

Sweetness perception of alternative sweeteners and viscosity – is there a correlation?

INTRODUCTION

Texture and consistency feature information about the composition of food. Furthermore they take potentially influence on the whole intensity of flavour and texture perception. Based on the hypothesis that a higher viscosity intensifies flavour and texture perception, aim of the present study was to prove whether there is a correlation between viscosity and sweetness perception in sweetened smoothies.

METHODS

Two different test series of orange-apple smoothies were developed using the hydrocolloids citrus fibre and pectin adjusting three viscosity alignments (20, 40 and 70 mPas). Furthermore, sucrose as well as the alternative sweeteners erythritol, maltitol, sucralose and acesulfam-k were applied in seven formulas, exclusively as well as in combination.

After previous tests to determine the sweetness of each applied sweetener and sweetener combination, the paired comparison test (acc. to DIN EN ISO 5495) [1] as well as the Quantitative Descriptive Analysis (QDA, acc. to DIN 10967-1) [2] was conducted by an experienced sensory panel consisting of 14 panelists.

STEP 1

Paired comparison tests (21 tests for pectin and 21 tests for citrus fibre smoothies) were conducted to comprehend the influence of viscosity on sweetness perception. For this purpose each viscosity alignment within one formula was compared to each other. Based on these results different formulas were chosen for conventionally profiling.

STEP 2

Sensory profiles were realized with Quantitative Descriptive Analysis using a balanced block design with monadic sample presentation for profiling nine selected formulas with citrus fibre as well as with pectin. The sensory properties appearance, odour, flavour, texture and harmony were focused. Fourteen attributes were inquired using a scale from 0 to 10. The data were performed in three repetitions and statistically assessed by Analysis of variance and LSD test ($\alpha=0,05$).

RESULTS

This poster shows the results of the comparison between different viscosity alignments and sweetness perception. Moreover, the examination of sensory properties of orange apple smoothies by different viscosities and sweetener systems.

Same intensities of sweetness were adjusted during all sessions as well as comparable test conditions. Significant differences between the samples are marked by "*" in the spiderwebs.

PAIRED COMPARISON TESTS

Four of 21 paired comparison tests of the citrus fibre smoothies and five of 21 paired comparison tests of the pectin smoothies showed significant differences regarding sweetness. While citrus fibre smoothies with higher viscosities were perceived as significant sweeter than smoothies with lower adjustments, pectin smoothies with higher viscosities seem to act as sweetness-masking agent.

Sample 1	Sample 2	n	Answer		α
			Sample 1	Sample 2	
Erythritol (20 mPas)	Erythritol (40 mPas)	22	3	19	0,0009 ***
Erythritol_Maltitol (40 mPas)	Erythritol_Maltitol (70 mPas)	28	7	21	0,0125 *
Erythritol_Maltitol (20 mPas)	Erythritol_Maltitol (70 mPas)	21	5	16	0,0266 *
Erythritol_Sucralose (20 mPas)	Erythritol_Sucralose (40 mPas)	21	5	16	0,0266 *

Fig. 1: Differences in sweetness between citrus fibre smoothies with variable viscosity adjustments

Sample 1	Sample 2	n	Answer		α
			Sample 1	Sample 2	
Erythritol (20 mPas)	Erythritol (70 mPas)	22	12	3	0,0009 ***
Maltitol (20 mPas)	Maltitol (40 mPas)	22	17	5	0,0169 *
Maltitol (40 mPas)	Maltitol (70 mPas)	21	17	4	0,0072 **
Erythritol_Maltitol_Sucralose (40 mPas)	Erythritol_Maltitol_Sucralose (70 mPas)	20	16	4	0,0118 *
Erythritol_Maltitol_Sucralose (20 mPas)	Erythritol_Maltitol_Sucralose (70 mPas)	20	16	4	0,0118 *

Fig. 2: Differences in sweetness between pectin smoothies with variable viscosity adjustments

LITERATURE

[1] EN ISO 5495, Sensorische Analyse – Prüfverfahren – Paarweise Vergleichsprüfung (2007)
[2] DIN 10967-1, Sensorische Prüfverfahren – Profilprüfung Teil 1: Konventionelles Profil (1999)

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QUANTITATIVE DESCRIPTIVE ANALYSIS

The tests were carried out in comparison to a sucrose reference sample with a sweetness of 1,0 and an adjusted viscosity of 40 mPas.

PROFILING DATA – CITRUS FIBRE smoothies

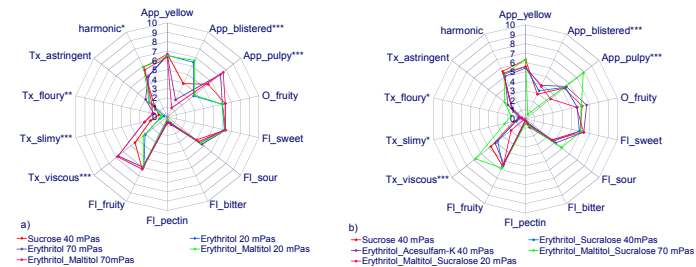


Fig. 3: Comparison of intensities between smoothies containing different amount of citrus fibre and a) polyols b) combinations of polyols and intense sweeteners

Profiling reveals significant differences in blistered and pulpy appearance, viscous, slimy and floury texture as well as in harmony. In particular, smoothies with high viscosity adjustments (70 mPas) feature significant higher intensities in pulpy appearance and in viscous, slimy and floury texture than smoothies with the low viscosity (20 mPas). The latter are significant more blistered. The sucrose containing reference sample and the erythritol_maltitol (20 mPas) smoothie show significant higher intensities regarding harmony than the solely erythritol containing samples with low (20 mPas) and high (70 mPas) viscosities.

PROFILING DATA – PECTIN smoothies

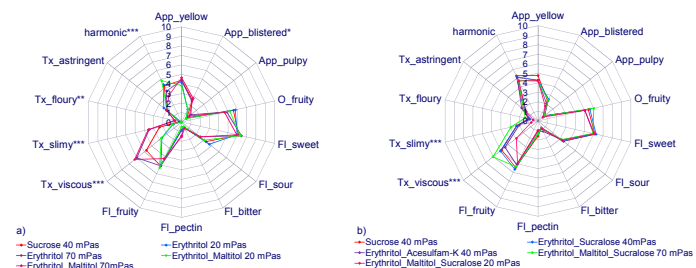


Fig. 4: Comparison of intensities between smoothies containing different amount of pectin and a) polyols b) combinations of polyols and intense sweeteners

Significant differences were determined in blistered appearance, viscous, slimy and floury texture as well as in harmony. While alternative sweetened smoothies with 70 mPas show significant higher intensities in these product properties, smoothies with the lowest adjustment feature higher intensities regarding harmony. The erythritol_maltitol smoothie with the lowest viscosity adjustment is significant more harmonic than the strong adjusted erythritol_maltitol and erythritol smoothie. No significant differences regarding harmony exist between the sucrose containing reference sample and the low viscous smoothies as well as the erythritol smoothie with 70 mPas.

CONCLUSION

Due to the results of the paired comparison tests it can be assumed that citrus fibre intensifies sweetness perception while pectin seems to mask sweet flavour. However, this trend can not be evaluated by performing conventional profiling. Significant differences occur exclusively in appearance and texture, based on the three different viscosity adjustments or rather amounts of fibre.

Both, the applied hydrocolloids and the alternative sweeteners do not influence the product characteristics odour and flavour.