EVALUATION OF LACTIC ACID PRODUCTION ACTIVITY OF PROBIOTIC LACTOBACILLI

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https://doi.org/10.5281/zenodo.17318338

Relevance: Today, lactic acid is considered one of the most demanded bioproducts worldwide. This acid is widely used in the food industry, pharmaceuticals, cosmetology, and many other sectors. Therefore, selecting suitable raw materials and determining optimal biotechnological conditions to increase production efficiency is one of the urgent scientific and practical tasks. Whey, a by-product of the dairy industry, is regarded as a promising raw material for lactic acid production.

Aim of the study. One of the important tasks is to select the most active strains of lactic acid bacteria for efficient lactic acid production and to determine the maximum production period of lactic acid synthesized by them. The obtained results will provide a scientific and practical basis for optimizing the lactic acid production process, increasing economic efficiency, and developing environmentally friendly biotechnologies.

Methods and approaches. The amount of lactic acid was determined by a spectrophotometric method based on the formation of a colored complex with ferric chloride ($FeCl_3$). In this method, lactate ions react with $FeCl_3$ to form a yellow-green ferric lactate solution.

- 2 ml of 0.2% $FeCl_3$ solution was taken, and 50 µl of lactic acid solution was added and mixed.
- The optical density of the resulting solution was measured at a wavelength of 390 nm (using a 1300-SF spectrophotometer).
- A $FeCl_3$ solution alone was used as a control.
- Calibration curve was constructed using standard lactic acid solutions (X-axis — optical density, Y-axis — concentration).
- Based on this curve, the concentration of lactic acid in the culture fluid was calculated in mg/ml units.

Results. The amount of lactic acid in the tested strains *P. acidilactici* 1G, *P. acidilactici* 2G, *L. plantarum* 3G, *L. brevis* 4G, and *L. fermentum* LF1 was determined by spectrophotometry. It was found that the highest lactic acid yield in these strains was observed on the 4th day of cultivation. On day 1, *L. fermentum* LF1 produced 15.72 g/L of lactic acid, which increased to 40.91 g/L by day 4. *P. acidilactici* 2G produced 9.72 g/L on day 1, and 18.91 g/L on day 4. *L. plantarum* 3G produced from 1.47 g/L on day 1 to 11.25 g/L on day 4. *L. brevis* 4G produced 1.08 g/L on day 1 and 8.01 g/L on day 4. *P. acidilactici* 1G produced 3.02 g/L on day 1 and increased to 9.39 g/L by day 4. The study results demonstrated that lactic acid production ability significantly varies among strains and depends on cultivation duration. The highest producer strain was *L. fermentum* LF1, which reached 40.91 g/L of lactic acid on day 4, while *L. plantarum* 3G was the lowest producer, with 11.25 g/L on day 4. *P. acidilactici* 2G and *L. fermentum* LF1 strains also showed a significant increase in lactic acid production.

Conclusions. According to the results obtained by the spectrophotometric method, lactic acid production capacity depends on the genetic characteristics of the strain and cultivation conditions. *L. fermentum* LF1 strain produced the highest amount of lactic acid and is recommended as the most promising strain for applications in medicine, agriculture, and the food industry.