Sucrose, Reb-A had significantly more intense Bitterness, Licorice and Astringency.

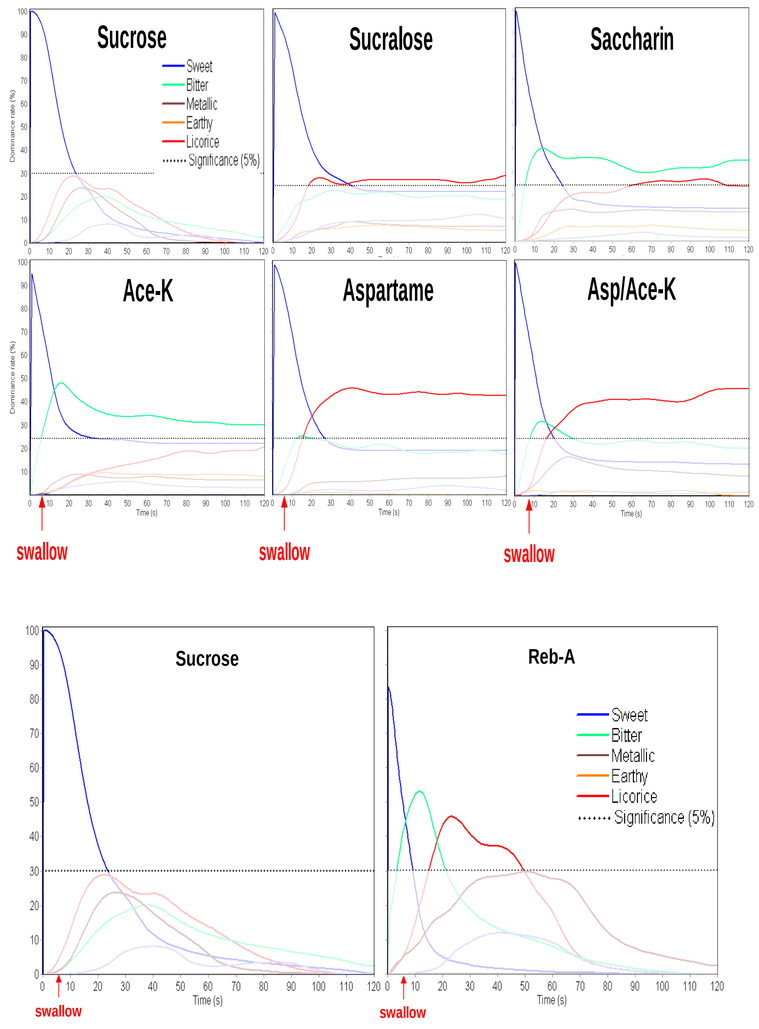

Fig 2:: TDS Profile of High Intensity Sweeteners

Sweet was the only dominant attribute for Sucrose whereas the HIS had other dominant attributes.

Ace-K /Asp blend has less bitter and licorice dominance compared to Ace-K and Asp, respectively

Sucrose and Saccharin had similar duration of Sweet dominance (24s) while Sweetness of the others lasted up to 40s.

Licorice dominance for Sucralose, Asp and Asp/Ace-K lasted for the duration of the evaluation.

Licorice dominance for Saccharin was brief and towards the end (47s),while Ace-k showed no Licorice dominance.

Saccharin and Ace-K had a long Bitter dominance (115s) as opposed to Asp and Asp/Ace-K (7-21s). Sucralose had no bitter dominance.

Reb-A had a short Sweet dominance compared to sucrose.

For Reb-A, Bitterness and Licorice were dominant from 5-12s and 10-40s, respectively, however had a shorter duration compared to the other sweeteners.

Reb-A has high intensities in Bitterness and Licorice but not increased duration of dominance of these attributes.

Conclusion

- QFP and TDS both provide information about the perception of sweeteners. However TDS gives more temporal perception and an understanding of how the off-notes occur over time.
- The two methods show that intensity and dominance are not parallel. As seen with Reb-A, higher intensities of Bitterness and Licorice did not indicate an increased duration of these attributes.
- TDS further confirmed the off-note attributes seen with QFP but provides a more granular temporality of the off notes. It can also show the impact of formulation on the temporal sensation of sweeteners.