

BREAD QUALITY IMPROVEMENT BY ADDING DEHYDRATED SOURDOUGH IN THE RECIPE

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Abstract

The production of sourdough, used for thousands of years, it can be considered that is one of the oldest biotechnological techniques. Currently, methods for manufacturing bakery products using sourdough could improve the texture, flavour, and increase the shelf life from a microbiological perspective. The fermentation process is based on the symbiosis between certain lactic acid bacteria and yeast. If desired to integrate the properties of traditional bread in the industrial manufactured, a profitable and simple to use technology is the utilization of dehydrated sourdough in the recipe. The aim of this paper is to examine the influence of dehydrated sourdough addition over the sensorial and physicochemical properties of wholemeal and white bread. The assessed characteristics were: smell, flavour, crumb appearance, total acceptability, elasticity, acidity, volume and porosity. The study demonstrate that the quality of bread obtained with dehydrated sourdough was improved: higher acidity, better elasticity and porosity, higher volume, higher score for total acceptability, more pleasant flavour and taste. Technological aids such as sourdough utilization can be a very helpful instrument to increase bread quality but also bread shelf life.

Key words: bread; dehydrated sourdough; sensory properties; shelf life.

INTRODUCTION

Bread is the most common and well-known food in the world, a very old component that is part of human nutrition (Arranz-Otaegui A. et al., 2018). Studies show that bread is present uninterruptedly in the daily diet. The average consumption of bread per capita is 97 kilograms per year. Given this quantity, it is observed that the average level of consumption in Europe is exceeded (Tamba-Berehoiu et al., 2014). Bread was originally a household product, and for the industrialization of the bakery it was necessary to develop the technology and science of food and first of all it was necessary to discover the microorganisms responsible for the development of the dough and implicitly of the sourdough. The sourdough is in fact an old natural yeast used in baking and which over the years has been replaced by yeast produced at the industrial level and with chemical agents (Nionelli L., & Rizzello C., 2016). This natural fermenting agent has stood the test of time and is still maintained today, used by consumers who are increasingly aware of the nutritional

quality of food and of course its impact on health.

Traditional sourdough is the result of a mixture of water and flour where the native lactic bacteria of yeast and flour produce the phenomenon of fermentation. The so-called back-slopping process, which is characterized by the use of small amounts of product in the initial fermentation as the starter culture in the next fermentation process, is the one that promotes proteolysis, synthesis of exopolysaccharides, enzymes, antifungal compounds and organic acids (Brandt M.J., 2019). Both the level of these compounds and their formation in the dough are directly proportional to the selected strains used to start the fermentation, to the activity of the natural microbiota of the flour and to the quality of the raw materials (Păcularu-Burada B. et al., 2020). The interest regarding the improvement of the fermentation process was given by that search to diversify the raw materials considering first of all their nutritional and functional properties (Papadimitriou K. et al., 2019; Reese A. T. et al., 2020; Rizzello C. G. et al., 2019). The

bioavailability and bioavailability of non-nutrients and nutrients are particularly important to ensure adequate nutrition of the fermentation process and the health benefits that the final product can bring (Păcularu-Burada B. et al., 2020; Siepmann F.B. et al., 2018). The glycemic index of bread may be lowered by the sourdough. The sourdough can also release bioactive peptides, improve the properties of the dietary fiber complex, increase the absorption of phytochemicals, minerals and vitamins. If we compare two categories of bakery items: an item containing rye flour or whole wheat flour and another item of highly refined white wheat flour, we notice that the former has higher amounts of vitamin E and B1. Foods can be enriched with vitamins B1 and E by adding additional vegetable ingredients. These additives in the bakery area have been used for diversification, and for enriching the flavor, aiming to be a motivation and a guide to a healthier consumption of food (Gherghina et al., 2015). The lactobacilli present in the dough have a microbial metabolism that produces new active compounds such as potentially prebiotic exopolysaccharides and amino acid peptides and derivatives (Păcularu-Burada B. et al., 2020; Chiş M.S. et al., 2019; Rashmi B. S. et al., 2020). The scientific community is interested in the by-products of microbial metabolism because it is possible to create new products based on maintaining health in case of chronic non-communicable diseases such as diabetes and cancer, autoimmune diseases, irritable bowel syndrome, heart disease, colitis, high cholesterol, irritable bowel syndrome (Bo S. et al., 2017; Diowksz A. et al., 2020; Gobetti M. et al., 2019; Olojede A.O. et al., 2020; Rizzello C.G. et al., 2017). "Functional foods" are a relatively recent concept. This concept has proven to have developed rapidly in the last few years. This type of food should support the improvement of health and well-being and at the same time should reduce the risk of chronic high diseases, but also degenerative diseases such as cancer, obesity, cardiovascular disease and gastrointestinal disorders (Zamfir et al., 2014).

MATERIALS AND METHODS

The Web of Science database has been used to search the electronic library for articles

published in recent decades. This search for literature included research articles and reviews. The keywords used were: bread; dehydrated sourdough; sensory properties; shelf life. The analysis took place in the physico-chemical analysis laboratory (Mass - electronic scale, Volume - Fomet, Porosity - sharp brass perforator, analytical/technical scale, Elasticity - elasticity determination device; Acidity - laboratory determinations, Moisture - laboratory determinations, Ash - calciner, Fat - Soxhlet, Protein - Kjeldhal) and in the sensory analysis laboratory (in a large room for observing the social distance regarding the situation we are in), with a group of trained examiners (evaluation panel). The samples were sliced shortly before to avoid drying/hardening, each sample being pre-coded.

RESULTS AND DISCUSSIONS

Being considered a long tradition in the production process of bakery products, the use of sourdough plays an important role. We can obtain the dough by spontaneous fermentation of a mixture of water, salt and flour, the dough and in recent years the control of the fermentation process as well as specific cultures has been used. The sourdough is used in baking process and its main qualities such as its ability to improve the quality and prolong the shelf life of bread have been widely studied (Arendt EK et al., 2007; Gocmen D. et al., 2007; Katina K. et al., 2006; Martinez-Anaya M.A., 2003). The impact of these specific processing conditions on the microbial quality of wheat and bread dough was investigated by Debonne et al.

The sensory evaluation panel consisted of 9 people with an average age of 30 years, where 4 bread samples were analyzed coded as follows: 534 - Bread with white flour, without sourdough.

239 - Bread with wholemeal flour, without sourdough.

620 - Bread with white flour, with sourdough.

345 - Bread with wholemeal flour, with sourdough.

The samples were analyzed individually and the neutralizing agent was water for rinsing the mouth. The questionnaire that accompanied the tests included all these characteristics and will be evaluated on a scale from 0 to 5.

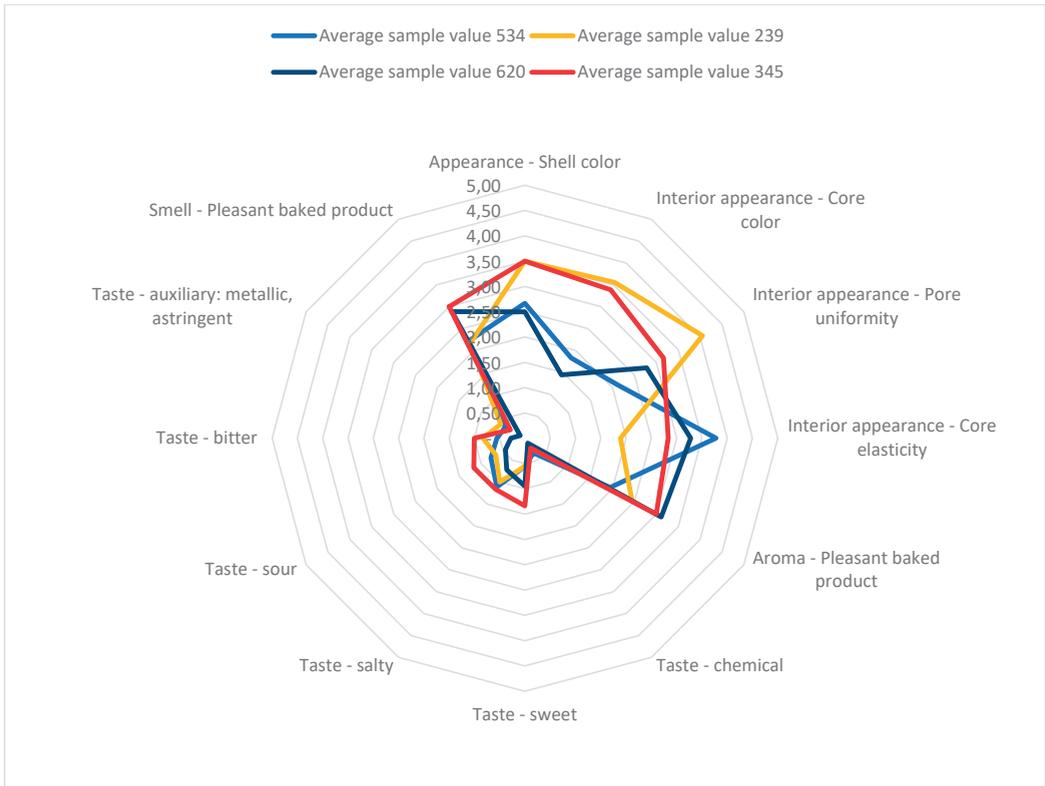


Figure 1. Diagram of the sensory characteristics of bread samples



Figure 2. White flour bread samples



Figure 3. Whole grain flour bread samples

The quality of sourdough largely depends on the type of wheat from which the flour used in the fermented dough is made.

Wholemeal flour is recommended because it has many nutrients or microbial substrate, such as phytochemicals and vitamins, minerals, as well as sterol, phenolic and tocopherol compounds. The main ingredient in sourdough is traditionally wheat flour.

However, different types of flour, whether conventional or unconventional (quinoa, corn, oats, barley, rye, sorghum) can replace wheat in order to increase quality and meet consumer needs.

The use of so-called unconventional flours in the manufacture of doughs can improve some of the beneficial health effects associated with bakery products.

The consumer's perception of the quality of the bread is mainly determined by sensory and health attribution.

Table 1. Sensory analysis results

Characteristics	Average test value 534	Average test value 620	Average test value 239	Average test value 345
Exterior appearance - color	2.66	2.51	3.51	3.51
Interior appearance - color	1.82	1.43	3.55	3.38
Interior appearance - pore uniformity	2.1	2.77	4.05	3.16
Interior appearance - elasticity	3.77	3.27	1.88	2.82
Aroma - pleasant baked product	1.93	3.10	2.43	3.01
Taste - chemical	0.32	0.10	0.21	0.21
Taste - sweet	0.55	0.93	0.55	1.32
Taste - salty	1.10	0.71	1.01	1.16
Taste - sour	0.77	0.43	0.66	1.16
Taste - bitter	0.55	0.27	0.82	1.01
Taste - auxiliary: metallic, astringent	0.43	0.10	0.55	0.32
Smell - Pleasant baked product	2.21	2.88	2.16	3.01
Total acceptability	1.66	0.55	1.10	0.55

Table 2. Physico-chemical results

Sample Test	534	239	620	345
Moisture (%)	43.86	45.47	43.83	38.51
Moisture in breadcrumbs (%)	0.35	0.51	3.75	5.91
Mass (g)	385.97	398.6	386.66	364.67
Acidity (°)	1.0	2.2	1.1	2.1
Total ash (%)	1.88	2.63	1.91	2.67
Protein	14.02	17.57	13.50	16.27
Fat (%)	0.1	0.4	0	0.3
Starch (%)	74	66	71	58
Total dietary fiber (%)	0.32	2.83	0.28	2.46
Salt (%)	0.958	0.87	0.94	0.81
Volume (cm ³ / 100 g)	341	223.5	381.8	252.7
Porosity (%)	81	63	76	68
Elasticity (%)	97	71	96	86

CONCLUSIONS

All aspects regarding quality of bread (texture, flavour, nutritional quality and shelf life) are influenced by the use of sourdough in bread-making process. The sort of cereal flours, the metabolism of fermenting microorganisms, the baking conditions, the characteristics of sourdough preparation are the factors who determine the bread aroma. As an alternative to adding value to sourdough bread, we can use the unconventional alternative flours and in the same time allowing gluten-free bread production. The increased bioaccessibility of non-nutrients and nutrients and the bioactive compounds released from the matrix contribute to the health benefits from the consumption of sourdough bread.

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