RECOVERY OF BETULINIC ACID FROM PLANE TREE BARK
(Platanus acerifolia L.)

J.M. Pinilla¹, A. López-Padilla², G. Vicente³, J.C. Quintela⁴, G. Reglero⁵, T. Fornari²

¹Natac Biotech. Parque Científico de Madrid. C/ Faraday 7, 28049, Madrid, Spain
²Departamento de Producción y Caracterización de Nuevos Alimentos. Instituto de Investigación en Ciencias de la Alimentación (CIAL) CEI UAM+CSIC, C/ Nicolás Cabrera 9, 28049, Madrid, Spain

INTRODUCTION
Betulenic acid (BA) [3β-hydroxy-lupe-20(29)-en-28-oic acid] is a triterpenic acid which can be isolated from various botanical sources including clove, rosemary, tea, and the bark of several betula species (birch trees) [1]. BA as well as its derivatives, have demonstrated a wide range of biological activities, including anti HIV-1 activity, anti-inflammatory activity, antimarial activity, anticancer and apoptotic activity [2, 3].

The presence of BA at concentrations up to 3 % (30 mg/g) in the external dried bark of plane (Platanus acerifolia L.) tree was previously reported [1].

In this work different advanced extraction techniques, such as ultrasounds assisted extraction (UAE), pressurized liquid extraction (PLE) and supercritical fluid extraction (SFE) were studied and compared with conventional solid-liquid extraction (SLE), with the target of recovering BA from the bark of Platanus acerifolia L. Different GRAS ( Generally Recognized as Safe) solvents were utilized (ethanol, ethyl acetate and SCCO₂) and different process conditions were investigated.

EXTRACTION METHODS

<table>
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<tr>
<th>P. Acerifolia L. Bark</th>
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<tr>
<td>d₅₀ = 0.5mm</td>
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<td>ρₚₑₐₓ = 381.7 kg/m³</td>
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<td>Moisture = 9.5%</td>
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RESULTS

Figure 1. Effect of temperature on the extraction of BA from Platanus acerifolia bark: % mass BA in the extract (a) extraction yield (%) and BA recovery (b).

Figure 2. Comparison between the extraction methods using liquid ethanol (SLE, UAE and PLE) and SFE with 0, 10 and 20 % ethanol cosolvent (a) BA recovery; (b) BA concentration; (c) ethanol consumption.

CONCLUSIONS
1. Plane tree bark extract with high concentration of BA was obtained by ethanol UAE, followed by a simple fractionation step using water. This approach produced an extract with 46.21 % mass of BA and 2.7 % yield. Furthermore, ethyl acetate UAE can produce almost two fold increase of extraction yield (53.91 %) with ca. 20 % mass of BA in the extract.
2. The effect of increasing temperature is producing higher yields but lower BA concentrations in the extract (Fig. 1). This conclusion holds for both ethanol and ethyl acetate solvents.
3. The highest BA recovery related with the ethanol consumption was obtained using UAE and SFE (2.4 and 3.0-5.7 mg BA / ml ethanol, respectively).
4. The preliminary SFE accomplished in this work permit to presume that the use of ethanol as CO₂ cosolvent has the most significant effect on the extraction of BA from plane tree bark. In comparison with SLE, UAE and PLE, 20 % ethanol cosolvent resulted in high yield (4.34 %). Good concentration of BA in the extract (18.30 % mass) and almost one third of ethanol consumption. Further investigation to optimize SFE conditions and attain higher BA recovery is necessary.

REFERENCES

AKNOWLEDGMENTS
This work has been supported by project ALIBIRD-5209/16GR-1460 from Comunidad Autónoma de Madrid. A. López-Padilla thanks to COLCIENCIAS (562-2012) and Medellin Mayor’s office (Sappencia/Esala Mundos Program, 2013) for his PhD fellowship.