

WHEAT FIBER AS ADDITIVES IN REDUCED CALORIES WHEAT BREAD – PART TWO: NUTRITIONAL AND SENSORIAL EVALUATION

Neli Darie, M. Ognean, Claudia Felicia Ognean

“Lucian Blaga” University of Sibiu, Faculty of Agricultural Sciences, Food Industry
and Environmental Protection, 5-7, Ion Rațiu Street, Sibiu, 550012, România,
neli.darie@ulbsibiu.ro

Abstract

The fiber content of wheat bread enhancing with wheat fiber was calculated. We also calculate the caloric value of the same products in order to prove a high caloric content reduction in products which wheat fiber was added. Product acceptability was judged by sensory evaluation. Breads made with 10% wheat fiber received the highest overall score. Also wheat bread with 15% was found acceptable. The sample which had 20% wheat fiber added was evaluated as being at the limit of the acceptance. An important reduction for the caloric value was obtained for each sample which had wheat fiber added.

Keywords: *wheat fiber, dietary fiber, reduced calorie, wheat bread*

Introduction

Dietary fiber, although not always defined as such, has been consumed for centuries and has been recognized as having health benefits (Wolever, 1993; USDA/DHHS, 2005). Fiber intake through the consumption of foods rich in this dietary component, such as fresh vegetables, fruits, whole grains, and nuts, is associated with reductions in plasma and LDL-cholesterol, attenuating glycemic and insulin response, increasing stool bulk, and improving laxation (Jian-xian, 1995; Asp, 1997; Brown, 1999, Favier, 1997). Moreover, through its physiologic responses, dietary fiber consumption has established the basis for associating high-fiber diets in epidemiological studies with reduced risk of most of the major dietary problems in the wide world: obesity, coronary disease (Willett, 1999; FAO/WHO, 2000), diabetes, gastrointestinal disorders, including constipation, inflammatory bowel diseases like diverticulitis and ulcerative colitis, and colon cancer (ANZFA, 2000; FAO/WHO, 2000; USDA/DHHS, 2005). Recent epidemiological data show that a diet high in fiber generally reflects a

healthier life style and fiber intake can be viewed as a marker of a healthy diet (FAO/WHO, 2000).

In Table 1 shows the recommended consumption of dietary fibers per day according Institute of Medicine of the National Academies.

Table 1. Recommended consumption of dietary fibers per day (AI – Average Intake) according the Institute of Medicine of the National Academies

Category of population		Age	AI (g/day)
New born		0-6 month	-
		7-12 month	-
Preschool		1-3 year	19
		4-8 year	25
School	boy	9-13 year	31
		14-18 year	38
	girl	9-13 year	26
		14-18 year	26
Adults	men	19-30 year	38
		31-50 year	38
		51-70 year	30
		over 70	30
	women	19-30 year	25
		31-50 year	25
		51-70 year	21
		over 70 year	21
Especially physiological status	expecting	14-18 year	28
		19-30 year	28
		31-50 year	28
	nursing	14-18 year	29
		19-30 year	29
		31-50 year	29

However, increasing fiber consumption in the diet has been a difficult challenge, as fiber sources usually used in foods have not, generally speaking, made high-fiber foods with high quality taste properties. It is important from a food product development standpoint that high-fiber foods, made using high fiber ingredients, not only supply fiber, but also provide enhanced functional properties to make high-fiber foods taste better, thus encouraging continued high fiber intake.

The fiber content of wheat bread enhancing with wheat fiber was calculated. We also calculate the caloric value of the same products in order to prove a high caloric content reduction in products which wheat fiber was added.

Experimental

Almost all bakers use a standardized bread quality evaluation system, simply called scoring. Many attributes are evaluated such as taste, flavor, crust color, texture, mastication, crumb color, crumb porosity, general appearance, slicing, humidity, crumb elasticity and density. A perfect score is 100 and scores above 97 are extremely rare while 90 are passing.

Laboratory acceptance panels were used to give an indication of consumer acceptance of the products under study. Bread, baked the day before sensory testing, was served at room temperature. Bread samples were plain wheat (control sample), 10%, 15%, 20% and 25% wheat fiber fraction. Servings of each bread, identified by code numbers, on a single tray were served to each panelist. Servings were approximately 1 cm thick slices from pup loafs.

Panelist (30 students from bread making laboratory discipline) was presented the test samples in individual panel booths under normal (daylight) illumination. They evaluated each product, including a control (plain wheat) sample, for quality attributes: taste, flavor, crust color, texture, mastication, crumb color, crumb porosity, general appearance, slicing, humidity, crumb elasticity and density.

Acceptability of each quality attribute was rated with a score from 1 (lowest) to 10 (highest). Overall acceptability of each sample was rated on a verbal nine-point hedonic scale, and these ratings were converted to numerical scores where 1 = dislike extremely and 9 = like extremely. Products were considered acceptable if their scores for overall acceptability were above 5 (neither like nor dislike).

Results and Discussion

Picture of the outcomes breads are showed in pictures from Figure 1. The results of bread sensorial evaluation are given in Table 2. As it can be seen breads containing 10 % wheat fiber fraction was considered by 30 consumer panelist as more than acceptable for all

Wheat Fiber as Additives in Reduced Calories Wheat Bread – Part Two: Nutritional and Sensorial Evaluation

specific quality characteristics and overall acceptability. Despite overall score > 6.5 for bread containing 15% wheat fiber fraction consumer panelist judged texture, mastication and density quality items as unacceptable. Those quality items received score < 5 for wheat bread sample with 15% added wheat fiber.

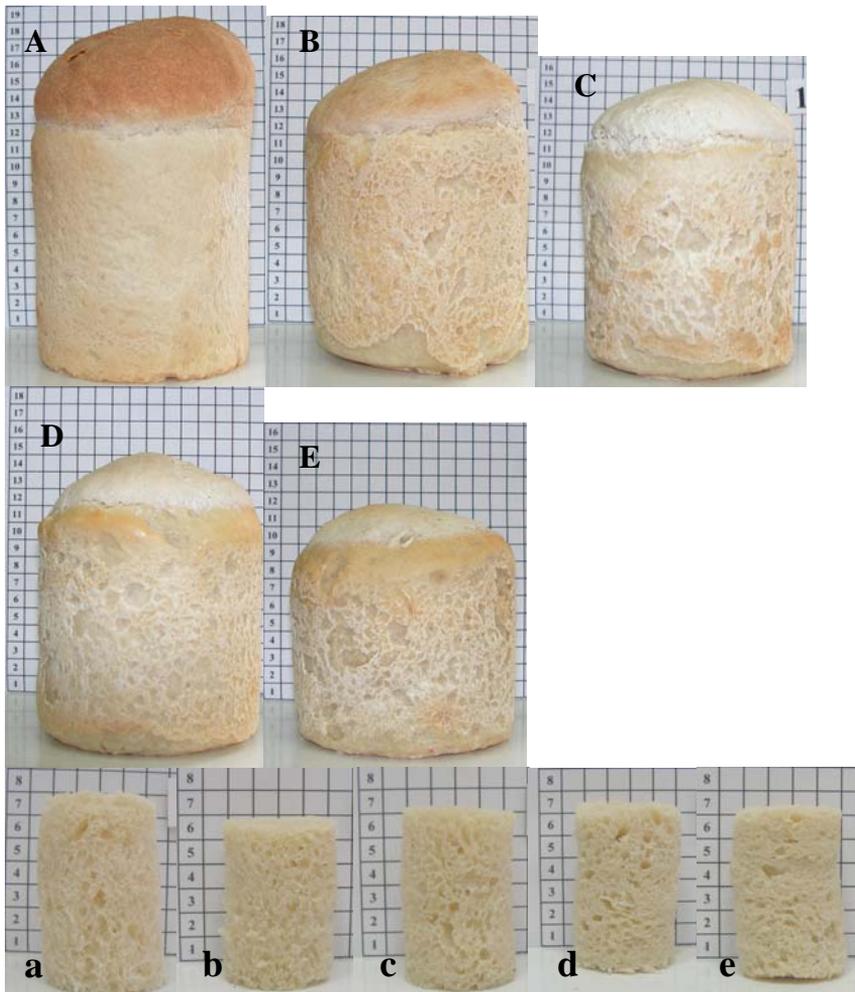


Fig. 1. Images of loaf (A - control samples, B - 10% fiber, C - 15% fiber, D - 20% fiber, E - 25% fiber) and crumb (a - control samples, b - 10% fiber, c - 15% fiber, d - 20% fiber, e - 25% fiber control samples)

Bread containing 20% wheat fiber fraction was judged as being at the limit of acceptability. For many quality items it receives score < 5 (see Table 2). Sample which had 25% wheat fiber fractions was considered being as an unacceptable product.

Table 2. Sensorial bread evaluation

Quality items	Control sample	10 % wheat fibre	15% wheat fibre	20% wheat fibre	25% wheat fibre
Taste	9.1	8.91	8.79	8.75	7.89
Flavor	8.14	8.22	7.89	7.52	7.15
Crust color	7.9	6.68	5.85	5.15	4.51
Texture	8.52	7.01	4.12	2.51	1.11
Mastication	8.42	6.84	4.89	3.12	1.56
Crumb color	9.05	8.65	8.54	8.24	7.67
Crumb porosity	8.5	7.63	5.78	3.63	3.02
General appearance	9.4	7.79	6.83	5.46	2.21
Slicing	9.11	9.5	9.06	8.78	7.56
Humidity	9.62	8.05	5.46	3.56	2.34
Crumb elasticity	9.08	8.45	7.41	3.89	2.16
Density	9.06	8.22	4.07	3.15	2.37
Overall score	8.83	8	6.56	5.31	4.13

Table 3 – The reduction of the caloric value for the outcomes breads

Sample	Bread humidity	Fiber content	Caloric value	Percentage reduction of the caloric value
	%	g/100g bread	kcal/100g bread	
Control sample	46.46	2.14	216.95	-
10% wheat fibre	49.77	6.53	182.80	15.74
15% wheat fibre	51.23	8.78	168.88	22.15
20% wheat fibre	52.48	9.98	156.94	27.66
25% wheat fibre	53.14	11.72	147.92	31.81

The caloric values of the breads were calculated (see Table 3). An important reduction for the caloric value was obtained for each sample which had wheat fiber added. The more wheat fiber added the more water binding and the lowest caloric value for the outcome product. So

the bread containing 25% wheat fiber fraction bound the highest amount of water. The reduction of the caloric value of this sample was 31.81% compared with control sample. But our 30 consumer panelist found this sample as unacceptable.

Conclusions

In the end we find that bread containing 15% wheat fiber fraction is the best good choice both for sensorial and nutritional reasons.

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