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Abstract – SY13

BOBCAT: BIOTECHNOLOGIES FOR SUSTAINABLE PRODUCTION OF BIO-BASED COMMODITIES AND SPECIALTY PRODUCTS IN A CARDOON-BASED BIOREFINERY

DOCIMO T.*, PAOLO D.**, LOCATELLI F.**, CAPPETTA E.* , COMINELLI E.**, D'ALESSANDRO R.*, DE PALMA M.*, GRAZIANI G.***, LANGELLOTTI A.L.****, MARTELLO A.****, OLIVIERO M.****, POLLIO A.****, RITIENI A.***, RIZZO M.*****, ANTONELLO V.*****, RE I.*****, D'IMPORZANO G.*****, TUCCI M.*, SPARVOLI F.**

*) Institute of Biosciences and Bioresources, CNR, Portici (Italy)
**) Institute of Agricultural Biology and Biotechnology, CNR, Milan (Italy)
***) Department of Pharmacy, University of Naples Federico II, Naples (Italy)
****) Centre of Innovation and Development in the Food Industry, University of Naples Federico II, Portici (Italy)
*****) Consorzio Italbiotec, Milan (Italy)

Cardoon (*Cynara cardunculus* L. var. *altilis*) is a traditional Italian vegetable crop, with high yields of seed oil with a good fatty acid profile (high oleic acid) and a vigorous ligno-cellulosic biomass characterized by valuable compounds that can be recovered both from the apical part (e.g. chlorogenic acid and other polyphenols) and from roots (inulin). Despite its value as a multifunctional industrial crop, cardoon biomass suffers from seasonal availability and high variability of its quality and quantity. To overcome these hurdles and improve the production and accessibility of bioactive compounds, in this project we investigate the potential use of cardoon cell cultures as an alternative to field cultivation, in the frame of a sustainable cell-based biorefinery. For this reason, different organs and tissues (seeds, hypocotyls, cotyledons and leaves) of cardoon cv. Spagnolo have been characterized for their biochemical and transcriptional profile of fatty acid and phenylpropanoids profile. The molecular analysis of both of these pathways allowed the identification of promising genetic targets to boost the production of the monounsaturated fatty acids/MUFAs (via modulation of committed enzymes of oleic acid biosynthesis) and to increase the accessibility of the cellulose fraction for improved recovery of hydrophilic bioactive compounds. This latest strategy revolves around the reduction of lignin content of cells via the alteration of MYB genes, transcriptional factors known to be master regulators of development and stress response in plants. The research activities also aim at optimizing and scale-up the growth of wild type and engineered plant cell cultures in economically and environmentally sustainable conditions (e.g. using industrial by-products and wastewaters as nutritive substrates), in line with the principles of Circular Economy