Phenolic composition and bioactivities of acorn shell: An exploratory study

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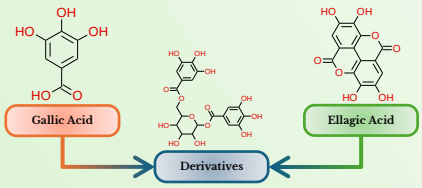
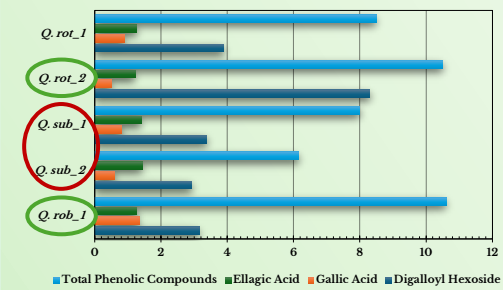
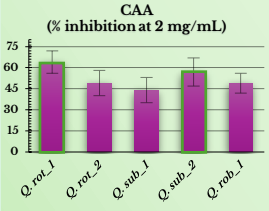
Introduction

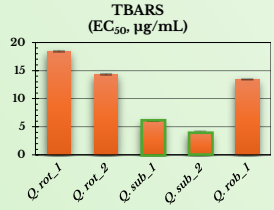
Pedunculate (*Quercus robur* L.), holm (*Quercus rotundifolia* Lam.), and cork (*Quercus suber* L.) oaks are widespread across the Portuguese landscape, covering an estimated area of 1.151 million hectares, which represents about 36% of the country's total forested area [1]. Acorns from these oaks are nutrient-rich, exhibiting an abundant composition of starch, protein, fat, and essential minerals such as calcium (Ca), phosphorus (P), potassium (K), and magnesium (Mg) [2]. They also contain beneficial unsaturated fatty acids, particularly oleic acid and vitamin E, and biologically active compounds like phenolic compounds [2]. This study assessed acorn shells' phenolic composition and bioactive properties to determine their potential as a source of bioactive compounds for developing new bio-based products..

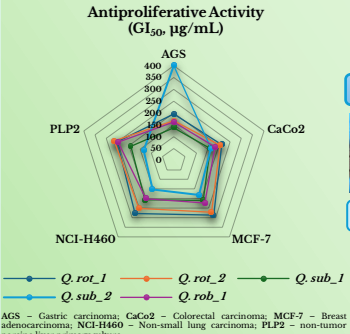
Results



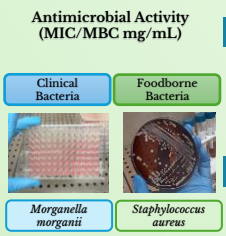








AGS – Gastric carcinoma; CaCo2 – Colorectal carcinoma; MCF-7 – Breast adenocarcinoma; NCI-H460 – Non-small lung carcinoma; PLP2 – non-tumor porcine liver primary culture



The extracts showed the ability to inhibit the bacterial growth of some of the strains tested, with an emphasis on these 2 cultures

Methodology

Acorn Shell

Ground into

Acorn Flour

Aqueous extraction, freeze-drying and analysis of the extract

Phenolic Composition | Antioxidant Activity | Antimicrobial Activity | Antiproliferative Activity




HPLC-DAD-ESI/MS | TBARS & CAA | Clinical & Foodborne Bacteria | Sulforhodamine B Colorimetric assay

Conclusion

Five acorn shell samples from different locations and species were analyzed and the phenolic composition and bioactivities of the extracts were successfully determined. The phenolic profile of all samples was similar and of the 9 phenolic compounds tentatively identified, all corresponded to gallic acid, ellagic acid or derivatives of both. The majority phenolic compound found in all the extracts was digalloyl hexoside. The studied samples exhibit an interesting antioxidant potential, demonstrating ability to inhibit lipid peroxidation and to neutralize reactive oxygen species formation in cellular environment. Interestingly, the *Q. suber* samples stood out, despite having a lower total phenolic content than the extracts of the other species. The samples also showed antiproliferative activities, interfering with the proliferation of all the tumor cell lines tested. An interesting antibacterial activity was also observed, particularly for *Q. suber* extracts. The development of further studies with a larger number of samples, in order to obtain more detailed information and, therefore, identify the bioactive compounds responsible for the promising activities demonstrated would be of great interest.

References

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How this work fits in the Sustainable Development Goals (SDGs) ?

This work supports SDGs 3 and 8. It contributes to Goal 3 by seeking an extract from acorn shells with bioactive properties that can enhance food products, promoting health and well-being. It also contributes to Goal 8 by utilizing an unused by-product from trees that cover 36% of the national territory, aiding in the development and growth of a sustainable economy.