

Valorisation in bread of dietary fibres from by-products of the agro-industries

Roiseux O.^{1,2}, Sindic. M.², Vanderbeke E.³, Blecker C.² and Deroanne C.²

¹ R&D, WalAgri S.A., Sombreffe, Belgium ; roiseux.o@fsagx.ac.be

² Department of Food Technology, Gembloux Agricultural University, Belgium ; technoalum@fsagx.ac.be

³ AVEVE Group, Merksem, Belgium ; ev.cbl@aveve.be

I. Introduction

Research on Dietary Fibres at Gembloux Agricultural University

For many years, the Department of Food Technology located at Gembloux Agricultural University (Belgium) has been involved in extracting, characterizing and valorising **dietary fibres**.

Many **by-products** from agro-transformation are inexpensive, available in large quantities and have often a high dietary fibre content. They are often undervalorized in the feed industry or for cogeneration. So, it could be possible to get a higher added-value from these products by using their nutritional potential in food formulation. Ingredients produced from these by-products could also help to improve sensory properties of many foodstuffs as bread for instance.

Formulation of dietary food with new organoleptic properties

The aim of this work is to develop food products with **nutritional allegations** and **new tastes, textures and aspects**.

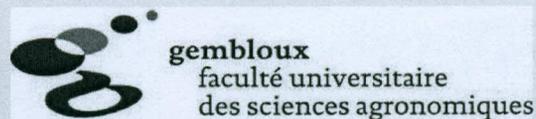
In collaboration with WalAgri and AVEVE Group, we present the case of **bread** enriched by insoluble dietary fibres from a local cereal by-product source (**insoluble fibres**). A comparison is made with bread enriched by commercial **soluble dietary fibres** from lemon peels (ID Food) regarding to texture properties and consumer acceptability.

Interests of dietary fibres incorporation in foods

From a **nutritional** point of view, it is well known that the consumption of dietary fibres is recommended for preventing or treating Western diseases including colon cancer, gastrointestinal disorders, diabetes and coronary heart disease. However, current consumption of dietary fibres in Western countries is only about 20g/day.person, while the recommended intake is 30-45g/day.person.

Moreover, dietary fibre intake must be balanced between soluble and insoluble fractions : most **cereals** are rich in the **insoluble** dietary fibres fraction, whereas **fruits and greens** contain more **soluble** dietary fibres.

There are also interest in the **techno-functional properties** of dietary fibres. For example, water holding capacity influences formulation (hydratation), processing (viscosity, firmness, stickiness) and shelf-life of food products.



II. Ingredients characteristics

Production of ingredients : Effects on final applications

The **source** and **process** used to recover the fibres have a strong influence on their chemical and physical properties which have a direct impact on the technofunctional properties of the final product and the physiological effects on human health.

In this case, lemon fibres are first dried before being micronized, whereas cereal husks are only micronized. Incorporation of this **micronized** powders bring several innovations from the point of view of organoleptic properties :

- **aspect** : homogeneity (color and texture) of the crumb
- **texture** : no roughness in mouth
- **taste** : acid for lemon fibres ; « rustic » for cereal fibres

Particle size – Composition – Technofunctional properties

Particle size	d(0,5)	Cereal fibres ^a	Citrus fibres ^b
	Total fibres¹		85 %
Solubles (in TF) ¹		5 %	52 %
Insolubles (in TF) ¹		95 %	48 %
Composition (DM)	Cellulose (in IF) ²	43 %	
	Hemicelluloses (in IF) ²	48 %	
	Lignins (in IF) ²	9 %	
	CHO	1 %	22 %
	Proteins	3 %	7 %
	Lipids	< 1 %	1 %
	Ash	6 %	3 %
Humidity (FM)		5 %	< 10 %
	Technofunctional properties		
WHC ³		360 %	500 %
OBC		250 %	100 %
Color		beige – brown	off-white
	L*	64	73
	a*	2,5	2,8
	b*	18	26

^a Source : WalAgri ; ^b Source : ID Food ¹ AOAC 985.29 ; ² AACC 32-20 ; ³ AACC 88-04

III. Applications of fibres in bread : items to be solved

Nutritional benefits to use fibre ingredients in breads

¹ For **dietary fibre enrichment** of food products (3 % = "rich in fibres" and 6 % = "enriched in fibres") → must be calculated from formulations and analysed in breads

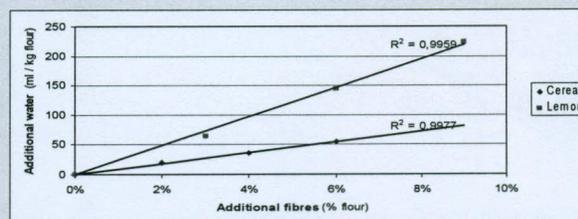
² For **reducing the calorific value** (reducing Glycemic Index, WHC)

³ For better **preservation** of breads (keeping softness) by higher water holding

Bread	Soluble fibres ¹	Insoluble fibres ¹	Total fibres ¹
Farine	0,5 %	0,6 %	1,1 %
Blanks	0,6 %	0,7 %	1,3 %
3 % lemon fibres	1,0 %	1,9 %	2,9 %
6 % lemon fibres	2,2 %	3,3 %	5,5 %
9 % lemon fibres	3,0 %	4,4 %	7,4 %
2 % cereal fibres	0,6 %	2,3 %	2,9 %
6 % cereal fibres	0,8 %	5,0 %	5,8 %

¹ AOAC 985.29

Technological aspects

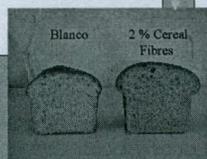


→ Bigger additional water for lemon fibres because of bigger WHC

There is no problem for making of breads with cereal fibres. Nevertheless, **weight** and **volume** of breads decrease with the amount of lemon fibres and crumb density increase.

The study of **firmness** (AACC 74-09) in the course of time show a better preservation for some formulation → relation between WHC and additional water to study

A **consumer test** (n = 60) has showed no difference in preference between an industrial bread enriched with cereal fibre and a commercial white bread. On the other hand, acidity and lemon smell and taste of bread enriched with lemon fibres open future applications with shellfish like oysters.



Acknowledgements

Bernier C., Janas S., Ladeuze S., Schene K. (students from FSAGx)
Potel Aurore from Realdyme