Organic pollutants uptake by tree species

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Environmental pollution from pharmaceutical and personal care products has become in recent years issue of increasing concern, since the widespread use and continuous release of these substances into the aquatic environment, together with the scarce removal efficiency of traditional water treatment plants. Plant uptake has been demonstrated to be effective for the removal of heavy metals as well as organic contaminants, since plants have the ability to absorb, translocate, and eventually metabolize organic xenobiotic compounds.

The potential of trees in the remediation of some xenobiotics was explored using *Populus alba* L. Villafranca clone as model plant species. Different contaminants belonging to the class of pharmaceutical and personal care products (caffeine, erythromycin, sodium dodecyl sulfate), and heavy metals (zinc), were tested in order to investigate poplar tolerance to these pollutants, and its capability to take up and eventually metabolize pharmaceutical and personal care products.

Villafranca clone maintained a healthy phenotype during the treatments with all the tested pollutants, excluding sodium dodecyl sulfate, where severe foliar necrosis occurred, caused by the release of sodium from the molecule.

With the exception of caffeine, that has been found to be rapidly translocated in leaves, the other pollutants (i.e. erythromycin, and dodecyl sulfate) were preferentially retained at higher concentrations in roots.

The ability of Villafranca clone to metabolize the target xenobiotics has been demonstrated. In particular, degradation of caffeine-(trimethyl-^{13}C) in theobromine-(dimethyl-^{13}C) and theophylline-(dimethyl-^{13}C) was observed.

Additional peaks were detected in the mass chromatograms of erythromycin-treated plant extracts, and they are thought to be epimers of erythromycin.

This work puts the basis for a further investigation of tree tolerance to heavy metals and pharmaceutical and personal care products pollutants, and for studies on tree metabolism of these xenobiotics.