Economic evaluation for industrial scale production of cynaropicrin from Cynara cardunculus

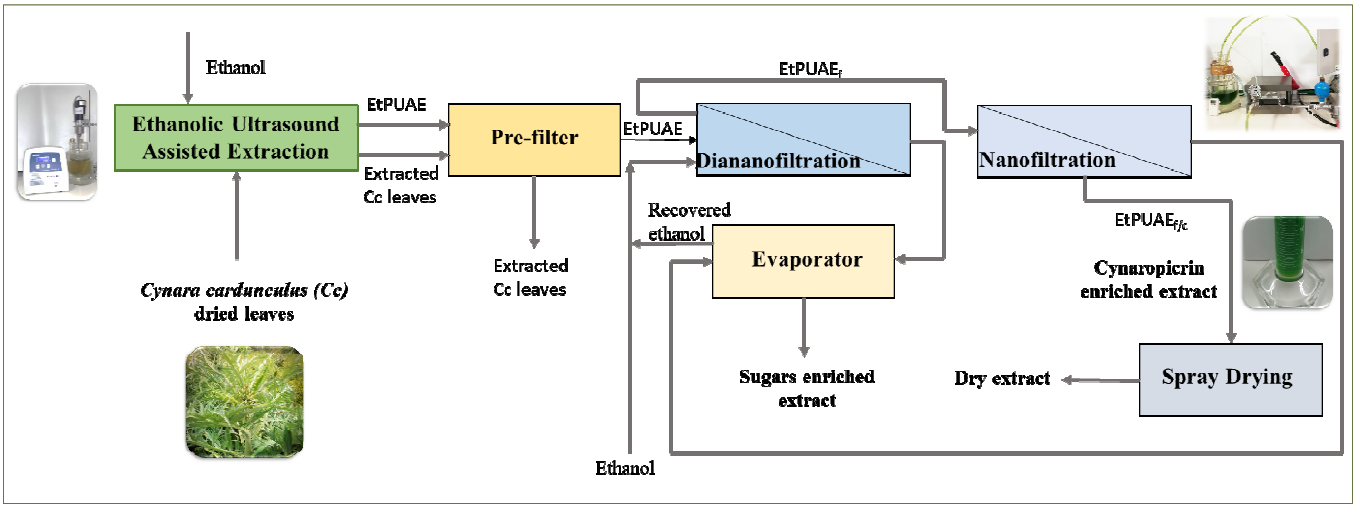
T. Brás[1,2*], C. Brazinha[2], L.A. Neves[2], M.F. Duarte[1,3], J. Crespo[2]

[1]Centro de Biotecnologia Agrícola e Agro-Alimentar do Alentejo (CEBAL) / Instituto Politécnico de Beja (IPBeja), 7801-908, Beja, Portugal [3]LAQV/REQUIMTE
[2]FCT, Universidade Nova de Lisboa, Campus de Caparica, 2829-516 Caparica, Portugal
[3]MED – Mediterranean Institute for Agriculture, Environment and Development, CEBAL, 7801-908 Beja, Portugal
- Email: teresa.bras@cebal.pt

INTRODUCTION

❖ In recent years, more environmentally friend techniques have been investigated and used for the separation, purification and concentration of bioactive compounds, promoting a reduction of processing time and solvent consumption, as well as an increase of the final recovery yield [1]. For the first time applied for cynaropicrin from *Cynara cardunculus* extraction and following extract fractionation, the combination of ultrasound assisted extraction [2] and organic solvent nanofiltration [3] seems to be a promising process for cynaropicrin enriched extracts for industrial application. However, **industrial application is highly dependent of the economic evaluation and the identification of key parameters in order to guarantee a profitable process**.

AIM: Economic assessment of the overall cynaropicrin enriched extracts integrated process and the evaluation of its potential for an industrial scale application



RESULTS

Cynara cardunculus leaves processing capacity (TON/year)	10
Dry extract (kg/year)	520
Investments costs	
Total fixed investment cost (€)	1 349 403.00 €
Total equipment costs (€)	377 800.00 €
Total costs (capital + total operational) (€/year)	907 516.00 €
Revenues (€/year)	1 300 000.00 €
Annual return	
Return without taxes	392 484.00 €
Taxes (25%)	98 121.00 €
Return after taxes (€/year)	294 363.00 €
Pay-back (year)	4.58

❖ Investment cost represents 60% of total costs, with main equipment's being 28% of the total investment.

❖ Dry extract selling price represents the key parameter, to which the pay-back period is more sensitive.

❖ Impact of the biomass cost is not relevant.

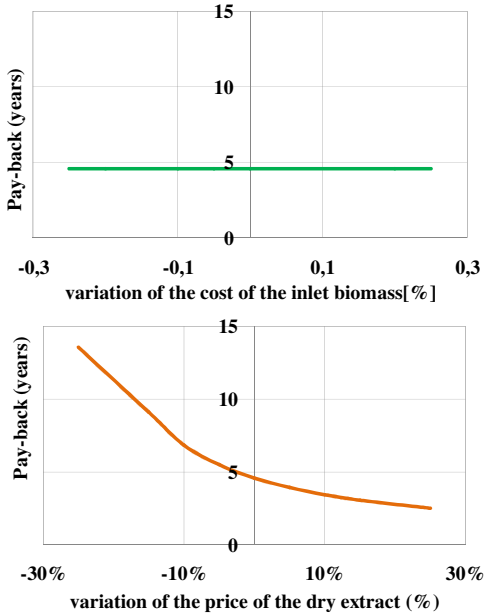


Figure 1. Impact of biomass cost and of extract selling price on the pay-back period of a plant for production of cynaropicrin rich extracts.

References

[[1] Conde, E., Moure, A., Domínguez, et al., Separation, Extraction and Concentration Processes in the Food, Beverage and Nutraceutical Industries , **2013,** pp. 506-594, ISBN: 978-1-84569-645-0
[2] Brás, T., Paulino, A. F. C., et al. Industrial Crops and Products, **2020**, 150, 112395.
[3] Brás, T.; Rosa D.; Gonçalves A.C. et al. Sep. Purif. Technol., **2020**, *submited*

ACKNOWLEDGMENTS

This work was supported by the Program Alentejo 2020, through the European Fund for Regional Development under the scope of to MedCynaraBioTec – Selection of *Cynara cardunculus* genotypes for new biotechnological applications: the value chain improvement of cardoon, a well-adapted Mediterranean crop (ALT20-03-0145-FEDER-039495).. This work was also supported by the Associate Laboratory for Green Chemistry – LAQV, which is financed by national funds from FCT/MCTES (UID/QUI/50006/2019), and Project UIDB/05183/2020 to Mediterranean Institute for Agriculture, Environment and Development (MED). Luísa A. Neves and Teresa Brás acknowledge FCT/MCTES for financial support through FCT Investigator Contract IF/00505/2014, and PhD grant (SFRH/BD/110969/2015), respectively.