Abstract

1. **Biofuel Production from Phytoremediation Derived Sunflower Biomass**
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4. There are presently more than 3 million contaminated sites all over EU, according to the EEA (report 25186 EN). Heavy metal contamination is of particular concern, as metals are not degradable. Phytoremediation is gaining attention from the public and is an attractive low cost alternative for soil requalification, by establishing a vegetation cover which will stabilize the site, avoiding dispersion of contamination and simultaneously removing

pollutants. Although the fate of harvested biomass is a common obstacle for its implementation, it may represent an opportunity for producing energy.

This work presents a novel integrated strategy comprising the utilization of all plant parts for the generation of biodiesel. Combinations of sunflower and plant growth promoting microbiota were assessed growing in agricultural and metal contaminated soils.

Harvested plant tissues were analysed and it was possible to observe that accumulation of Zn and Cd was made mainly in the roots, followed by the stems and the flowers, with the values registered for plants grown in contaminated soils being higher than the reported phytotoxic levels described in literature. Also, plants grown in the agricultural soil presented higher biomass rates.

Sunflower seeds were then used for oil extraction and it was possible to observe efficiencies of up to 20 ml oil/m^2, with only the oil from plants grown in industrial soil presenting levels of 1.8 mg Zn/l. Plant stems were used for bioethanol fermentation with yields of up to 280 and 162 ml/m^2 for plants growing respectively in agricultural and industrial soils. Once again only plants grown in the industrial soil presented detectable levels of 1.1 mg Zn/l (and no Cd).

Biodiesel was then produced via transterification of the extracted oil with the produced ethanol, allowing the complete production of a biofuel from this phytoremediation derived biomass. Reference parameters and heavy metal levels were determined and compared for both the biodiesel derived from plants grown in industrial and agricultural soils

5. This presentation will help the audience to understand that the use of biomass grown in degraded and abandoned soils, not involving agricultural soils for energy crop cultivation, may increase the sustainability of utilizing biomass for energy generation, while it may allow for increasing the available agricultural soil through the consequent gradual decontamination of such brownfields.

6. Ana Marques has completed her PhD in Biotechnology and her potdoctoral studies from the Portuguese Catholic University. She has been involved in research activities since 2000, when she was a researcher at Technical University of Denmark working on the

production of bioparticles for biofilm applications. Since 2002 she has been developing work at CBQF concerning the remediation of disturbed soils using plant-based technologies, with the application of biological tools. She has published 2 book chapters and 22 papers in international peer reviewed journals, participated in numerous conferences and has been serving as a reviewer in several reputed scientific journals.

7. Research interests concern the remediation of disturbed soils using plant-based technologies, with the application of biological tools (mycorrhizal fungi, plant growth promoting bacteria, endophytes, organic amendments, etc) and wastewater biological treatments. The fate and application of produced biomass in phytoremediation strategies is the most recent focus of research.

8. 2 book chapters, 23 papers in international peer reviewed journals; cited 620 times with an h-index of 14.

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