STUDY REGARDING THE POSSIBILITIES TO OBTAIN NON-YEAST BREAD

— research paper —

Gabriela CONSTANTINESCU (POP)[1], Adriana DABIJA, Amelia BUCULEI

Faculty of Food Engineering, Stefan cel Mare University, Romania

Abstract: The aim of this study was to evaluate the possibility to obtain bread using kephir-like leavening agent. We use the straight method for making bread. Kephir was selected for its rich chemical composition in Lactobacillus, so we could adapt a bread making method with MLC. Three samples were analysed: P1 - bread with flour, yeast, water and salt;,P2 - bread with flour, yeast, kephir, water and salt; P3 - bread with flour, kephir, water and salt. The samples were examined from sensorial, physico-chemical and technological point of view. The conclusions are that in order to obtain a competitive foodstuff it will be necessary to exchange the straight bread making technology with indirect methods.

Keywords: kephir, straight method, bread making

INTRODUCTION

Bread is a major component of nutrition and bread manufacturing is one of the oldest processes known, having been practiced for thousands of years. However, the mechanisms associated with bread's aging process have not been fully understood. Bread aging is a result of changes in starch, protein microstructure, moisture migration and redistribution. The economic problems arising from bread's aging process and the microbial spoilage of bread have recently triggered extensive research in this area. Another important aspect for developed countries is the sensorial deterioration of industrial bread and having, as a result, the consumers' preference for other types of foodstuff. Also, in these developed countries, longer shelf-life and a high nutritional value are issues of great importance.

This research focused on using enzymes in the manufacturing of bread, through the use of mixed starter cultures containing lactic bacteria and

[1] Corresponding author. Mailing address: Faculty of Food Engineering, Stefan cel Mare University, Universitatii 13, 720229 Suceava, România. Tel. +40 230 216147. Fax: +40 230 520267. E-mail: gabriela.constantinescu@fia.usv.ro)

yeasts. This ensured a mixture of flour with better rheological properties, it prolonged the shelf-life, it improved the resulting bread from an sensorial and nutritional point of view, and it satisfied recent consumer demand for „natural" manufacturing technology.
The use of mixed cultures has several important advantages compared to the use of bakery yeast, such as improving taste and texture and extending shelf-life due to its antimicrobial compounds.In these mixed cultures, yeasts act primarily as fermentation agents, while other compounds may contribute mainly to the sensory quality and the shelf-life of bread. Through the Standard of Identity No. 149 A/1987 prepared by the IDF (International Dairy Federation) the microbiota of kephir granules is defined as consisting of different species of yeast (*Saccharomyces kefir, Candida kefir*) and lactic bacteria (*Lactobacillus caucasicus, Laxctobacillus casei, Streptococcus lactis* and *Streptococcus diacetilactis*), which gives them their special flavour due to its slight alcohol content (1-2 %). Kephir use in bakeries for bread manufacturing has not been recorded so far, and it can be considered an interesting prospect. It is expected that kephir increases bread's resistance to deterioration and leads to the manufacturing of bread with improved flavour and aroma.

MATERIALS AND METHODS

In order to obtain some available experimental data, wheat flour obtaining from FLAMURA 85 wheat variety grinding in Chopin Laboratory Mill was used like control sample. The analytical flours obtained quality (Table 1) was determined in accordance with the international standard methods (ash content – ICC104/1, wet gluten – ICC105/2, protein content – ICC106/2, hydration capacity with Pharinograph - ICC115/1). The moisture content of the wheat flour and bran were determined by oven drying at 1300C for 1 hour.

Table 1. Analytical parameters of control flour

Moisture %	Ash %	Wet gluten %	Protein %	Hydration capacity %
13.3	0.48	27.3	10.3	62.6

Like raw material I used also compacted fresh yeast (*Saccharomyces cerevisiae)* from S.C. ROMPAK, Pascani, with 32.5% dry matter and 46.54% protein content (N x 6.25). For baking tests, iodized salt

manufactured by the Salina Cacica Salt Mines was used. Kephir used in the experiments was supplied by Napolact Cluj and had the following quality parameters: fat 3%, dry substance 10.3%, acidity 90ºT.
There were established 3 samples: P1 - bread with flour, yeast, water and salt; P2 - bread with flour, yeast, kephir, water and salt; P3 - bread with flour, kephir, water and salt. The recipe used for making breads is shown in Table 2.

Table 2. Recipe for bread with kefir

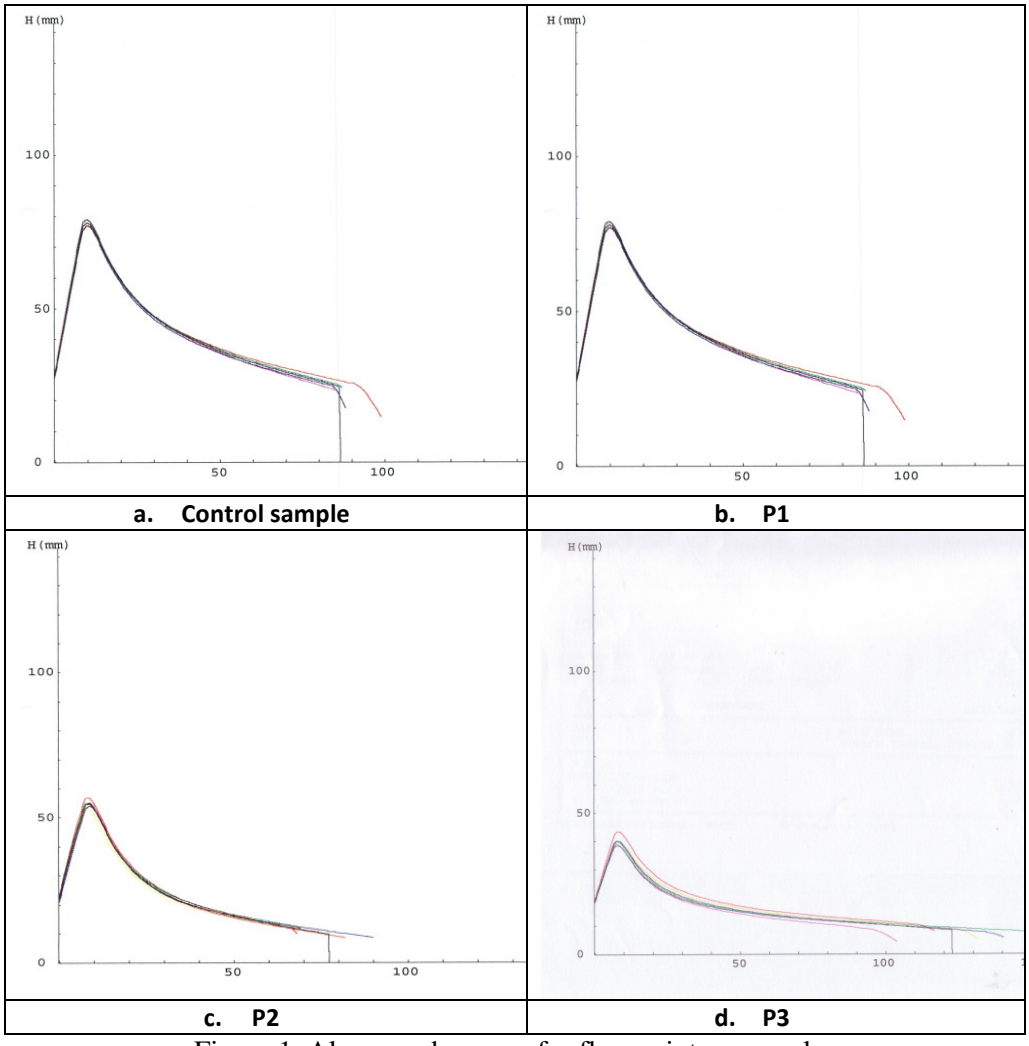
Ingredients and technological regime	UM	P1	P2	P3
Raw materials and ingredients				
Wheat flour	grams	1000	1000	1000
Fresh yeast	grams	8	4	0
Kefirr		0	4	8
Salt	grams	7	7	7
Water	cm^3	270 to 300	270 to 300	270 to 300
Technological parameters				
Kneading time	min	10-15	10-15	10-15
Proffer time	min	20-25	20-25	20-25
Temperature of blanks	^0C	30-32	30-32	30-32
Baking time	min	30-35	30-35	30-35
Baking temperature	min	240-260	240-260	240-260

Dough was prepared using a straight dough method.
After baking, the samples were cooling 6-8 hours in controlled atmosphere (UV lamps). In order to be scoring (after 24 hours), and to be examined from microbiological point of view (after 72 hours), the samples were sliced for packed in plastic bags Microbiological quality of bread over 3 days at room temperature was evaluated according with SR EN ISO 4832/2006 quality standard. Also, it was made determination of technological properties through Alveograph curves, in order to make recommendation for different usages. A Chopin Alveoconsistograph was used for determination of resistance of deformation (tenacity) P, dough extensibility, L, the value of P/L, and the mixing energy W according with the international standard SR ISO 5530 – 4. The experiments are made in the research laboratory of Ştefan cel Mare University of Suceava, Faculty of Food Engineering.

RESULTS AND DISCUSSIONS

Quality assessment of doughs obtained by adding kefir

In order to evaluate the impact of partially or totally substituting bakery yeast with kephir, we followed the rheological behaviour of the obtained doughs. The obtained alveograms are shown in Figure 1 and their corresponding values in Table 3.



a. Control sample | b. P1

c. P2 | d. P3

Figure 1. Alveograph curves for flour mixture samples

Table 3.Results of the alveogram

Sample	Characteristics of the alveogram			
	P [mm]	L [mm]	W [10^{-4}J]	P/L
P1	86	87	241	0,99
P2	61	78	123	0,78
P3	44	123	136	0,36
Control	84	85	240	0.92

Analyzing the obtained data, it can be observed that in the case when the yeast is totally subsituted with kephir, the rheological qualities of the dough worsen, especially its tenacity (P), a fact which indicates that the bread's volume might be well below normal. Sample P3's extensibility increased by 29.26% compared to sample P1, which suggests that the dough will be more difficult to process, for it being recommended baking in trays to maintain shape and volume.
For intermediate sample P2, for which only half of bakery yeast quantity was substituted with kephir, we observe a clear influence of rheological properties with a reduction in tenacity (P) of 29.07% and in extensibility (L) with 10.34%, but not irrevocably affecting the dough's baking capacity. The expected result for baking test are close to sample P1, with a possible decrease in volume.

Quality assessment of bread obtained by adding kephir

Based on the technological process previously established, experiments were conducted on the influence of different quantities of kephir on bread's quality obtained through straight method.

Sensorial analysis

From a sensorial point of view, the obtained finished product can be analyzed by taking into consideration external appearance, symmetry of form, crust color and structure, colour, core elasticity and porosity, taste, smell, signs of microbial deterioration and the presence of foreign content. Visually, whole loaves were analyzed by measuring the symmetry and regularity of shape, loaf volume, appearance and crust colour. The breads are presented in Figure 2.

In terms of appearance it can be seen that the first two samples (P1 - witness bread flour, yeast, water and salt and P2 - bread flour, yeast, kephir, water and salt) have relatively similar shape and volume, while sample P3 (whole wheat bread, kephir, water and salt) is obviously smaller and has low volume. Between samples P1 and P2, there is a similarity of crust color and approximately the same diameter, while sample P1 has a slightly glossier appearance. Obviously, in terms of height, P2 is less than sample P1 due to lower amount of yeast that couldn't be substituted with the same quantity of kephir. For sample P3, there is a decrease of diameter compared to P1 by 2-3 cm, and also an uneven crust color, presenting burnt areas alternating with discolored areas. In terms of volume, there is a reduction more than 50% for sample P3 compared to P1, so kephir practically cannot substitute for yeast in bread manufacturing by straight method.

Figure 2. Baking test results

It was also noticed that for sample P3, the core appears to look unbaked, because an appropriate porosity could not be developed. It is probable that through the straight method, the kneaded kephir dough does not have enough time to leaven properly. Therefore, it requires choosing an indirect method of manufacture, the two-phase or three-phase method.

Physico-chemical and specific analysis

To assess kefir's influence on the quality of bread the three samples were analyzed in terms of moisture, acidity, mineral substances and fat content. The results are shown in Figure 3.

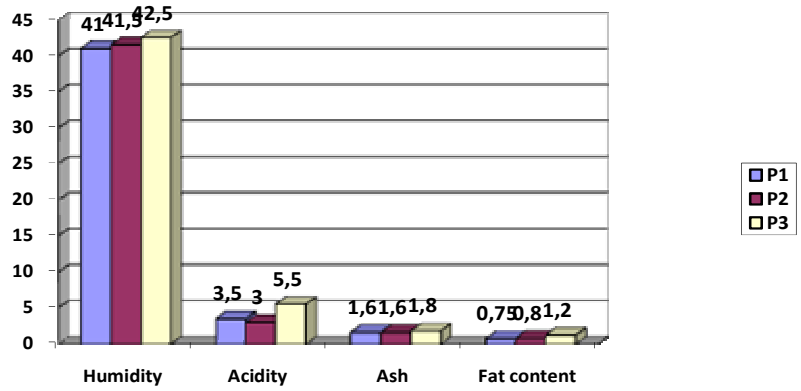


Figure 3. Phisical chemical evaluation of bread samples

As shown in the graph, the addition of kephir did not significantly influence the humidity of the final products; however, because of high lactic acid content sample P3 has a higher acidity than P1 witness sample. Regarding mineral substances and fat content, it was not observed measurable changes that could influence the nutritional quality of the finished products. Next, the three samples were tested in terms of specific qualities of a representative bakery product: core porosity and elasticity. Pore distribution is relatively uniform for the first two samples, except that, for sample P2 it can be observed better pore size. For sample P3, porosity is compromised because kephir did not have the ability to generate enough CO2 to ensure an appropriate volume and pore precursors. These observations are confirmed by practical measurements, illustrated in Figure 4.

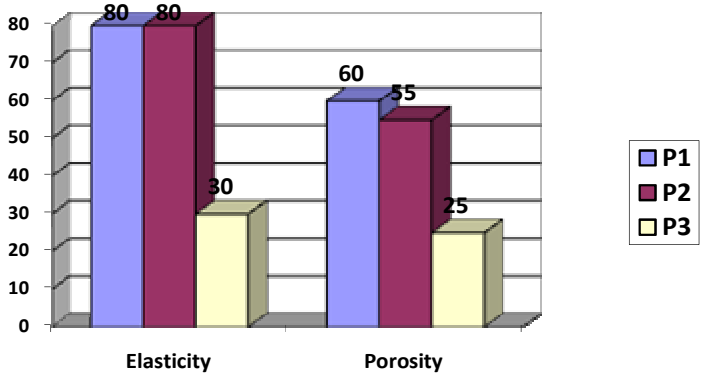


Figure 4. Evolution of the characteristics of elasticity and porosity of bread samples

As observed in Figure 4, the bread's core elasticity for the three samples is kept stable in the first two samples (P1 - witness bread flour, yeast, water and salt) and P2 - bread flour yeast, kephir, water and salt), while for P3 (whole wheat bread, kephir, water and salt) elasticity is reduced by 62.5%. Regarding porosity, there was a slight decrease (about 8.3 %) for P2 (bread flour, yeast, kephir, water and salt) compared to P1 (witness bread flour, yeast, water and salt), while for sample P3 (bread flour, kephir, water and salt) there was a 58.33% decrease compared to P1 and 54.54% compared to P2.

CONCLUSIONS

The purpose of this paper was to evaluate the possibility of obtaining bread using kephir as leavening agent. A straight method was used for obtaining the samples. The three bread samples were obtained by partially and totally subsituting bakery yeast with kephir. P1 - bread with flour, yeast, water and salt;P2 - bread with flour, yeast, kephir, water and salt; P3 - bread with flour, kephir, water and salt. The obtained samples were analyzed from sensorial, physico-chemical and technological points of view. The results obtained show that:

- From sensorial point of view, P3 is eliminated, while P2 (bread with flour, yeast, kephir, water and salt) remains a viable option.
- Adding kephir did not significantly influence the finished products' humidity; however, sample P3 has a greater acidity than P1 due to its high content of lactic acid
- Taking into consideration mineral substance and fat substance content, there were no quantifiable changes that would influence the nutritional quality of the finished goods
- With samples P1 and P2 there were similar crust color and appearance, the same diameter, while sample P1 has a slightly glossier appearance. Obviously, in terms of height, P2 is less than sample P1 due to lower amount of yeast that couldn't be substituted with the same quantity of kephir
- In terms of volume, there is a reduction more than 50% for sample P3 compared to P1
- For sample P3, the core appears to look unbaked, because an appropriate porosity could not be developed. It is probable that through the straight method, the kneaded kephir dough does not have enough time to leaven

properly. Therefore, it requires choosing an indirect method of manufacture, the two-phase or three-phase method

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