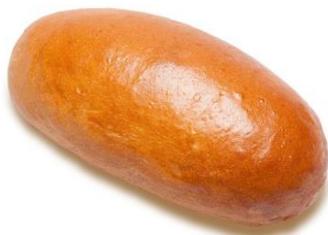


FIBRACTIVE FOS 60 APPLICATIONS IN THE CONFECTIONERY AND BAKERY SECTOR



Azucarera[®]
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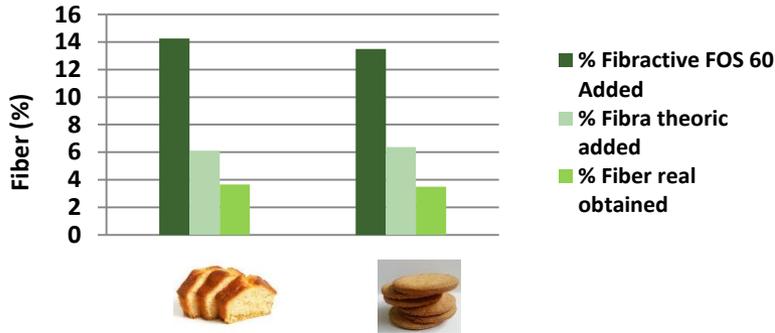
cetece
CENTRO TECNOLÓGICO

fOS⁶⁰
Fibractive

APPLICATIONS OF FIBRACTIVE FOS 60 IN THE BAKERY AND PASTRY SECTOR



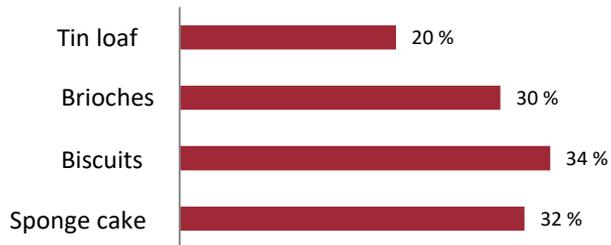
SOURCE OF FIBRE



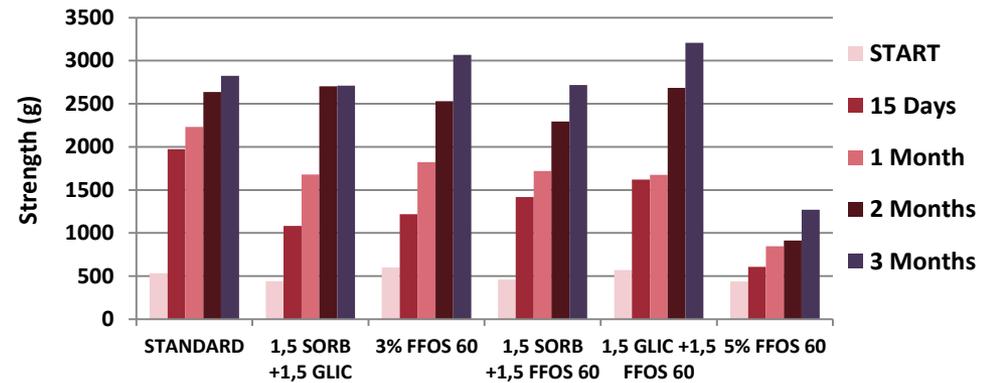
Claims achieved in cookies and biscuits:

- Fiber source (3 g fiber / 100 g final product)
- Reduced fat content (- 30% original formula))

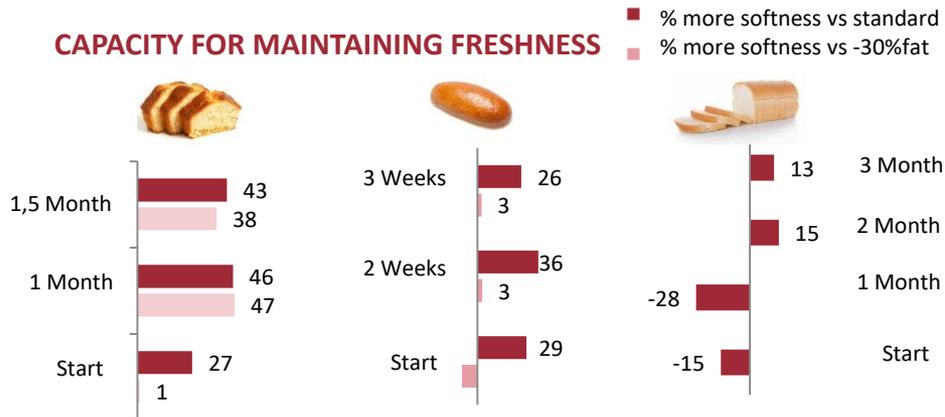
REDUCED FAT CONTENT



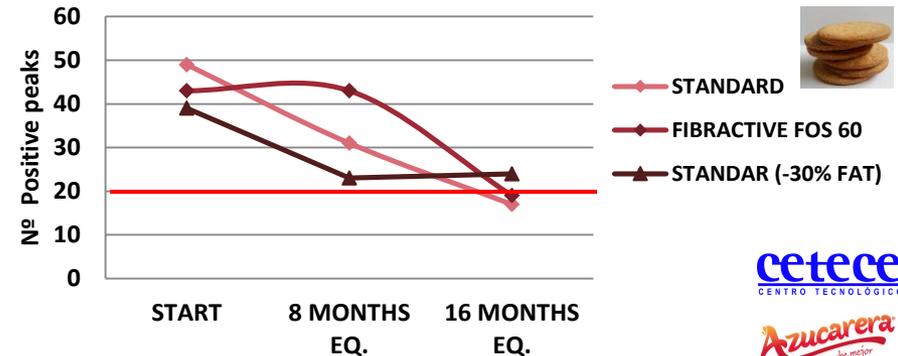
COMPARISON WITH DIFFERENT HUMECTANTS ON THE MARKET



CAPACITY FOR MAINTAINING FRESHNESS



EVOLUTION OF CRISPNESS IN BISCUITS



USE OF FIBRACTIVE FOS 60 IN WHIPPED DOUGH



Objective

Incorporate fructooligosaccharides (FOS) with 60% pureness (**FIBRACTIVE FOS 60**) to reduce fats and sugars and increase the fibre content in the product

STANDARD	Product prepared with a standard sponge cake formula
STANDARD (-30% FAT)	Formula containing 30% less fat with regard to the sponge cake standard
FIBRACTIVE FOS 60	Formula containing 30% less fat and increasing the fibre up to the “source of fibre” standard

FORMULAE UTILISED

INGREDIENTS	STANDARD (%)	STANDARD (-30% FAT) (%)	FIBRACTIVE FOS 60 (%)
Wheat flour	27.8	29.7	28.3
Eggs	22.4	24.0	22.9
Sugar	22.4	24.0	14.9
Liquid milk	7.6	8.2	5.8
Fibractive FOS 60	--	--	14.3
Milk powder	--	--	0.3
Oil	18.6	12.9	12.3
Baking powder	0.9	0.9	0.9
Salt	0.3	0.3	0.3

Reduced from the formula (for ingredient)

- Sugar (33,5%)
- Fat (28 %)
- Milk (23,7%)

Included in the formula

- Fibractive FOS 60 (14,3%)

COMPARATIVE RESULTS

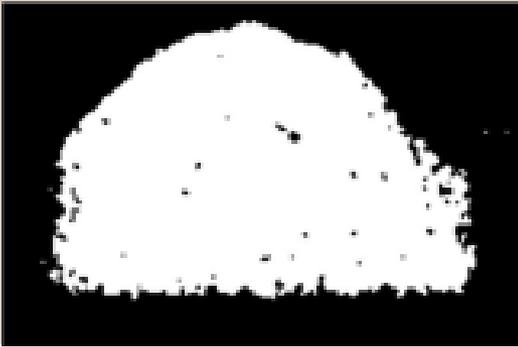
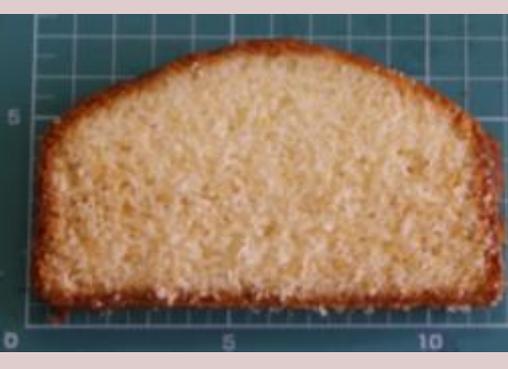
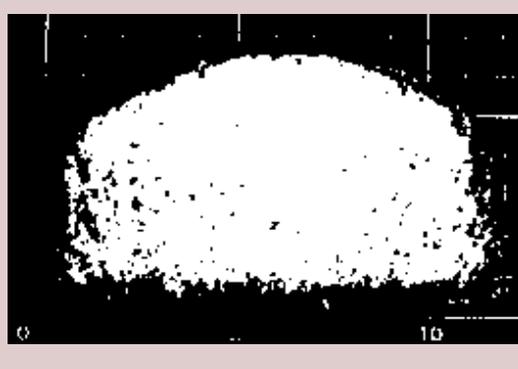
		STANDARD (-30% FAT)	FIBRACTIVE FOS 60
MORPHOLOGY	Weight (g)	207	212
	Volume (cm ³)	570	575
	% Weight loss	10.0	7.8
	Density (/cm ³)	0.36	0.37
	Main slice height (cm)	6.9	6.1
	Main slice width (cm)	11.6	11.7
	Collapsing	No	No
COLOUR	L*	50.4	41.7
	a*	18.9	20.2
	b*	36.4	27.4

• The height of the FOS 60 sponge cakes was reduced slightly

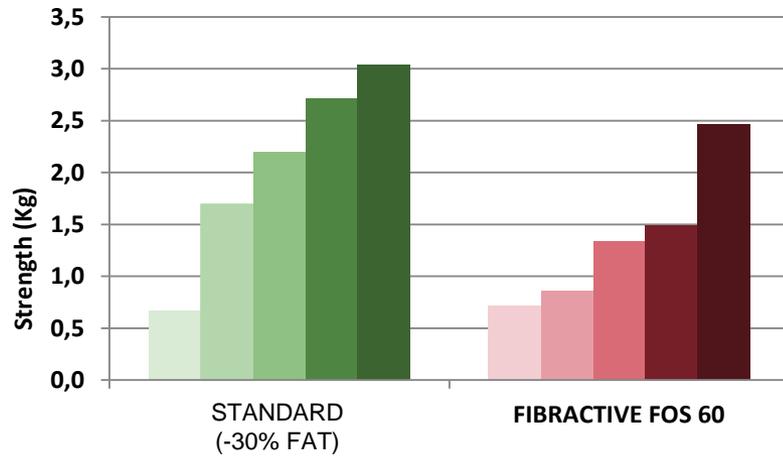
• Crumbs that were darker than the standard were observed

• Sponge cake with Fibractive FOS 60 is closest in appearance to sponge cake without fibre

COMPARATIVE RESULTS

I	OUTER APPEARANCE	MAIN SLICE	TEXTURED DETAIL
STANDARD			
STANDARD (-30% FAT)			
FIBRACTIVE FOS 60			

TEXTURE DEVELOPMENT OVER TIME (start, 15, 30, 45 and 60 days)

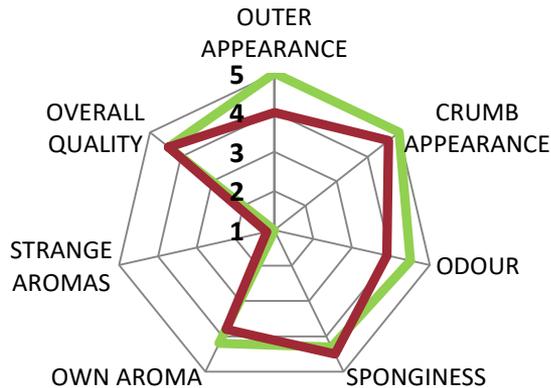


- The freshening effect of Fibractive FOS 60 can be noted

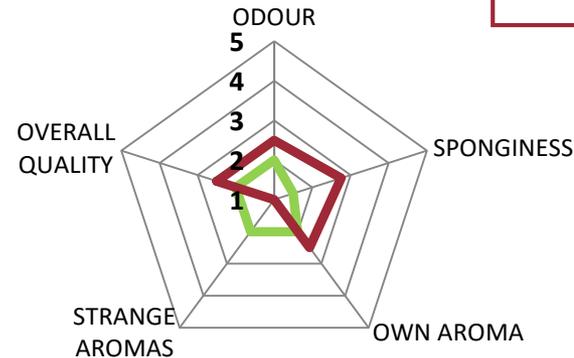
- Sponge cakes remain fresh for a longer period of time

SENSORY DEVELOPMENT

START



2 MONTHS



- The sponginess and overall quality of the sponge cake with Fribactive FOS 60 is noted after two-months shelf life

NUTRITIONAL COMPOSITION OF THE SPONGE CAKES

	Nutritional information per 100g			
	STANDARD		FIBRACTIVE FOS 60	
Energy value kJ /kcal	1711	409	1500	366
Fats g	22.8		15.53	
of which are saturated g	3.6		2.6	
Carbohydrates g	44.5		49.5	
of which are sugars g	25.4		26.93	
Fibre g	<0.5		3.66	
Proteins g	6.5		7.07	
Salt g	1.0		0.89	

- Reduced > 30% fat
- A sponge cake with "source of fibre" standard is obtained

CONCLUSIONS

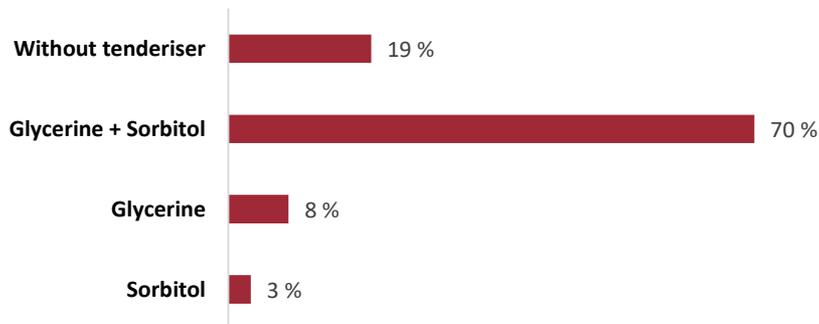
- **FIBRACTIVE FOS 60** can be incorporated to achieve sponge cakes that can claim to be a nutritional “**source of fibre**” and “**reduced fat content**”
- It is necessary to **adjust** the **water** and **sugar** content of the formulae in order to incorporate **FIBRACTIVE FOS 60** successfully
- Over time, sponge cakes with **FIBRACTIVE FOS 60** are fresher and spongier than sponge cakes without fibre. Its freshening effect on whipped dough **increases the freshness of the sponge cake by 30%** compared with low-fat standard sample

COMPARATIVE STUDY OF FIBRACTIVE FOS 60 AS A TENDERISER IN WHIPPED DOUGH



MARKET SURVEY ON THE USE OF TENDERISERS IN MUFFINS

(Source: in-house)



TESTS	
P1	Standard sponges, made without using any tenderiser.
P2	Sponges made with sorbitol (1.5% mass) and glycerine (1.5% mass) in the customary dosages used in the sector.
P3	Sponges made with FIBRACTIVE FOS 60 with a dosage of (3% mass).
P4	Sponges made with sorbitol (1.5% mass) and FIBRACTIVE FOS 60 (1.5% mass).
P5	Sponges made with glycerine (1.5% mass) and FIBRACTIVE FOS 60 (1.5% mass).
P6	Sponges made with FIBRACTIVE FOS 60 with a dosage of (5% mass).

FORMULAE USED

Ingredients	P1		P2		P3		P4		P5		P6	
	%	CONTR OL (g)	%	1.5 SORB + 1.5 GLYC (g)	%	3% FIBRACTIVE FOS 60 (g)	%	1.5 SORB + 1.5 FIBRACTIVE FOS 60 (g)	%	1.5 GLYC + 1.5 FIBRACTIVE FOS 60 (g)	%	5% FIBRACTIVE FOS 60 (g)
Wheat flour	27.5	800	27	800	27	800	27	800	27	800	26.7	800
Eggs	22.3	650	21.9	650	21.9	650	21.9	650	21.9	650	21.7	650
Sugar	22.3	650	21.9	650	21.9	650	21.9	650	21.9	650	21.7	650
Liquid milk	7.5	220	6.1	180	6.1	180	6.1	180	6.1	180	5.1	150
Oil	18.45	539	18.2	539	18.2	539	18.2	539	18.2	539	18	539
Baking powder	0.9	26	0.9	26	0.9	26	0.9	26	0.9	26	0.9	26
Salt	0.3	8.7	0.3	8.7	0.3	8.7	0.3	8.7	0.3	8.7	0.3	8.7
Calcium propionate	0.17	4.9	0.17	4.9	0.17	4.9	0.17	4.9	0.17	4.9	0.16	4.9
Fibractive FOS 60	0	0	0	0	3	88	1.5	44	1.5	44	5	146
Glycerine	0	0	1.48	44	0	0	0	0	1.48	44	0	0
Sorbitol	0	0	1.48	44	0	0	1.48	44	0	0	0	0
Cream of tartar	0.6	17.4	0.58	17.4	0.7	20.7	0.7	20.7	0.7	20.7	0.7	20.7

COMPARATIVE STUDY OF FIBRACTIVE FOS 60 AS A TENDERISER IN WHIPPED DOUGH



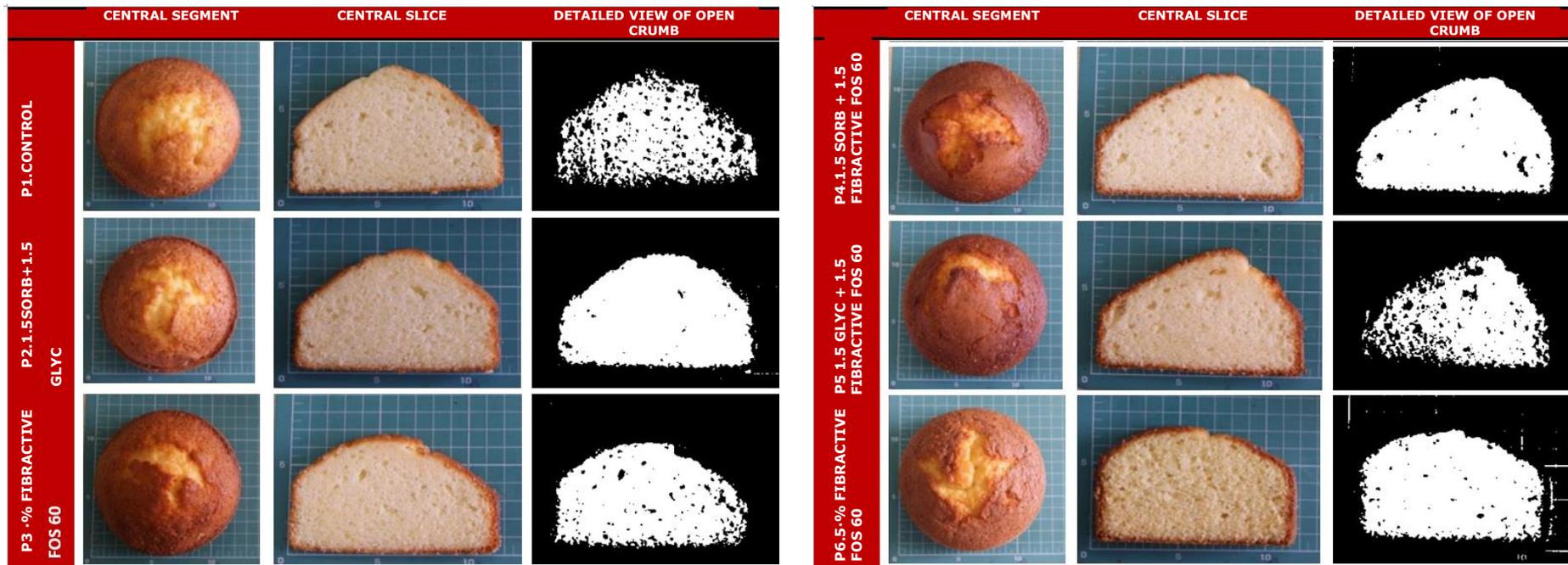
COMPARATIVE RESULTS

	P1	P2	P3	P4	P5	P6	
	STANDARD	1.5 SORB +1.5 GLYC	3% FIBRACTIVE FOS 60	1.5 SORB + 1.5 FIBRACTIVE FOS 60	1.5 GLYC + 1.5 FIBRACTIVE FOS 60	5% FIBRACTIVE FOS 60	
pH WHIP	5.70	5.9	5.85	5.87	5.86	5.82	
WEIGHT (g)	212.5	212.5	215.5	214.0	211.5	213.5	
VOLUME (cm ³)	750	840	860	860	780	620	
% WEIGHT LOSS	7.6	7.6	6.3	7.0	8.0	7.2	
DENSITY (g/cm ³)	0.28	0.25	0.25	0.25	0.27	0.34	
MAIN SLICE HEIGHT (CM)	7.1	6.9	7.0	7.3	7.0	6.4	
MAIN SLICE WIDTH (cm)	11.5	11.4	11.4	11.2	11.5	11.4	
COLOUR	L*	45.38	42.36	40.79	35.97	36.29	36.45
	a*	20.30	19.60	20.47	16.20	17.56	14.48
	b*	28.42	24.29	23.16	16.15	17.26	16.17
SINKING	No	No	No	No	No	No	
BAKING TIME (min)	30	30	28	24	24	26	
Remarks	Whip whiter					Whip slightly less dense	

- With regard to the external appearance, significant differences were observed due to the growth of the sponges
- Those samples which contained Fibractive FOS 60 produced darker sponges and presented a smaller crown and a rounder shape than those samples that did not contain it.

COMPARATIVE STUDY OF FIBRACTIVE FOS 60 AS A TENDERISER IN WHIPPED DOUGH

IMAGES OF THE SPONGES PRODUCED



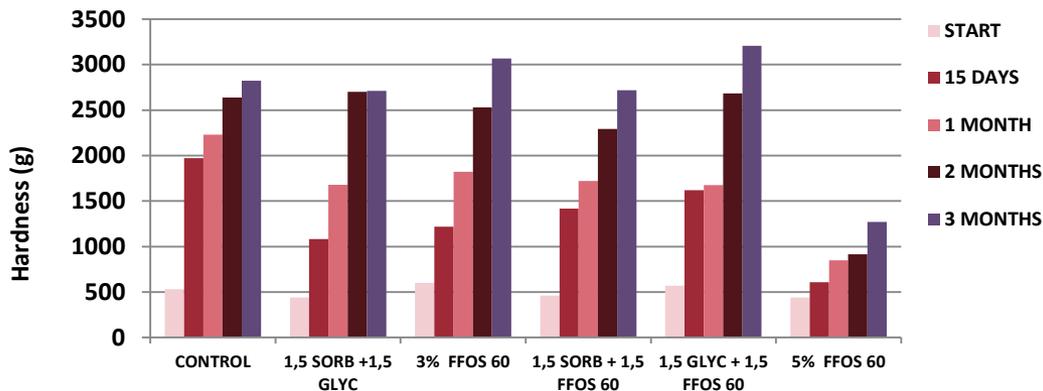
MOISTURE DEVELOPMENT

	P1	P2	P3	P4	P5	P6
HUMIDITY	STANDARD	1.5% SORB +1.5% GLYC	3% FIBRACTIVE FOS 60	1.5% SORB + 1.5% FIBRACTIVE FOS 60	1.5% GLYC + 1.5% FIBRACTIVE FOS 60	5% FIBRACTIVE FOS 60
START	20.65	19.45	19.45	20.20	19.95	21.30
1 MONTH	17.60	17.45	17.60	17.55	16.50	18.35
2 MONTHS	16.14	16.29	16.71	16.41	16.62	17.59

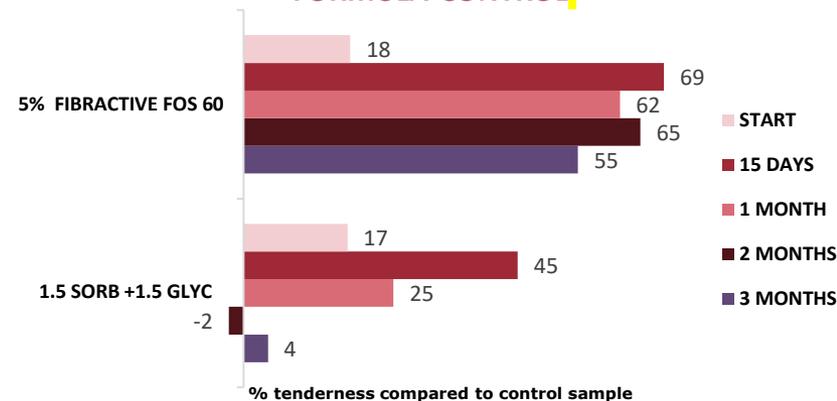
COMPARATIVE STUDY OF FIBRACTIVE FOS 60 AS A TENDERISER IN WHIPPED DOUGH



TEXTURE DEVELOPMENT OVER TIME

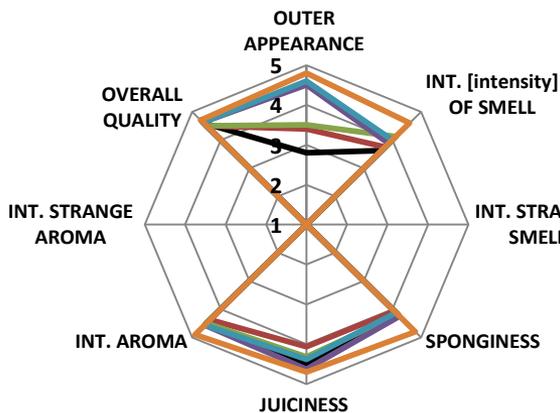


COMPARISON OF TENDERNESS WITH STANDARD FORMULA-CONTROL

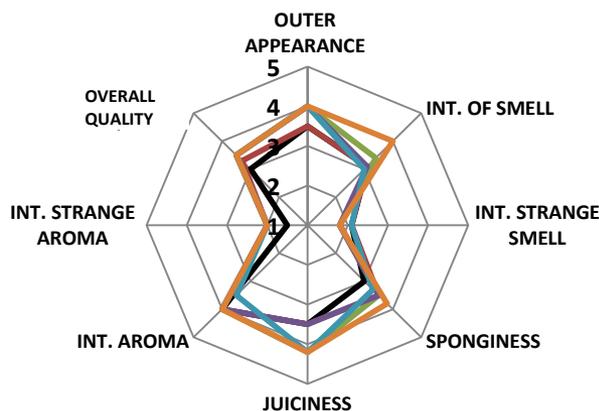


SENSORY DEVELOPMENT

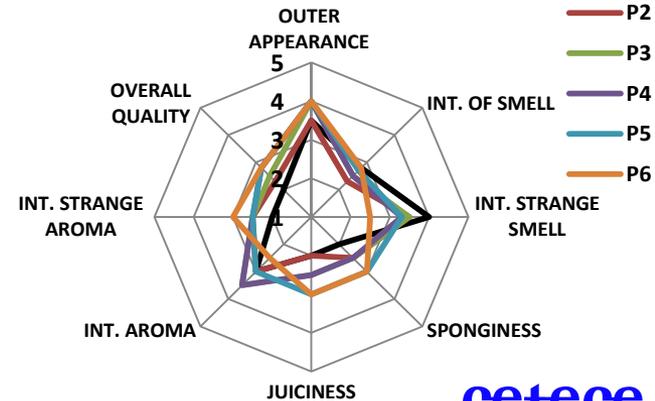
START



1 MONTH



2 MONTHS



- The sponges with FOS 60 at a dosage of 5% are those that show the greatest intensity of smell and aroma, and at the same time they are the softest and spongier of all those studied and at all frequencies.

COMPARATIVE STUDY OF FIBRACTIVE FOS 60 AS A TENDERISER IN WHIPPED DOUGH



CONCLUSIONS

- Fibractive FOS 60 is a **useful tenderiser for whipped doughs**, both in combination with other tenderisers and on its own.
- Its addition in combination with sorbitol or glycerol, in the usual dosages (3% tenderiser in dough) is successful. With this, we achieve similar results to those given by the combination of glycerol and sorbitol.
- Dosages of **3% of Fibractive FOS 60**, added as a moistener, give whipped doughs similar results to those produced by the combination of glycerol and sorbitol.
- Dosages of **5% of Fibractive FOS 60** result in a substantial improvement of its texture, making the sponges more tender and spongier. Sponges that **are 50% more tender** were achieved when compared with those made using other tenderisers on the market at the standard dosages.
- In addition to its tenderising effect, Fibractive FOS 60 **adds intensity of smell and aroma to sponges**.

USE OF FIBRACTIVE FOS 60 IN BISCUITS



Objective

Incorporate fructooligosaccharides (FOS) with 60% pureness (**FIBRACTIVE FOS 60**) to reduce fats and sugars and increase the fibre content in the product

STANDARD

Product prepared with a standard biscuit formula

STANDARD (-30% FAT)

Formula with 30% less fat with regard to the standard biscuit

FIBRACTIVE FOS 60

Formula containing 30% less fat and increasing the fibre up to the “source of fibre” standard

FOS[®]
Fibractivé

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FORMULAE UTILISED

	STANDARD (%)	STANDARD (-30% FAT) (%)	FIBRACTIVE FOS 60 (%)
Wheat flour	58.9	58.9	59.4
Sugar	14.1	14.1	12.9
Fat	14.1	8.5	8.5
Glucose syrup	7.1	7.1	--
Fibractive FOS 60	--	--	13.5
Sodium bicarbonate	0.35	0.35	0.35
Ammonium bicarbonate	0.35	0.35	0.35
Salt	0.35	0.35	0.35
Vanillin	0.05	0.05	0.05
Water	4.7	10.3	4.6

- Glucose syrup was eliminated (100 %)
- Fat and sugar was reduced (39,7 %)
- FOS 60 was incorporated (13,5%)

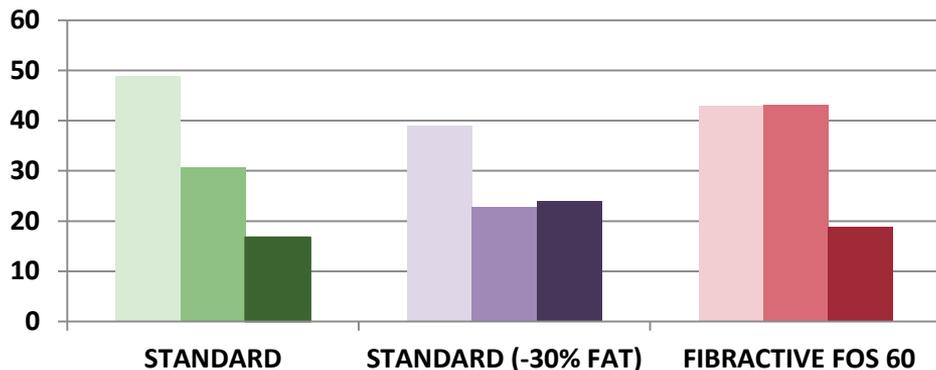
COMPARATIVE RESULTS

		STANDARD	STANDARD (-30% FAT)	FIBRACTIVE FOS 60
Pictures of biscuits:				
MORPHOLOGY	Average weight of 10 biscuits (g)	114.6	107.7	109.6
	Average height of 10 biscuits (cm)	6.1	6.7	6.7
	Diameter (cm)	6.1	6.4	6.4
COLOUR	L*	63.4	64.4	61.5
	a*	9.8	10.4	12.4
	b*	32.4	33.2	33.6
Baking time (min)		7.5	9	7
Product defects:		No	No	No

- Greater degree of homogeneity among all the formulae under study, with similar expansion
- Slight darkening with Fibractive FOS 60, positive in biscuits

TEXTURE DEVELOPMENT OVER TIME (start, 8 and 16 days equivalent)

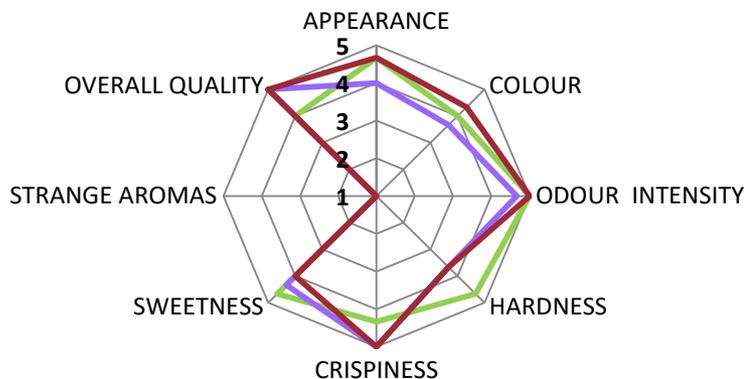
Crispiness in biscuits (No. of texture analyzer peaks)



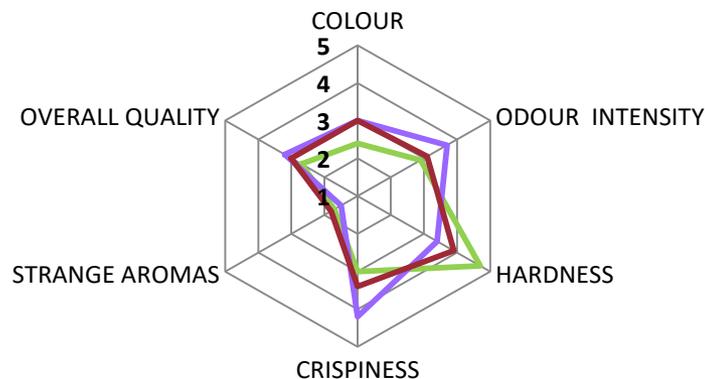
• An increase in crispiness is observed in biscuits with Fibractive FOS 60

SENSORY DEVELOPMENT

START



16 MONTHS EQUIV



• Correct sensory development of biscuits with Fibractive FOS 60



NUTRITIONAL COMPOSITION OF THE BISCUITS

	Nutritional information per 100g			
	STANDARD		FIBRACTIVE FOS 60	
	1958	465	1800	422
Energy value kJ /kcal				
Fats g	16.2		10.65	
of which are saturated g	5.6		3.6	
Carbohydrates g	73.4		73.8	
of which are sugars g	21.5		25.47	
Fibre g	--		3.5	
Proteins g	6.5		7.65	
Salt g	0.6		0.65	

- Reduced > 30% fat
- Biscuits with "source of fibre" standard are obtained

CONCLUSIONS

- The inclusion of FIBRACTIVE FOS 60 in biscuits makes it possible to achieve a product labelled as **“source of fibre”** and **“reduced fat content”**
- It is necessary to **adjust** the content of the remaining ingredients in the formulae in order to incorporate **FIBRACTIVE FOS 60** successfully
- Samples with FIBRACTIVE FOS 60 showed **greater crispiness** and **suitable sensory development** over time

USE OF FIBRACTIVE FOS 60 IN PASTRY PRODUCTS



Objective

Incorporate fructooligosaccharides (FOS) with 60% pureness (**FIBRACTIVE FOS 60**) in order to reduce fats in products without affecting the texture of the same

STANDARD	Product prepared with a standard brioche formula
STANDARD WITH LESS FAT	Product prepared with a standard brioche formula with reduction of fat
FIBRACTIVE FOS 60	Product prepared with fat reduction and using FIBRACTIVE FOS 60

FORMULAE UTILISED

	INGREDIENTS (% flour base)	STANDARD	STANDARD WITH LESS FAT	FIBRACTIVE FOS 60
SPONGE	Strong wheat flour	30	30	30
	Water	15	15	15
	Compressed yeast	5	5	5
	Strong wheat flour	70	70	70*
	Liquid milk	15	15	11,5
	Butter	20	10,5	10,5
	Fibractive FOS 60	--	--	13
	Sugar	18	18	8,5
	Eggs	24	24	24
	Improver	1,5	1,5	1,5
	Salt	1,2	1,2	1,2

Reduced from the formula

- Sugar (52,7%)
- Fat (47, 5 %)
- Milk (23,3%)

Included in the formula

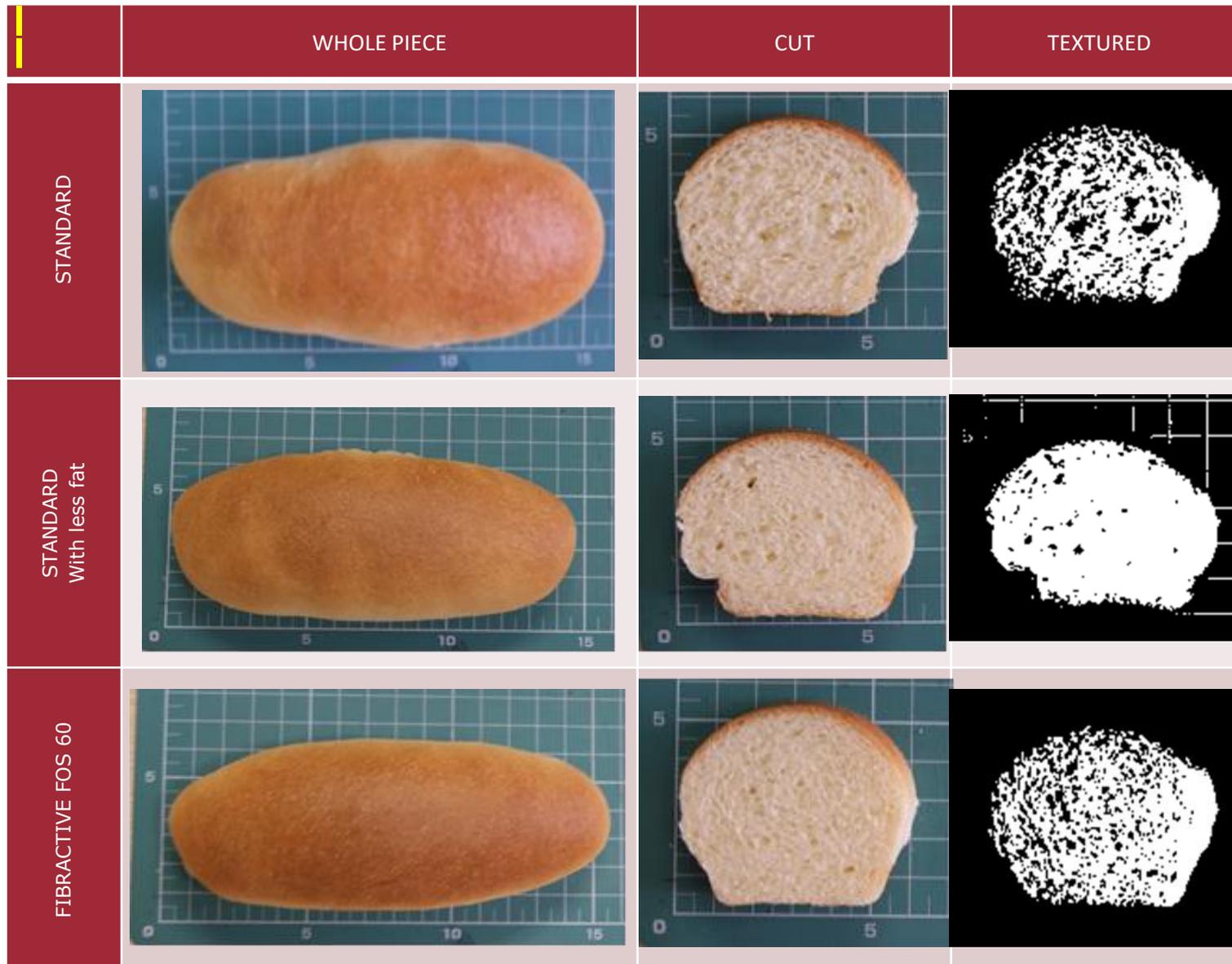
- Fibractive FOS 60 (6,8 %)
- * For Fibractive FOS 60 formula flour of force W = 403 and P / L = 1.15 was used

COMPARATIVE RESULTS

		STANDARD	STANDARD less fat	FIBRACTIVE FOS 60
MORPHOLOGY	Average weight (g)	53.8	54.7	56.7
	Average Height/ Width (cm)	4.5/6.0	4.8/5.6	4.8/6.1
	Average length (cm)	14.2	13.6	14.0
COLOUR	L*	44.1	44.5	47.1
	a*	18.5	15.3	17.3
	b*	26.7	24.6	27.9

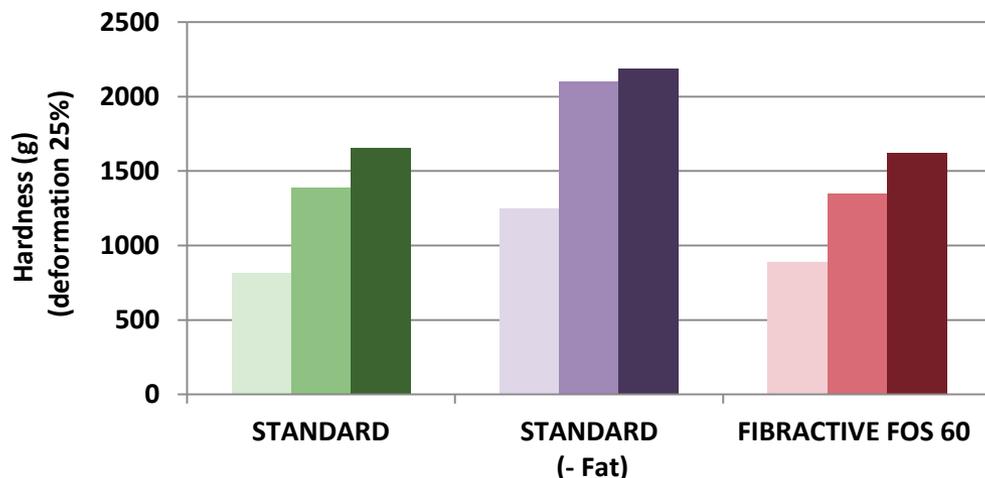
- A slight improvement is noted in the morphological characteristics of the brioches that used Fibractive FOS 60

COMPARATIVE RESULTS



- Appearance of the brioche crumb using Fibractive FOS 60 is very similar to the standard sample

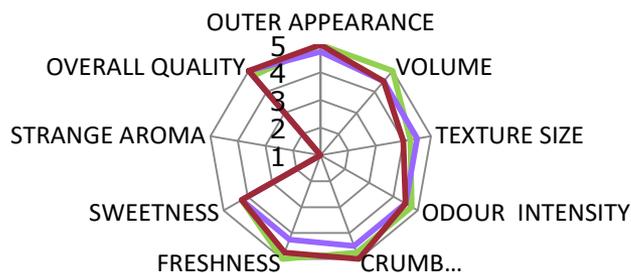
TEXTURE DEVELOPMENT OVER TIME (start, 2 and 3 weeks)



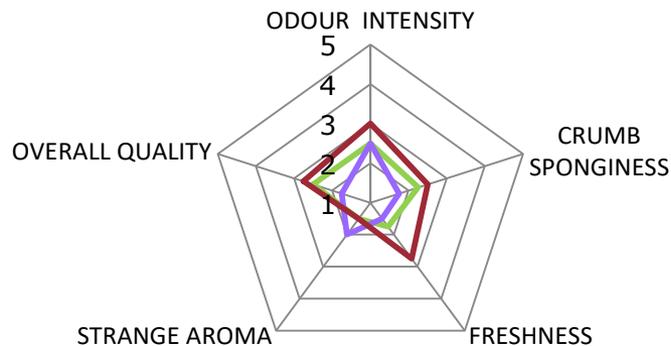
- The freshening effect of Fibractive FOS 60 is shown, which keeps the product fresher over a longer period of time

SENSORY DEVELOPMENT

START



3 WEEKS



- At the end of their shelf life, brioches using Fibractive FOS 60 show sensory valuations that are superior to the standard samples

NUTRITIONAL COMPOSITION OF THE PASTRY PRODUCTS

	Nutritional information per 100g			
	STANDARD		FIBRACTIVE FOS 60	
Energy value kJ /kcal	1470	349	1319	313
Fats g	11,8		8,3	
of which are saturated g	7,2		4,4	
Carbohydrates g	50,1		48,6	
of which are sugars g	9,2		8,8	
Fibre g	--		< 0,5	
Proteins g	10,8		11,1	
Salt g	0,72		0,76	

- Fat content is reduced by 30 % in the original formula

CONCLUSIONS

- Compared with the standard samples, a **humidity fixation** and **freshening effect** is noted in samples that contain Fibractive FOS 60
- Regarding the shelf life of products, it is noted that brioche with Fibractive FOS 60 have a better ageing process than the standard samples. **Aroma intensity** is better maintained, as well as **juiciness and freshness over time**
- By adjusting the fat of the formula it possible to achieve a product labelled as **“reduced fat content”**

USE OF FIBRACTIVE FOS 60 IN TIN LOAF



Objective

Incorporate fructooligosaccharides (FOS) with 60% pureness (**FIBRACTIVE FOS 60**) to improve the texture of the product

STANDARD

Product prepared with a standard tin loaf formula

FIBRACTIVE FOS 60

Product prepared using FIBRACTIVE FOS 60

FORMULAE UTILISED

Ingredients (% flour base)	STANDARD	FIBRACTIVE FOS 60
White flour	100	100
Water	55	52
Compressed yeast	7	7
Bean flour	2	2
Sugar	8	--
Fibractive FOS 60	-	11
Sunflower Oil	1.5	1.5
Salt	1.6	1.6
Improver	0.9	0.9
Calcium propionate	0.6	0.6
Sorbic acid (70% pureness)	0.17	0.17
Vinegar	0.6	0.6

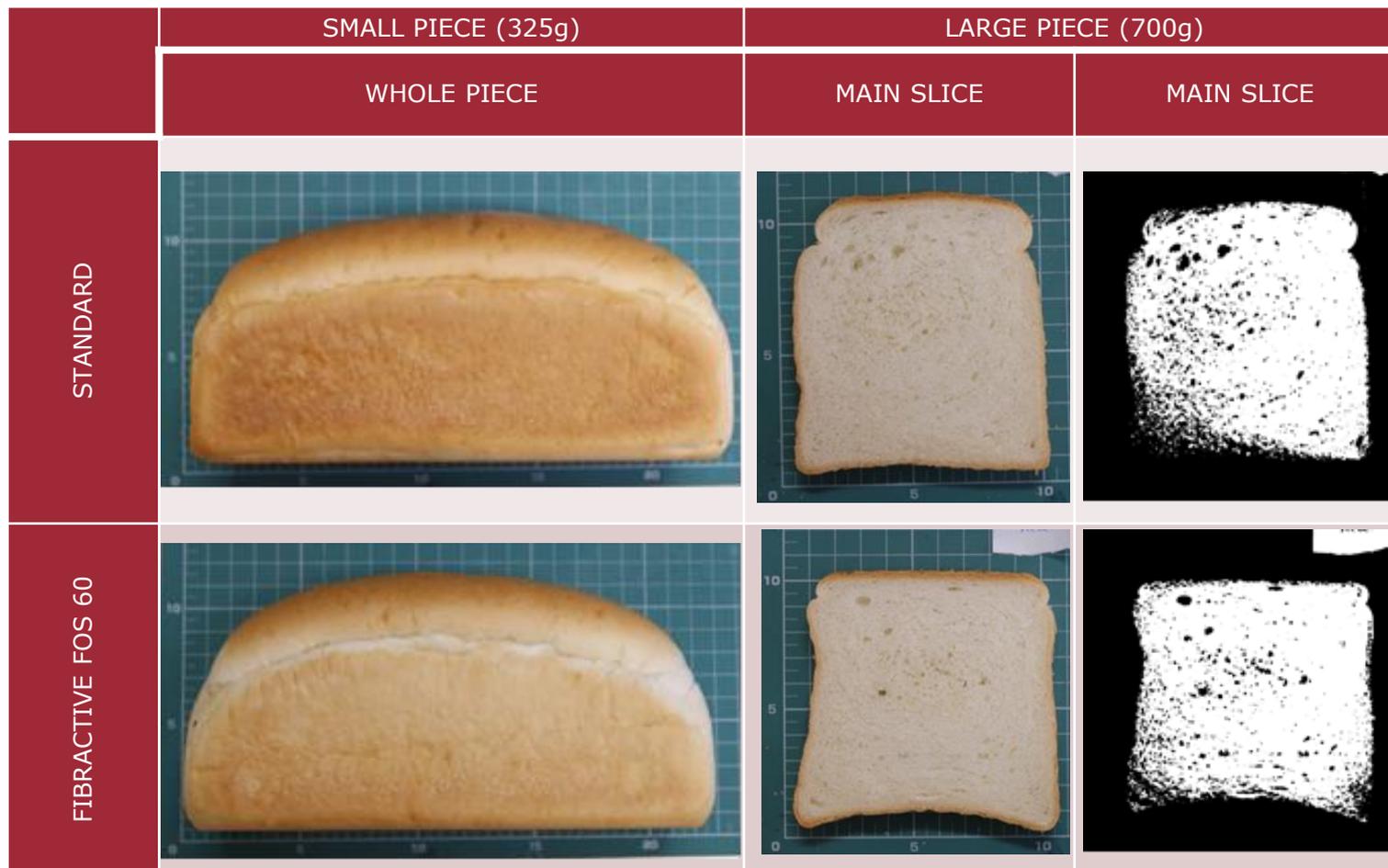
- Sugar was eliminated from the formula (100%)
- Fibractive FOS 60 was incorporated (6,2%)

COMPARATIVE RESULTS

		STANDARD	FIBRACTIVE FOS 60
SMALL PIECE	Volume (cm3)	1335	1380
	Average weight (g)	293	293
	Density (g/cm3)	0.22	0.21
	Height/width of main slice (cm) SMALL PIECE	9.0/7.7	10.1/7.7
	Height/width of main slice (cm) LARGE PIECE	10.0/9.0	8.9/9.4
COLOUR	L*	47.1	52.8
	a*	15.8	15.0
	b*	27.8	30.2
	Product defects	No	No

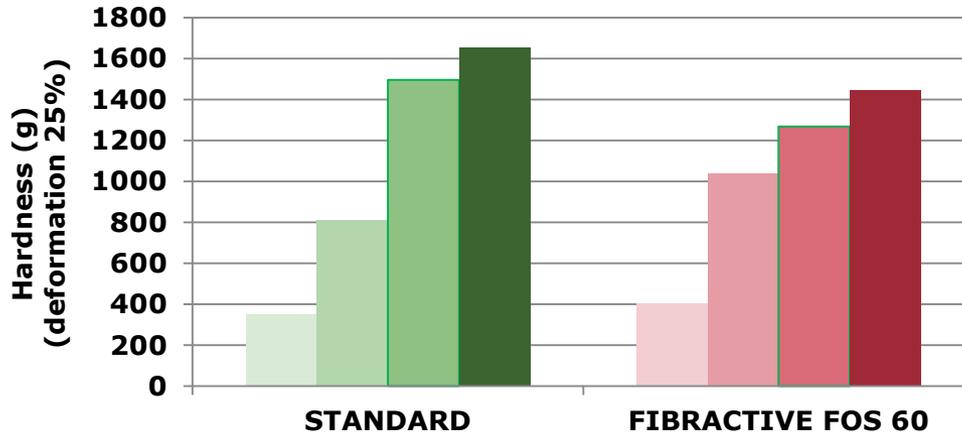
- Loaves prepared with Fibractive FOS 60 were slightly more intense in colour compared with the standard sample

COMPARATIVE RESULTS



- The appearance of loaves with Fibractive 60 were similar to the loaves of the standard sample

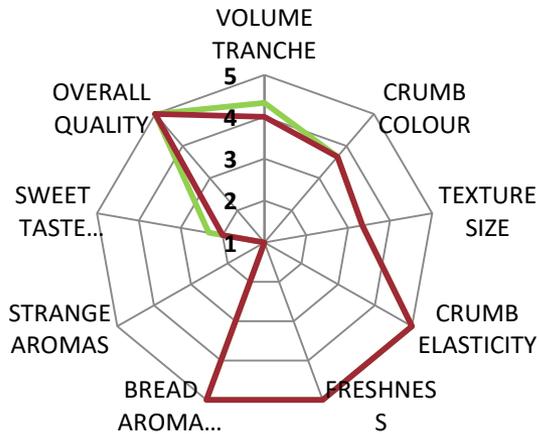
TEXTURE DEVELOPMENT OVER TIME (start, 1, 2 and 3 weeks)



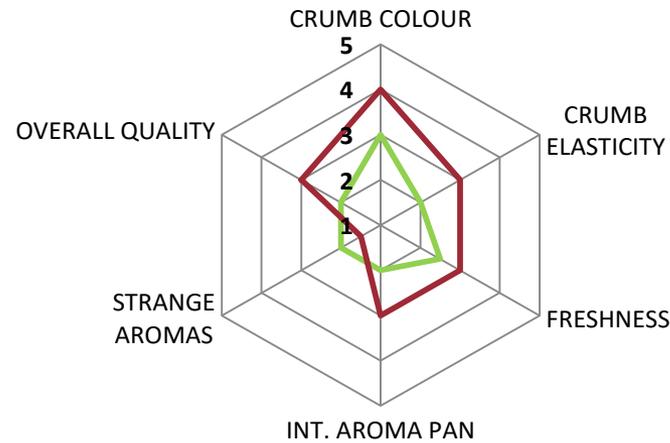
• Loaves using Fibractive FOS 60 were noted to be slightly fresher

SENSORY DEVELOPMENT

START



3 WEEKS



NUTRITIONAL COMPOSITION OF TIN LOAF

	Nutritional information per 100g			
	STANDARD		FIBRACTIVE FOS 60	
Energy value kJ /kcal	1172	277	1158	273
Fats g	3.0		2.4	
of which are saturated g	0.8		0.6	
Carbohydrates g	52.8		52.7	
of which are sugars g	4.9		3.9	
Fibre g	--		< 0.5	
Proteins g	9.6		10.2	
Salt g	1.0		1.0	

CONCLUSIONS

- Inclusion of FIBRACTIVE FOS 60 in the product allows a **13% reduction in hardness** compared with the standard sample