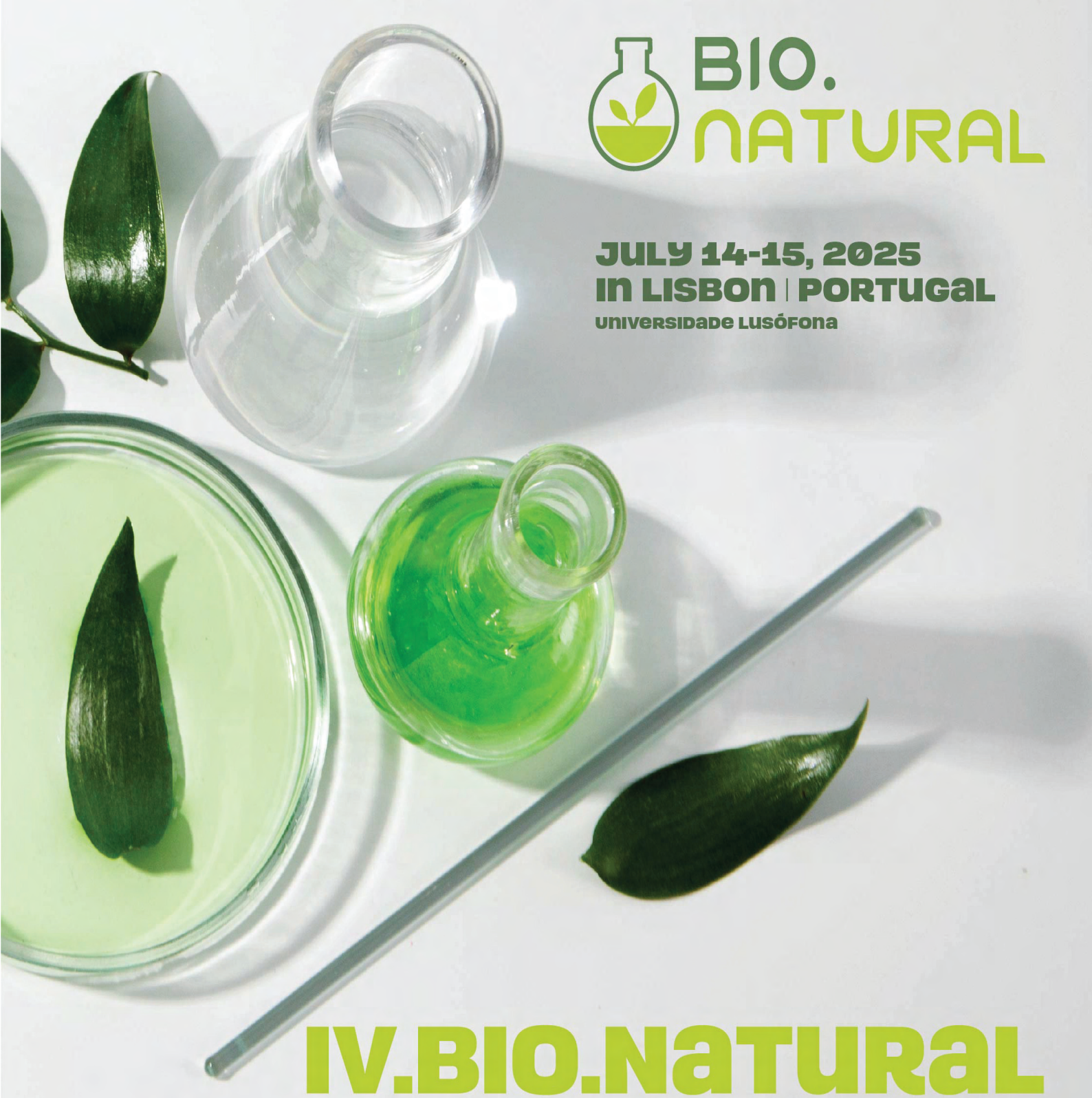

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In the shade of a cork oak: Globalized Bioactive Natural Products under Changing Environmental and Climatic Condition

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Abstract

A key focus of natural products (NPs) research has mostly been on the bioactivity and chemistry of these products. Over the last decades, research on NPs has seen exciting developments both with regards to scientific and technological approaches in all areas (biological-pharmacological activity, structural chemistry, analysis, searching for new sources, and agricultural developments). However, as we look at this development over the period, we also see some important and unique challenges. So far, the paradigm has been developing an evidence base, and far less attention has been paid to sustainability and equitable sourcing.
Here, we propose a framework that prioritizes a focus on environmental aspects of development (see Figure 1) and discuss the scientific basis for this and research needs.

Ascertaining the quality of the finished products made available to consumers ultimately requires countries to have a robust yet simple-to-use regulatory system.
Climate change is reshaping today's 'Vila Morena', including medicinal plants' ecology and pharmacological value, but very little attention has been paid to this, for example, with regard to European ecozones. We have the tools in natural product research, and this presentation will argue for the need to develop a framework for using it under changing circumstances and requirements. I will use examples from our work in these areas, which highlight how such a framework can be developed (cf. Mykhailenko et al. 2025, Heinrich et al 2021), including the development of quality standards (Heinrich et al. 2022).
Heinrich, KM., et al (2020) Access and Benefit Sharing Under the Nagoya Protocol-Quo Vadis? Six Latin American Case Studies Assessing Opportunities and Risk. Front. Pharmacol. 11, 765.

Feasibility of the sustainable harvesting of botanical ingredients for the pharmaceutical Industry: The Case of Epilobium hirsutum

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Abstract

The pharmaceutical industry increasingly relies on high-quality herbal raw materials (HRM) to develop effective and safe therapeutic agents. In this context, optimisation of the collection of HRM is a critical step to ensure standardised composition and, as a result, therapeutic efficacy and safety of the final botanical products [1]. Epilobium hirsutum L. is widespread in European countries and is traditionally used as a tea with anti-inflammatory and prostate-protective effects[2]. However, marker compounds such as oenothein B, gallic acid, and hyperoside could play an important role in their antiviral activities[3], which further emphasises the importance of the standardised collection of HRM and the assessment of the chemical profiles. In this study, we investigated the phytochemical variability of E. hirsutum across different habitats (mesic grassland, wet grassland, and lake shore), plant parts (leaves and stems), and phenological stages (April–October). Using HPLC and HPTLC methods, 11 marker compounds were quantified in 78 samples collected biweekly throughout 2023. Chlorogenic acid was predominant in samples from shaded habitats, reaching up to 2.25 mg/g in leaves during the vegetative phase. Flavonoids such as isoquercitrin and hyperoside peaked in leaves from lake shore and wet grassland habitats during flowering. Oenothein B, a key ellagitannin, showed the highest accumulation in wet grassland leaves during flowering (73.97 mg/g). Shaded, moist habitats promoted greater biosynthesis of secondary metabolites.Preliminary in vitro studies of E. hirsutum extracts showed potential anti-coronavirus SARS-CoV-2 activity against the Omicron strain at 10 µg/mL with inhibition percentages of 46.1%, which is due to the high polyphenol content. Oenothein B showed promising in vitro anticoronavirus activity with an IC50 of 6.08 µM in hACE2-overexpressing HEK293 cells, mimicking the entry of wild-type SARS-CoV-2 into human host cells.

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