LACTIC ACID PRODUCTION PATHS FROM ORGANIC SOURCES

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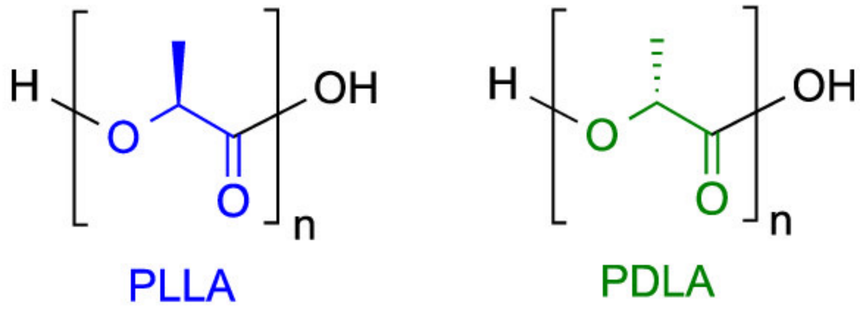
ABSTRACT

The research for better options in the industry of lactic acid production is a modern concern to solve in the most efficient way, in which we achieve the preservation of food security, a sustainable and economic viable production, and solutions to reduce global plastic pollution adopting biodegradable alternatives. There must be a previous critic evaluation to start production that considers the specific substrate and its characteristics, desire product, viability in a social and economic way, and fermentative microorganism.

INTRODUCTION

- The 2-hydroxypropanoic acid or **lactic acid (LA)** is a very adaptable chemical that can be employed as:
  a) an acidic flavor corrector, flavor enhancement and preservative in regular consumption industries,
  b) feedstocks, or raw material, of common use chemicals,
  c) a monomer to create a biodegradable plastic filament called **polylactic acid (PLA**).

  The LA possess two optical isomers: dextro-LA (d-LA) and levo-LA (l-LA) (Hofvendahl, K., 2000).



Molecular structures of poly (l-lactic acid) or PLLA, and poly (d-lactic acid) or PDLA (Tsuji, H., 2021).

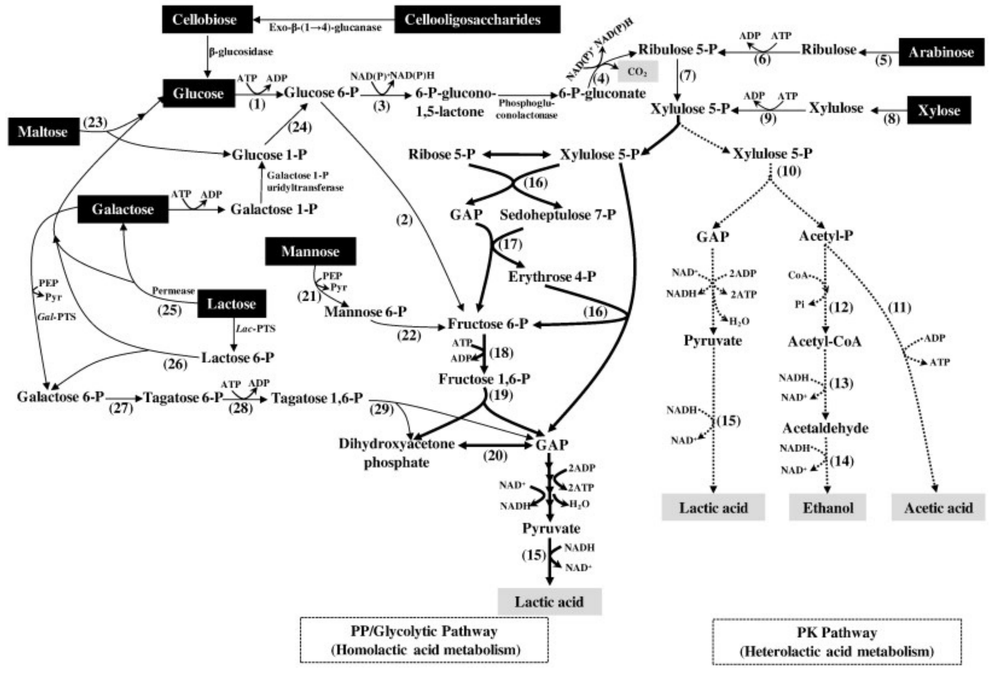
- LA can be produced in two ways: with a chemical synthesis or with a fermentation of the studied subtract, as:
  a) A mixture of equal amount of LA isomers is obtained with a chemical synthesis,
  b) An isolated isomer, d-LA or l-LA, when a specific microorganism that ferments a substrate, from a renewable source, is used at low temperatures that demands small energy requirements.

  Nowadays, the world preference in LA synthesis is the fermentative option (Abdel-Rahman, M., 2013).

- In addition, the LA production by fermentation has a wide range of microbial options in the families of bacteria and cyanobacteria, fungi, yeast, and algae; their single or mixed use would be depending on the quality and quantity expected (Abdel-Rahman, M., 2013), and to the substrate type employed.

- Finally, the economic and sustainable factors must be considered. The elevated price of LA production industry lays in the mainly feedstock of starch from corn and potato that compete with food security. A solution could reside in common food waste which is richer in carbohydrates and nutrients for the fermentation process to substitute the current substrate and reduce pollution (Zhang, Z., 2021).

The organic source composition will determinate which microbial family is suggest to be used, considering chemical and physical control parameters, and how to produced LA in order to reach maximum efficiency.



LA metabolic synthesis paths from diverse carbohydrates by LA bacteria (Abdel-Rahman, M., 2013).

CONCLUSIONS

✓ The quest to find concrete substrate alternatives to synthetize a racemic mixture or a stereospecific (d-LA or l-LA) isomer as a main product, or as raw material for polylactic acid main output; must have to consider the condition of the feedstock and its implication to food safety and profit in order to chose the most suitable path to obtain the desire product and to meet sustainability.

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