

## **Cardoon roots valorization by combined microbial biotransformation for lactic acid production**

**Raffaella Desirè Di Lorenzo**<sup>1</sup>, Immacolata Serra<sup>1</sup>, Paola Branduardi<sup>1</sup>

E-mail: [raffaella.dilorenzo@unimib.it](mailto:raffaella.dilorenzo@unimib.it)

<sup>1</sup> University of Milano-Bicocca, P.zza della Scienza 2, 20126, Department of Biotechnology and Biosciences, Milano, Italy

**Keywords:** cardoon-inulin-microbial biotransformation-Lactic acid

Cardoon, *Cynara cardunculus* L. from *Asteraceae* family, is a Mediterranean perennial plant, growing naturally in harsh habitat characterized by high temperature, salinity and drought. Interest in valorizing this crop has been growing in recent years. In particular, inulin obtained from the roots can be used as substrate in industrial fermentation processes for the production of different chemicals, therefore with a wide range of applications. In this context, our work is based on the use of cardoon roots hydrolysates as fermentation substrate to obtain a microbial sustainable process for lactic acid (LA) production, known to be an attractive chemical platform with different uses, in particular as monomer for polylactic acid (PLA) production.

In order to release fructose from inulin we exploited the inulinase-producing yeast *Kluyveromyces marxianus*, a promising industrial host for the production of several compounds because of its thermotolerance, high growth rate, and broad substrate spectrum, but poor in respect to organic acid tolerance. For the production of LA from fructose, we exploited two engineered yeasts already characterized for high titer and yield of production and for robustness towards organic acid, respectively: *Saccharomyces cerevisiae* (strain m850 [1]) and *Zygosaccharomyces parabailii* (strain Z2  $\Delta$ Leu+LDH [2]). The natural ability to hydrolyze inulin was used to set-up and compare two bioprocesses based on cardoon roots: 1) SSF (Simultaneous Saccharification and Fermentation), where the supernatant of *K. marxianus* cultivation was used in media formulation and *S. cerevisiae* or *Z. parabailii* were inoculated for converting the sugar in LA; 2) CBP (Consolidated BioProcess), in which *K. marxianus* was inoculated together with one or the other LA producing yeasts, in different ratio. Our results will be presented and commented, together with future perspectives.

Funded by MIUR (PRIN, 2017KBTk93).

<sup>1</sup> VALLI, M. (2006). *Applied and environmental microbiology*.

<sup>2</sup> DATO, L. (2010). *FEMS yeast research*.