

## USING INULIN IN BAKERY PRODUCTS

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### Abstract

*Inulin, a soluble fiber may be added in bakery products to increase their fiber and calorie content, to develop new functional claims or health claims like a bifidogenic or prebiotic effect. In our technical study we used rolls as bakery products. The general effect of Instant Fibruline from Enzymes & Derivates Romania on processing and the final product characteristics will be described. We will consider modifications of recipe and production methods to develop healthy rolls with inulin in order to meet quality expectations (a good taste and texture).*

**Key words:** *inulin, fiber, roll, prebiotic, bifidogenic.*

### Introduction

People throughout the world wish to lead a healthier lifestyle and for some individuals this means altering their diet. Bakery products are an important part of today's diet. Today, thanks to healthy and functional ingredients such as inulin we can achieve healthier products with different possible nutritional or functional claims: high fiber, sugar-free, fat reduced, calorie reduced, prebiotic, enhanced calcium absorption, etc.

The scientific nutritional studies from all over the world approved the claim of functional foods for all foods and beverages delivering 5g inulin in a daily portion (Brighenti, 1999).

Inulin is a soluble fiber. Dietary fibers are generally vegetable substances-parts of plant cells-that are not or very little digested, reabsorbed or metabolized by the digestive enzymes of the upper part of the digestion system and are subsequently more or less fermented or

metabolized by the microbial flora of the colon (Costin, 1999). Dietary fibers are divided in two groups:

- (water) insoluble fibers, also called bulking agents (e.g. cellulose, lignin, some semi celluloses)
- (water) soluble fibers, also called swelling agents (e.g. gums, mucilage, pectin, some semi-celluloses) (Benech, 2005).

Inulin is a soluble fiber belonging to the fructans group-chain of fructose units ending or not in one glucose unit. It occurs in over 36000 plant species like: banana, onion, globe artichoke, asparagus, leek, chicory root, garlic, Jerusalem artichoke. The largest amount of inulin sold on the market foods is extracted from chicory roots, which has between 15-20g/100g inulin. Chicory is considered to have come from Europe, Western and Central Asia and North Africa and is now cultivated in many continents (Van de Wiele, 2004).

Inulin's functional claims may be resumed as:

- modulation of lipid metabolism :
  - reduced blood lipids;
  - less "bad" cholesterol;
- reduction of the risk of colon cancer;
- stimulation of the immune system;
- dietary fiber:
  - undigested but fermented in the large intestine;
  - improved intestinal functions;
- probiotic & bifidus promoter;
- enhanced calcium absorption;
- low caloric value (Coudray, 1997);

In our technical study we used inulin from SC. Enzymes & Derivates Romania SA EDR-Costița-Neamț which has a range of three types of inulin: Fibruline XL-long chain inulin, Fibruline Instant-native inulin, Fibrulose F 97-oligofructose.

## **Experimental**

The study was carried out on rolls as bakery products. Inulin supplementation into dough formulation meant Fibrulose using in

different doses, like fiber improver. Fibrulose product is a oligofructose from chicory roots. Modification of recipes and production methods in order to develop functional products will be described.

*Flow chart of rolls:*

*Mixing* -slow speed 1-2 minutes; water temperature 22°C

↓ -second speed 7-8 minutes; dough temperature 28°C

*First dough fermentation* – temperature 30-32°C; time 30 minutes;

↓ - relative humidity 90%

*Machining (wire-cutting)* -in pieces of 2250g (30 pieces of 75g)

↓

*Intermediary dough fermentation* -15 minutes

↓

*Dough molder* - in rolls of 75g

↓

*Final dough fermentation* - 50 minutes

↓

*Backing* - time 8-10 minutes/temperature 250-260°C

A reference roll is developed. After setting the reference sugar reduction is realized thanks to the use of Fibrulose in combination with flour. The formulations are presented in table 1.

**Table 1** - Recipes of rolls with Fibrulose

Ingredients (kg)	Reference	Fibrulose 5%	Fibrulose 10%
Wheat flour	10	10	10
Yeast	0.500	0.500	0.500
Salt	0.150	0.150	0.150
Crystal sugar	0.200	0.100	-
Vegetable fat powder	0.500	0.500	0.500
Skimmed milk powder	0.300	0.300	0.300
Water	5.200	5.200	5.500
Fibrulose	-	0.500	1.00

When inulin is used in the recipe dough hardens and decreases and this effect is bigger for higher concentration of inulin. Dough is significantly softer and it becomes very difficult to mould. In order to improve this effect we increased the first dough fermentation from 30 minutes to 50 minutes and reduced the last fermentation with 10 minutes. (dough comes to the normal texture) in order to facilitate dough molder. However, the water content of the dough is slightly increased: 10 % of inulin will require approximately 2-3% extra-water.

### **Results and Discussion**

In combination with flour, inulin improves final products: a very good taste is achieved, with excellent development and a good texture. The final product has a higher volume and stays fresh for a longer period of time (even after 3 days of storage). The three versions have the features from table number 2.

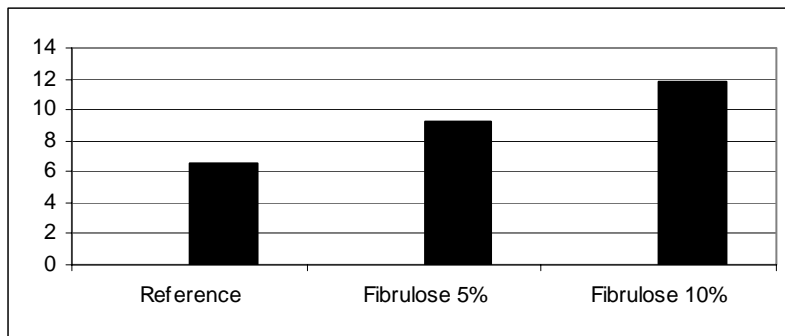
**Table 2.** The features of the three formulations

Features	Reference	Fibrulose 5%	Fibrulose 10%
Taste	Agreeable, slightly sweet	Very sweet	Agreeable, more sweet than the reference
Porosity %	85	90	91
Elasticity %	96	99	99
Water content%	34	30	27.4
Acidity	1.2	1.2	1.2
Fiber content/ roll of which inulin	6.6	9.2 2.6	11.8 5.2

Because fibrulose is a soluble fiber it will absorbed water during the baking process. Unlike other fibers due to its structure-short chain inulin (oligofructose) a part of added water absorbed by fibrulose will be conceded during baking. So, as a result of his structure the finished products will have a smaller humidity. Inulin is considered beneficial in many countries and it has been used as a source of dietary soluble fiber for many years. Because of its technical advantages and ease of

use, it can be used at high levels in many applications, allowing high fiber claims.

In the figure 1 it can be seen the deference of fiber content between the reference and the formulations with inulin.



**Fig.1.** The fiber content of the three formulations

The human colon is naturally bacteria beneficial for the host's health, such as lactobacilli and bifidobacteria. In contrast to these probiotic bacteria, prebiotics are food ingredients that are selectively fermented in the colon by beneficial bacteria. Studies have shown that human subjects which were given doses of Fibruline as low as 5 g per day have shown prebiotic effects (Coudray 1997). *That's nearly one slice of roll with 10% inulin!*

In the same context Coudray (1997) claims that Fibrulose can also enhanced calcium absorption at a daily dose of 15 g Fibrulose per day. *That's nearly three slices of rolls with 10% inulin!*

## Conclusions

Inulin (Fibrulose) is the perfect ingredient for bakery applications. It is an excellent low calorie bulking, agent for sugar substitution or for fiber enrichment.

It also allows other functional claims like prebiotic or bifidogenic effect and enhanced calcium absorption. The advantages of using inulin in bakery products may be resumed as:

- *technical advantages:*

### *Using inulin in bakery products*

- easiness of incorporation in mixes;
- good dough processability;
- excellent finished products rolls: a very soft texture, a good development and a good taste;
- shelf life is improved;
- *nutritional properties:*
  - fiber enrichment of bakery mixes
  - prebiotic or bifidogenic effect;
  - enhanced calcium absorption;

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