Durable phytoremediation with Miscanthus x giganteus: composition in metals and potassium for its uses as biofuel

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Abstract

Plants are an alternative being considered for the production of biofuel, but development of energy crops increased competition in the use of land resources. Brownfields cover approximately 239 Mha of the world's unexploited soils. Miscanthus x giganteus is able to produce biofuel and is able to grow on polluted sites. The present study is focused on Cd, Cu, Cr, Ni, Pb, Zn and K contents in roots, rhizomes, stems and leaves to optimize bioenergy production on brownfields. Regarding metal partitioning, Cr and Ni are not accumulated in the whole plant. Bioconcentration factors and translocation factor calculations show that Cd, Cu, Pb and Zn are mostly stocked in rhizomes and roots. Low concentrations of metals in aboveground biomass should facilitate its use in combustion units. K content is similar in control samples and brownfield samples during the growing season, but K remobilization is blocked at the end of autumn if plants are cultivated on brownfields. K increase in aboveground biomass could be a limiting parameter of biofuel production in brownfield cultures because of critical problems of fouling and slagging in combustion units. K regulation associated to exclusion of metal should be investigated to standardize engineering practices in brownfield culture.

Recent and relevant Publications

1. Laval-Gilly P., Henry S., Mazziotti M., Bonnefoy A., Comel A., Falla J., 2017, "Miscanthus x giganteus composition in metals and potassium after culture on polluted soil and its use as biofuel", Bioenergy Research, DOI: 10.1007/s12155-017-9846-3.
2. Mazziotti M., Henry, S., Laval-Gilly P., Bonnefoy, A., Falla J., 2017, "Comparison of two bacterial DNA extraction methods from non-polluted and polluted soils », Folia Microbiologica, DOI 10.1007/s12223-017-0530-y
3. Técher D., D'Innocenzo M., Laval-Gilly P., Henry S., Bennasroune A., Martinez-Chois C., Falla J., 2012, "Assessment of Miscanthus × giganteus secondary root metabolites for the biostimulation of PAH-utilizing soil bacteria", Applied Soil Ecology, 62, 142-146
4. Técher D., Martinez-Chois C., Laval-Gilly P., Henry S., Bennasroune A., D'Innocenzo M., Falla J., 2012, « Assessment of Miscanthus x giganteus for phytoremediation of long term PAH contaminated soils », Applied Soil Ecology, 62, 42-49



Biography

Philippe LAVAL-GILLY (ReseachID J-8118-2013) is Assistant Professor at the Laboratory of Soil and Environment and Associate Director of the Technological Institute of Thionville-Yutz (University of Lorraine, France). He began his career working in immotoxicology to study the relationships between pollution and immunity. But, as Lorraine is particularly rich in brownfields, he naturally became interested in the durable phytoremediation of contaminated soils. His activity is particularly focused on the influence of metallic and organic pollutants on the rhizosphere through root exudates and microorganisms, as well as on the biomass produced. He is currently working on Miscanthus x giganteus as model for its ability to produce an important biomass and to grow on brownfields. He also tries to develop the use of the biomass produced on brownfields (energy, construction materials, etc.) in short circuits of valorisation.

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Notes/Comments: