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PHENOLIC COMPOUNDS WITH ANTIRADICAL ACTIVITY FROM THE CORK BOILING WASTEWATER ANAEROBIC DIGESTION

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Abstract:

Purpose of the work. This work aims to develop a procedure that explores the different types of valorization that can be obtained by integrating a biological process, such as the anaerobic digestion, to promote the bioconversion of the industrial cork effluents (cork boiling wastewater, CBW).

Approach. This approach concerns to gain insight about the valuable molecules that are present in the CBW before anaerobic digestion process and in the digested flow. Anaerobic experiments were conducted under mesophilic conditions of temperature. Several important compounds of industrial interest were identify and quantified.

Scientific innovation and relevance. The main innovation of this work lies in the fact that the application of the anaerobic process has never been study in terms of the treatment and valorization of the industrial cork effluents. This is a very relevant work because the cork (outer bark of the cork-tree: Quercus suber L.) is a product of high environmental, economic and social importance in western Mediterranean region, being Portugal the world-leading producer and exporter.

Results. The achieved results indicate that the anaerobic digestion improves the CBW characteristics in terms of the industrial interest. An antiradical activity increase was registered due to the selective production of some phenolic compounds. Ten phenols (gallic acid, protocatechuic acid, caffeic acid, vanillic acid, syringic acid, ellagic acid, pcoumaric
acid, ferulic acid, o-coumaric acid and trans-cinnamic acid) were identified by HPLC analysis in the cork processing wastewaters and in the digested flow. Ellagic acid, present at concentration of 96.5 μg mL-1, and galic acid, at considerably lower amount (19.5 μg mL-1), are the major components of the CBW phenolic fraction. On the other hand, the concentration of phenols of benzoic acids family (gallic, protocatechuic, vanillic and syringic acids) and the o-coumaric acid have been improved during the anaerobic process.

Conclusions. The obtained data show that the anaerobic digestion can be regarded as a biological process that provides other profits than energetic and agricultural valorization of the industrial cork effluents. Industrial valuable molecules can be recovery under a multiple biochemical valorisation plan involving the anaerobic process. Some of these compounds, as the ellagic acid, are molecules that are important components of the human diet due to their potential antioxidant activity, their capacity to diminish oxidative stress-induced tissue damage resulted from chronic diseases, and their potentially utilization in cancer therapy.