Assesment of the Biofuel Production Potential from Phytoremediation Sunflower Biomass

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Abstract

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).