

TeRiFiQ

Project no. 289397

Combining Technologies to achieve significant binary Reductions in Sodium, Fat and Sugar content in everyday foods whilst optimizing their nutritional Quality

Start date of project: 1 January 2012

Duration of project: 4 years

Call: FP7-KBBE-2011-5

Theme: KBBE.2011.2.3-05 [Processed foods with a lower salt, fat and sugar content]

Funding Scheme: Collaborative Project (small or medium-scale focussed research project targeted to SMEs)



Deliverable D4.3

Preliminary sensory analysis

Abstract: The reduced fat, salt and sugar versions of existing products of SATIVA were subjected to sensorial analysis using trained panels, with an emphasis on attributes linked to fat, salt and sugar perception.

Due date of deliverable: M36

Actual submission date: M36

Lead contractor/partner for this deliverable: CENTIV

WP4 Leader: IFR

Contributors: SATIVA

Dissemination level	
PU Public (must be available on the website)	<input checked="" type="checkbox"/>
PP Restricted to other program participants (including the Commission Services)	<input type="checkbox"/>
RE Restricted to a group specified by the consortium (including the Commission Services)	<input type="checkbox"/>
CO Confidential, only for members of the consortium (including the Commission Services)	<input type="checkbox"/>



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Glossary

Reminder of task 4.3 and deliverable 4.3

Selected formulations developed in Task 4.1 were incorporated into more realistic formulations at the pilot lab scale by SMEs (Centiv and Sativa) in Task 4.2.

The foods were formulated with degrees of salt and fat reduction, processed and then subjected to sensorial analysis using trained panels.

The sauces alone will be assessed to minimize any interactions with other components of the ready meals.

Aim

The main aim of this task 4.3 was to determine sensory characteristics of pilot scale formulations and identify the most promising strategies.

The formulations showing the most promise in terms of processing and storage stability together with positive sensory attributes will be selected for further development into real food production and subsequent full meal sensory testing in Task 4.4.

Introduction

1.1 Sensory Assessment of pilot scale formulations

The reduced fat and salt or sugar versions of existing products were successfully reproduced at the pilot lab scale by SMEs (Centiv and Sativa).

Sensory evaluation is often the final step in new product development. Sensory analysis can provide initial guidance during the bench-top stage when the product is taking shape. In the end, the product must be acceptable to the chosen consumer. Sensory analysis can also contribute road markers along the way utilizing consumer expectations before a product is completed. Therefore, sensory analysis plays a vital role in measuring production at the plant insuring product consistency and acceptability.

1.2 Approach

The objective of the sensory tests was to determine differences between pizza sauce and sweet filling cream formulated with degrees of salt\sugar (20-25%) and fat reduction (30%), and standard formulas.

The new formulations were described in details in deliverable *D4.2 Pilot scale production of test meals*.

Preliminary consumer acceptance tests were performed by Centiv and Sativa, and will be described in *D4.4 Pilot product quality assessment*: Report describing the overall quality, safety, nutrition and consumer acceptability of the modified products.

Sensory evaluation

The sensory evaluation was performed by trained assessors aiming to determine if there were significant differences between standard and reformulated products (pizza sauce and sweet filling cream). The sensory evaluation was conducted in the sensory laboratory by Expergo Sensory Research, Romania (according to the requirements of ISO 8589 and it holds international certification ISO 9001: 2008 "Qualitative Market Research based on sensory evaluation for food and beverages" no 00818 / EXP09D).

The panel consisted of 6 assessors, who were trained in sensory evaluation techniques. Both males and females were represented in the panel. All of them had long experience in product evaluation with more than 50 hours of general sensory training. Four training sessions before the sensory evaluation were organized. Each assessor assessed the same number of samples with replication.

The sensory attributes to be used were agreed by all evaluators and were clearly defined during training sessions held before the actual test.

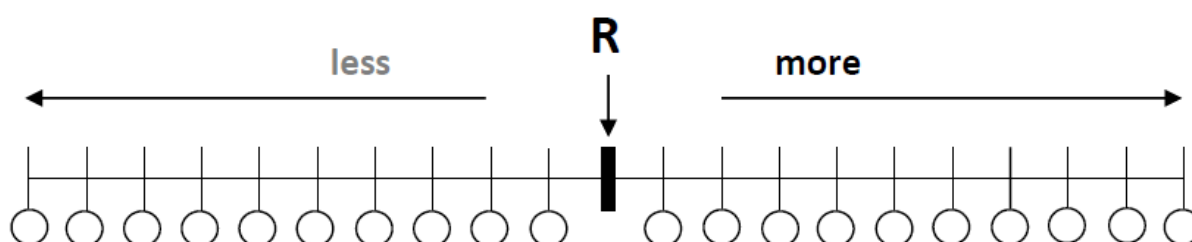
Expergo Sensory Research together with project partners Centiv, Sativa, IFR and INRA agreed on the sensory attributes before the training of the panel. The attributes are listed in Table 1.

Table 1. Agreed sensory attributes to be used in evaluation of pizza sauces and sweet creams

PIZZA SAUCE ATTRIBUTES	SWEET CREAM ATTRIBUTES
COLOUR	COLOUR
SMELL	SMELL
SALTY	SWEET
SMOOTHNESS	SMOOTHNESS
FATINESS	FATINESS
AFTER TASTE	AFTER TASTE

All the samples were evaluated regarding colour attribute on 5500 K light.

The products have been evaluated by rating the intensity of each attribute on a bipolar scale with 10 points. The scale was plotted as in the example below:



The QDA descriptive method was used because it was considered the best method for achieving the objective. The method characterises the sensory properties of the products. Sensory qualities and their intensity can be measured using this technique. In this way the sensory differences between standard and reformulated products were highlighted and quantified.

In order to remove a source of expectation error from the experiment, all reformulated samples were coded with random 3-digit codes. Samples with standard recipes used as a reference in evaluating differences of attributes intensity were coded with the symbol “R”:

Results and Discussion

The aim of the sensory evaluation was to collect more information regarding preference or acceptance of reduced fat, salt and/or sugar versions compared to existing commercial products manufactured by Sativa (standard).

Each evaluator received and evaluated the samples in same quantity, quality and temperature (ambient temperature).

Determining differences between samples

According to selected comparative analysis method linked to the size of scale and product type, analyzing differences will be reported as follows:

Up to 10% of the scale = 0:±1 unit > a marginal difference

Between 10%-20% of the scale = ±2 unit > an acceptable difference

Between 20%- 50% of the scale = ±2:±5 unit > significant difference

Over 50% of the scale = ±5:±10 unit > different product

Sensory difference profiles

Although the measuring scale was 10 points, the graphical representation of the profile was done on a smaller scale (5 points) to focus on our area of interest.

Differences in rating of each assessor for replicates were measured by calculating the tolerance between ratings for each attribute. Acceptable tolerance was considered below 10% of scale. In our case the acceptable tolerance was ± 1 unit (Kemp et al., 2009) see Figure 3 (green line). The value set for acceptance tolerance was not exceeded.

No significant differences ($\pm 2:\pm 5$) were found between the standard and reformulated formulas. Small differences only were registered, all $< \pm 2$, and 40% of comparisons scored $\leq \pm 1$. These small and marginal differences can easily be masked with minor adaptations of the recipe (e.g. adding a natural pigment/food colorant etc.).

Table 2 below provides the mean of differences for each attribute:

PIZZA SAUCE	Colour	Smell	Salty	Fattiness	Smoothness	After taste
Difference	-1,67	0,58	0,58	1,00	1,58	1

SWEET CREAM	Colour	Smell	Sweet	Fattiness	Smoothness	After taste
Difference	-1,83	-1,33	1,5	0,83	1,67	1,33

Table 3. Pizza sauce: Minimum, maximum, mean and standard deviation values of the data:

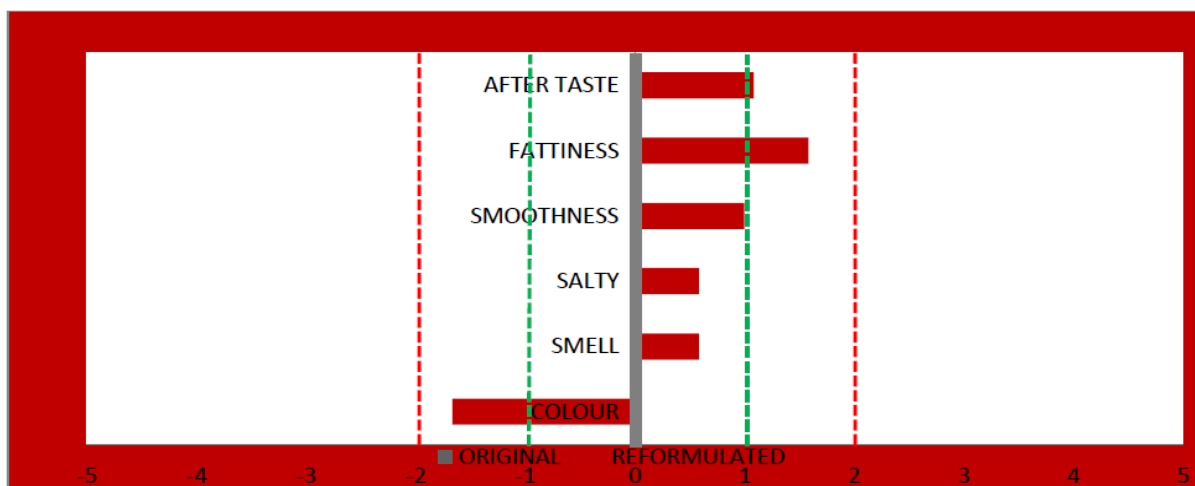
	colour	smell	salty	fatt	smooth	After taste
MIN	-2	0	0	0	1	0
MAX	-1	1	1	2	2	2
MEAN	-1.667	0.583	0.583	1.000	1.583	1.083
STD.DEV.	0.492	0.515	0.515	0.426	0.515	0.515

Table 4. Sweet feeling cream: Minimum, maximum, mean and standard deviation values of the data:

	colour	smell	sweet	fatt	smooth	After taste
MIN	-2	-2	1	0	1	1
MAX	-1	-1	2	1	2	2
MEAN	-1.833	-1.333	1.500	0.833	1.667	1.333
STD.DEV.	0.389	0.492	0.522	0.389	0.492	0.492

ANOVA test can't be used because the reference was zero (origin of scale). Therefore a statistical parametric method was chosen to check whether the sample was significantly different than the reference: z-test (for comparing the mean of sample to a value). The statistical z-test showed no significant differences between mean sample and theoretical mean 1. This means that the general profile of the samples generated by these 6 attributes did not show a significant difference to the reference in both products as shown in Figure 3.

Pizza sauce



Sweet filling cream

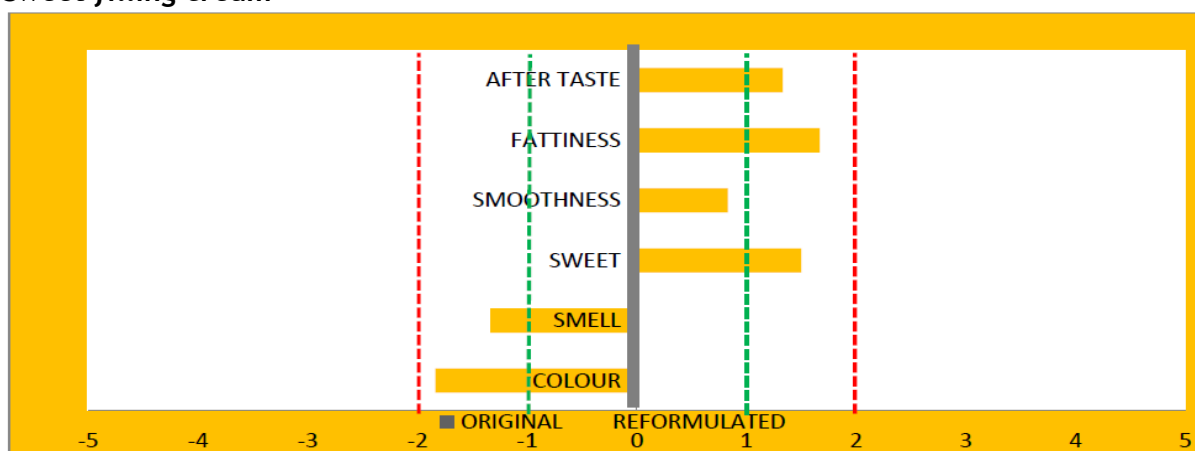


Figure 3. Diagrammatic representation of sensory differences between sample and reference products

A Tukey’s HSD test to compare by pairs the differences between assessors has been used. According to results of Tukey’s HSD (Honestly Signifant Different) test, all the assessors’ paired comparisons did not shown significant differences in rating for all attributes and both products. The panel was homogenous and well trained.

5. Conclusions

The reformulated products performed very well in these initial sensory tests compared to the reference, standard products. Statistically, the observed differences were not significant. However, it was very positive to see that the reformulated products appeared to have small improvements in perception of fat, salt and sugar, despite the reductions the content of these ingredients. A more detailed description of the differences is given below.

<p style="text-align: center;">Some small, but consistent observations were made, as described below, which ought to be addressed to minimise the impact of reformulation on the sensory properties.</p>
<p style="text-align: center;">The colour of both reformulated products was lighter. The change in the colour is due to the incorporation of GOW emulsion (cloudy white).</p>
<p style="text-align: center;">Both products showed a slightly more intense after-taste due to the fact that their slightly oily and mouth persistence.</p>
<p style="text-align: center;">Both products showed slightly improved perceptions in terms of creaminess.</p>
<p style="text-align: center;">Pizza sauce sample performed better in terms of similarity.</p>
<p style="text-align: center;">The after taste of vanilla sweet cream was higher than standard samples because the sugar replacer (Stevia extract) used had a specific after taste.</p>
<p style="text-align: center;">It is recommended to improve the smell of reformulated vanilla sweet cream by increasing the flavour dosage by 25%.</p>
<p style="text-align: center;">As it was showed, the persistence of sweetener aftertaste has increased the sweet intensity perception also. It is recommend to reduce the dosage of sweetener by 10%.</p>

References:

1. ISO 8589:2010 Sensory Analysis -General guidance for the design of test rooms
2. ISO 6658:2005 Sensory Analysis - Methodology - General guidance
3. ISO 8586: 2012 Sensory Analysis - General guidelines for the selection, training and monitoring of selected assessors and expert sensory assessors
4. ISO 11056:2008 Sensory Analysis - Methodology - Magnitude estimation method
5. ISO 4121:2008 Sensory Analysis - Guidelines for the use of quantitative response scale
6. ISO 11035:2007 Sensory Analysis - Guidelines for establishing a sensory profile by a multidimensional approach
7. Sarah E.Kemp, T.Hollowood, J.Hort 2009 Wiley-Blackwell, Sensory Evaluation - a practical handbook
8. Herbert Stone, Joel L. Sidel 2004, Sensory Evaluation Practices
9. T. Næs, P. B. Brockhoff, O. Tomic 2010, Statistics for Sensory and Consumer Science



Annex 2

1.3 Deliverable Check list

To be completed by Deliverable leader

	Check list	✓	Comments
BEFORE	I have checked the due date and have planned completion in due time	✓	Please inform project management team of any foreseen delays
	The title corresponds to the title in the DoW (Description of Work)	✓	If not please inform project management team with justification
	The contents corresponds to the description in the DoW (Description of Work)	✓	
	The dissemination level corresponds to that indicated in the DoW (Description of Work)	✓	
	The contributors (authors) correspond to those indicated in the DoW (Description of Work)	✓	
	The Table of Contents (ToC) has been validated with the WP Leader	✓	Please validate the ToC with the WP leader before drafting the deliverable
	I am using the Trees4Future deliverable template (title page, styles etc)	✓	Can be found in the intranet
AFTER	The deliverable has been reviewed internally in my organization	✓	Please ask colleagues to review the deliverable for its scientific content
	The deliverable has been reviewed by all contributors (authors)	✓	Make sure all contributors have reviewed and approved the final version of the deliverable. You should leave sufficient time for this validation.
	I have done a spell check and had the English verified	✓	Ask a colleague with a good level of English to review the language of the text and do a spell-check too.
	I have sent the final version to the WP Leader for approval	✓	Please send the final validated draft to the Coordinator (project management team) & ExC for validation before the submission to the EC.



1.4 Deliverable Review Feedback

This deliverable is

Excellent (the deliverable has fully achieved its objectives and technical goals).

Good (the deliverable has achieved most of its objectives and technical goals with relatively minor corrections to be made).

Unsatisfactory (the deliverable has failed to achieve critical objectives and needs to be significantly revised).

The following modifications should be made:

Page n°	Changes to be made	Response to requested changes

