

QUALITY INDEXES OF SPONTANEOUS FLORA SOURDOUGH OF DIFFERENT FLOURS

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Summary: Fermented products based on sourdough shows many advantages in opposition with fermented products with commercial yeast. In the paper are represented and analyzed the results on the research of organoleptic, microbiological and physico-chemical quality indicators of sourdough of 3 types of flours: wheat, soryz (*sorghum oryzoidum*) and rye. It was established that all the parameters of the examined samples fell within the limits of the values which were stipulated in the specialized literature for sourdough with spontaneous flora.

Key words: sourdough with spontaneous flora, lactic bacteria, yeast, acidity, fermentation, organoleptic aspects.

Introduction

The spontaneous flora sourdough is defined as a mixture of water and flour (and possibly salt or sugar) fermented by lactic acid bacteria and endogenous or exogenous yeast, being inseparable from fermented dough mixes, especially from bakery and pastry products. Literary sources report that fermented products based on spontaneous flora sourdough show many advantages as opposed to commercial yeasts fermented products such as: it favors the cellulose predigesting, by making bakery products easier to digest; it contains important digestive prebiotics; it inhibits bacterial growth by creating a more acid environment and by producing antibacterial agents; it has a better flavor and texture compared with just yeast fermented products; it presents an increased nutritional value due to the increasing of mineral availability and the decreasing of the glycemic index, etc [8,9,14]. The spontaneous flora sourdough is obtained due to some successive series of "freshening", which optimize the acidification and fermentation capacity (leavening). Due to this refreshment, a natural selection of sourdough occurs, creating a true ecosystem, which establishes trophic relationships which depend on metabolic capacities of the present microorganisms. Here can be found more than 50 species of lactic acid bacteria (*Lactobacillus*) and over 20 species of yeast (*Saccharomyces* and *Candida* in particular) [6, 8, 12]. The main challenges for a successful sourdough occur during the selection and development of starter cultures (based on the pre-existing flour flora and the one from the environment), as well as during the sourdough maintenance through successive refreshments [5,8].

The developing methods of spontaneous flora sourdough are quite long, often difficult, and require skills and experience. Typically, the processes for producing include the initial period of fermentation from 24 to 48 hours, which allow the selection of microbial flora. The second period of fermentation follows after the first refreshment with subsequent updates (usually at intervals of about 8 hours). The concerned steps may last several days and fosters the development of a balance between the existent microbial species. The determinant factors for a balanced development of micro flora are:

temperature, water and food availability. It considers that a high-quality sourdough must contain from 10^6 - 10^7 ufc/g yeast and 10^7 - 10^8 ufc/g lactic bacteria, with a numerical ratio between them from 1:10 to 1:100 [1,5]. Its fermentation capacity is optime if sourdough's volume is increased at least 2 times in 4 hours (Table 1).

Table 1. Quality indices of sourdough probes (5)

Quality indices	Refresh	Spontaneous sourdough flora
pH	4,0-4,3	3,8-4,0
Titrateable acidity, degrees	6,5-8,0	Maximum of 20
Yeast, CFU/g	-	10^6 - 10^7
Lactic acid bacteria CFU/g	-	10^7 - 10^8
Volume increase, cm ³	-	At least 2 times

Materials and methods:

Materials: As a basis for research materials were used:

- ☉ sourdough from wheat flour;
- ☉ sourdough from soryz flour;
- ☉ sourdough from rye flour.

In the process of obtaining sourdough were used wheat, soryz and rye flour. For the first step, there were taken equal proportions of water and flour (50:50), with the exception of the rye flour (where the proportion was of 75:50). The obtained mixtures were covered with perforated polyethylene film and were left for fermentation at the temperature of 24-28°C. The general scheme of obtaining the sourdough from the flours mentioned is shown in Figure 1.

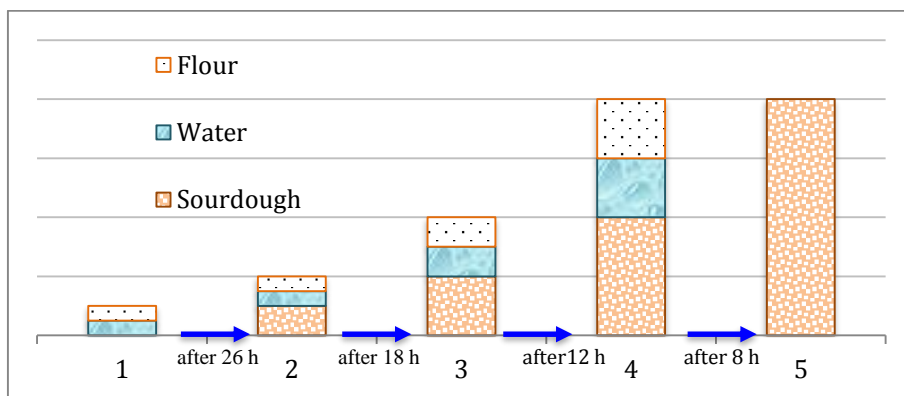


Fig. 1. General scheme of obtaining the sourdough

Methods: for sourdough samples, there were determined the next quality indicators: micro-biological (the total number of bacteria, the number of yeast), organoleptic (aspect and colour, smell, consistency), titrateable acidity and pH (10 grams of sourdough are omogenized with distilled water for 5 minutes, after which the pH was determined) and fermentation capacity (100 ml of sourdough are placed in a graduated cylinder and is left for

fermentation for 4 hours. Then the volume evolution is tracked [5, 8].

Results and discussions

Obtained probes of sourdough from different flour types had volume evolution values which were framed in the limits of those specified in specialized literature: wheat and soryz flour sourdough volume was increased approximately 2,7 times, and the rye flour - about 3,2 times (Figure 2). The higher values of rye flour sourdough volume evolution can be explained, probably, through the high amylase activity, the easily hydrolysable starch and high content of reductive carbohydrates with which is characterized specified flour.

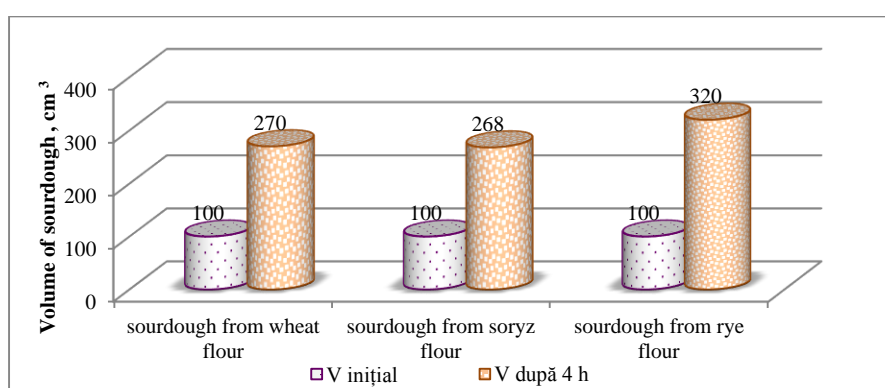


Fig.

2. The change of the final samples' volume of sourdough during 4 hours

At the sourdough preparation, the main role in acid formation belongs to mesophilic bacteria with optimal activity at 30-35 C, and thermophilic bacteria, with a minor role, have optimal activity at 48-52 C. Therefore, the final acidity of the sourdough is taken as the maturation index. The descent of the pH is favorable for fighting the disease effect of bread and processing of flours from sprouted wheat, with a high amount of amylase.

After 26 hours of fermentation, sourdough from the rye flour, is described with lower pH values (3,9) in comparison with the rest of the samples, whose pH were 4,56 (sourdough from wheat flour) and, respectively, 4,88 (sourdough from soryz flour) (Figure 3). Subsequent acidification of the sourdough samples was gradually modified. After 64 hours the obtained results from sourdough were: 3,6 (sourdough from rye flour), 4,1 (sourdough from wheat flour) and 4,3 (sourdough from soryz flour). These results are close to the values specified in the respective scientific studies in the specialized literature (Tabel 1).

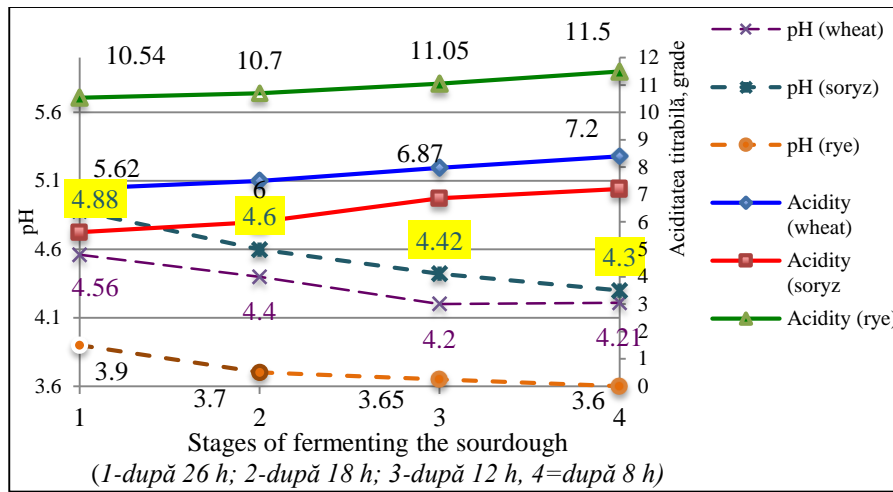


Fig. 3. Titratable acidity and pH evolution of sourdough probes during 64 hours

The results are due to the acids formed during the lactic fermentation, which increased the leaven's acidity and moved the pH toward more acidic values.

The sourdough's micro flora is the result of a natural selection of the original flour flora (dependent on the conditions of cultivation and grain storage) and the ambient one which favors the particular development of the microorganisms. Microorganism species depend on the coexistence/compatibility between them (acid tolerance) [3, 6, 13].

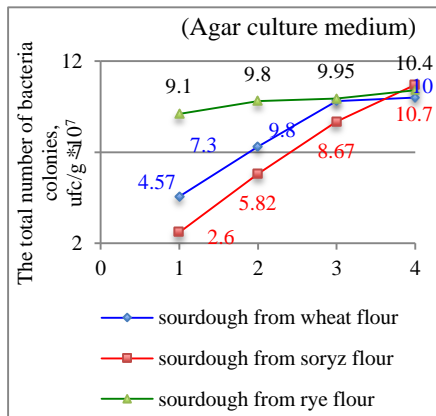


Fig. 4. Evolution of the total number of bacteria in samples of spontaneous flora sourdough

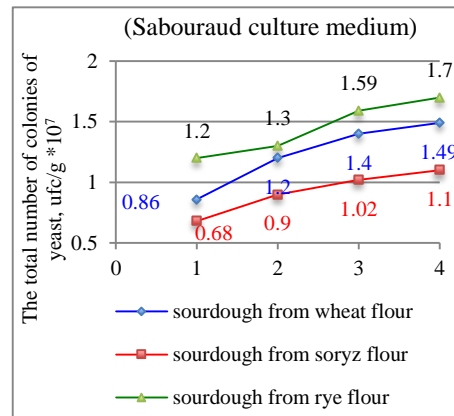


Fig. 5. Evolution of the total number of yeast in samples of spontaneous flora sourdough

(1-after 26 h; 2-after 18 h of first freshening; 3-after 12 h of the second freshening, 4-after 8 h of the third freshening)

The total number of bacteria and yeast was increased during the maturity period of sourdough probes (after 64 hours) till $10,4 \cdot 10^7$ and $1,7 \cdot 10^7$ ufc/g in rye flour sourdough, $10,0 \cdot 10^7$ and $1,49 \cdot 10^7$ cfu/g-in wheat flour sourdough and $1,1 \cdot 10^7$ cfu/g in soryz flour sourdough (Figure 4 and 5).

Aromatic aspects. The aroma of sourdough and bakery products obtained with sourdough is attributed to a complex of aromatic substances of microbial and aromatic origin, in particular, to lactic and acetic acid, produced by lactic bacteria. Other aromatic compounds like alcohols and esters derived from yeasts' and lactic bacteria's metabolism starting with the contained precursors that are present in flour and sourdough. Aromatic quality of sourdough depends on pH and the ratio between lactic acid and acetic one from composition.

Tabelul 2. The characteristic of organoleptic indexes of spontaneous flora sourdough's samples

Organoleptic indexes	Flour sourdough from:		
	Wheat	Soryz	Rye
Color and Appearance	Homogeneous, yellowish-white, typical feedstock.		
Smell	Pleasant, sweetish, characteristic raw materials without mold or foreign odors.		
Consistency	Spongy, with multiple and uniform pore.		
	Creamy, homogeneous.	Soft, slightly sandy (due to the absence of gluten)	Dense, slightly more viscous (compared to the rest of the samples).

Obtained organoleptic composition of sourdough probes (Figure 2) correspond to the requirements for a high-quality sourdough [5,8].

Conclusions

1. Obtained quality index values (titratable acidity, pH, fermentation capacity, sensory and microbiological indicators) of spontaneous flora sourdough from 3 flour types (wheat, soryz and rye) fall within the values specified in scientific studies from specialized literature.
2. The spontaneous flora sourdough from soryz flour could be an efficient alternative in developing gluten-free bakery products and pastry.

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