



## Development of sourdough starter made with lactic bacteria strains isolated from ecologic flour

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### Abstract:

In the present research, eight sourdoughs were obtained and analysed, which differed by the selected LAB strains, isolated and identified from wheat, rye and corn ecologic flours, used in sourdough preparation. The structure and fermentative capacity of the formed sourdough starters was analysed for pH, total tritrable acidity, viability of lactic acid bacteria and natural yeast. The use of starter culture has a positive effect on the dough obtained in the laboratory, improving the biotechnological properties and the production time. The main independent variables (biotechnological parameters) with influence on the quality of the fermented product were found to be: dough consistency, inoculum, duration of the fermentation process and temperature. Thus, sourdough with superior bioactive properties was obtained under the following optimized fermentation conditions: dough consistency – Dy 180; inoculum volume of starter LAB strains 1%, fermentation temperature – 30 °C; fermentation time – 24 h. The analysis showed that the use of *L. plantarum* LM2, *L. brevis* LM 6, *L. bifermentas* LM7 și *L. coryniformis* LM8 as starters did significantly help to obtain improved sourdoughs, these being characterized by higher microbial growth, higher acidity values and superior fermentation than control samples. These characteristics may be essential to ensure the reproducibility and stability of industrial sourdough bread production.

The results obtained in this experimental study demonstrate that the strains of lactic acid bacteria isolated from spontaneous ecologic flour sourdoughs are promising for the development of starter cultures.

### • Introduction

Microorganisms play an important role in developing cereal flour foods based on the characteristics of sourdough, with numerous reports on the natural microbiota. All the datas in literature indicates that the lactic acid bacteria (LAB) present in sourdough may originate from flour, other dough ingredients, and the environment in which it is produced.

The use of starter cultures in the bakery industry allows for the intensification of the fermentation process, reduces the stages of the technological process and improves the food safety of the product. The selection of lactic acid strains for the purpose of developing biotechnologically active starter cultures is based on pure cultures whose cultivation temperature and the content of the nutrient medium are of particularly important significance

### • Material and method

Lactic acid bacteria strains isolated from spontaneous doughs characterized according to their biotechnological properties were used to evaluate the ability to obtain sourdough with improved properties. All lactic acid bacteria strains were activated from a refrigerated culture stored at 4°C by incubation at 30°C for 24 hours in 5 mL of MRS broth (Oxoid, UK). Subsequently, 1 mL of the suspension of each strain was taken separately and added to 9 mL of fresh MRS broth medium. The bacterial cultures were incubated for 18 h at 30°C. After incubation, the tubes were centrifuged for 5 minutes at 10,000 rpm (laboratory centrifuge) to separate the cells from the compounds in the medium. The obtained biomass was suspended in 2.5 ml of sterile physiological saline solution for each strain separately. The obtained starter culture inoculum was added to the formed dough in different concentrations: 1%, 1.5%.

The analysis of LAB and yeast, pH and TTA was performed on the sourdough obtained with culture starters after 24 h of fermentation.

### Conclusions

The use of starter culture obtained by combining isolated strains *L. plantarum*, *L. brevis*, *L. bifermentas*, adapted to obtain acid doughs at the laboratory level and selected for their antimicrobial properties against pathogenic and spoilage bacteria and molds, allows for the improvement of the technological process, food safety and the extension of the shelf life of the finished product. Thus, sourdough with superior bioactive properties is obtained under the following optimized fermentation conditions: dough consistency – Dy 180; inoculum volume of starter lactic acid bacteria strains 1%, fermentation temperature – 30°C; fermentation duration – 25 hours.

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### • Results and discussions

High metabolic activity is observed due to the values obtained in the case of acidity and pH for the doughs obtained with starter culture. The TTA results correlate with the results obtained from the evaluation of pH, which decreases significantly with increasing acidity.

A significant increase in acidity values is observed compared to the control samples, especially the microbiota rich in lactic acid bacteria (fig 1).

Doughs obtained by adding 1% starter culture showed gas release on the surface, through the presence of bubbles and foam formation, even though they did not increase in volume.

An increase in the LAB population is observed correlated with the values obtained in the case of acidity and pH. These correlations can be more easily highlighted in fig. 2. One of the major characteristics of dough fermentation is a decrease in pH proportional to the maturation of the LAB community that produces lactic and acetic acid, eventually reaching a pH of approximately 4.0.

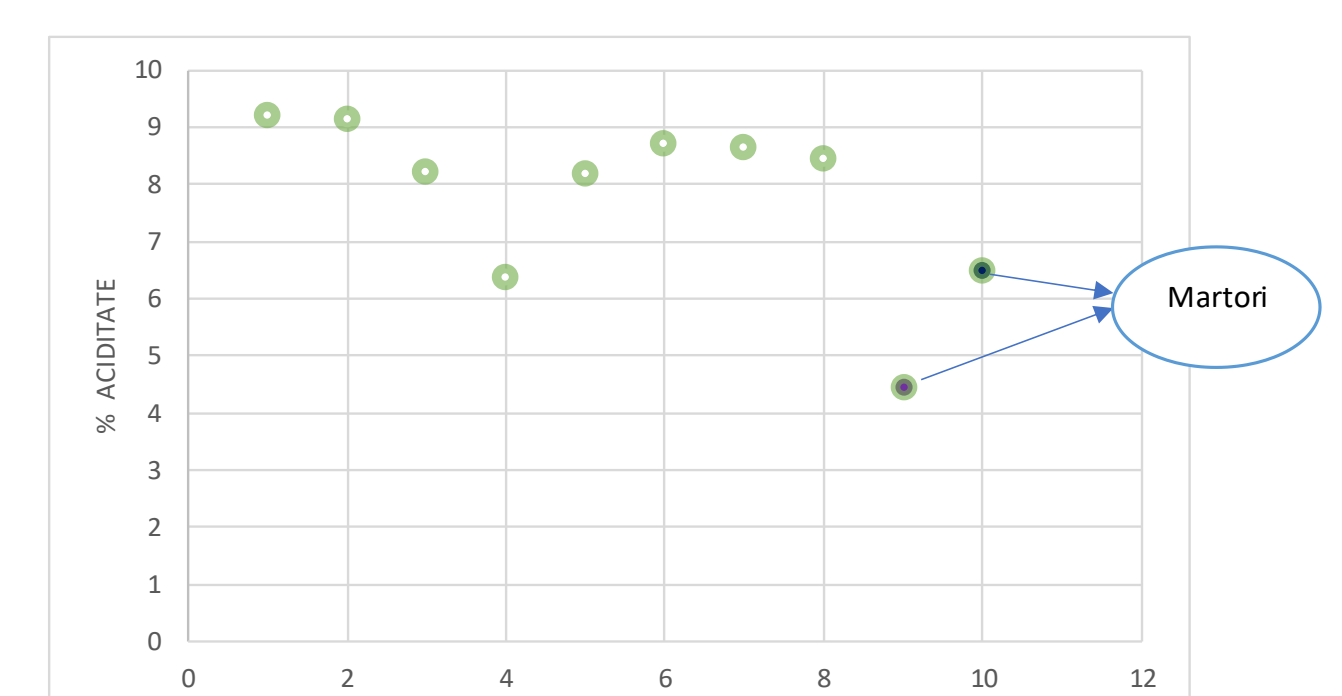


Fig. 1. Evolution of acidity of 1% starter dough samples compared to controls

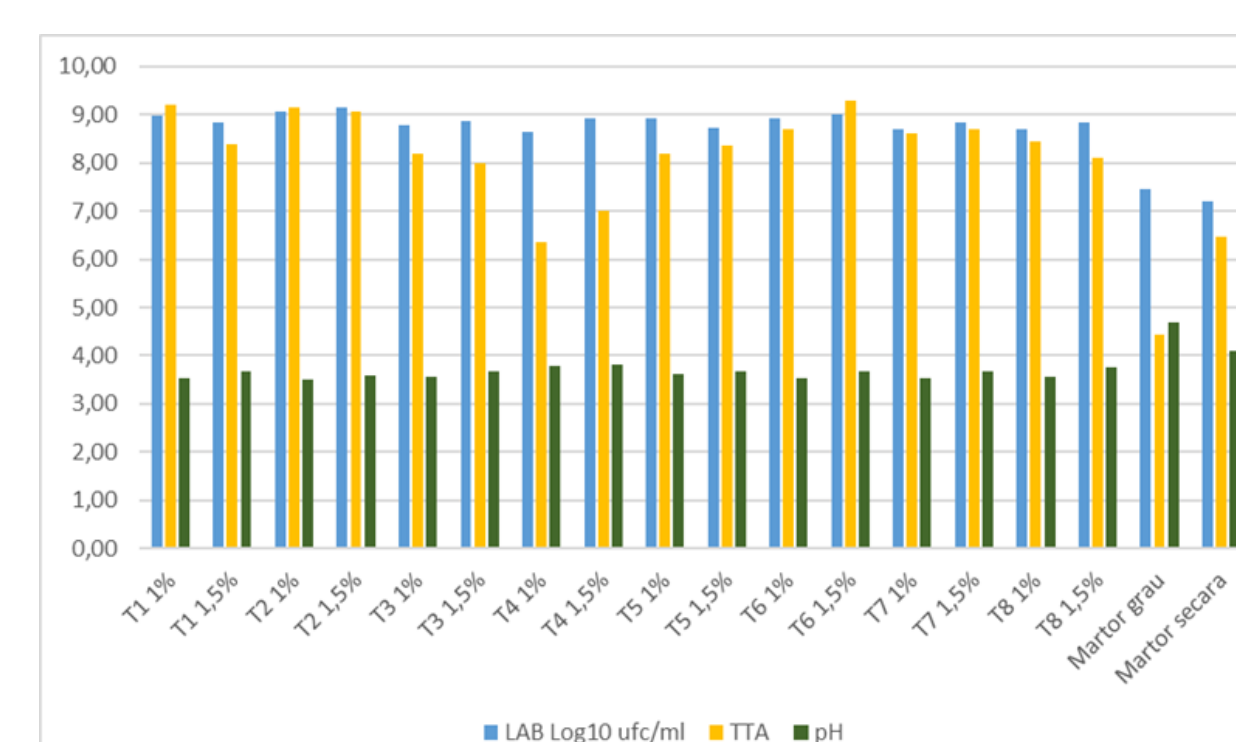


Fig. 2. Variations in physicochemical parameters compared to the growth of lactic acid starter bacteria

The most productive doughs in terms of lactic acid bacteria population, acidity and pH are doughs with the addition of *L. brevis* LM6, *L. plantarum* LM2, *L. bifermentas* LM7 and *L. coryniformis* LM8, these representing mature doughs with the potential to be used in the growth process in bread making. Due to the characteristics of the sourdoughs obtained with the starter cultures of *L. brevis* LM6, *L. plantarum* LM2, *L. bifermentas* LM7 and *L. coryniformis* LM8, these strains are selected to be tested in combinations, in order to identify the most efficient starter cultures for obtaining the active ingredient.